National Defence / Défense nationale

B-GA-442-001/FP-001

TACTICAL AVIATION TACTICS, TECHNIQUES AND PROCEDURES

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 Commander 1 CAD **2000-12-15**

Canada

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OPI: 1 Wing A7 Doctrine **2000-12-15**

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FOREWORD

AUTHORITY

1. This publication, *Tactical Aviation Tactics, Techniques and Procedures* (TTPs), is issued on the authority of the Commander 1 CAD. It is effective upon receipt and supercedes the TTPs dated 1999-06-01.

2. Suggestions for amendment should be forwarded to Headquarters 1 Wing, Attention: A7 Doctrine.

AIM

3. The aim of this publication is to standardize 1 Wing CH 146 Griffon Helicopter tactics, techniques and procedures required to conduct the tactical aviation doctrinal tasks and missions detailed in B-GA-441-001/FP-001, *Tactical Level Aviation Doctrine*.

SCOPE

4. This publication applies to both aircrew and squadron support personnel. All personnel responsible for the planning and conduct of CH 146 operations must be familiar with the information in this publication.

5. The Table of Organization and Equipment (TOE) is based on that identified for OP SABRE Utility Squadrons, but may vary dependant on the operation. It will be used for the tactical employment of the CH 146 helicopter to support land force operations, other commands, and government agencies.

6. Promulgation of this publication does not negate the need for unit COs and squadron personnel to plan and employ helicopters in the most efficient means reflective of the environment, the theatre or the tactical situation, and the higher commander's intent.

REFERENCES

7. The primary references for the preparation of this publication were:

a.	AD-121-F01/JX-000	*CF Manual of Abbreviations*;
b.	AAP-6 (U)	*NATO Glossary of Terms and Definitions*;
c.	ATP-40 (A)	*Doctrine and Procedures for Airspace Control in the Combat Zone*;
d.	ATP-41 (A)	*Airmobile Operations*;

e.	ATP-49 (B)	*Use of Helicopters in Land Operations*;
f.	B-GA-440-000/AF-000	*Tactical Helicopter Operations*;
g.	B-GA-441-001/FP-001	*Tactical Level Aviation Doctrine*;
h.	B-GL-300-000/FP-000	*Canada's Army*;
i.	B-GL-300-002/FP-000	*Land Force Tactical Doctrine*;
j.	B-GL-300-003/FP-000	*Land Force Command*;
k.	B-GL-301-003/FP-000	*Peacekeeping Operations*;
l.	B-GL-303-001/FP-001	*Specific Operations - AIRMOBILE OPERATIONS*;
m.	B-GL-371-002/FP-001	*Field Artillery, Vol. 2, Duties Of The Battery Commander And The Observer*;
n.	CFACM 40-46	*CH146 Standard Manoeuvre Manual*;
o.	CFACM 60-2605	*Airlift Operations - Search and Rescue*; and
p.	R-GL-F01-101 (FM1-101)	*Aviation Battlefield Survivability*.

8. Related references include the following:

a.	STANAG 7030	*Combat Search And Rescue (CSAR)*;
b.	FM 90-4	*Air Assault Operations*; and
c.	FM 43-130	*Intelligence Preparation of the Battlefield*.

9. **Family Of Tactical Aviation Publications**. The tactical aviation doctrine, tactics and procedures family of publications are as follows:

a. B-GA-440-000/AF-000. *Tactical Helicopter Operations*;

b. B-GA-441-001/FP-001. *Tactical Level Aviation Doctrine*;

c. B-GA-442-001/FP-001. *Tactical Aviation Tactics, Techniques and Procedures*;

d. B-GA-443-001/FP-001. *1 Wing Unit Standing Operating Procedures (WUSOPs)*;

e. B-GA-444-001/FP-001. *1 Wing Tactical Aide Memoire (TAM)*; and

f. B-GA-445-001/FP-001. *1 Wing CH 146 In-Flight Systems and Procedures Handbook*.

RECORD OF CHANGES

CH No.	Page Number(s)	Change Date	Date Entered	Signature
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6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

AVIATION MISSION PLANNING

GENERAL

1. Aviation mission planning, like any military planning procedure, is based on Battle Procedure. Tactical aviation support is predicated on the requirements of the supported unit's plans and operations.

2. The land force commander receiving tactical aviation support, although not directly concerned with the details of tactical aviation support planning, should be aware of the capabilities and limitations of tactical aviation when formulating plans. Land force staffs use the operational planning process to develop their orders. An aviation version of this process can be found at Annex A.

3. Mission success can be determined by the effective use of Battle Procedure (BP) as a foundation for effective planning. The principles of BP include:

a. anticipation of tasks;

b. early warning;

c. an effective grouping system;

d. effective and pertinent drills, procedures and SOPs; and

e. concurrent activity.

PLANNING CONSIDERATIONS

4. Planning considerations may include:

a. an effective training program and system of standards to determine the operational readiness of individual aircrew/ groundcrew;

b. maintaining a current tactical situation map at tactical aviation formation HQ and sub-unit command posts;

c. maintaining a current record of aircraft availability and serviceability;

d. briefing of aircrew;

e. confirmation of tasks by supported units and if time permits, rehearsals;

f. locating tactical aviation formation sub-units in appropriate locations to provide communication and support to supported units; and

g. providing a logistic plan designed to avoid interruption of support.

THE PLANNING PROCESS

5. **Receive The Warning Order**.

6. **Conduct An Initial Time Estimate/Map Recce**. As much as possible, adhere to the principle of using one third of the time available for your planning and giving the remaining two thirds to subordinates for their planning.

7. **Issue A Warning Order**. Send a Wng O to appropriate units, flights or sections, following as required the following format:

   a. general outline/probable mission;

   b. earliest time or notice to move for the mission;

   c. time and location of orders, and who will attend;

   d. special requirements and aircraft configuration if known; maximize concurrent activities for all parties;

   e. restrictions on recce and movement; and

   f. acknowledgement by all addressees. (Who/what means/by when).

8. **Receive Orders**. As a minimum, the AMC and ALO should attend these orders. Other attendees should include the Sqn Ops O, the Flt Comd and AUCs. The initial planning checklist in Chapter 2 can be used to start filling in information.

9. **Outline Plan/ Recce Plan**. Once orders are received, consider a detailed recce plan either eyes on, map or photographs. Ensure a plan is developed before setting out on a recce to avoid wasting time. Start to develop the plan by dividing it into the five following phases:

   a. the ground tactical plan;

   b. the landing plan;

   c. the air movement plan;

   d. the loading plan; and

   e. the staging plan.

10. **Issue A Supplementary Warning Order**. This will ensure that concurrent activity is taking place. This is especially important during short notice, time critical missions. Pass on as much information as is available concerning:

   a. routes;

   b. PZ, LZ locations;

   c. probable loads;

   d. ammunition; and

   e. CEOIs, etc.

11. **Conduct Recce And Liaison**. The ALO should have been dispatched to the LUC immediately after the Orders were received, unless further coordination between the AMC and the ALO was required.

12. **Complete The Estimate**. Most msns will only allow for a cbt estimate to be conducted.

a. A written or mental appreciation is composed of the following sections:

(1) aim;

(2) factors;

(3) courses open; and

(4) plan.

b. **Aim**. The aim can be difficult to decipher, therefore, conduct a mission analysis/assessment of the tasks to be completed to develop the mission clearly. It details:

(1) what is to be done both specific and implied tasks plus constraints, restraints and limitations;

(2) where is it to be done;

(3) when is it to be done; and

(4) any limitations on movements or timings.

c. **Factors**. The aviation mission commander should be provided with sufficient information to evaluate the pertinent factors as they pertain to the task. Below are some, but not all, the factors that impact a mission:

(1) **Enemy**:

(a) size and type of enemy forces;

(b) dispositions and probable activities or probable intentions in the area of operations (attacking, defending, in reserve, etc);

(c) equipment/weapons/ranges. Proximity of enemy AD (capabilities, location, range, etc) in proximity to the area of operations;

(d) reaction to aircraft/tactical helicopters;

(e) offensive/tactical air and air defence capability; and

(f) enemy's status, i.e. morale, state of supply, strength, etc.

(2) **Friendly Troops**:

(a) aviation and air assets available for the mission;

(b) disposition and plans of units in the area of operations;

(c) fire support available;

(d) details of other users of air space, i.e. artillery, mortars, drones, fighters, and other ac, i.e., a forecast of activities in the airspace;

(e) any assistance available from friendly troops, i.e. direct fire support, early warning, air defence, Electronic Warfare (EW) support; and

(f) alternate aviation locations and any planned moves.

(3) **Aircraft Performance**:

(a) density altitude;

(b) all up weight (AUW);

(c) any restrictions on aircraft performance;

(d) range/endurance;

(e) mission equipment required; and

(f) maintenance/servicing inspections, i.e. hours remaining.

(4) **Equipment and Personnel**:

(a) aircraft configuration and equipment requirements;

(b) aircraft and equipment availability;

(c) aircrew availability and limitations;

(d) any personnel or equipment to be collected or delivered prior to the task (FARPs);

(e) armament; and

(f) crash/survival equipment.

(5) **Communications**:

(a) security and availability of frequencies/call signs, unit codes, codewords, passwords & nicknames;

(b) nets to be monitored; and

(c) reports required by when, to whom and how.

(6) **Logistics**:

(a) fuel/oil requirements, and refuelling facilities;

(b) rearming facilities (FARP requirements);

(c) rations and water; and

(d) casualty evacuation.

(7) **Airspace Coordination**:

(a) coordination for reserving corridors or routes through the area of operations with the proper control agency;

(b) information of friendly air defence postures and gun/troop positions;

(c) the availability of indirect fire support (Fire Support Plan); and

(d) other operations or activities in the mission area, which may have an effect on the aviation units (i.e., CAS).

(8) **Ground**:

(a) the general area of operations (where the mission will take place);

(b) possible routes, cover, background, concealed approaches, possible observation and fire positions; and

(c) predominant ground, orientation features, reference points and probable navigation/communication difficulties.

(9) **Meteorology**:

(a) local conditions;

(b) forecast for the next four to twenty four hours;

(c) general conditions;

(d) conditions affecting aircraft performance;

(e) hours of darkness, daylight remaining, first light/last light;

(f) sun position;

(g) conditions of moonlight; and

(h) wind; and

(10) **Time and Space**:

(a) time available for the operation (when the mission will take place);

(b) time appreciation to include, time available for recce, rehearsals, preparation of operations; and

(c) the possible move by the aviation unit, priorities, and logistics factors.

d. **Courses Open**. This is generally an outline of the methods for achieving the aim. Try to have three to four Course of Action (COAs) for comparison. From the factors, consider the enemy COAs first, then yours and compare each to determine the most likely COA.

e. **Plan**. From the courses open, the best plan is chosen and detailed planning and orders are produced. The other COAs should not be totally discarded, as certain points may be required if the situation requires any change in the plan chosen.

13. **Prepare and Issue Orders**. An example of Aviation Mission Orders can be found at Annex B to Chapter 3.

Annex A to
Chapter 1

THE DECISION MAKING PROCESS

1. The Operational Planning Process is discussed in depth in B-GL-300-003/FP-000, *Land Force Command*. A diagram of the decision making process is included at the end of this chapter. This Annex is based on the land force planning process and has been modified for aviation to provide COs, Flt Comds and squadron staff with guidance on decision making. Often, tac hel squadrons do not have the time to complete a detailed formal estimate. However, it is important for mission success that an estimate is conducted, even if it is abbreviated.

2. In a time constrained environment the importance of warning orders (Wng Os) increases as available time decreases. Subordinate units must have information to allow them to conduct concurrent planning.

a. **Mission Analysis**. Receipt of the mission and mission analysis are the first steps in the tactical decision making process. Often the tac hel unit is given multiple tasks to support a formation's mission and the CO and staff must make a careful analysis of their mission in order to ensure that they can meet all assigned tasks with the assets available. Mission analysis consists of actions related to:

(1) gathering facts,

(2) analyzing the superior's mission and intent,

(3) developing specified and implied tasks from orders, guidance, and habitual relationships,

(4) determining the constraints and the limiting factors,

(5) determining the essential tasks, and

(6) determining the availability of assets;

b. **Mission Statement**. Once these factors are analyzed the CO can approve a mission statement;

c. **Course of Action (COA) Development**. To develop COAs the staff must focus on key information necessary to make decisions. An essential element in COA development is that the course developed must support another unit's concept of operations. In most cases the tac hel mission is to support another unit. Since the COA developed is executed in conjunction with the supported unit**,** the staff must ensure that the two plans are mutually supporting and fully integrated. Focusing on the supported unit's mission and concept of operations during COA development, allows the staff to remain focused and likely limits the number of COAs developed, thus saving time. COA development includes the following elements:

(1) determining enemy activities and capabilities,

(2) analyzing the assets available (maintenance, crew cycles, crew experience),

(3) developing a concept of operations,

(4) determining command and control means and control measures (these should be kept to a minimum), and

(5) developing a COA statement;

d. **Concept of Support Development**. For units conducting missions where the unit's helicopters are task organized to a supported formation or unit (OPCON), the mission analysis should be further developed into a concept of support for their unit. The CO and staff must assess the status of the unit (maintenance, crew cycle), and match that against the current mission load of the unit. Based on this assessment, the staff determines the best method to employ the unit helicopters to accomplish all assigned missions;

e. **Decision**. Staff analysis identifies the best COA for recommendation to the CO. Analysis begins when the Sqn Ops O or the mission commander briefs the CO about each COA. If a COA is deemed inadequate, then the staff must modify the COA to make it feasible or eliminate it. Once a COA is determined to be feasible, it is compared against other feasible COAs, usually by comparing them against the enemy COAs. The results of this comparison are briefed to the CO who decides which COA is developed into the order; and

f. **Plan Development**. The CO and squadron staff must always keep in mind the following considerations when developing the plan and orders for the helicopter unit:

(1) **Staff Integration**. All staff members play a critical role in the development of plans and orders. The Sqn Ops O must ensure that each relevant section and flight is integrated into the planning process so that all squadron elements can be synchronized. Intelligent Preparation of the Battlefield (IPB) provides the Sqn Intelligence Officer (IO), the tools needed to quickly evaluate incoming information and intelligence;

(2) **Time Management**. Planning for helicopter missions requires detailed coordination with external units. When supporting other formations or units, information received initially is often incomplete. The ops staff must work diligently to gather all facts regarding missions. The Sqn Ops O or mission commander ensures that orders are produced in a timely manner; and

(3) **Warning Orders**. Warning orders may be written or verbal, but they must occur to ensure that all flights are updated with the latest mission data. In helicopter operations, complete information may not be available at one time, therefore effective warning orders by the staff are critical to the success of the unit's missions. Subsequent warning orders can be developed if critical information becomes available after the initial warning order has been issued. The most important factor is to give as much initial planning information as possible, as soon as possible.

3. **Abbreviated Decision Making**. The focus of any decision making is to quickly develop a flexible plan that increases the likelihood of mission success. While difficult to do in an abbreviated manner, all staffs must be capable of producing a sound plan in a short time. Anticipation, coordination, and preparation are the keys to success in a time-constrained environment. There are two primary techniques to save time in the decision making process as follows:

a. the CO provides guidance and limits the options, focusing the staff on the areas that the CO feels are most important; and

b. limit the number of COAs that are developed. In extreme cases, the CO may direct that only one course of action be developed.

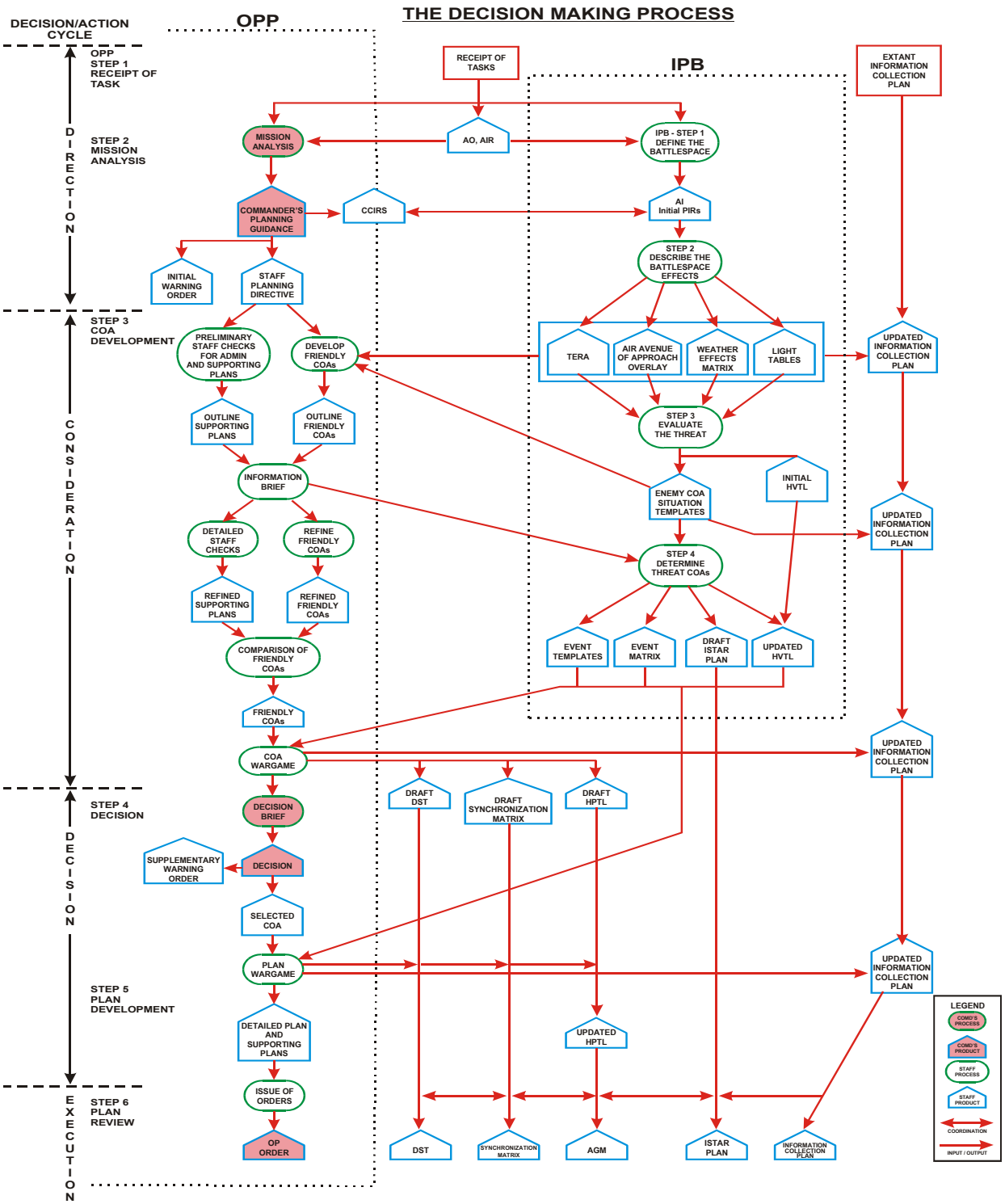


Figure 1-A-1: The Decision Making Process

CHAPTER 2

AIRMOBILE INITIAL PLANNING CHECKLIST

GENERAL

1. The purpose of this chapter is to provide a suggested format for an airmobile planning checklist. This checklist should be used by the AMC during the initial coordination with the AFC or LUC in the development of the airmobile plan. It will assist in developing critical information needed by both the aviation planners and the ground forces. From this, the Op O can be written.

2. Initial information required from the AFC for the Op O:

a. **Ground Unit Mission**:

_____

_____

b. **Enemy Situation (Receive from unit IO)**:

(1) location/equipment;

(2) capabilities; and

(3) probable COAs during the airmobile.

c. **Friendly Situation (Obtain An Operations Overlay from the Ops O)**:

(1) mission of next higher unit;

(2) AFC's intent; and

(3) location of adjacent units.

d. **Airmobile Task Organization**.

(1) forces available for the airmobile; and

(2) command relationship of available forces.

e. **Concept of the Ground Operation**.

f. **Force Required to be Air Moved**:

(1) Total # of Pax;

(2) Total # of Sling Loads (by type):

TYPE	**NUMBER**	**WEIGHT**
_____	_____	_____
_____	_____	_____

(3) Internal Cargo Requirements (Type, amount, and weight).

g. **Proposed PZ Locations**.

h. **Proposed LZ Locations**.

i. **Fire support assets available**.

j. **Reconnaissance helicopter missions**.

k. **Attack helicopter missions**.

l. **Planned Rehearsals (DTG)**:

(1) ground force operations rehearsal;

(2) airmobile operations rehearsal;

(3) fire support rehearsal; and

(4) PZ Rehearsal.

3. **Fire Support/EW Plan**.

a. Supporting artillery unit (Type and Location).

b. Gun-target (GT) line for firing batteries.

c. Receive a copy of current target lists produced by the FOO.

d. EW assets available for the mission.

e. **Close Air Support**:

(1) unit/type Aircraft;

(2) number of missions/sorties;

(3) munitions;

(4) final control procedures; and

(5) airspace control measures in effect for CAS.

4. **Landing Plan**.

a. Tentative H-Hour (if known).

b. Primary LZ selection:

LZ NAME	**LZ LOCATION**
_____	_____
_____	_____

c. Alternate LZ Selection:

LZ NAME	**LZ LOCATION**
_____	_____
_____	_____

d. Total number of loads for each LZ.

e. **LZ Preparatory Fires**:

(1) initiated by;

(2) initiate at (Time/Loc); and

(3) type of last round.

f. **Attack/Armed Helicopter Supporting Fire Plan**:

(1) weapons configuration;

(2) holding area locations;

(3) battle position locations;

(4) on-station times;

(5) relief times;

(6) weapons orientation;

(7) sectors of fire;

(8) fire control measures (ROEs, engagement priorities, target priorities); and

(9) AD weapons control status.

g. **Door gun weapon status.**

h. **Holding area locations.**

i. **Extraction Requirements**:

(1) **Primary PZ Selection:**

PZ NAME	**PZ LOCATION**	**PZ MARKING**
_____	_____	_____
_____	_____	_____

(2) **Alternate PZ Selection:**

PZ NAME	**PZ LOCATION**	**PZ MARKING**
_____	_____	_____
_____	_____	_____

(3) Extraction Code Words.

5. **Air Movement Plan**.

a. **Air Routes/Corridors/Axis**:

(1) primary (See Overlay); and

(2) alternate (See Overlay);

b. **Attack/Armed Helicopter Concept**:

(1) link up time and location with lift assets;

(2) attack routes:

(a) primary; and

(b) alternate; and

(3) actions on contact;

c. **Fire Support Plan**:

(1) responsibility for calling fires;

(2) firing battery gun:

(a) target line;

(b) call sign; and

(c) frequency; and

(3) target list (on overlay if possible);

d. **False Insertions/Deception En route**:

LZ NAME	**LZ LOCATION**
_____	_____
_____	_____

e. **Time warnings that the flight crews will provide to the ground forces**;

f. **Hazards en route**;

g. **Downed Helicopter Procedures**:

(1) flight crew; and

(2) passengers;

h. **Bump Plan**; and

i. **En Route Mission Abort Criteria**:

(1) loss of aircraft; and

(2) other.

6. **Loading Plan**.

   a. **PZ Data**:

      (1) PZ number;

      (2) PZ name;

      (3) PZ location;

      (4) PZ landing heading;

      (5) PZ markings;

      (6) PZ control frequency and procedures;

      (7) PZ control officer;

      (8) PZ diagram (attach to this a sketch of the PZ); and

      (9) external load procedures.

   b. **Total Pax to be moved**;

   c. **PZ security plan**;

   d. **Helicopter Loads**:

      (1) priority of loads;

      (2) ACL for each helicopter;

      (3) ammo/ pyros;

      (4) combat load of the PAX (including Ruck Sacks, Weapons, etc.);

      (5) special equipment required;

      (6) number/type of sling loads; and

      (7) slung load procedures (Hook-up Procedures, Markings, Rigging, and Locations);

   e. static loading required (Yes/No); and

   f. doors open/doors closed?

7. **Other Coordination Requirements**:

   a. **Follow-on Missions/Contingencies**:

      (1) CASEVAC (Determine pick-up locations, drop off locations, call signs and frequencies of drop off sites, codewords); and

      (2) re-supply operations;

   b. **CSAR and Downed Aircrew/Helicopter** procedures, security, and location(s);

c. **ALSE Requirements**:

(1) floater collars (Yes/NO); and

(2) life rafts (Yes/No);

d. **Armament Requirements**:

(1) chaff/flares; and

(2) ammo/door guns;

e. **MOPP Level;**

f. **Location and time of the LUC orders;** and

g. **Location and time of the aviation Orders**.

8. **Command and Signals**.

a. **AFC location during the airmobile;**

b. **LUC location;**

c. **AMC location;**

d. **Sqn Ops O location;**

e. **Sqn CP location for airmobile;**

f. **Will Airborne C2 be Used (Yes/No?):**

(1) pick-up time and location;

(2) passengers;

(3) COMSEC loading procedures; and

(4) ROZ limits/procedures.

g. **Communications Procedures:**

(1) establish radio nets for PZ control, lifted unit, Avn Comd Net, Tac Air Net, Fire Sp Net; and

(2) verify COMSEC.

9. **FARP Procedures**. Coordinate FARP requirements through Ops.

10. **Force Protection**:

a. fratricide avoidance measures;

b. weapons handling; and

c. risk assessment.

11. **Time Check** with key personnel.

CHAPTER 3

AVIATION MISSION ORDERS AND AIRCREW MISSION BRIEFING FORMATS

GENERAL

1. The purpose of this chapter is to provide a suggested format for Aircrew Mission Orders and an Aircrew Mission Briefing. The orders and briefing are based on the standard CF "Orders" format, but are modified slightly to address all the details required in an aviation specific mission.

AVIATION MISSION ORDERS

2. Aviation Mission Orders can be used for airmobile, air movement, medical support operations or any other aviation type operation with modifications as the mission dictates. It is in the format of an Op O and may be used by the AMC to issue orders or by the Flight Commander or Element Lead in issuing their orders. Depending on the size of the operation and level the orders are given, certain details may be eliminated or added.

3. This is a comprehensive set of orders. Many of the items can be briefed as "SOP" or left out if they are covered in Unit SOPs, Air Movement Table or Mission Log Card. The key is to **only brief the information needed for each level. Do not try and tell the element leads, section leads or aircraft captains how to do their jobs**. The format for Aviation Mission Orders is detailed at Annex B.

AIRCREW MISSION BRIEFING

4. The briefing is used at the element and section level and provides the basic information that would have been provided from the formation and mission commander's briefings. This is not a complete brief and as such, some items may have to be included. Depending on the complexity of the mission and number of elements involved, this briefing may not be required at the element level since all personnel will have been present at the higher orders but will be used at the section and crew level only.

5. At this level of briefing, the Mission Planning Card will encompass the majority of the information found below and the Briefing may be taken mainly from that. **Brief only what is required. Do not brief SOP items as other than "SOP"**. The format for an Aircrew Mission Brief is detailed at Annex C.

Annex A to
Chapter 3

AVIATION MISSION ORDERS PREAMBLE

MSN Number:

1. **Introduction and Admin Notes (Ops O or D/AMC)**

   a. roll call;

   b. aircraft status and significant limitations; and

   c. hold all questions until the end of the briefing.

2. **Mission Overview**. A two minute synopsis to acquaint all with scenario before orders.

3. **Time Zone**: (local/zulu/GPS/gunner).

4. **References**. It is important to specify the Datum in use for Msn. Different scale maps may use different Datums, i.e., an AWACS 1:500,000 may be different than a Land Forces 1:100,000 or a 1:50,000.

5. **Weather**. (Briefed by Met pers if aval).

   a. **Reqr**: Ceiling_____ Visibility_____ Winds_____;

   b. **Actual**:

      (1) Ceiling_____ Visibility_____ Winds_____;

      (2) Alt_____ Max Temp_____ Min Temp_____;

      (3) Max PA_____ Max DA_____;

   c. **Weather Forecast**:

      (1) Ceiling_____ Visibility_____ Winds_____;

      (2) Alt_____ Max Temp_____ Min Temp_____;

      (3) Max PA_____ Max DA_____; and

   d. **Light Data**:

      (1) Sunrise_____ Sunset_____ Moonrise_____ Moon Set_____;

      (2) Moon Phase_____ Moon Position_____ Moon Elevation _____ Illum_____(MLx).

6. **Active Ranges/ No Fly Areas.**

Annex B to
Chapter 3

AVIATION MISSION ORDERS FORMAT

"ORDERS"

1. **SITUATION**.

   a. **GENERAL**. A simple description of the overall mission.

   b. **ENEMY** (Briefed by IO if aval):

      (1) loc/size;

      (2) wpns;

      (3) morale;

      (4) movement;

      (5) strengths;

      (6) weaknesses;

      (7) air defence;

      (8) air threat;

      (9) NBCW threat;

      (10) laser threat;

      (11) artillery threat;

      (12) EW capabilities (DF/Jam);

      (13) latest contacts;

      (14) avenues of approach;

      (15) likely courses of action; and

      (16) disposition of land forces.

   c. **FRIENDLY**.

      (1) location/size;

      (2) boundaries;

      (3) current intent - two levels higher; and

      (4) current and forecast AD and AAAD Weapons Control Status - Weapons Hold, Weapons Tight or Weapons Free.

   d. **ATTS and DETS**.

2. **MISSION**. (Who, what, where, when, why) to (type of sp) (who) from (where) (when).

3. **EXECUTION**.

a. Commander's Intent.

b. Concept of Operations.

c. Groupings and Tasks:

(1) **Aircrew Grouping**. (If preparing written orders, it is suggested that a task allocation matrix Annex be used).

ac	**Crew**	**C/S**
____	_____/_____/_____	_____
____	_____/_____/_____	_____
____	_____/_____/_____	_____
____	_____/_____/_____	_____

(a) **UTTH**.

i. Grouping; and

ii. Tasks.

(b) **LOH**.

i. Grouping; and

ii. Tasks.

(c) **AH**.

i. Grouping; and

ii. Tasks.

(d) **ARTY**.

i. Grouping; and

ii. Tasks.

(e) **EW Sp**.

i. Grouping; and

ii. Tasks.

(f) **CAS Sp**.

i. Grouping; and

ii. Tasks.

(g) **Maint**.

i. Grouping; and

ii. Tasks.

(h) **Log Sp**.

i. Grouping; and

ii. Tasks.

d. **Coordinating Instructions**.

(1) **Timings**. **H-Hour**- _____(L or Y-Hours as reqr)

(a) Phase 1 - _____;

(b) Phase 2 - _____;

(c) Phase 3 - _____;

(d) Phase 4 - _____;

(e) _____ hrs/min notice to move eff_____; and

(f) No go time - _____;

e. **Staging Plan**:

(1) started by;

(2) check in;

(3) taxi;

(4) location of staging;

(5) lighting;

(6) Post Start procedures (i.e. SPS 65 Self Test);

(7) Arming Point procedures (i.e. Ground Arming ASE);

(8) take-off;

(9) formation type/spacing;

(10) speed;

(11) route to PZ;

(12) landing time at PZ; and

(13) hazards.

f. **Loading Plan**:

(1) location of ALO;

(2) location of first chalk;

(3) use of signals;

(4) bump plan (keep it very simple):

(a) U/S ac;

(b) spare ac; and

(c) min ac reqr.

g. **Air Movement Plan**:

(1) time off PZ;

(2) formation type/space en route;

(3) movement technique;

(4) route/altn;

(5) altitudes;

(6) speed;

(7) lighting;

(8) hazards; and

(9) pathfinders:

(a) signals; and

(b) action at CCP.

h. **Landing Plan**:

(1) LZs; and

(2) landing formation.

i. **Extraction Plan**:

(1) PZs;

(2) timings (on call/by who/what means/lost comms back-up);

(3) method;

(4) CASEVAC; and

(5) PWs.

j. **HA**:

(1) location;

(2) landing formations; and

(3) radio watch procedures.

k. **Airspace** (Much of this can come from the ACO/SPINS):

(1) ACP;

(2) ROZ/MEZ/HIDACZ, etc;

(3) start point;

(4) release point;

(5) coordination altitude;

(6) CCPs (Coordination Control Points); and

(7) air defence status.

l. **Deception Plan**:

(1) false LZ(s);

(2) actions in LZ; and

(3) timings.

m. **ASE** (This can be referred to the Mission Log Card):

(1) ASE-MAWS (AUTO/OFF);

(2) RLWR; and

(3) CMDS Status (Auto/Manual, which helicopter(s)).

n. **IFF** (This can be referred to the Mission Log Card):

(1) MODE 1;

(2) MODE 2;

(3) MODE 3A; and

(4) MODE 4.

o. **Door Gun Weapon Control Measures**:

(1) ROE; and

(2) Door Gun Weapon Status. Either:

(a) STOWED;

(b) LOADED; or

(c) READY.

p. **Actions On Contact**:

(1) on ingress;

(2) at LZ/other; and

(3) on egress.

q. **Door Gun Ammunition Rates** (Referred to in %):

(1) en route to PZ;

(2) en route to LZ;

(3) at LZ; and

(4) egress to FARP/HA.

r. **SAR/ CSAR Procedures** (If different from SOPs);

s. **Fuel**:

(1) **BINGO Fuel**. Define (ac is at min fuel and required to RTB); and

(2) **JOKER Fuel**. Define (fuel required to complete the msn and RTB/FARP).

t. **Fire Plan** (Briefed by BC or FOO):

(1) Gun positions;

(2) Details. (times, control measures, authorization to adjust, location of BC or FOO party ...); and

(3) **CAS Plan**:

(a) ac type;

(b) C/S;

(c) laser codes;

(d) ordnance;

(e) station time;

(f) IP locations; and

(g) sorties available.

u. **Emergencies**:

(1) en route;

(2) lost lead;

(3) IIMC; and

(4) downed helicopter.

v. **NBC (MOPP) Level**.

4. **SERVICE SUPPORT**.

a. **Material and Services**.

b. **FARP**.

(1)

LOC	**NAME**	**OPEN**	**CLOSE**
_____	_____	_____	_____
_____	_____	_____	_____

(2) Ammo aval -_____

(3) Fuel aval -_____

(4) Restrictions -_____;

c. **Transport**. (if applicable).

d. **Personnel**.

(1) rations; and

(2) rest.

e. **Aircraft configuration**.

f. **PW Handling**.

5. **COMMAND AND SIGNALS**.

a. **Command**:

(1) Commander;

(2) Altn Comd;

(3) AFC;

(4) AMC; and

(5) LUC.

b. **HQ LOCs**: Bn/Coy/Wing/Sqn/Tac Base.

c. **Communications**:

(1) AD net (pri/altn freqs, C/S, codewords, who monitors);

(2) ground unit net (pri/altn freqs, C/S, codewords, who monitors);

(3) CAS net (pri/altn freqs, C/S, codewords, who monitors);

(4) Arty net (pri/altn freqs, C/S, codewords, who monitors);

(5) other (EW);

(6) HVQK Net - _____;

(7) IFF;

(8) Anti-Jamming Procedures;

(9) Lost Comms; and

(10) EMCON. (radio minimize/radio silence, etc.).

d. **Codes in Effect**. _____ valid:_____;

e. **Local Password**.

f. **CODEWORDS/ NICKNAMES**.

g. **Confirmatory Orders**:

(1) where;

(2) when; and attendees.

h. **Rehearsal**:

(1) where;

(2) when; and attendees.

i. **Debriefing**:

(1) where;

(2) when; and attendees. (intelligence staff, Ops, etc.).

6. **TIME CHECK**.

7. **QUESTIONS**.

Annex C to
Chapter 3

AIRCREW MISSION BRIEFING FORMAT

ALL TIMES (LOCAL/ZULU/GPS/GUNNER)

1. **SITUATION**.
   a. enemy;
   b. friendly forces;
   c. atts and dets; and
   d. weather and illumination.
2. **MISSION**. (Who, what, where, when, why).
3. **EXECUTION**.
   a. General outline/route;
   b. Groupings and Tasks (by section or aircraft. May use matrix);
      (1) groupings:

Callsign	**Crew**	**Aircraft**
_____	_____	_____
_____	_____	_____
_____	_____	_____

      (2) tasks.
   c. **Coordinating Instructions**:
      (1) timings;
         (a) start;
         (b) check-in;
         (c) take-off;
         (d) en route;
         (e) PZ; and
         (f) LZ;
      (2) altitudes/airspeeds;
      (3) formation type and spacing;
      (4) lead changes;
      (5) bump plan/aircraft U/S;

(6) PZ and LZ formations;

(7) airspace:

(a) ROZ/ACP/RANGES;

(b) start point;

(c) release point; and

(d) coord altitudes;

(8) fast air:

(a) time on target; and

(b) type and numbers;

(9) IFF;

(10) actions on contact (By Section/Individual Aircraft);

(11) emergencies/ downed aircraft;

(12) fuel:

(a) BINGO (min fuel to RTB); and

(b) JOKER (min fuel to complete msn and RTB/FARP); and

(13) IIMC/lost lead.

4. **SERVICE SUPPORT**

a. **FARP**.

LOC	**NAME**	**OPEN**	**CLOSED**
_____	_____	_____	_____

b. **Personnel**:

(1) rations; and

(2) rest.

c. **ac configuration**.

5. **COMMAND AND SIGNALS**

a. **Command**:

POSITION	**NAME**	**LOC**	**C/S**
AMC	_____	_____	_____
ELM LD	_____	_____	_____
SEC LD	_____	_____	_____

b. **Signals**:

(1) formation C/S;

(2) element C/S; and

(3) freqs:

	PRI	**ALTN**	**CODEWORD**
A/A	_____	_____	_____
GND FORCE	_____	_____	_____
TAC AIR	_____	_____	_____
SQN	_____	_____	_____

(4) HVQK/ KY58 Fills.

6. **TIME CHECK**.

7. **QUESTIONS**.

CHAPTER 4

DOOR GUNNERY

GENERAL

1. The primary purpose of door guns on the CH 146 is to provide self-defence during flight and on the ground, for the helicopter, its crew and its passengers. They supply a suppressive fire capability that, along with other protective techniques such as evasive manoeuvres and ASE, allows the helicopter to carry out missions in a hostile tactical situation. Door guns will normally be part of the mission equipment for any operations where there is a risk of the helicopter being fired upon by hostile forces.

DESCRIPTION

2. The C6 LEP installation is composed of three separate assemblies, the Machine gun External Pintle Connection (MEPC), the Light External Pintle Connection (LEPC) and the Light Pintle Head (LPH). An optional intercom foot switch is also available.

3. The normal self-defence configuration for a CH 146 is a C6 mounted on each side of the helicopter. Each installation consists of one General Purpose Machine Gun (GPMG), 7.62 mm, C6, with spade grips and trigger housing, fitted on a LPH, mounted on the LEPC (Figure 4-1). A right hand installation requires the GPMG LH/RH conversion kit (Figure 4-2). The LPH incorporates an elastic cradle assembly with approximately one centimetre of available travel designed to absorb vibration caused by weapon firing and prevent transmission of this vibration through the mount to the airframe. The assembly is installed on the hard points located at FS 129 and 155 and permits flight with doors closed. The left and right pintle heads and guns are different and not interchangeable.

4. In addition to the vibration absorption mechanism, the LPH is composed of the C6 attachment mount, an articulated fork that allows azimuth and elevation movement, the ammunition box bracket and catch bag. The LEP gun mount was designed to cover an arc of fire of approximately 130 ^{o} and is limited by physical stops. The user can adjust the specific arc of fire with respect to the helicopter during installation of the mount. The total arc of fire, however, cannot be changed. A 60^{o} forward and 70 ^{o} aft (measured perpendicular to the helicopter centreline) arc of fire was determined to provide the best overall compromise and ensure adequate clearance from compatible mission kits. Elevation coverage is approximately 50 ^{o}; +5 ^{o} up and -45 ^{o} down, measured with respect to the helicopter floor. Total travel is again defined by physical stops.

5. In order to minimize the risk of FOD to the helicopter, a canvas bag is fitted under the LPH to collect empty casings and links. The capacity of the bag is limited to approximately 450 casings and links, the equivalent expenditure of two full belts of ammunition. Shortly after the expenditure of two complete belts, the casings and links will fill the bag to the point where they will interfere with the machine gun's mechanism, causing a stoppage. Few engagements in a combat situation would allow the firing of even this much, but if a prolonged firing of more than

two belts is required, the bag should be opened. Such a situation implies that damage to the helicopter is more likely from enemy action than from FOD.

6. The characteristics of the machine gun, as well as the handling drills, are described in B-GL-385-004/PT-001 *General Purpose Machine Gun*, 7.62 mm, C6, and will not be repeated, in detail, in this publication. The handling drills will be carried out as detailed in that publication, the only required deviation for the door gun application being the inversion of left and right where necessary for the right hand feed gun. Also, barrel changes in flight are not advisable, and are normally not even required due to the short engagements and additional cooling by the relative airflow. Barrels are matched to specific machine guns and serialized; they must not be interchanged. In an emergency, such as being downed in hostile territory, the guns may be removed from the mounts and, with the bipod re-installed, used to provide local defensive fire.

Figure 4-1: Right Hand Installation

LIMITATIONS

7. The airspeed with the guns secured and the doors closed is 140 KIAS or the calculated V_{NE} With the doors open to operate the guns, the cargo door open V_{NE} applies.

8. The door guns are compatible with the following external mission kits: Thermal Imaging System, Nite Sun, Skis, HF Antenna and Aircraft Survivability Equipment. The C6 LEP installation is not compatible with the following internal mission kits: auxiliary fuel tank (same side), longitudinal litter kit (same side), lateral litter kit and spotter windows (same side). When the rescue hoist is installed, the right hand machine gun and mount must be removed before the hoist can be operated.

9. While in flight, 100% Rotor RPM is maintained for all normal operations.

10. The C6 GPMG will be operated at low rate of fire (650 rounds per minute) only.

AIRCRAFT CONFIGURATION

11. As noted above, the normal defensive configuration consists of GPMGs mounted on both sides of the helicopter. Two guns will provide an adequate defense for the helicopter by providing nearly all round fire, mutual support, and depth, particularly in formations. Any resort to the use of a single gun must only be made after a complete estimate of the tactical situation and thorough risk assessment that considers the inadequacy of such a configuration. The use of the rescue hoist will not allow for installation of the right hand door gun; missions requiring the use of the hoist in a hostile situation will likely require the addition of a second helicopter for the mission to provide the necessary covering firepower.

12. The right hand door gun will be manned by the Flight Engineer (FE), who will be seated on the right hand transmission seats. While still able to provide clearing calls from that side, he must remain at that station, and will be unable to move through the cabin in order to carry out such functions as “two full” checks, or to assist the pilots in any other cockpit drills.

13. An appropriately trained door gunner, who will be seated on the left hand transmission seats, will man the left hand gun. Although the responsibility to clear the left side remain with the left hand pilot, the left hand gunner is also required to voice appropriate clearing calls for the left side of the helicopter when necessary, but like the FE, must remain at his station, and is normally unavailable for other duties in the cabin.

14. Each door gun requires a locally produced bag for carrying a spare barrel, cleaning/tool kit, and the bipod for the gun. This bag may be carried in the baggage compartment. A locally produced strap, with six snap hooks, is tied to the floor rings and is used to secure the ammunition boxes.

15. The positioning of the two gunners precludes the normal eight-passenger capability for the CH 146. Retaining the five forward facing seats may allow the stanchion posts to interfere with the gunners’ ability to traverse the gun easily through its allowable arc of fire. Use of the four man, rear facing seat to provide additional capacity should only be considered if the passengers are not wearing fighting order. To carry more than five soldiers in fighting order, the forward facing seats may be removed and seat belts installed on the floor tie down rings in a suitable, mission specific arrangement.

16. Each door gunner will wear a FE restraint harness, with the tail attached to the transmission bulkhead lashing rings. Flight gloves are adequate for handling the gun, including barrel changes, but arctic mitts with trigger fingers may be necessary during cold weather operations. Door gunners will also wear flight helmets with visor down to communicate and to protect head, eyes and hearing. Due to the increased sound pressure, it is recommended that the gunners should also wear earplugs during firing.

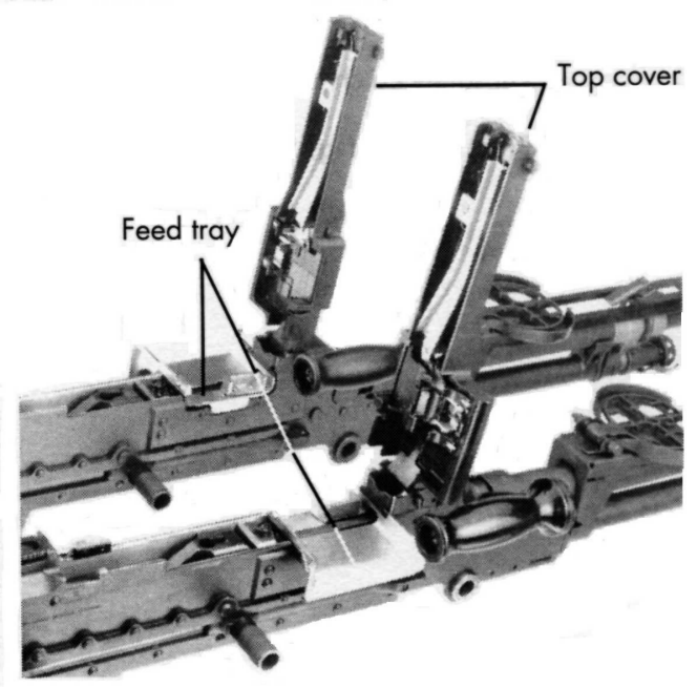


Figure 4-2: C6 GPMGs with Left and Right Hand Feeds

MACHINE GUN THEORY OF FIRE FOR DOOR GUNS

17. During firing of machine guns from ground or air, an understanding of the factors affecting MG fire, and methods of compensating that may be available, will allow the door gunner to effectively engage targets.

18. Ballistics is the science of the motion of projectiles and the conditions that influence that motion. The four types of ballistics influencing helicopter-fired weapons are interior, exterior, aerial and terminal. Each type produces dispersion, which is the degree that projectiles vary in range and deflection about a target.

INTERIOR BALLISTICS

19. Interior ballistics deals with characteristics that affect projectile motion inside the barrel, and includes the effects of propellant charges. Gunners cannot compensate for these characteristics when firing. The relevant characteristics are:

a. **Barrel Wear**. Gaseous action, propellant residue, and projectile motion wear away the barrel's inner surface or cause deposits to build up. These conditions result in lower muzzle velocity, a decrease in accuracy, or both;

b. **Propellant Charges**. Production variances can cause differences in muzzle velocity and projectile trajectory. Temperature and moisture in the storage environment can also affect the way propellants burn; and

c. **Projectile Weight**. The weight of projectiles of the same caliber may vary. These variations do not significantly influence trajectory.

EXTERIOR BALLISTICS

20. Exterior ballistics deal with characteristics that influence the motion of the projectile as it moves along its trajectory. The trajectory is the flight path of the projectile as it flies from the muzzle of the weapon to the point of impact. Aerial fired weapons have all the exterior ballistic characteristics associated with ground fired weapons. They also have other characteristics unique to helicopters. The characteristics of exterior ballistics are discussed below:

a. **Air Resistance**. Air resistance, or drag, is caused by friction between the air and the projectile. Drag is proportional to the cross section area of the projectile and its velocity. The bigger and faster a projectile is, the more drag it produces.

b. **Gravity**. The projectile's loss of altitude because of gravity is directly related to range. As range increases, the amount of gravity drop increases. This drop is proportional to time of flight (distance) and inversely proportional to the velocity of the projectile. Door gunners must correct for gravity drop. Table 4-1 shows gravity drop for different projectiles.

Projectile	Approximate Muzzle Velocity (feet per second)	Range (metres)	Approximate Gravity Drop (mils)
7.62 mm	2,800	1,000	7
.50 cal	2,900	1,000/1,500	9/18
20 mm	3,380	1,000/1,500	9/21
30 mm	2,640	1,000/2,000	15/60

Table 4-1: Gravity Drop

c. **Yaw**. Yaw is the angle between the centerline of the projectile and the trajectory. Yaw causes the projectile's trajectory to change and drag to increase. The direction of the yaw constantly changes in a spinning projectile. Yaw maximizes near the muzzle and gradually subsides as the projectile stabilizes, in the manner of a properly thrown football.

d. **Projectile Drift**.

(1) When viewed from the rear, most projectiles spin in a clockwise direction. Spinning projectiles act like a gyroscope and exhibit gyroscopic precession. This effect causes the projectile to move to the right, which is called the **horizontal plane gyroscopic effect**. As the range to target increases, projectile drift increases.

(2) to compensate for this effect in aircraft without fire control computer solutions, the gunner increases any correction, such as elevation, depression, or deflection, to hit the target. To compensate for projectile drift, the gunner establishes combat sight settings or adjusts rounds toward the target. This compensation is known as using "burst on target". Figure 4-3 shows projectile drift; and

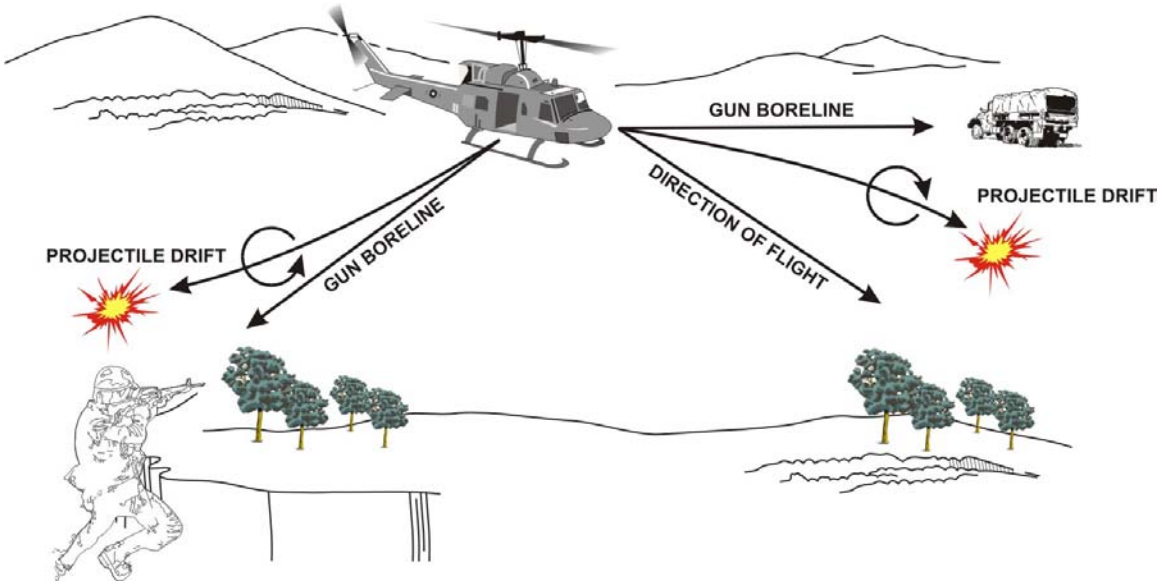


Figure 4-3: Projectile Drift

(3) **Wind Drift**. The effect of wind on a projectile in flight is called wind drift. The amount of drift depends on the projectile's time of flight and the wind speed acting on the cross sectional area of the projectile. Time of flight depends on the range to the target and the average velocity of the projectile. When firing into a crosswind, the gunner must aim upwind so that the wind drifts the projectile back to the target. Firing into the wind or downwind requires no compensation in azimuth but will require range adjustment.

AERIAL BALLISTICS

21. Aerial ballistics are the characteristics peculiar to projectiles fired from helicopters. These include:

a. **Rotor Downwash Error**. Rotor downwash acts on the projectile as it leaves the gun barrel. This downwash causes the projectile's trajectory to change. A noticeable change in trajectory normally occurs when the helicopter is operating below effective translational lift. Effects of the rotor downwash are as follows:

(1) maximum error is induced by rotor downwash when the weapon system is fired from a helicopter hovering IGE, as shown in Figure 4-4. Air flows downward through the rotor system and causes the round to pitch up as it leaves the barrel.

(2) When the round passes beyond the rotor disk, air flows upward and causes it to wobble. This airflow causes both lateral (azimuth) and linear (range) errors.

(3) When the helicopter is hovering OGE (Figure 4-5) the relative wind strikes the round only from above after it leaves the barrel. This condition decreases the lateral error. However, the velocity of the rotor downwash increases because of the additional power required to maintain OGE hover, which may increase linear dispersion.

(4) High density altitudes and a heavily loaded helicopter further increase linear dispersion. During IGE and OGE hovering flight, the true airspeed vector of the helicopter affects the position of rotor downwash and the speed of the downwash at the barrel muzzles. For example, holding a position over the ground during a right crosswind results in a true airspeed vector to the right and a shift of the downwash to the left. This shift affects the left bullets for a longer time during launch than the right bullets. The left bullet also will pitch up to a higher quadrant elevation and go farther than the right bullet.

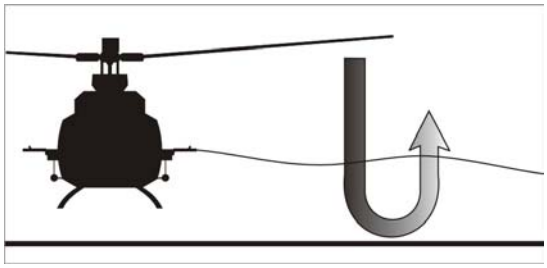


Figure 4-4: Downwash IGE

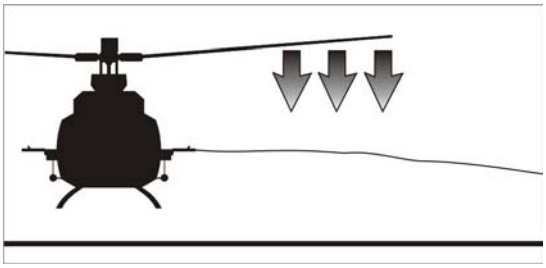


Figure 4-5: Downwash OGE

b. **Spin Stabilized Projectiles**. Certain exterior ballistic characteristics are peculiar to spin stabilized projectiles fired from weapons with rifled barrels. These weapons include the .50 calibre and 7.62 mm machine guns, and the 20 and 30 mm cannons. When fired in a fixed mode (straight ahead of the helicopter), the projectiles generally have the same ballistic characteristics as ground fired weapons. However, relative wind changes and the velocity of the helicopter increase or decrease the velocity of the projectile. Ballistic characteristics influencing spin stabilized projectiles fired from positions other than a stabilized hover are discussed as follows:

(1) **Trajectory Shift**. When the boreline axis of the weapon differs from the flight path of the helicopter, the movement of the helicopter changes the trajectory of the projectile. For off axis shots within ±90 ^{o} of the helicopter's heading, trajectory shift causes the round to hit left or right of the target. To correct for trajectory shift, the gunner leads the target. To lead the target, the gunner places fire on the near side of the target as the helicopter approaches it. The amount of lead depends on the airspeed of the helicopter, angle of deflection, velocity of the projectile, and range of the target. Figure 4-6 shows trajectory shift. Table 4-2 shows some examples of how to compensate for trajectory shift.

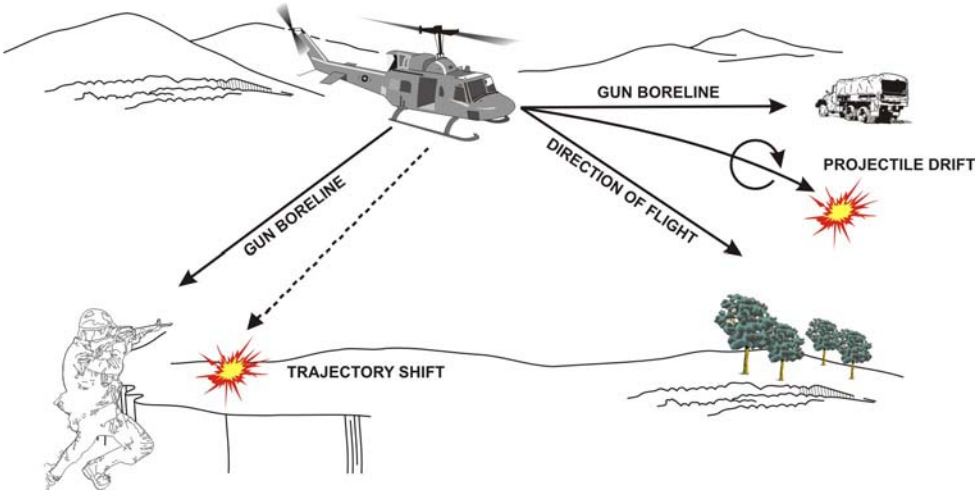


Figure 4-6: Trajectory Shift

Projectile	Approximate Muzzle Velocity (FPS)	Helicopter Velocity (kts)	Lead Angle (mils)
7.62 mm	2,800	100	51
.50 cal	2,900	100	49
20 mm	3,380	100	47
30 mm	2,640	100	64
40 mm	795	100	182

Table 4-2: Typical Lead Angles for a 60 Degree Deflection Shot at 1,000 Metres

(2) **Port-Starboard Effect**. Trajectory shift and projectile drift combine to constitute the port-starboard effect. When targets are on the left, the effects of drift and shift compound each other; both cause the round to move right. To hit the target, the gunner must correct for both ballistic effects by firing to the left of the target. When targets are on the right, the effect of projectile drift (round moves right) tends to cancel the effect of trajectory shift (round moves left). Therefore, firing requires less

compensation. The range and airspeed at which a target is engaged determine which effect is greater. For example, at ranges less than 1,000 metres, trajectory shift is greater. The gunner must fire to the right of the target. At ranges beyond 1,000 metres, the effect of projectile drift is greater and tends to cancel the effect of trajectory shift.

(3) **Projectile Jump** (vertical plane gyroscopic effect):

(a) When a crew fires a weapon from a helicopter in flight and the weapon's muzzle is pointing in any direction other than into the helicopter's relative wind, the projectile will experience projectile jump. Projectile jump begins when the projectile experiences an initial yaw as it leaves the muzzle. The yaw is in the same direction as the projectile's direction of rotation. The jump occurs because of the precession (change in axis of rotation) induced by crosswind.

(b) The amount a projectile jumps is proportional to its initial yaw. Firing to the right produces a downward jump; firing to the left produces an upward jump. To compensate the gunner must aim slightly above a target on the right of a helicopter and slightly below a target on the left. The amount of compensation required increases as helicopter speed and angular deflection of the weapon increase. Compensation for projectile jump is not required when firing from a hover.

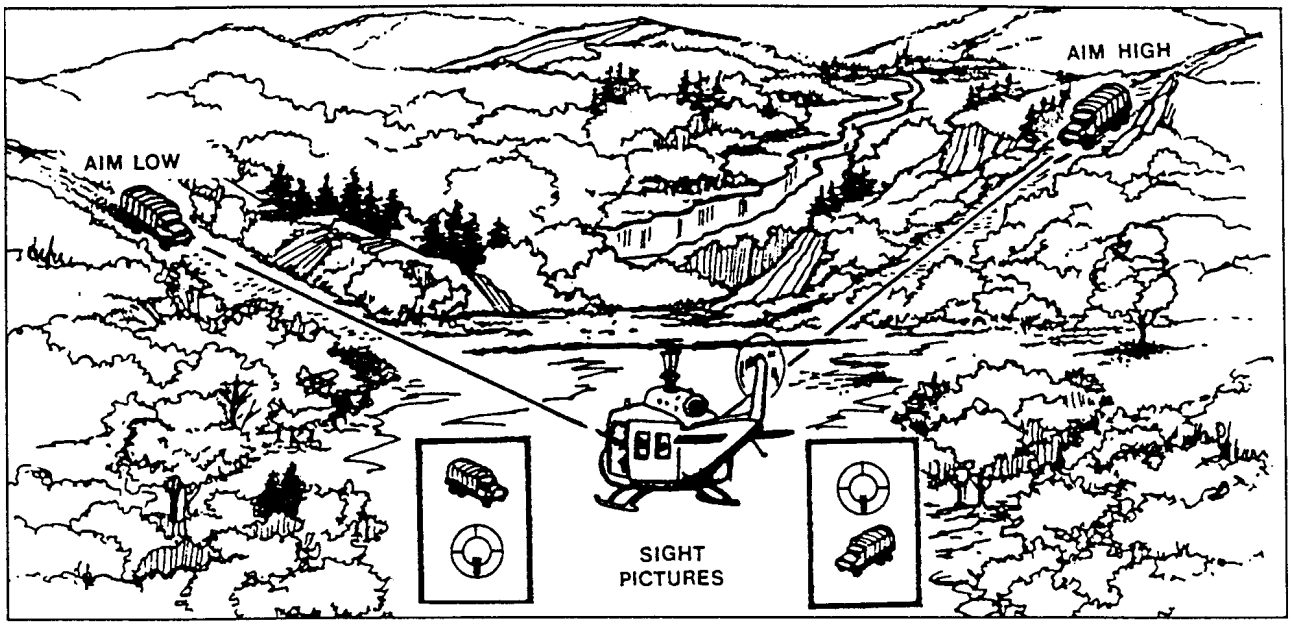


Figure 4-7: Projectile Jump

TERMINAL BALLISTICS

22. Terminal ballistics describes the characteristics and effects of the projectiles at the target.

23. **Dispersion**. If several projectiles are fired from the same weapon with the same settings in elevation and deflection, their points of impact will be scattered about the mean point of impact of the group of rounds. The degree of scatter (range and azimuth) of these rounds is called dispersion, and creates a cone of fire. The mean point of impact with respect to the target center, or intended air point, is an indication of the weapon's accuracy. Both dispersion and accuracy determine whether a particular weapon can hit an intended target; for machine guns, as range increases, dispersion increases and accuracy decreases. Dispersion is caused by errors inherent in firing projectiles. These errors are influenced, in part, by the factors discussed in the ballistics paragraphs. In addition, they may be influenced by the vibrations in the mount and condition of the sighting systems. The cone of fire striking the ground creates a pattern called a beaten zone.

24. **Vibrations**. Because mounts for weapons are fixed to the helicopter, vibrations in the helicopter transmit through the mounts. These vibrations affect azimuth and elevation. Because door guns are free to traverse and elevate within limits, and are in the gunner's hands, the gun barrel will never be pointed exactly the same for each round.

25. **Sights**. The condition of the sights (if used) and the accuracy of their alignment with the bore axis of the weapon cause a displacement of the dispersion pattern of the projectiles. Firing the door gun by instinctive pointing and correcting using tracer and strike further widens dispersion.

26. **Boresight**. Proper boresighting of aircraft weapons is critical to accurate fires. Improper boresighting is a factor in dispersion differences between like aircraft.

27. **Impact Factors**. Several factors will influence the gunner's ability to effectively adjust fire and engage a target:

a. **Tracer**. Tracer ammunition does not generally begin burning brightly until about 100 metres and burns out at approximately 800 metres. It can also be difficult to see the tracer during daylight against a bright background such as snow or very light coloured sand. At target ranges beyond 800 metres, the burnout may be mistaken for impact, especially if there is no other strike indications;

b. **Surface Conditions**. Along with tracer, observation of bullet strike is important for adjusting fire. If the target is in an area where bullet strike may not be visible, such as heavy vegetation, and beyond tracer visibility, the following technique may be used. An area near to the target in which strike is visible is fired upon to adjust, then a further adjustment is made into the target; and

c. **Angle of Impact**. During plunging fire, bullets will bury themselves, but as the angle of incidence shallows, they will bounce and skip, depending on the surface. Generally, it is preferred to have bursts strike just short of the target, particularly if they will strike shallow, in order to allow easier viewing of strike and greater impact on the target.

28. These ballistic factors may seem to confuse the gunner's ability to align the gun appropriately to bring fire on a target. However, knowledge of these factors combined with some experience firing in several flight regimes and the use of "burst on target" adjustment will allow the gunner to quickly bring effective fire on the desired target without complicated sighting mechanisms.

TARGET ACQUISITION

29. In order to ensure timely detection and location of targets in order to suppress them, door gunners, and pilots as well, need to be aware of why things are seen, visual search techniques, range estimation, and target indication methods.

30. The ability to observe effectively is an acquired skill. An understanding of the recognition factors is required in order to develop that skill. These factors are:

a. **Shape**. Experience teaches one to associate an object with its shape or outline. At a distance, the outline of an object can be recognized long before the details that make it up can be determined.

b. **Shadow**. Against a dark background the light surfaces of an object will be distinguishable while against a light background the dark or shadowed sides will show. In addition, an object may cast a shadow beside it, which may be visible although the object itself it is out of sight. Objects in a shadow may be missed because the eye tends to accept conspicuously dark or light areas as uniform, and does not seek out minor differences in darkness or lightness within them.

c. **Silhouette**. Anything silhouetted against a contrasting background is conspicuous. Any smooth flat background, like water, a field or, most frequently, the sky will provide such a contrast. Any object may be silhouetted simply by being seen against a background of a different colour. Clothing and camouflage are chosen to match the background, if possible.

d. **Movement**. Although movement by itself seldom reveals the identity of an object, it is the most important factor for revealing existence. Even though the other recognition factors have been completely eliminated, an observer will be attracted to an area if movement is not controlled. The observer may be concentrating on one area, but he will not fail to detect movement in another area through side vision.

e. **Spacing**. In nature, things are seldom regularly spaced. Regular spacing, therefore, usually indicates man made objects, and attracts the eye of the observer. Examples are regularly spaced fire trenches or parked vehicles.

f. **Position**. An object is often identified by its position in relation to its surroundings. A long object on a railroad track is assumed to be a train; similar objects on a river and parallel to its banks are assumed to be boats or barges. A large structure in a group of frame buildings might be a barn. Position is nothing more than the relationship in space of one object to another object or objects.

g. **Texture**. Texture may be defined as the relative smoothness of a surface. A rough surface, such as a field of grass, reflects little light and casts many shadows on itself. It appears very dark to the eye or on a photograph. A smooth surface, such as the roof of a building, reflects more light.

h. **Colour**. Colour is an aid to an observer when there is contrast between the colour of an object and its background. The greater the colour contrast, the more visible the object. While colour alone will not usually identify an object, it is often an aid in locating the object or confirming a tentative identification. A secondary consideration is the tone of a colour. Usually, the darker shades of a given colour will be less likely to attract an observer's attention than the lighter, more brilliant shades.

i. **Scale**. Objects that differ greatly in size from those around them will be more readily distinguishable than objects amongst others of approximately the same size.

j. **Noise**. Sudden noises contrast with the normal quiet of a battlefield. Loud noises such as the firing of artillery weapons or the running of generators can pinpoint locations. During the Korean conflict sound ranging equipment provided the initial location of 80 % of the enemy indirect fire weapons. In a helicopter, the report of a firing weapon on the ground will seldom be heard. However, explosions nearby, and strikes by projectiles or fragments on solid parts of the helicopter, will certainly be noticed, and may give some indication of the direction of the threat.

k. **Shine**. Flashes of light reflected off uncamouflaged materials such as glass and metal quickly attract the attention of ground and air observers.

VISUAL SEARCH TECHNIQUES

31. **Definition**. The systematic visual coverage of an area, so that all parts of the area have passed within visibility. This will allow the detection and recognition of objects on the ground that may be fleeting and transient in nature.

32. **Factors Affecting Search**:

a. condition of the eyes, helmet visor, etc;

b. height and higher speed increases the search area, but at the expense of discernment;

c. apparent difference in ground speed with height;

d. type of terrain;

e. terrain often masks objects so that they can only be seen for short periods of time; and

f. personal factors such as interest, under/over expectation, and comfort for the observer.

33. **Side Scan Technique**. This technique normally is used when the helicopter is operating at an altitude of 100 feet AGL or higher at cruise airspeed. The crew is looking for readily visible or obvious sightings. Over most terrain, the observer systematically:

a. looks out approximately 1,000 metres and searches in toward the helicopter;

b. looks out one half the distance (500 metres) and searches in toward the helicopter;

c. looks out one fourth the distance (250 metres) and searches in toward the helicopter; and

d. the observer repeats the procedure.

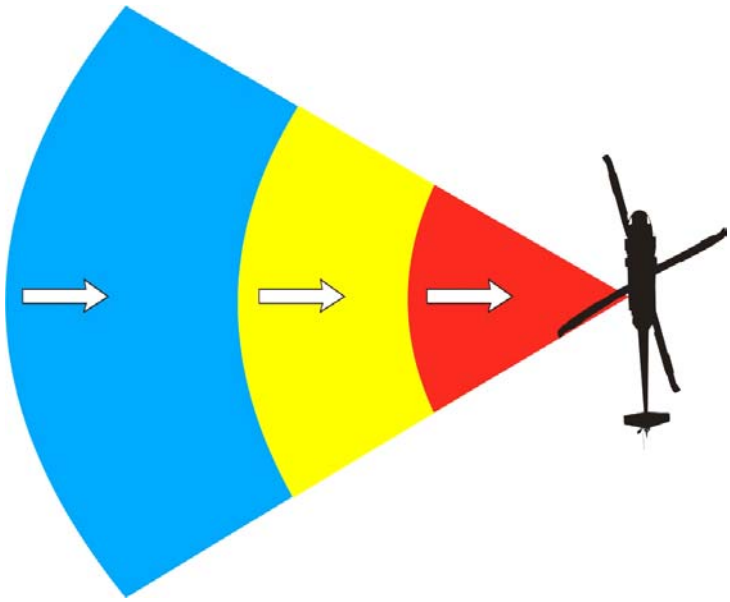


Figure 4-8: Side Scan Technique

34. **Motive Technique**. This technique is used when the helicopter is operating at terrain flight altitudes and at airspeeds of 10 KIAS or greater. The entire area on either side of the helicopter is divided into two major sectors: the non observation sector and the observation work sector. The non observation sector is the area where the aircrew's field of vision is restricted by the physical configuration of the helicopter. The observation work sector is that portion of the field of vision to which search activity is confined. The observation work sector is subdivided into two smaller sectors:

a. The **acquisition sector** is the forward 45 degree area of the observation work sector. This area is the primary area of search.

b. The **recognition sector** is the remainder of the observation work sector. In using the motive technique, the observer looks forward of the helicopter and through the centre of the acquisition sector for obvious sightings. He then scans through the acquisition sector, gradually working back toward the helicopter.

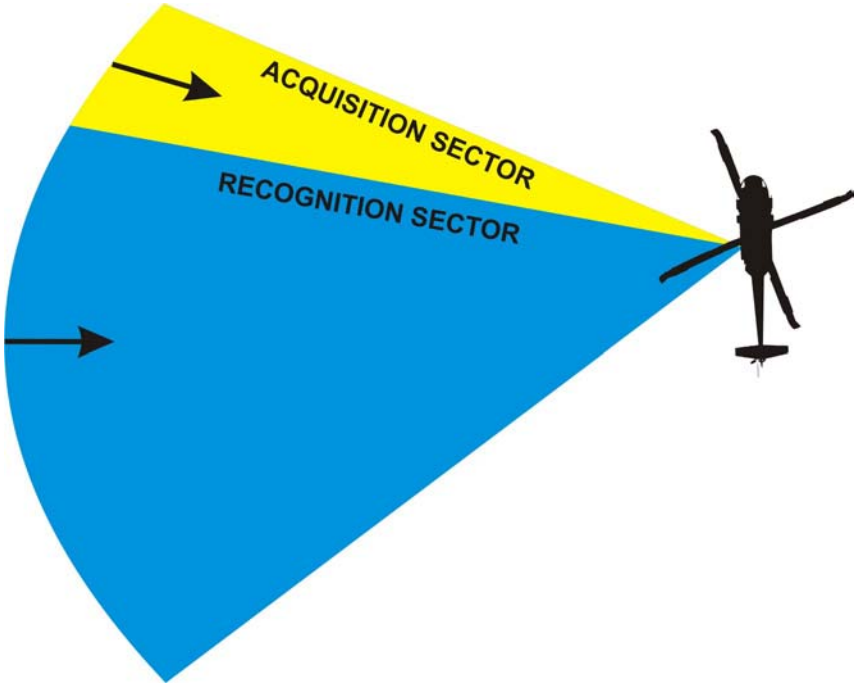


Figure 4-9: Motive Technique

35. **Stationary Technique**. This technique is used at NOE altitudes with the helicopter hovering in a concealed position.

36. When using the stationary technique, the crew makes a quick, overall search for sightings, unnatural colours, outlines, or movements. They start scanning to the immediate front, searching and area approximately 50 metres in depth. he crew continues to scan outward from the helicopter, increasing the depth of the search area by overlapping 50 metre intervals until they have covered the entire search area.

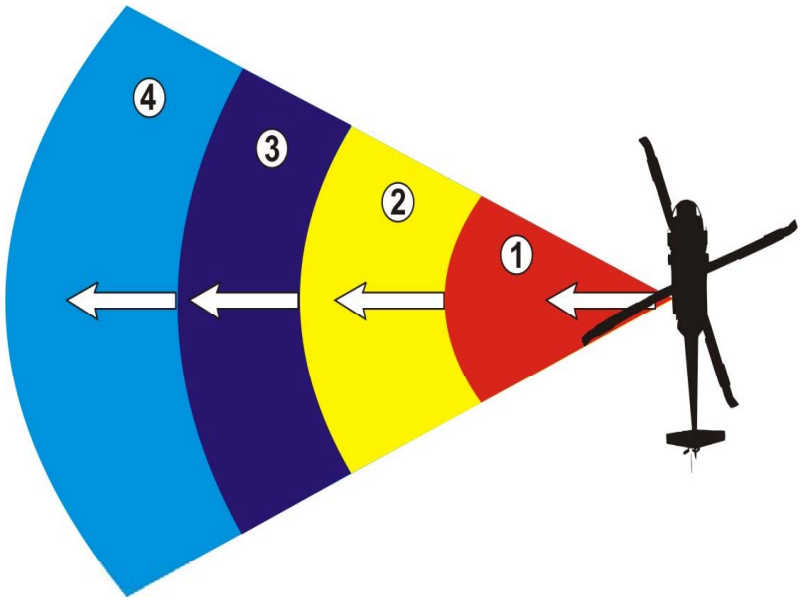


Figure 4-10: Stationary Technique

RANGE ESTIMATION

37. **General**. It is important that an observer be able to judge distances accurately in order to report target locations and to quickly adjust fire. Any one or a combination of the following range estimation methods may be used.

38. **Unit of Measure Method**. A known accurate distance is taken, e.g. a football field, and that unit is applied repeatedly between the observer and the target. This system requires practice and a good knowledge of the ground. Observers must be able to see all of the ground between themselves and the target, otherwise there would be nothing to which they could relate the unit of measure.

39. **Recognition Method**.

a. Range determination by recognition is simple and accurate when practised. The target must be visible with the unaided eye. The principle of this method is that when the crew sees a target, they can determine the range according to what they recognize. For example, if a target can be recognized with the unaided eye as a tank, it is probably within 1,500 metres. The table shows what the average person can identify with the naked eye at various ranges. The ranges shown are the maximum ranges for identification.

TARGET	UNAIDED EYE
Tank crew, troops, machine gun, anti-tank gun, mortar	500 metres
Tank, armoured personnel carrier, truck-by model (i.e. T-72)	1,000 metres
Tank, howitzer, APC, truck (generic)	1,500 metres
Armoured vehicle, wheeled vehicle	2,000 metres

Table 4-3: Identification Ranges

b. When using the recognition method, the size and clarity of the target in relation to its background must be considered. Some light and terrain conditions make a target seem closer; others make it seem farther away. The conditions outlined below may cause an error in estimating ranges by the recognition method:

(1) Seems closer - Bright, clear day.
Sun in front of target.
Targets at higher elevations.
Bright colours.
Contrast.
Looking across ravines, hollows, rivers, depression.
Desert.
At sea.

(2) Seems farther - Fog, rain, hazy.
Sun behind target.
Targets at lower elevations.
Small targets.
Dark colours.
Camouflaged targets.

40. **Tracer Burnout**. The 7.62 mm tracer burns out at about 800 m. This can be used by firing a ranging burst at a far off target and using the burnout as a unit of measure.

TARGET INDICATION

41. In order to identify and report the positions of targets to the rest of the crew, and to others in a formation, the range and one or a combination of the following target indications are used:

a. **Direct Indication**. Obvious targets are indicated verbally by the direct method. The person indicating gives the range and where to look and describes the target. The terms, as illustrated in Figure 4-11, are:

(1) CENTRE OF ARC, for targets on the axis;

(2) LEFT or RIGHT, for targets at right angles to the axis; and

(3) SLIGHTLY, QUARTER, HALF, or THREE QUARTERS, and LEFT or RIGHT, for targets between the axis and the left and right of arc.

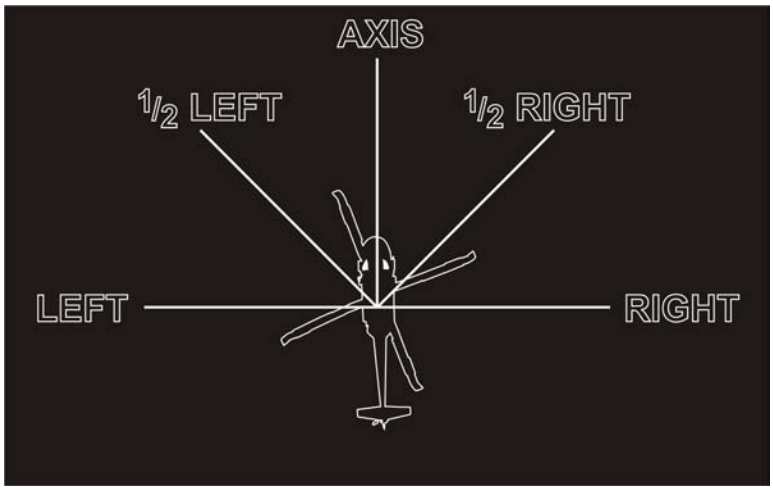


Figure 4-11: Direct Indication

b. **Clock Ray Indication**.

(1) Two methods of using clock face indications are available. The first involves using the helicopter as the centre of the clock face, and identifying targets by range and clock direction. Aircrew are already quite familiar with this technique. See Figure 4-12.

(2) The second technique refers to an obvious reference point in the field of view and imagines a vertical clock face superimposed over it. The observer gives the range to the target, whether the target is left or right of the reference point and the appropriate hour on the clock face to indicate the direction of the target from the reference point. See Figure 4-13.

Figure 4-12: Clock Ray Method

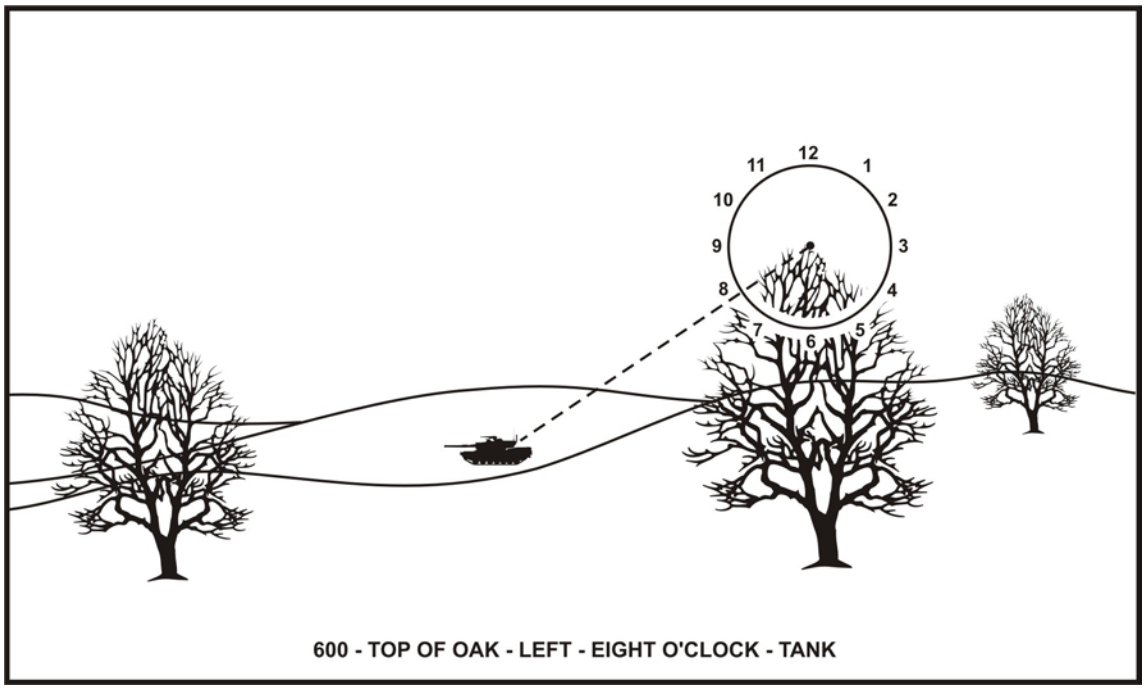


Figure 4-13: Second Clock Ray Method

c. **Reference Point Indication**. Reference points must be prominent and unmistakable objects within the field of view. The aim of supplying reference points is to direct the gunner's eyes along a path of points towards the intended target. The direction of an indistinct target may be indicated by successive or auxiliary reference points. Tracer and/or strike may be used as a reference point, i.e. "Watch my tracer".

DOOR GUNNERS

42. Door gunners on helicopters are concerned with threats to the helicopter and crew on board, whether the helicopter is in the air or on the ground. Door gunners must be able to acquire and engage a wide variety of targets from many different flight profiles.

43. Gunners may also be other personnel from within or outside the unit. Crew coordination is critical between the door gunners and the helicopter's pilots. The door gunners and pilots maintain communication and work as a team to acquire targets, as well as safely fly the helicopter.

44. **Duties**. Door gunners provide direct fire as protection for the helicopter and crew. To effectively employ their weapon, door gunners must:

a. thoroughly understand the weapon system's functional characteristics and operation, as well as its capabilities and limitations;

b. have a thorough knowledge of tactical helicopter employment;

c. be prepared to act independently, based on the threat and ROEs, to engage targets without a specific command from the pilot; and

d. act as observers to assist the pilot and copilot in the safe operation of the helicopter.

45. **Weapons Maintenance**. The door gunner will perform the inspections of their weapons and subsystem(s) on the helicopter, unless specified otherwise by unit SOP or directives. The door gunner is responsible for ensuring that the correct type and amount of clean and serviceable ammunition is on board the helicopter for the mission. The non FE door gunner will not assist in the daily inspection, preflight, post flight and other maintenance operations involved with the helicopter unless member is qualified and certified by a proper maintenance authority.

46. Door gunners must act as observers to help the pilots operate the helicopter safely. During flight and ground operations, door gunners will maintain a watch for hazards and obstructions to flight. These obstructions may vary from high tension wires and other helicopters along the flight path to obstacles such as tree stumps in the landing zone. Reporting potential or actual targets to the pilots is a specified task of the door gunner. From the gunner's side of the helicopter, the primary observation sector is normally 15^{o} off the nose of the helicopter all the way to the rear.

47. During both combat operations and training, door gunners must maintain situational awareness. They must know the location of friendly troops, the location of other helicopters in their formation (including escorting attack helicopters), and the classification and location of the target(s) to be engaged. A door gunner may also be required to mark a ground location with smoke grenades or tracers.

48. The CH 146 Standard Manoeuvre Manual (SMM) has procedures for the crews to follow during an emergency landing. The door gunners must know these procedures, and the procedures for removing weapons, electronic equipment (radios, COMSEC devices), or other sensitive equipment or items (such as maps and CEOIs) from the helicopter. The gunner must know how to destroy or assist in the destruction of sensitive equipment, if necessary, to prevent capture.

WEAPON CONTROL AND FIRE COMMANDS

49. **General**. Before departing on a mission, the aircraft commander will brief the crew on the situation and mission. The briefing is mission dependent, but will normally include the friendly situation, enemy situation, rules of engagement, possible target areas, marking of targets, mission specific fire commands, and other mission specific information. Loading ammunition in the aircraft weapon systems should be dictated by the unit SOP or parent unit operating procedures or directives.

50. **Door Gun Weapon Control Measures**. The following are the CH 146 door gun weapon control measures. The weapon's status is whichever weapon control measure is ordered to be in effect for a specific mission, area or time:

a. **"STOWED"**. When enemy contact is not likely or as an administrative measure by the Aircraft Commander (AC), the door gun(s) will remain **unloaded, in the "STOWED" position**.

b. **"LOADED"**. When enemy contact is possible, the door gun(s) will be placed **in the position to fire, i.e. "LOADED"**. However, firing will only be executed on order of the AC.

c. **"READY"**. When enemy contact is expected, the Door Gunner makes the decision to fire, based on the mission brief and ROEs. The door gun(s) will be **"READY"** to engage targets. After engaging a target with an initial long burst, the Door Gunner shall advise the AC of the type of target and its location.

d. **Changes to the Door Gun Weapon Status**. The Door Gunner will acknowledge changes to the door gun weapon status to the AC. If the status is other than "**STOWED**", the gunner will report "**LEFT/ RIGHT/GUN 'LOADED' or 'READY'**".

FIRE EFFECTS

51. The effect of fire on a target will be of three types: Suppression, Neutralization or Destruction, dependent on the type of target and the weapon engaging.

52. **Suppression**. Suppression may be defined as direct and indirect fires, electronic countermeasures, or smoke brought to bear on enemy personnel, weapons, or equipment to prevent effective fire on friendly forces:

a. suppressive fire by the individual helicopter is normally unplanned, is defensive in nature, and executed as a self-defence engagement. A suppression engagement is a hasty engagement to prevent, modify, or stop an enemy engagement. Aircrews should use suppression to break contact and gain manoeuvre time and space;

b. suppression is not a decisive engagement;

c. the gunner firing the suppression engagement may not be able to see the effect on the target;

d. aircrew may attempt suppression against virtually any target for self-defence. For example, a crew may engage an armoured target with machine guns at close range, forcing the crew to "button up", and damaging vision equipment and radio antenna, to gain time and situational awareness for evasion; and

e. the primary purpose of helicopter door guns is to provide suppressive fire on threat targets.

53. **Neutralization**. Neutralization takes a target out of action temporarily. Neutralization of a target occurs when it suffers 10 per cent or more casualties or damage. Depending upon the type of target and its exposure, door guns may be able to neutralize a target.

54. **Destruction**. Destruction puts a target out of action permanently. Direct hits with high explosive munitions are normally required to destroy hard material targets, but door guns may on rare occasions be able to destroy certain targets. Destruction requires large expenditures of ammo.

HANDLING DRILLS AND WEAPON CONTROL ORDERS

55. To effectively employ this weapon, you must correctly carry out the appropriate handling drills and thoroughly understand the weapon control orders:

a. **Load Drill**. On the order **"RIGHT/ LEFT GUN - LOAD"**:

(1) point the weapon in safe direction;

(2) open the feed cover;

(3) check that the ammunition and the belt links are not damaged;

(4) position the belt on the feed tray, links uppermost, first round against the cartridge stop;

(5) hold the belt in position and close the feed cover; and

(6) report **"RIGHT/ LEFT GUN - LOADED"**;

b. **Unload Drill.** On the order **"RIGHT/ LEFT GUN - UNLOAD -CLEAR GUN"**:

(1) point the weapon in safe direction;

(2) cock the gun and move the safety catch to "SAFE";

(3) raise the feed cover and remove the belt;

(4) clear the feed tray;

(5) close the feed cover and move the safety catch to "FIRE";

(6) aim down range and fire the weapon;

(7) raise the feed cover; and

(8) report "**RIGHT/ LEFT GUN - CLEAR"**;

c. **Ready**. On the order **"RIGHT/ LEFT GUN - READY",** or reception of a fire control order:

(1) cock the gun and, if not immediately followed by a fire control order, move the safety catch to "SAFE"; and

(2) report "**RIGHT/ LEFT GUN - READY**";

d. **Fire**. On the order **"RIGHT/ LEFT GUN - FIRE"**, or, depending on the weapon control measure in effect, a target being identified:

(1) align the gun barrel with the target; and

(2) push the trigger;

e. **Cease Fire**. On the order **"RIGHT/ LEFT GUN - CEASE FIRE"**:

(1) the gunner will stop firing and apply the safety catch; and

(2) report "**RIGHT/ LEFT GUN - SAFE"**;

f. **Make Safe**. On the order **"MAKE SAFE"**:

(1) complete the unload drill;

(2) complete the load drill (use new ammo belt box if rounds expended or nearly expended); and

(3) report "**RIGHT/ LEFT GUN - LOADED"**;

g. **Immediate Action (IA) drill**:

(1) If the gun fails to fire:

(a) report "**RIGHT/ LEFT GUN - STOPPAGE**";

(b) cock the gun and push the cocking handle fully forward;

(c) open the feed cover, clear the feed tray and close the feed cover;

(d) align the gun barrel with the target and squeeze the trigger. A round may be fired; and

(e) reload and cock the weapon. Realign with the target and continue firing; and

(2) If on attempting to carry out the IA drill, the cocking handle cannot be pulled fully to the rear, a damaged link is jamming the feed pawls:

(a) point the weapon in a safe direction;

(b) hold the cocking handle as far to the rear as possible; to assist in holding, hook the thumb in the trigger guard;

(c) open the feed cover, clear the feed tray, and close the feed cover; and

(d) complete the cocking action, point weapon in safe direction, squeeze the trigger, reload, cock the gun, align with the target, and continue firing;

CAUTION

Extreme caution must be exercised if a live round is jammed in the chamber, as it may cook-off or be fired mechanically during attempts to clear it.

h. **Changing Barrels**. Barrels must be changed during periods of prolonged firing. For example, 100 rounds per minute for over five minutes. In peacetime, after two belts are fired during a continuous engagement, the barrel is changed to minimize wear and to preserve barrel life. Barrels should not be changed while the helicopter is in flight. To change barrels:

(1) complete the unload drill;

(2) cock the gun and remove the barrel;

(3) stow the hot barrel;

(4) inspect the new barrel, ensuring that the gas regulator is set properly, the serial numbers match those on the receiver, and no obstruction is in the barrel;

(5) insert the new barrel and ensure it is securely mounted;

(6) complete the load drill (if cleared to do so); and

(7) cock the gun and continue firing (if cleared to do so);

i. **Runaway Gun**. A runaway gun is one which continues to fire after the trigger has been released. When this occurs, the belt is grasped and twisted, the action will break the belt and stop the gun from firing; and

j. **Dropping Casings**. A maximum of two belts can be fired before the casing bag is full. When the gunner reports that his casing bag is full, the helicopter will be slowed to 70 kts or less, and placed in a gentle turn towards that gunner:

(1) the aircraft commander will order report "**RIGHT/ LEFT GUN - DROP CASINGS**";

(2) the gunner will apply the safety catch, open the bag, and direct the empty casings out of the helicopter, ensuring none remain on the cabin floor; and

(3) the gunner will close the bag and report "**RIGHT/ LEFT GUN - BAG EMPTY"**.

DOOR GUN FIRE CONTROL ORDERS

56. **General**. The format to be used for door gun fire control orders is the common GRIT format, used by the Army. This will ensure commonality should personnel from other types of units be assigned as door gunners.

a. **Group**. Identify the right and/or left side gun as the one that will be engaging the tgt.

b. **Range**. This is given to within 50 metres, to ensure that the gunner is focussing out the correct distance.

c. **Indication**. This is the location of the target, with reference to the helicopter or ground features.

d. **Type of fire**. This instructs the gunner(s) as to how the target is to be engaged, and normally includes an executive word of command to fire.

e. **Examples**:

(1) "Left Gunner, 400, ten o'clock, corner of tree line, muzzle flashes, rapid – '**FIRE**'"; and

(2) "Gunners, 3 to 400, tree line on both sides of LZ, **'FIRE'**".

FLANKING FIRE

57. **Flanking fire** refers to fire directed beside friendly troops. Door gunners must maintain situational awareness while firing to avoid fratricide, especially when troops are dismounting from the hel. The following rules must be adhered to when firing the C6 GPMG from the hel:

a. **Rule One**. Friendly troops must be in sight, or in a known position relative to the helicopter.

b. **Rule Two**. Barrels must not point, nor bullets fall, within the safety angle of 300 mils (15 ^{o}), measured from our own troops.

c. **Rule Three**. Machine guns prepared for firing must neither be manipulated nor traversed within the 300 mil limit. The angle through which they are manipulated outside the edge of the target must be added to the basic allowance of 300 mils.

d. **Rule Four**. The 300 mil limit extends to a point 300 metres beyond the center of the furthest beaten zone.

e. **Rule Five**. Careful allowance must be made for wind blowing towards our own troops by adding the estimated mil allowance for the wind to the basic allowance of 300 mils.

f. **Rule Six**. The safety allowance must be measured by an accurate means. A hand held out at full arm's length, with fingers extended, is equal to 300 mils.

58. During unload drills, the troops should remain on the ground in position lined up next to the skid toes as per Figure 4-14. During take off, the gunners must avoid firing near or over the troops on the ground.

Figure 4-14: Flanking Fire Considerations

NOTE

The 300 mil angle is intended to allow for the inherent flexibility of the weapon and its mounting system, while still permitting effective fire capability in close proximity to our own troops. Firing of live ammunition is **NOT** recommended during training.

FORMATION DOOR GUNNERY

59. **Crew Coordination**. Formation door gunnery consists of the techniques used to acquire and engage targets from helicopters flying in formation at terrain flight altitudes.

60. Aircrew and door gunners in the formation must use effective crew coordination procedures to visually acquire, identify and engage targets. Both helicopters and passengers are vulnerable to attack during airmobile operations. Therefore, it is imperative that door gunners respond by delivering direct fire on these targets. This chapter discusses crew coordination procedures, gunner employment, and firing techniques to be used during formation operations.

61. **Test Firing**. When possible, test firing of door guns should occur before entering hostile areas to ensure that weapons are serviceable. An appropriate area, which allows the safe discharge of the weapons, should be designated close to the aviation unit's base of operation.

62. **Aircrew Duties**. Before departing on a mission, the pilot in command must orient his crew on the situation and the mission. This orientation will include the friendly situation, rules of engagement, possible target areas, fire commands, the location of emergency medical and survival equipment, and other available information essential to mission success.

63. **Coordination Between Helicopters**. Detailed procedures for communicating during live fire (training and combat) will be standardized and specified by WUSOPs. Crew members must clearly understand one another. In addition, positive communication between aircrews must specify the commence fire and cease fire procedures and firing azimuths of overlapping or sector fires for the flight. For example, lead calls formation "Cease Fire" upon landing in the LZ.

SECTOR OF FIRE DEFINITIONS

64. **Sector(s) Of Fire**. A sector of fire is an area to be covered by fire that is assigned to an individual, a weapon, a helicopter, or a unit. Door gunners are normally assigned two sectors of fire: a primary sector and a secondary sector. Door gunners must know the traversing limits and the definitions that apply when calculating sectors of fire in formation. Traversing limits are normally addressed in the AOIs.

65. **Inboard Gunner**. Gunner whose position is on the inboard side of a formation and usually has another helicopter in his field of fire. Figures 4-15 and 4-16 show examples of inboard gunner positions.

66. **Outboard Gunner**. Gunner whose position is on the outboard side of a formation that does not have another helicopter in his field of fire. Figures 4-15 and 4-16 show examples of outboard gunner positions.

67. **Safety Limit**. An imaginary line from the gunner's position outwards that is no closer than **two** rotor diameters by day and **three** rotor diameters by night from another helicopter.

68. **Permissible Sector of Fire**. The sector of fire of the door gunner that is limited by the traversing limits of the weapon system or by the amount of deflection he can traverse based upon the safety limit or any other factors (such as friendly troops or equipment) that prevent him from firing toward another helicopter in the formation. For safety reasons, the door gunner should not fire any closer than the safety limit. This distance will be determined by the gunner. However, the Figures in this section show the approximate angles for the sectors of fire for different helicopters when allowing for the safety limit. The permissible sectors of fire will constantly change due to changes in position of helicopters during formation flying.

69. Aircrew conducting formation flight firing must do so with an extreme sense of responsibility and with constant vigilance.

70. The employment of door gunners in formation adds another responsibility to the entire aircrew. In addition to being concerned with separation from other helicopters they must concentrate on permissible sectors of fire and when firing can commence and when it must cease. Any aspect of formation flying while employing door gunners can be fatal if principles are violated.

71. **Aerodynamic Interference**. Aircrew, especially door gunners, should anticipate aerodynamic interference between helicopters during formation flight. Aircrew flying trailing helicopters may encounter wake turbulence if they permit their helicopter to get below leading helicopter. Flight in the turbulent air may result in rapid attitude (pitch), roll, and yaw changes. Power may also have to be increased to maintain a proper position in a formation. Door gunners must be aware of the possibility of aerodynamic interference.

72. **Aircraft Separation**. The distance between helicopters or formations of helicopters can be greatly increased to fit the tactical situation. At higher altitude, helicopters should be positioned far enough apart to prevent a burst of antiaircraft fire from destroying the entire flight. At terrain flight altitudes, helicopters may be spread out to take advantage of the terrain. Additionally, flying loose and extended formations are less fatiguing to the pilot than flying close formations. Door gunners must be familiar with the techniques for maintaining proper aircraft separation.

73. **Helicopter Manoeuvring**. A helicopter is normally manoeuvred with primary reference to only one other helicopter in the formation. The constant effort required to detect any change in altitude, airspeed, or heading of the reference helicopter precludes watching helicopters other than the reference helicopter. If all helicopters guide correctly to their reference helicopter, then all helicopters have adequate distance and altitude separation for safe operation of the flight as well as door gunner employment. In those formations requiring a relative position to more than one helicopter (staggered trail), the aviator must use peripheral vision to the maximum, while concentrating on his reference helicopter. The pilots must also keep a constant mental picture of his door gunners' permissible sectors of fire as well as keeping track of locations of other helicopters in the formation. Gunners will also play a role in determining when they do and do not have permissible sectors of fire. It is possible for a gunner on one side of the helicopter to have a permissible sector of fire when the gunner(s) in another position(s) do not and vice versa.

74. **Manoeuvres**. Aircrews that will be conducting formation flight must also be familiar with the many different manoeuvres normally associated with formation operations. They must be aware of how those manoeuvres could change the permissible sectors of fire or in some cases restrict the gunners' fire altogether. Manoeuvres they must be familiar with include:

a. formation takeoff;

b. formation turns;

c. formation changes en route;

d. rendezvous and join up;

e. tactical formation break up;

f. formation landing; and

g. night formation landing.

ECHELON LEFT/RIGHT

75. This formation allows rapid deployment of the flank and allows unrestricted fires by outboard gunners in the lead and trail helicopter. It somewhat restricts suppressive fire by inboard gunners of lead and trail helicopter as well as the inboard and outboard gunners of other helicopters within the formation.

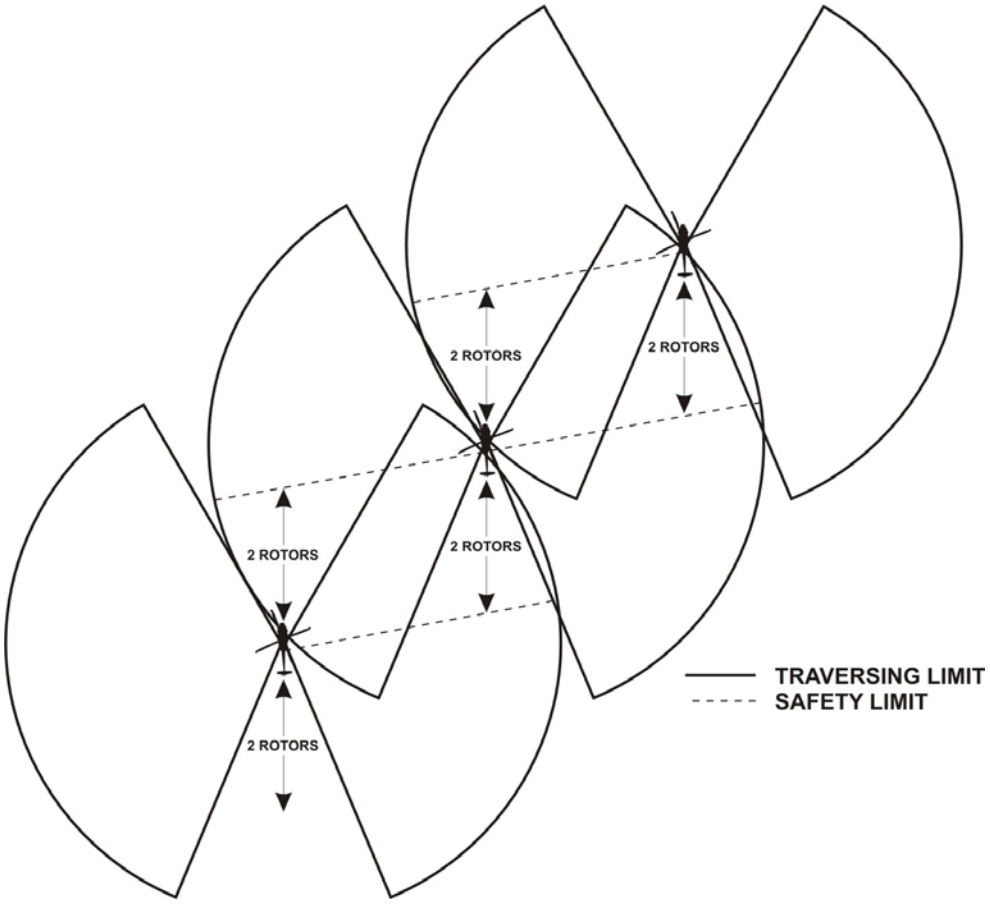


Figure 4-15: Echelon Left (Day)

TRAIL

76. Trail is a technique that permits the wingman in a two ship section or greater to freely manoeuvre in the zone extending 45 ^{o} on either side and to the rear of the lead's tail. Within the zone, the wingman may vary vertical separation, airspeed, and distance from lead. The distance the wingman trails the leader varies and depends upon visibility and terrain. The wingman must maintain visual contact with lead. However, the wingman must exercise caution not to overtake the lead. The flexibility of trail enables the wingman to change his position behind lead at will, without radio communication. The wingman is able to choose his own flight path to avoid obstacles, use terrain to the maximum advantage, or to provide fires against known or suspected enemy positions. Trail is best suited for tactical situations. This formation causes continuous changes in the permissible sectors of fire.

77. Depending upon aircraft position in the flight, it sometimes allows unrestricted fires of gunners while restricting fires of other gunners within the formation.

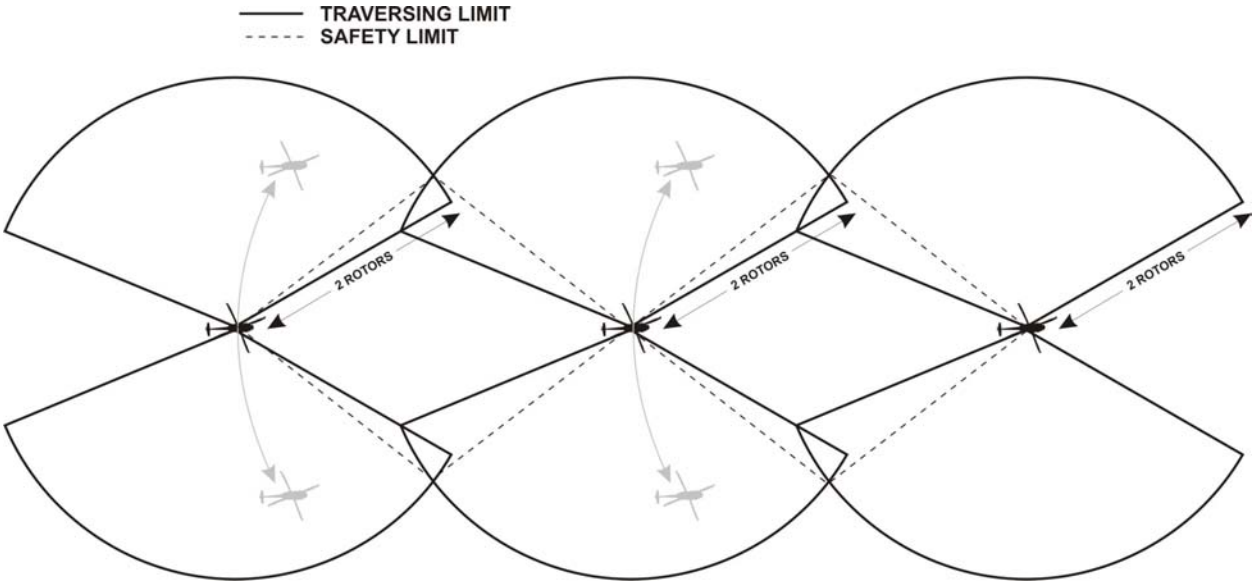


Figure 4-16: Trail (Day)

NOTE

Trail is the most challenging formation for controlling fires from door gunners. Because of the constant change involved in the formation, employment of door gunners during trail requires a great deal of training and command and control.

HOLDING AREAS

78. Formation elements proceed to holding areas when directed or when loitering is required. Each helicopter sites itself facing inwards, adjusting alignment of the weapon arcs to ensure overlapping arcs of fire and mutual support. Distance between helicopters is area specific with respect to size, shape and terrain. A rule of thumb is to have helicopters no further apart than one-third the effective range of the machine gun. See Figure 4-17.

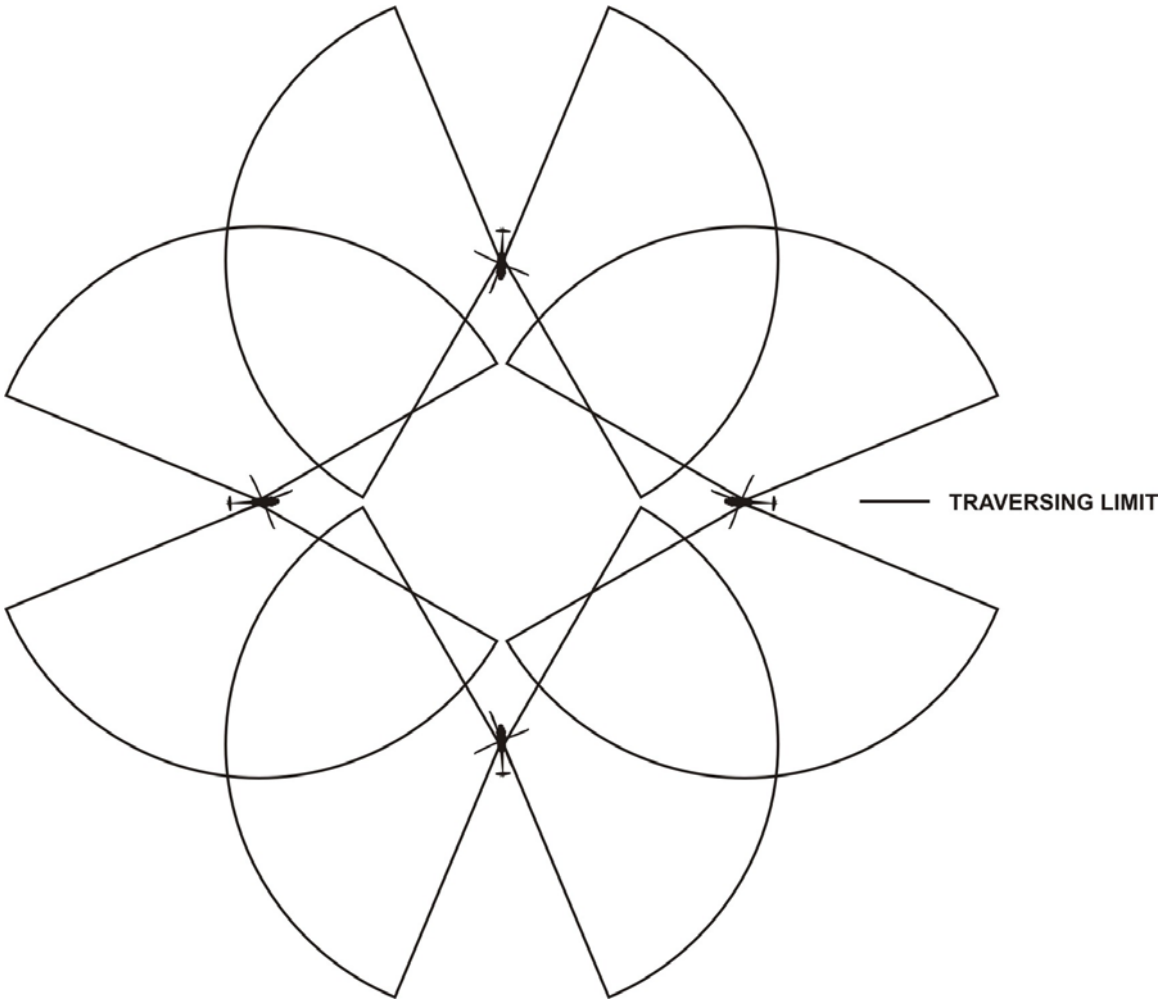


Figure 4-17: Holding Area Weapon Arcs

FIRING TECHNIQUES

79. **Fire Control Requirements**. Fire control includes all actions of the aircrews in planning, preparing and actually applying fire on a target. These actions include:

a. the ability to select and designate targets;

b. open fire at the instant desired;

c. adjust fire and regulate the rate of fire;

d. shift from one target to another;

e. overlap fires with other gunners; and

f. cease fire.

80. Failure to exercise fire control results in ineffective employment of the weapon systems and can result in danger to friendly troops or helicopters. It also results in an inability to engage a threatening target; loss of surprise; premature disclosure of positions, fire on unimportant targets, loss of time in adjusting fire, and wasted ammunition.

81. **Targets Of Opportunity**. The requirement for immediate fires arises from targets of opportunity or changes in the tactical situation. Immediate fire targets may be acquired by any door gunner(s) in the formation. However, all immediate fires require close coordination between other helicopters in the formation and, if the situation dictates, with the land force commander or his fire support coordinator.

82. **Target Acquisition**. Targets are acquired by all available means. Targets acquired by the aircrews are engaged and controlled under the direction of the pilot in command, pilot, air mission commander or with the land force commander to support the ground tactical plan. Engagement of targets acquired by other means will be according to existing directives or policies of the supported headquarters.

a. **Target identification** under natural light conditions at night may be difficult. The estimate and the tactical situation (such as cross FLOT) also apply to night operations. As with all operations, friendly positions must be positively known before commencing firing.

b. **Night Acquisition**. At night or during periods of low visibility, target acquisition becomes more difficult and crew responsibilities take on added importance. Proper crew training and knowledge of techniques available can turn the operation into an advantage for the door gunners. Aids to night target acquisition include:

(1) artificial illumination;

(2) night vision devices; and

(3) enemy fire. By spotting muzzle flashes or tracers, enemy fire may often be spotted from the air. However, the observer must rapidly pinpoint the muzzle flash or tracer location before it disappears.

83. **Principles of Application of Fire**. Application of fire consists of the methods crews use to get complete and effective coverage of a target area. Training in the methods of applying fire can be accomplished only after the aircrew and door gunners have learned to recognize the different types of targets they may find in combat, how to properly distribute, overlap and concentrate their fire, and how to maintain the proper rate of fire.

84. **Airspeeds**. Airspeeds en route should not exceed cargo doors open $V_{NE,}$ if door gunners are to be employed, unless the gun is stowed and doors closed.

85. **Targets**. The door gunner may have to engage a wide variety of targets during a mission. Suppression is a self-defence engagement and is intended to allow friendly helicopters to bypass the threat. Door gunners do not shoot at targets they do not intend to hit. Therefore, coordinated fires from all helicopters in the formation will enhance the probability of destroying the target.

86. **Overlapping Fires**. Gunners should initiate overlapping fires to provide the maximum fire available to destroy or suppress targets encountered en route.

87. **Fires En Route**. Techniques and procedures for engaging targets (for example, SA 14 team, observation post, small arms fire) en route will be specified by the unit to enhance mission security. Targets identified en route will be visible for a short duration; therefore door gunners must be prepared to respond immediately to this threat.

88. **Approach To Landing**. Aircrews and troops are most vulnerable during landing. Therefore, procedures for gunners to coordinate and employ simultaneous fires must be developed.

89. **On The Ground**. Door gunners must fire without delay or continue firing to suppress or destroy targets while troops disembark.

a. During troop egress, the procedures for gunners firing within the forward 90^{o} fan must be carefully followed to prevent fratricide. Situations may occur that require continued suppression while troops egress. Soldiers will have to egress toward the forward part of the helicopter and immediately take the prone position. This technique is potentially very dangerous. It takes a great deal of training and should be practised with blanks during exercises.

b. Overlapping or sector fire. After landing, enemy fires may be expected from any direction. Therefore, door gunners must use their discretion regarding fire control. To provide the most effective engagement techniques gunners should use overlapping fires or sector fires.

90. **Departure**. Gunners must be trained in troop dismounting and movement procedures from all helicopter landing formations. The gunner's ability to suppress targets is dependent upon troop actions and movements from helicopters in different formations. Depending on the threat in the landing zone, door gunners may be required to continue suppression to assist the inserted soldiers while they organize their actions during the ground tactical plan.

INITIAL TRAINING TECHNIQUES

91. Before door gun live fire formation exercises are carried out, initial training with blank ammo should be carried out to ensure all participants are safe and properly trained. The following notes will aid in setting up such training:

a. a maximum of five helicopters should participate in formation door gunnery formations. The OIC should select a route for the flight on which the door gunners can engage targets en route and in the LZ;

b. enemy force should be available to engage the helicopters and provide targets for the door gunner, when blank ammo is to be used. The enemy force should be soldiers with infantry weapons effect simulation equipment, and must have weapons capable of engaging the helicopters;

c. the crews involved in exercise will be thoroughly briefed and will rehearse the mission;

d. because the door gunners may NOT be shooting live mix ammunition, adjusting fires onto the targets may be difficult. This situation is unavoidable. The training value is in rehearsing formations and fire commands;

e. every opportunity should be taken during training missions with supported units to include door guns with blank ammunition; and

f. the objectives of the training are to:

(1) allow units to refine fire discipline;

(2) expose door gunners to formation door gunnery;

(3) exercise command and control with blanks;

(4) train gunners to place fires on target; and

(5) uncover formation door gunnery weaknesses within the unit.

NVG DOOR GUNNERY

92. **Effect on NVGs**. Little detrimental effects can be expected from muzzle flash, but the use of illuminating flares may be problematic. The burning tracer appears with a halo that tends to obscure the LOS to the target until the tracer is well down range.

93. **Extra Equipment**. Laser pointing devices are useful for indicating targets. Laser sighting devices may be installed on the guns as a very effective aid for aligning the gun on a possible target. Such sighting devices present no laser hazard to personnel inside the cabin.

94. **Engagement Techniques**. Past tracer burnout range, it will be difficult to detect bullet strike in order to adjust fire. Night firing beyond this range may make the helicopter a more obvious target due to the muzzle flash and the tracer path.

RANGE TRAINING

95. **General**. Initial training for door gunners will normally consist of:

a. C6 GPMG handling drills followed by the handling test;

b. helicopter Door Gun specific lessons (see note);

c. NVG familiarization for non aircrew;

d. familiarization firing on a ground range;

e. introductory Aerial Firing (day);

f. introductory Aerial Firing (night); and

g. introductory Formation Aerial Firing (day; night, if possible).

NOTE

All pilots who fly helicopters fitted with door guns must also receive this training.

RANGE DEFINITIONS

96. **Designated Area (DA)**. An area where the helicopter will take on ammunition to conduct range practices (restricted area).

97. **Arming/De-Arming point**. An area in which the aircraft weapons are armed within the confines of a designated live firing area (restricted area).

98. **Start Fire Line (SFL)**. An imaginary line on the ground, indicated on the range template, over which helicopters can commence firing.

99. **Cease Fire Line (CFL)**. An imaginary line on the ground, indicated on the range template, over which all firing ceases and weapons are secured.

100. **Firing Line**. An imaginary line, indicated on the range template, which delineates the area and the direction in which weapons can be fired. For helicopter door guns, the flight path between the SFL and the CFL generally is the firing line.

101. **Target Lane**. An area forward of the firing line, indicated on the range template, between the start and the cease lines designated as the impact area and where targets will be placed. (See Figure 4-18).

102. **Air Range Safety Officer (Air RSO)**. A specially trained pilot who sits in the helicopter cabin to control and monitor the door gun range exercise.

103. **Safety Assistant (SA)**. A qualified and experienced person who coaches and assists the door gunner during range exercises.

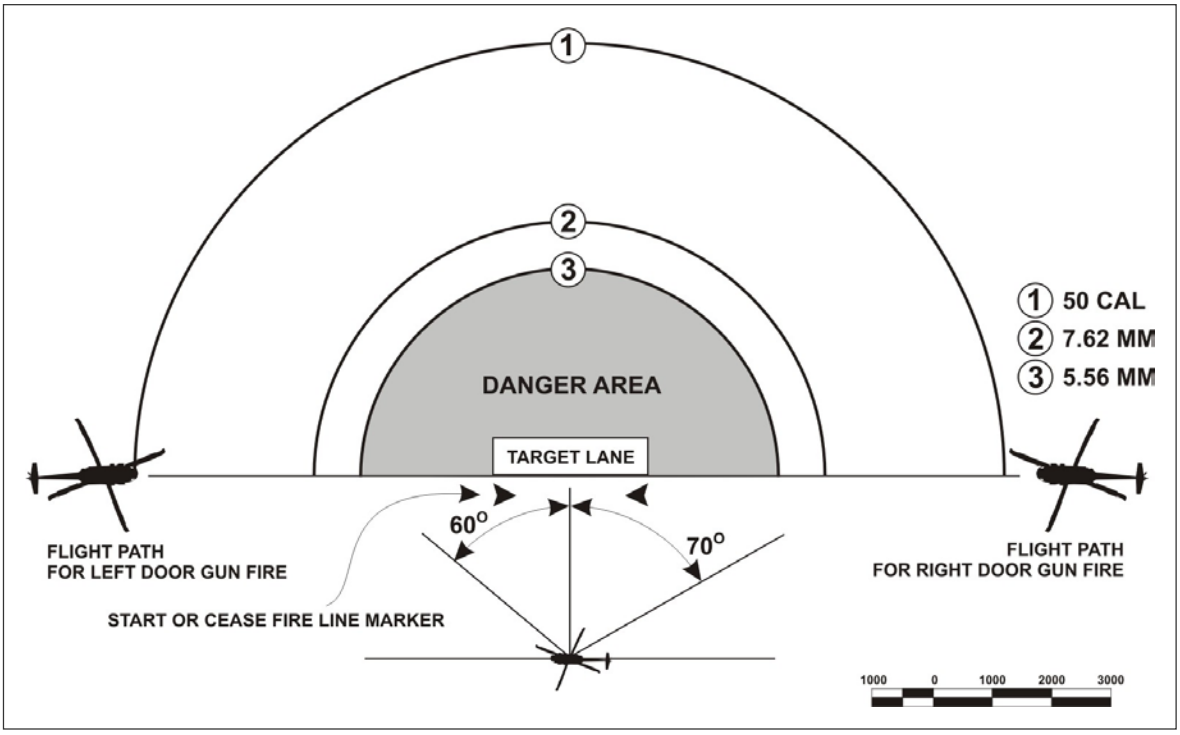


Figure 4-18: Basic Range Terms

HELICOPTER TACTICAL FIRING RANGES

104. Further information on range duties and responsibilities must be consulted during preparation and conduct of helicopter door gun firing exercises.

105. **General**. The primary purpose of a tactical range is to provide simulated training for the pilot and gunners to visualize enemy targets, as they would appear in a combat zone. It is permissible, however, for the tactical ranges to be used for all levels of helicopter weapons training. The layout requirements for a Type 2 helicopter tactical range are shown in Figure 4-19.

106. **Layout**. The layout of a tactical range will depend on mainly on training objectives and operational regulations. It is a basic principle of the orders that the siting, layout and operation of helicopter tactical ranges should be simple, flexible and easy to implement, operate and control. It is anticipated that, with the use of the appropriate template such ranges would change location often, with scheduling and reservation of the necessary real estate being the main problem with which to contend.

107. **Terrain**. Special emphasis should be placed on the siting of helicopter tactical ranges so as to make the best use of natural terrain. Hills, valleys, rivers, trees, etc., all provide an ideal backdrop for the placement of tactical targets.

108. **Firing Lane**. It is mandatory that the SFL and CFL be positively identifiable from the air. Advantage may be taken of natural terrain features to fulfill the requirement, however, when such features are either not available or readily distinguishable, the firing lane shall be marked.

109. **Targets**. Any targets used must present a realistic appearance, and must be sited to reflect logical tactics. Large orange panels are unacceptable, and do little to encourage use of the visual search techniques. During initial training, targets should be placed in or near areas with suitable surfaces for sensing bullet strike. At night, battery operated strobes are ideal for representing muzzle flashes, especially if made directional by placing in an empty, open ammunition box.

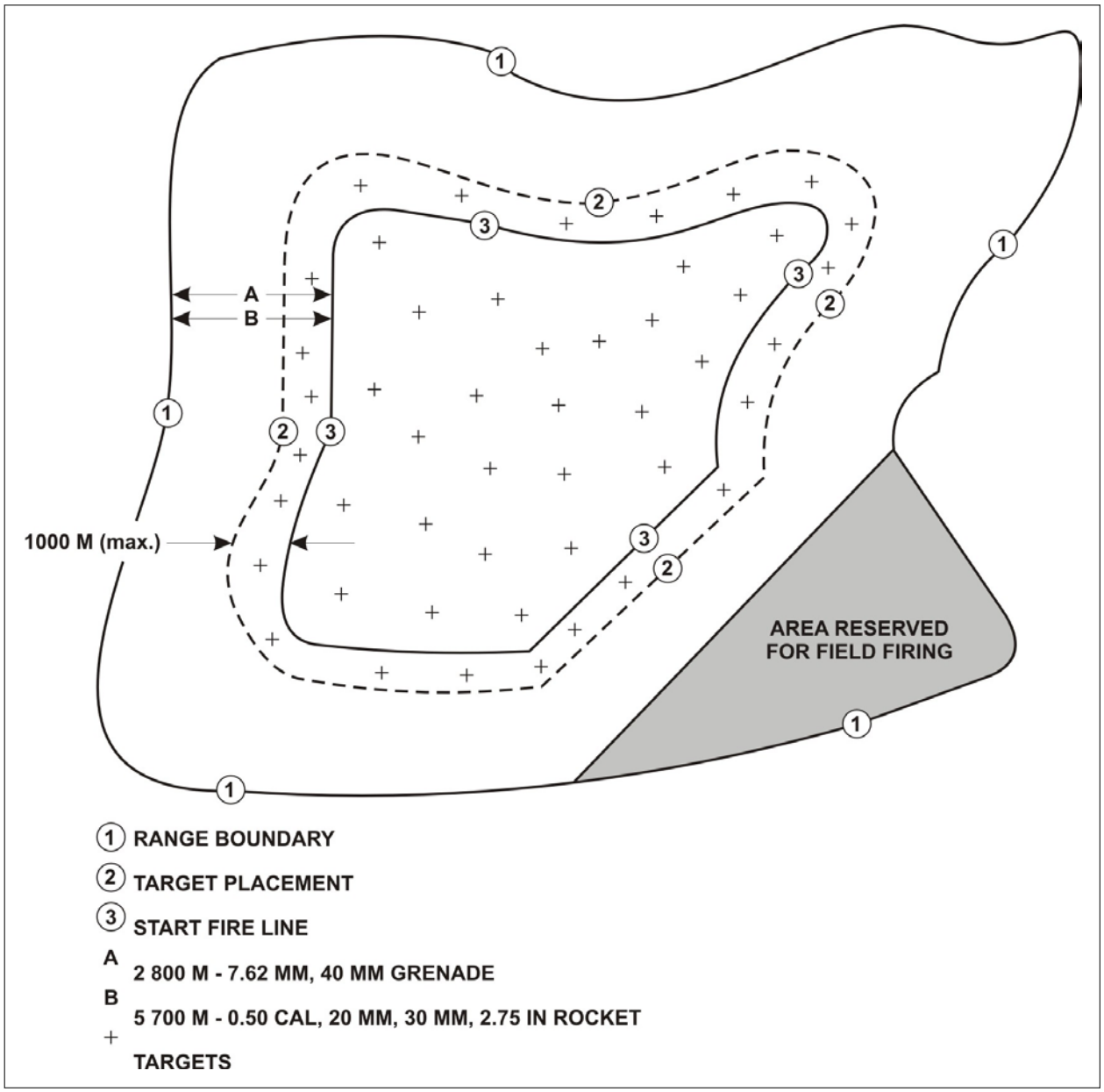


Figure 4-19: Helicopter Tactical Range

AIR RANGE SAFETY OFFICERS

110. An Air RSO is a person specifically appointed by the CO to ensure that range firing exercises are conducted safely. An OIC Exercise and an Air RSO must be specifically appointed for each range exercise, and may be the same person.

111. To be qualified for appointment as an Air RSO, a person must:

a. be qualified on the weapons or weapons system being used in the exercise by virtue of either a formal CF course or a combination of unit on the job training and experience that meets with the approval of the CO, and be familiar, in the case of air weapons ranges, with the relevant aircraft air ordnance delivery techniques and associated safety parameters;

b. have a comprehensive and current knowledge of the orders and procedures for ranges and range practices; and

c. have demonstrated the ability to supervise and control the applicable range practice.

112. The appointment of an Air RSO for helicopter door gunnery is limited to pilots. During firing practices, the Air RSO may monitor firing from the cabin position, or may occupy a pilot seat if Safety Assistants are onboard to monitor the door gunners.

113. Prior to performing duties as an Air RSO on an air weapons range, those appointed shall accomplish the following:

a. receive a briefing on Air RSO's duties, orders, etc., by a qualified Air RSO;

b. ensure that he/she is conversant with Range Orders, Base Standing Flying Orders, and relevant Squadron Orders; and

c. complete at least one range tour under the supervision of a qualified Air RSO. The potential Air RSO should control range traffic as much as possible during this instructional period.

114. An aircrew briefing is required to ensure that all participating aircrew are fully conversant with the following points prior to carrying out any exercises involving air to ground weapons:

a. boundaries and altitudes of the range danger area;

b. positions of targets;

c. R/T frequencies and range phraseology;

d. range orders;

e. attack patterns;

f. flying orders and restrictions for the conduct of air weapons exercises;

g. actions in the event of radio failure;

h. actions in the event of an inadvertent release or firing;

i. actions in the event of a runaway gun or a gun stoppage;

j. correct armament switch procedures for the helicopters concerned;

k. route to and from the range; and

l. emergency landing instructions.

115. In addition to the inspection of the individual weapons, firing safety includes ensuring that:

a. clearance is received from the Air RSO;

b. the weapon is on or past the SFL;

c. weapons are pointed down range and within the range fan limits;

d. if on the ground, no one is in front of the weapons or within the backblast area;

e. a range sweep is carried out prior to each day's firing;

f. no other helicopters are within the surface danger area; and

g. the weapons are not fired at less than the minimum safe slant range (200 m).

CHAPTER 5

AIRMOBILE SOPS

STANDING OPERATING PROCEDURES

1. **Time Zone**. All times ZULU from GPS.

2. **Grouping**. Formations will be grouped into four plane elements, each consisting of two, two plane sections.

3. **Formation Types and Spacing**:

   a. sections will maintain Trail formation when in element formation. Sections operating alone will maintain Trail formation in close or over heavy treed areas and Battle in open, flat terrain. A single element formation will use Trail in close terrain and Battle formation in open terrain that allows sufficient spacing;

   b. element spacing will be two minutes apart if the elements land separately at the LZ, otherwise, spacing will be 30 seconds or approx 1500 metres spacing between the last helicopter in the preceding element and the first helicopter in following element;

   c. each element will make best use of terrain while staying within the corridor; and

   d. spacing between helicopters must be briefed depending on the threat, terrain, visibility and lighting.

4. **Start, Taxi, Takeoff (T/O)**:

   a. T/O time. (Start time is only given if necessary);

   b. taxi in sequence on element lead's move;

   c. T/O will be on GPS time in stream;

   d. except for the initial radio check, if required, all manoeuvres will be predicated on time; and

   e. any delays in timings are to be expressed in H/L/Y + xxx minutes format.

5. **Loading Plan**:

   a. the ALO is to be dispatched to the LUC location ASAP prior to an /operation, will monitor the Sqn Comd net and estb comms with the D/AMC at the PZ;

   b. chalks (loads) are 8 pax summer and winter, and 6 pax in winter with rucksacks or toboggans. Chalks are to be established in decreasing order of priority left to right, front to back **from aircraft reference** (a minimum of 35 paces between chalks);

c. chalks are to be formed up in single line at either the 12 o'clock or the 3 o'clock depending on the landing formation used, divided into two groups of four. Figures 5-1 and 5-2 illustrate the loading procedures;

d. delays which will compromise assigned air corridor/fire support co-ordination timings must be communicated to element lead(s) and AMC/DAMC for the go/no go decision;

e. helicopters will depart the PZ when a thumbs up has been passed from the last ac to the preceding ac and so on up to the lead. Once thumbs up are all given, T/O will be on timings. For night operations, selection of NVG lights from flashing to steady in sequence from last helicopter to lead when ready for T/O. Once readiness is confirmed, takeoff will be predicated on timings as per the air movement table/mission planning card;

f. the lead ground chalk will pop smoke when the formation is on final approach. This will serve to orient the aircrew and to confirm that the PZ is secure; and

g. the standard chalk load timing of five minutes during summer and ten minutes during winter is to be used for planning considerations.

6. **Lifted Unit Bump Plan**:

a. loads are sited by the ALO by serial, in decreasing order of priority from chalk #1; and

b. if a helicopter goes U/S, the last chalk(s) is/are to be dropped.

7. **Avn Unit Bump Plan**:

a. a spare helicopter will be started by a pilot and an FE at the squadron location. To be used as a spare for unserviceabilities on start-up;

b. any hel that goes U/S, the AC and co-plt will take the spare helicopter, and the U/S helicopter FE will remain behind to secure the U/S helicopter;

c. if there is no spare helicopter and the element lead's helicopter goes U/S, the lead AC and co-plt will bump the crew from helicopter #4; FEs will remain with their individual helicopters;

d. if the D/AMC's helicopter goes U/S, bump the co-plt from helicopter #4; and

e. the alternate element lead is helicopter #3.

8. **Landing Pattern**:

a. elements will close up to landing formation at the RP. Landing formations depend on the threat, helicopter numbers, and size and shape of the landing area. At night, on touchdown all helicopters will turn NVG lights steady to flashing. Layout for various landing formations provided at Figure 5-4;

b. all LZ departures will be individually by helicopter ASAP and rejoin en route RV, unless there will be multiple elements in the LZ unloading simultaneously, then depart by element once thumbs up given as per PZ departure. During night operations, select NVG lights from flashing to steady, in sequence from last helicopter to lead when ready to T/O; and

c. troop disembarkation is as per Figure 5-5.

9. **Holding Area**:

a. elements will proceed to the HA when directed, or when loitering is required;

b. helicopters will hold by element, facing inwards for mutual support as per Figure 5-6 when no door guns are mounted or when dual door guns are mounted. When equipped with a single door gun only elements will adopt a box formation as per Figure 5-8. Distance between helicopters is area specific with respect to size, shape and terrain. The rule of thumb will have adjacent helicopters 1/3 effective range of weapon system (600 m range would have helicopters no more than 200 m apart);

c. if a door gun is mounted, that side of the helicopter to be facing outwards;

d. AMC,D/AMC, element leads and casevac ac to RV at a predetermined loc upon shutdown in the HA; and

e. if shutdown is required, AMC or D/AMC as appropriate, will carry a portable radio to maintain comms with the ALO. If a portable radio is not available, then the lead helicopter will hold the first listening watch for 15 minutes, followed by two, three, etc.

10. **Aircraft Configuration**:

a. eight-man seating configuration;

b. barrier net installed;

c. all lights OFF during Day. (Anti-collision lights on for training only.) Formation lights NVG, all others OFF;

d. ½ litter kit with one stretcher; and

e. **Fuel**:

(1) 1600 lbs initial fuel load lifting from sqn loc:

11,900 lbs	AUW
- 7,500 lbs	basic wt
- 1,600 lbs	fuel (200 lbs reserve)
- 600 lbs	crew

- 2,000 lbs	pax @ 250 lbs each
= 200 lbs	remaining

NOTE

1600 lbs will allow 30 kms transit to the PZ, two lifts to the LZ (50 kms each), transit to the HA 50 kms from the LZ, hold, then transit to the FARP.

(2) BINGO Fuel is the fuel required to fly from farthest point on the planned route to land with 200 lbs at the FARP or unit location; and

(3) JOKER Fuel is the fuel required to complete the mission and land at the FARP or the unit location with 200 lbs remaining; and

f. KY58 and Mode 2 IFF installed and filled.

11. **Weapon State and Usage**:

a. Door gun(s) “STOWED”, “LOADED” or “READY”, depending on ROEs and AMC orders.

b. Ammunition usage rates for door guns:

(1) en route to PZ – 10%;

(2) en route to LZ – 40%;

(3) in LZ – 30%; and

(4) en route to HA/FARP – remaining.

12. **Enemy Contact**:

a. **Enemy Ground Fire**:

(1) take immediate evasive action, return fire if able, turn away from fire and mask, inform element;

(2) element lead will send contact report(s) to the formation lead or AMC; and

(3) attempt to rejoin the element or proceed to the next RV/ACP for rejoin.

b. **Enemy Air Attack**:

(1) the first person making contact, will report the location of the threat relative to the element;

(2) the threatened section will turn towards the threat, spread out and attempt to mask;

(3) the other section will attempt to mask;

(4) once the threat has passed overhead, helicopters will attempt to mask/land until the threat exits area; and

(5) hels will attempt to rejoin the element or proceed to the next RV for rejoin.

13. **En Route Emergencies**:

a. Inform the element lead and maintain section integrity;

b. if en route to the LZ, the shadow helicopter will ensure that the helicopter with the emergency is on the ground and will then proceed to the LZ. AMC/LUC will decide if chalk is recovered;

c. any downed helicopter crew will carry out CSAR/ Downed Aircrew/ Downed Helicopter SOPs; and

d. consider a CMDS salvo, depending on the situation.

14. **Lost Lead**:

a. **VMC**. Inform the lead IAW EMCON policy, attempt to rejoin, then proceed to the next RV for rejoin; and

b. **IIMC**. IIMC procedures by element will be briefed, dependent on the formation to be utilized. As a default, the standard is:

(1) Lead calls heading and base altitude and climbs to base altitude plus 1500 ft;

(2) #2 turns 45 ^{o} away from Lead and climbs to base altitude plus 1000 ft;

(3) #3 turns 45 ^{o} away from Lead and climbs to base altitude plus 500 ft; and

(4) #4 turns 90 ^{o} away from Lead and #3, and climbs to base altitude.

NOTE

If weather is marginal, a fixed formation must be briefed, i.e. Section Leads in Trail Heavy Right, to ensure directions of climb do not conflict.

15. **Downed Helicopter** (see Chapter 7):

a. administer First Aid as required;

b. if possible, report the situation to the AMC;

c. if capture of the helicopter is likely, prepare it and all sensitive equipment for destruction in order of priority as follows:

(1) **Priority 1**. IFF equipment and classified electronic equipment including DTC with related pubs and documents and other material as defined by the national government concerned;

(2) **Priority 2**. Installed armament;

(3) **Priority 3**. Engine assembly;

(4) **Priority 4**. Airframe, control surfaces and undercarriage;

(5) **Priority 5**. Instruments, radios and electronic equipment; and

(6) **Priority 6**. Electrical, fuel and hydraulic systems;

d. Employ survival radio/locator and visual signalling devices to aid in locating of the downed aircraft;

e. Establish defensive positions around the recovery site;

f. If not immediately evacuated, proceed to a pre-planned pick-up point or follow the briefed escape and evasion plan; and

g. Assist as necessary in aircraft battle damage repair actions and in the evacuation of the helicopter and/or personnel from the site.

16. **Location Of Key Personnel**:

a. The platoon commanders are to be in the first chalk of every element;

b. The formation comd will be in #1 helicopter, D/AMC in helicopter #2, and altn lead in #3; and

c. AMC in separate C2 helicopter. If unable separate helicopter, AMC loc with LUC/FOO loaded by ALO.

17. **Communications**:

a. radio minimize unless silence specified;

b. if a radio check is required, then check in after engine start, on element frequency only. i.e. “Blues this is Lead, check in”, “Blue 2”, “Blue 3”;

c. if a check in time is given, and all element helicopters are not on HVQK by check plus 5 mins, all element helicopters to switch to backup element frequency;

d. if radio is suspected U/S and no radio check is to be carried out, inform lead via runner;

e. tactical C/S on FM nets, Fmn C/S on A/A nets;

f. if the FOO is not with the AMC/LUC, ensure that the artillery frequencies are made available;

g. the standard radio monitoring by sections within elements in a formation will be:

(1) **Section Leads In Elements**:

(a) VHF/FM supported unit net;

(b) HVQK formation net; and

(c) HVQK element net.

(2) **No. 2**:

(a) VHF/FM Tactical air net/artillery fire direction/Sqn Comd net as required;

(b) VHF/FM supported unit net; and

(c) HVQK element net.

18. **EMCON**:

a. Doppler - "Silent Mode";

b. RAD ALT - "OFF";

c. DME - "OFF";

d. Transponder (dependant which side of the IFF on/off line you are):

(1) all Squawk Mode 1, 2 and 4;

(2) element leads Squawk Mode 3 A/C for training; and

(3) helicopter #4 calls "Mode 1" on element frequency, five seconds before every half hour, unless under radio silence.

e. Lights. No White Lights.

19. **DEWS**:

a. all helicopters to have RLWR and MAWS selected "ON" but Flare on "SAFE"; and

b. if in Trail formation, last helicopter only to have Flare system "ARMED". If section in Battle formation, both helicopters to have Flare "ARMED".

20. **Time Check**. GPS time will be obtained before orders and hacked as backup. Once in helicopters, GPS time used from AMS as the primary source.

AIR LOAD TABLE CH 146

ACL: **MCL**:

LOADS	TIMINGS						
PASSENGERS/EQUIPMENT	PZ ARR	LOAD	LIFT	SERIAL	LOAD	LZ	REMARKS
1 2 3 4 5 6 7 8							
1 2 3 4 5 6 7 8							
1 2 3 4 5 6 7 8							
1 2 3 4 5 6 7 8							

Table 5-1: Air Load Table

ACL: 2000lbs **MCL**:

LOADS	TIMINGS						
PASSENGERS/EQUIPMENT	PZ ARR	LOAD	LIFT	SERIAL	LOAD	LZ	REMARKS
1 WO SMITH 2 MCPL JONES 3 CPL ALPHA 4 CPL BRAVO 5 PVTCHARLIE 6 PVT DELTA 7 PVT ECHO 8 PVT FOXTROT	1315	1330	1	1	1	DODGE	ALT LZ: BUICK
1 SGT GOLF 2 MCPL HOTEL 3 CPL INDIA 4 CPL JULIETTE 5 CPL KILO 6 6 X ERYX MSLS 7 2 X ERYX TUBE	1315	1335	1	3	9	FORD	ALT LZ: BUICK
1 etc 2 3 4 5 6 7 8							
1 etc 2 3 4 5 6 7 8							
1 etc 2 3 4 5 6 7 8							

Table 5-2: Example of an Air Load Table Format

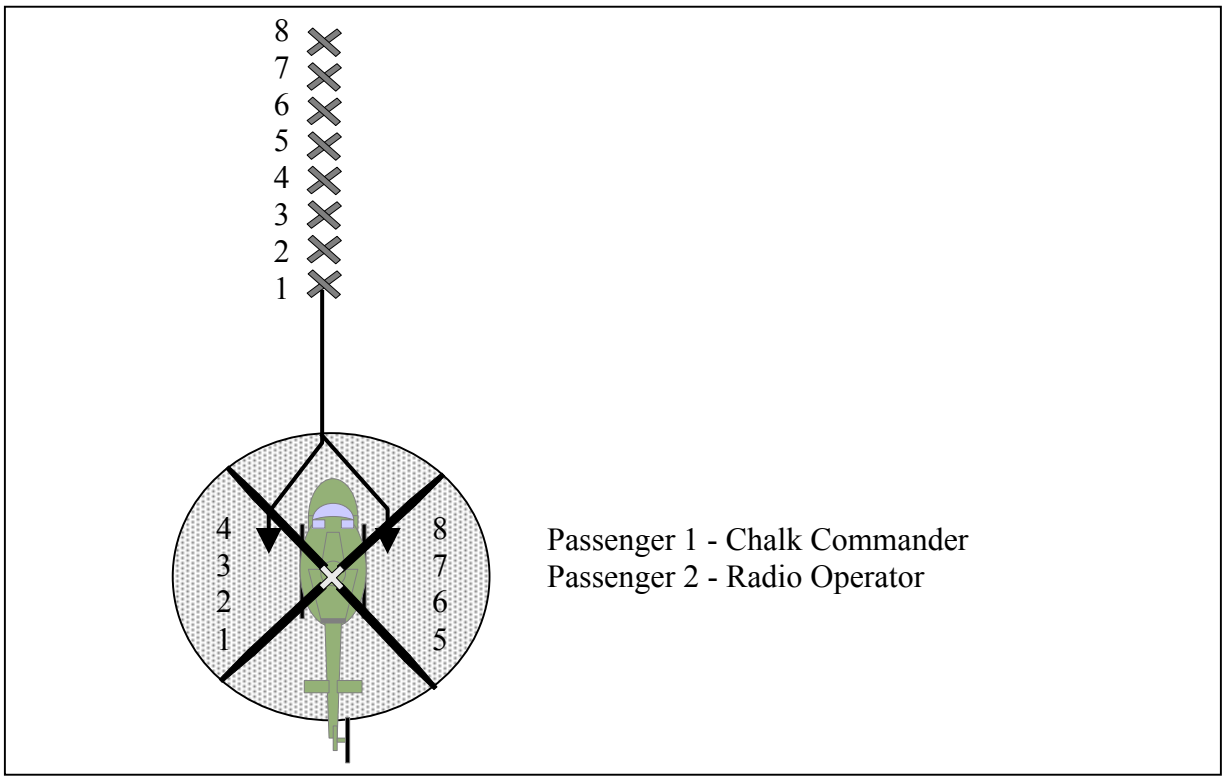


Figure 5-1: Troop Arrangement - Loading from the Front

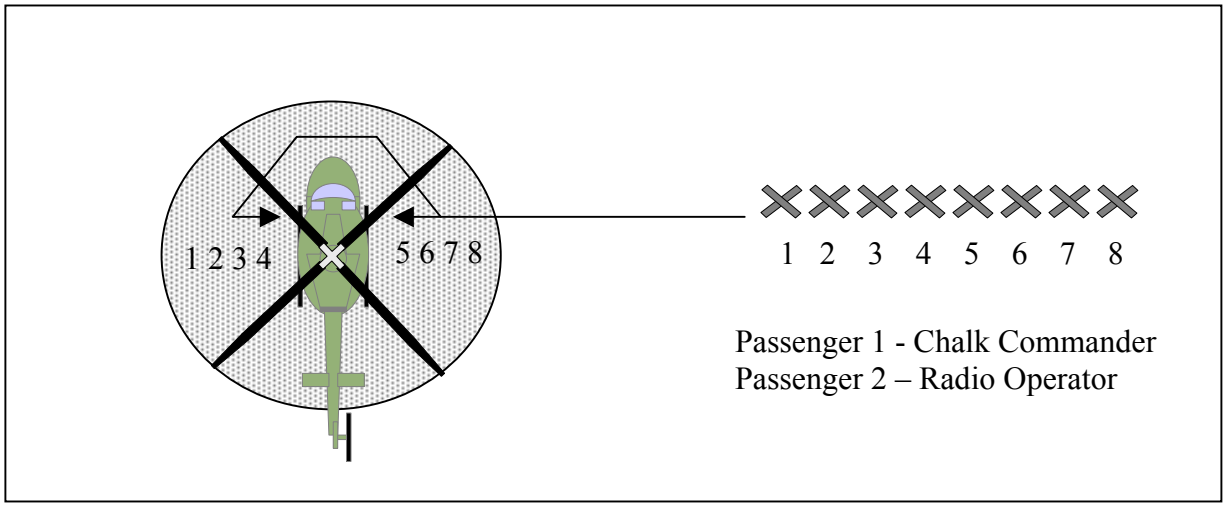


Figure 5-2: Troop Arrangement - Loading from the Side

Seat Position:

A - Pilot

B - Pilot

C - Flt Eng

1 - Chalk Comd

2 - Rad Op

3 - 4 Troops

5 - 8 Troops or Eqpt

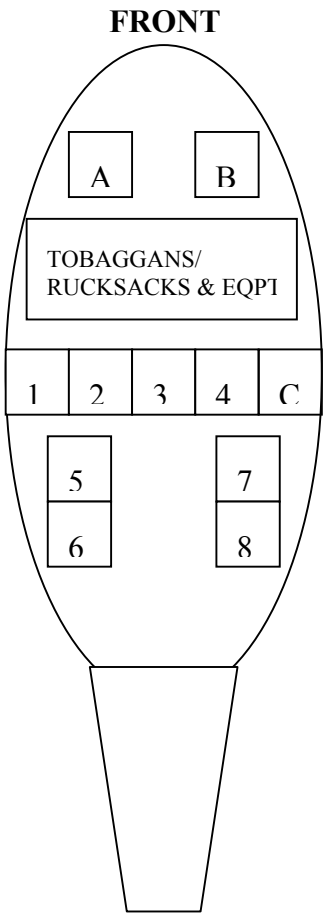


Figure 5-3: Seating Arrangement

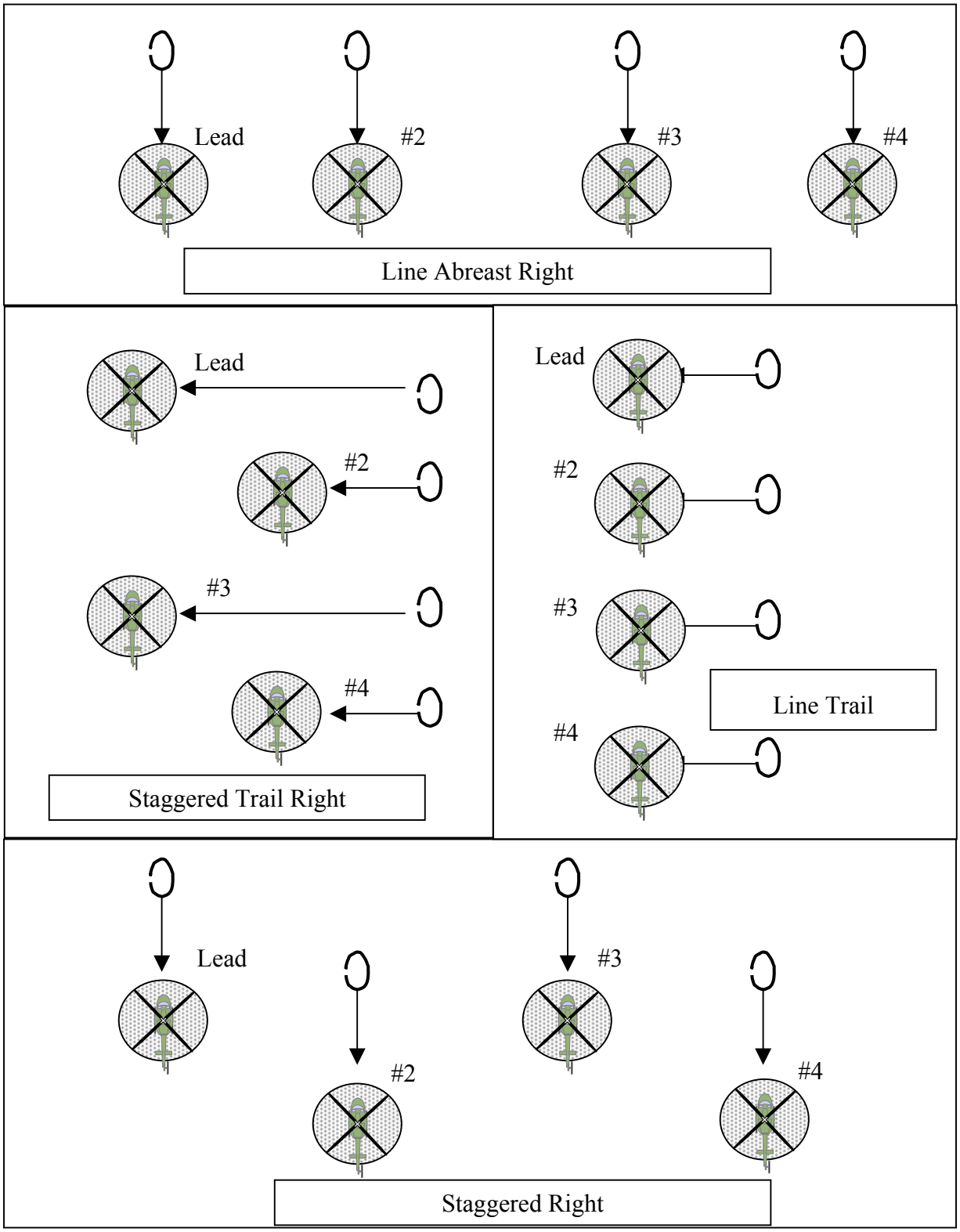


Figure 5-4: PZ Layouts for Various Landing Formations

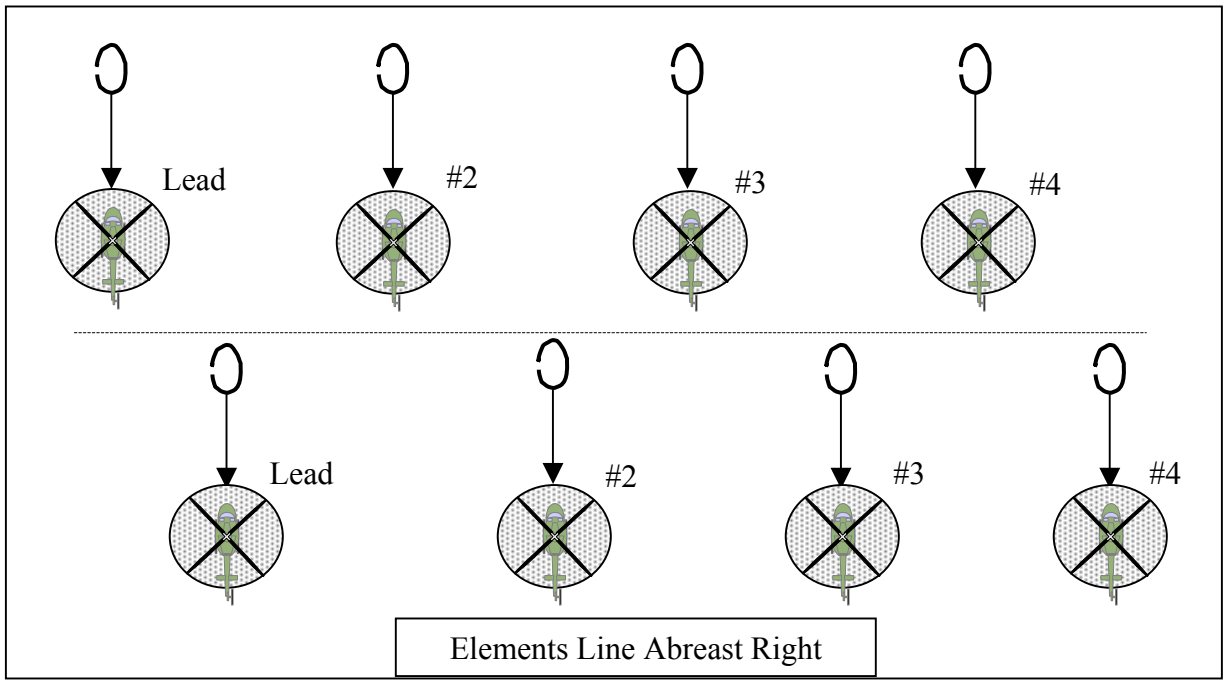


Figure 5-4: PZ Layouts for Various Landing Formations (cont'd)

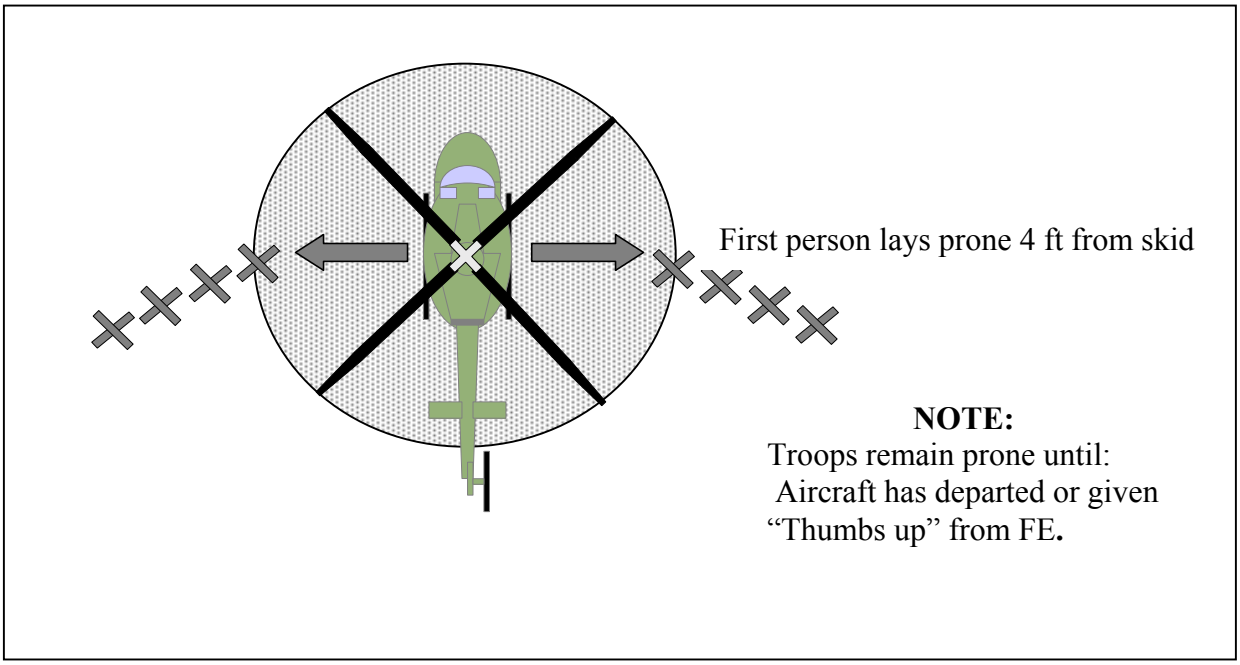


Figure 5-5: Troop Movement & Positioning on Disembarkation

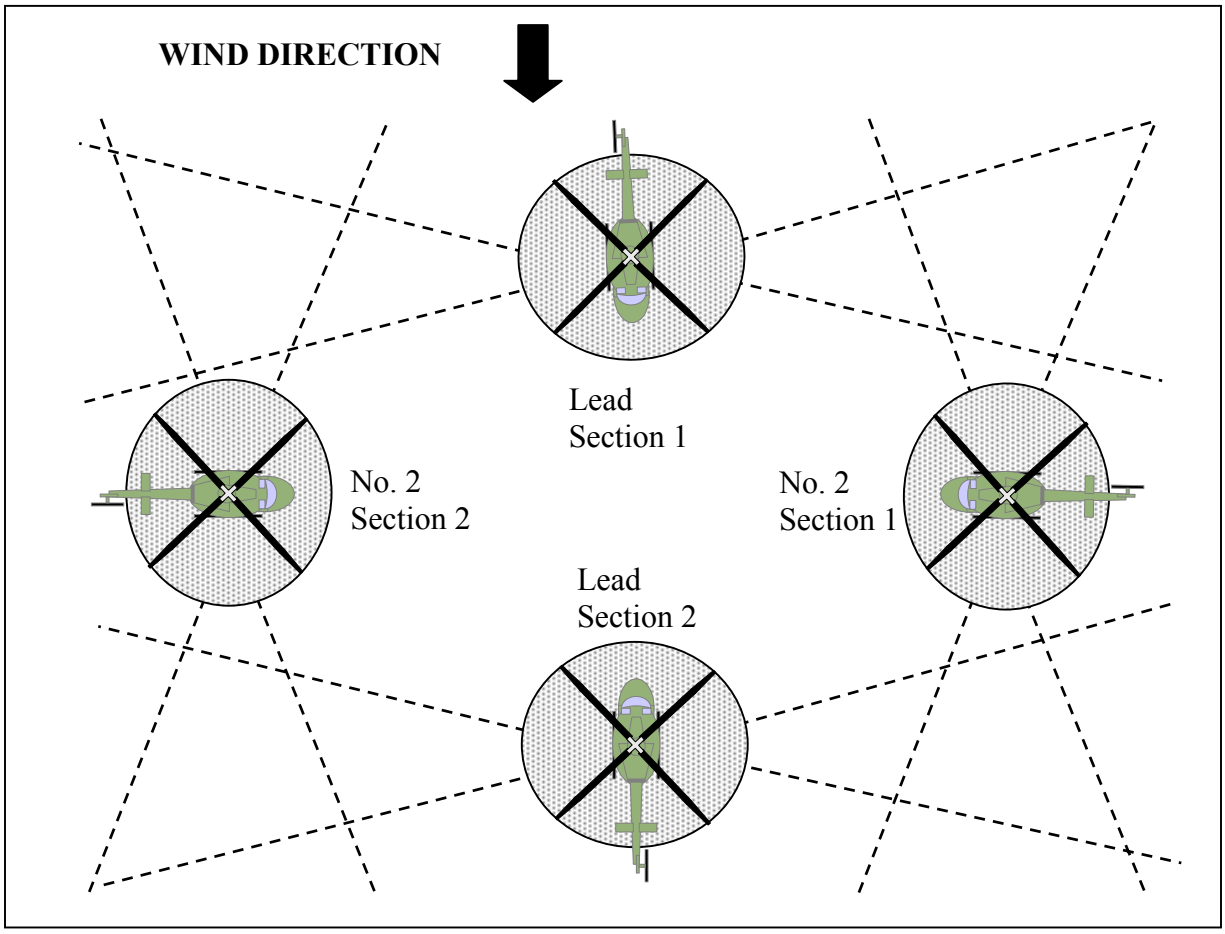


Figure 5-6: Holding Area Weapon Arcs of Responsibility

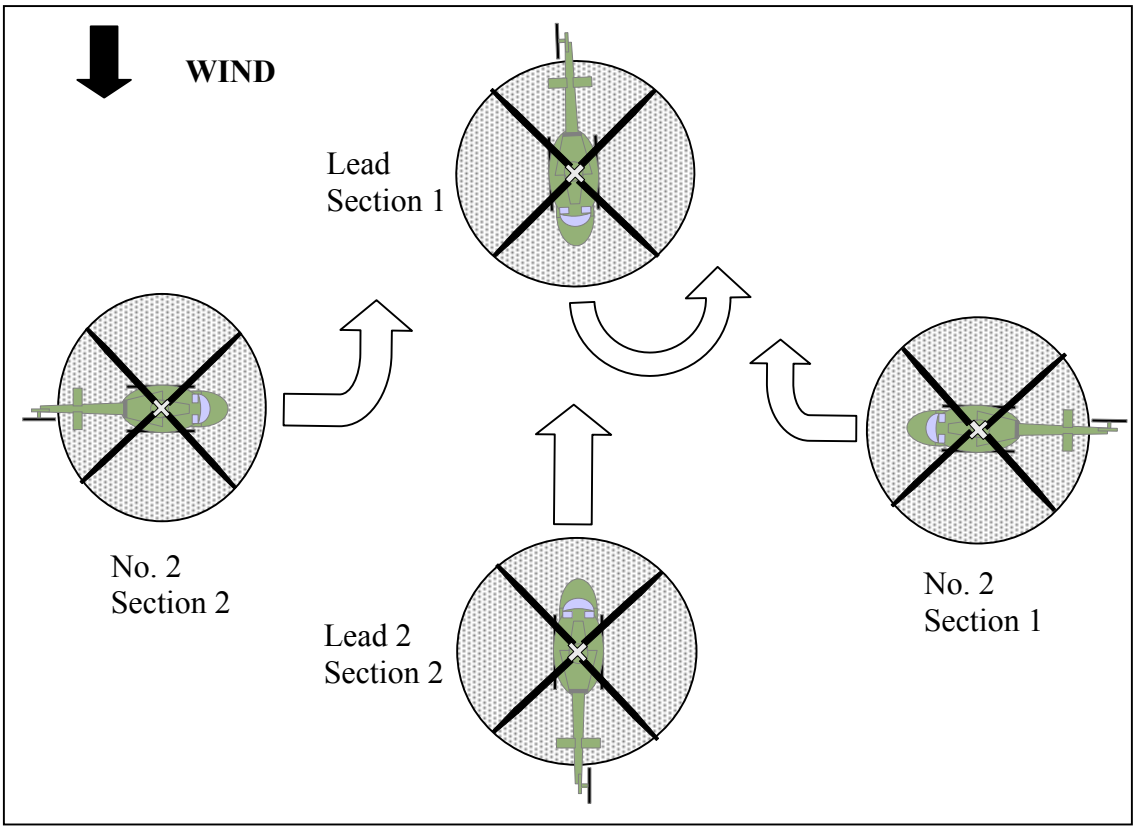


Figure 5-7 : Holding Area Formation Departure Procedure

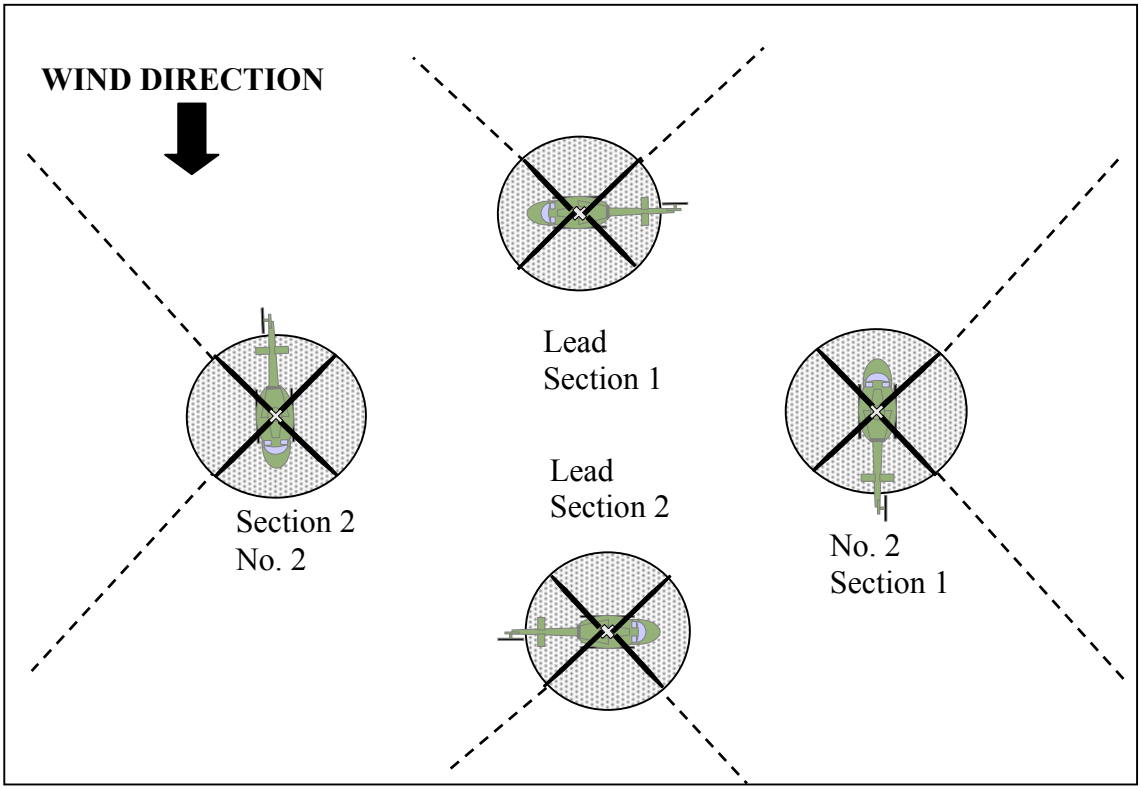


Figure 5-8 : Holding Area Weapon Arcs of Responsibility - Single Door Gun

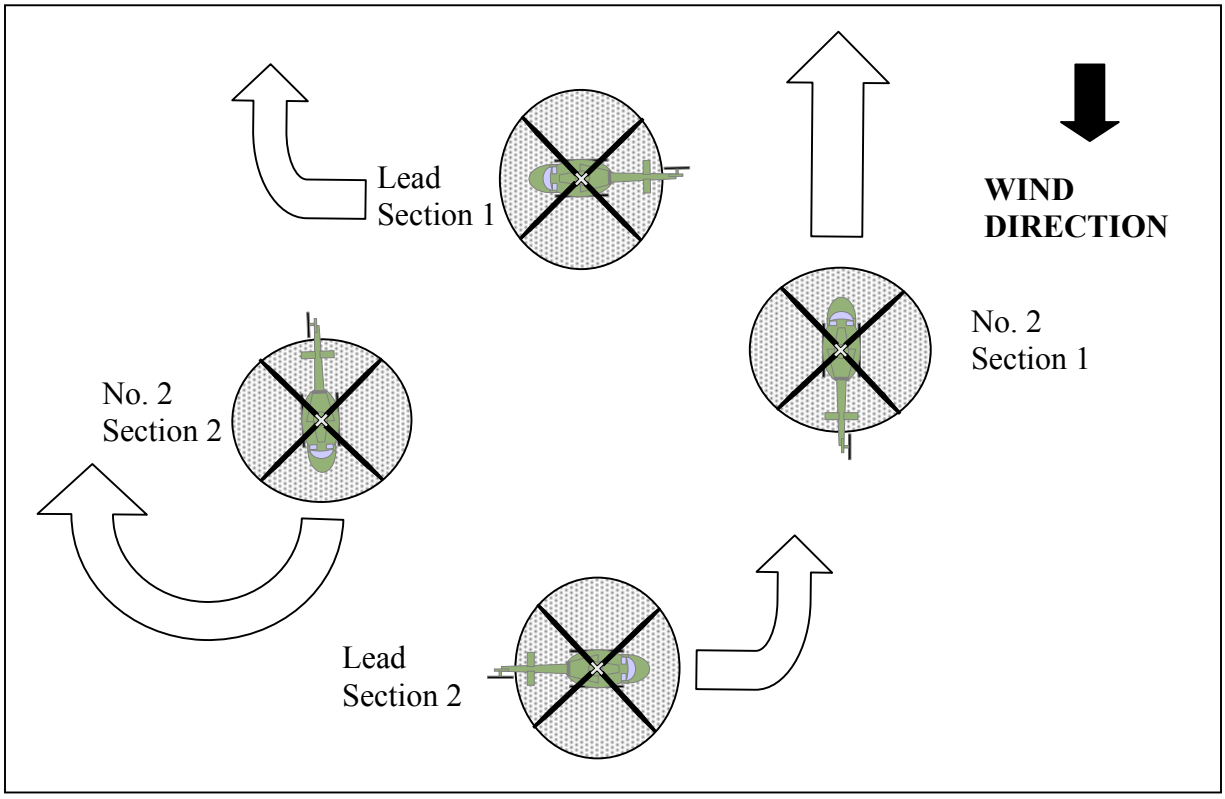


Figure 5-9: Holding Area Box Formation Departure Procedure

Reference Map:

P - Primary

A – Alternate

Copy No.

DTG:

H/L/Y HOUR: ————

AVN UNIT	LIFTED UNIT	STAGING PLAN			LOADING PLAN					AIR MOVEMENT						REMARKS
		T/O TIME	ROUTE	PZ	LIFT	SER	CHALK /LOAD	LOAD TIME	PAX/ CARGO	LIFT TIME	SP TIME	ROUTE	RP TIME	LZ	LZ TIME	MCL: ACL:

Table 5-3: Air Movement Table

Reference Map: EAST GRANOVIAN 21G

P - Primary

A – Alternate

Copy No.

DTG:

H/L/Y HOUR: 0955Z

AVN UNIT	LIFTED UNIT	STAGING PLAN			LOADING PLAN					AIR MOVEMENT						REMARKS
		T/O TIME	ROUTE	PZ	LIFT	SER	CHALK /LOAD	LOAD TIME	PAX/ CARGO	LIFT TIME	SP TIME	ROUTE	RP TIME	LZ	LZ TIME	MCL:2500 LBS ACL:2200 LBS
408 Sqn	2 RCR															
BLACK		L-34	SPADE	P-COW A-GOAT	1	1	1 – 4	L-25	4/B, FIRE BASE	L-20	L-17	COHO	L-3	P- BUICK A-FORD	L HR	RTN RTE: PINK
BLUE		L-34	SPADE	P-COW A-GOAT		2	5 – 8	L-25	HQ B COY, TROOPS & WPNS	L-18	L-15	COHO	L-1	P- BUICK A-FORD	L+2	RTN RTE: PINK
GREEN		L-33	SPADE	P-COW A-GOAT		3	9 – 12	L-24	1/A, PIONEER SECTION	L-16	L-13	CHUM	L+2	P - DODGE A - FORD	L+5	RTN RTE: CHINOOK
RED		L-31	SPADE	P-COW A-GOAT		4	13 – 18	L-20	HQ A COY, PIONEER SECTION	L-14	L-11	CHUM	L+4	P- DODGE A- FORD	L+7	RTN RTE: CHINOOK
BLACK				P-COW A-GOAT	2	1	1 – 4	L+24	5/B, TROOPS & WPNS	L+29	L+26	P-COHO A-CHUM	L+40	P-BUICK A- FORD	L+40	RTN RTE: PINK

Table 5-4: Example of An Air Movement Table

NOTES:

AIR MOVEMENT TABLE

The following explains specific parts of the Air Movement Table and what information is required in each column. Timings may be designed in relation to L, H, or Y hour or may be GPS/Clock time.

1. **AVIATION UNIT**. The AMC will enter the unit designation and element call signs in this column (for example 408 Sqn, Blacks, Blues tactical c/s Wolf 43A).

2. **LIFTED UNIT**. The ground unit's designation will be entered in this column in is order of commitment (for example, 2 RCR, J/2RCR).

3. **STAGING PLAN**. Information in these sub columns will only be filled in for the staging phase, after which, they will be left blank except for the PZ designation for subsequent lifts.

    a. **T/O Time**. This column refers to the time the elements/sections depart from the assembly area or squadron location. Taxi times and start times are the responsibility of the individual element/section leads to coordinate.

    b. **Route**. This will designate the primary and alternate routes from the assembly area/squadron location to the PZ.

    c. **PZ**. This designates the primary and/or alternate PZ for the mission. It will also be used for FARP designation where the helicopters are to be refuelled or the holding area.

4. **LOADING PLAN**. Information in these sub-columns will be utilized for the loading phase on the initial and subsequent lifts.

    a. **Lift**. All helicopters in a formation comprise a lift. When all helicopters are accounted for (see in example with 18 helicopters available) then the next lift is numbered. More than one squadron and elements of one or more ground units may be moved in the same lift.

    b. **Serials**. Serials are created by subdividing lifts, usually elements, into manageable components. CH 146 operations the serials/elements usually comprise one, two, or three sections (two, four, six helicopters). Serials within each lift are numbered sequentially, beginning with number 1. On subsequent lifts the serials will start again at 1. This helps in maintaining control when multiple pickup zones, landing zones and or flight routes are used and elements of the lift are separated.

    c. **Chalks/Loads**. Chalks are numbered sequentially, one for each helicopter allocated, within a lift. The number of loads per serial is dependent upon the number of PZs, LZs and flight routes to be used in the operation along with the size of the PZs and LZs. Chalks renumber at 1 for each new lift to avoid confusion on chalk numbering if multiple PZs are used.

d. **Load Time**. For large lifts, to avoid congestion in the PZ and sequence loading, a load time will be designated. For planning purposes, allow for five minutes in summer and ten minutes in winter for loading. This column is also used when refuelling is to be done and will designate the time the helicopters are scheduled for refuelling.

e. **Pax/Cargo**. This is a general description of the loads to be carried in each serial to identify special aircraft configurations (slung loads, TOW, mortars). It is not the responsibility of the aircraft captains to know in great detail the configuration of each load, therefore, this column should not be overly detailed.

5. **AIR MOVEMENT**. Information in these sub columns will be used for the air move phase of the operation in conjunction with the mission log card (see Table 5-5). The latter will have the details concerning ACPs, frequencies, codes, etc.

a. **Lift Time**. The lift time is the time a helicopter departs the PZ. This time should be planned to allow helicopters to depart the PZ, assemble into their in-flight formation and arrive at the start point at the required time. Normally two to three minutes prior to SP time is sufficient.

b. **SP Time**. This is the time the element lead is scheduled to cross the SP. The SP is usually 3 to5 kms from the PZ.

c. **Route**. This will list the route name only and will correspond to the primary route on the mission planning card. There may be a primary and alternate route listed in this space.

d. **RP Time**. This is the time the element lead is scheduled to cross the RP. It is usually 3 to 5 kms (two to three minutes) back from the LZ and will allow enough time for the element(s) to close up and adopt the landing formation. This may also be a critical timing for the commencement, shifting or check fire of a fire plan for landing.

e. **LZ**. This will designate the primary and alternate LZ by name or designation. The desired landing formation can be listed under the LZ code name if required. Ensure PZ and LZ names do not conflict.

f. **LZ Time**. This is the landing time for each element/serial. For planning purposes allow two minutes for unloading.

6. **REMARKS**. This column will contain any information necessary to ensure that the air movement table is understood. Types of information in here could include sequence of bump by load, return rtes, CASEVAC directions.

MSN ID:		Datum:	
Winds:	TZ	Var:	ESA
Mission:			

L-Hr: GROUPINGS

C/S	A/C	Crews	Radios			Remarks

C/S	Task/PZ/Route/LZ	Time

Bump Plan

KY-58 FILLS HVQK PRESETS

KY	Unit	KY	Unit	Chan	ID	Type	Chan	ID	Type
				1			4		
				2			5		
				3			6		

CODEWORDS/NICKNAMES/PASSWORDS

Word	Meaning	Word	Meaning
Password:	To:	Password:	To:

DEWS SETTING

MAWS		RLWR		Chaff		Flare	

FUEL/PERFORMANCE

Fuel Burn:	BINGO:	Joker:	FARP:
Weight:	OEI Q:	4 FT Q:	11, 9 Q:

FRP LOC/TIMES

WP	Grid	Name	Time	WP	Grid	Name	Time

NAV DTA – FLT PLAN - TIMINGS

SEQ	WP	Name	Grid	Trk	Dist	Leg Time	Run Rime	Remarks
INI								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								

RADIO PRESETS

#	C/S	Pri	Alt	KY-58	#	C/S	Pri	Alt	KY-58

IFF SETTINGS

SECTI ODE 1								
Mode 2		Mode 3		Mode 4				

Table 5-5: Mission Log Card

CHAPTER 6

AVIATION LIAISON OFFICER'S CHECKLIST

AND BRIEFING FORMAT

GENERAL

1. The purpose of this chapter is to provide suggested formats for two checklists. The first is for the Aviation Liaison Officer (ALO). It contains a list of required equipment for effective LO operations, as well as a list of information needed and actions to take at both the squadron and the supported unit. The second checklist is a suggested format for the ALO briefing. This checklist is a format, which contains the essential information that the ALO should provide on arrival, to the supported unit commander or the Point of Contact (POC).

2. **Required Equipment**. This equipment list is the minimum essential equipment for an ALO to sustain operations and provide essential support:

a. a vehicle with the mobility to match the supported unit's vehicles;

b. camouflage to cover the vehicle;

c. secure communications equipment capable of reaching the squadron from the supported unit. This must include remote operation capability and spare batteries;

d. tentage;

e. maps of the AO;

f. GPS;

g. night observation devices (NODs);

h. paper, acetate, alcohol, shop towels, pens, pencils, paper, alcohol markers, tape;

i. CEOIs to cover length of the operation;

j. reference materials (the type of ref material will vary depending on the mission);

k. signalling devices (strobe lights, IR chem lights, bean bag lights); and

l. a rad op.

CHECKLIST

3. **Actions prior to departure to the supported unit**:

a. the location of the supported unit;

b. the point of contact (POC, by name if possible);

c. the frequency and call sign of the supported unit;

d. the challenge and password for the supported unit; and

e. the current unit status:

(1) aircraft status;

(2) personnel status/crew cycle;

(3) communications; and

(4) security equipment.

4. **Locations**:

a. Squadron CP (Current and Future);

b. squadron sub units; and

c. FARP (Current and Future).

5. **Intelligence**:

a. the enemy situation;

b. known enemy locations;

c. probable enemy COAs;

d. weather outlook for the anticipated mission times;

e. familiar with enemy order of battle;

f. familiar with enemy electronic order of battle; and

g. enemy special operations (such as NBC, airborne, heliborne, etc.).

6. **Mission**:

a. special equipment requirements;

b. understanding of the mission and the commander’s intent;

c. copy of graphics and OP O; and

d. readiness state.

7. **General Information**:

a. Friendly AD locations;

b. friendly land force units in the AO (call signs and frequencies);

c. decon sites;

d. medical support in the AO;

e. boundaries and coordination points;

f. CAS availability (Call sign and frequency); and

g. **Actions at the Supported Unit**:

(1) determine the land force commander's intent for aviation use and the aviation mission;

(2) determine the locations of CPs (for brigade and lifted units);

(3) determine the FEBA and the FLOT;

(4) determine the locations of all artillery batteries;

(5) determine the locs of all friendly AD assets operating in the AO;

(6) brief the POC on the capabilities of the supporting aviation assets;

(7) determine the ground tactical plan;

(8) coordinate the passage of lines;

(9) determine the supported unit's communications plan;

(10) coordinate fire plans as required (obtain target lists from the FOO and assist in developing fire support plans for aviation missions);

(11) coordinate airspace for aircrew operating in the AO;

(12) determine the H-Hour (and establish an L-Hour or Y-Hour if applicable);

(13) coordinate EW support for missions; and

(14) determine the locations of medical support facilities in the AO.

8. Once this information has been received, the ALO should return to the squadron and continue to liaise between the supported unit and the squadrons necessary to coordinate mission details and conduct mission coordination.

9. **LO's Briefing**. This will assist the ALO in preparing for the briefing to the supported unit and should cover the following areas:

a. **Introduction**:

(1) Classification of the briefing;

(2) the purpose of the briefing; and

(3) what unit the ALO is from.

b. **Intelligence**:

(1) Enemy actions in and around the supporting aviation unit's area (past 24 to 48 hours);

(2) expected enemy contact in the aviation unit's AO; and

(3) aviation constraints that may affect the mission (weather).

c. **Operations**:

(1) the current location of the supporting aviation units(s);

(2) the location of supporting avn units(s) in the fol 24 to 48 hours;

(3) attachments to the aviation unit;

(4) detachments from the aviation unit;

(5) committed helicopters not available for support (CASEVAC, etc);

(6) the number and type of helicopters available to support the mission;

(7) planning the combat load per helicopter; and

(8) number of day and night crews available for the mission.

d. **Logistics**:

(1) the current aircraft status;

(2) the current weapons systems status;

(3) the expected aircraft status over the next 24 to 48 hours;

(4) the expected major weapons system status in the next 24 to 48 hours; and

(5) the current fuel and ammunition status.

e. **Command and Signals**:

(1) The call sign and the frequency of supporting aviation units and the ALO;

(2) the planned location of the ALO - before, during, and after the operation; and

(3) the procedural and positive control measure(s) that exist in the supported unit's area of operation.

f. **Coordination**:

(1) the planning time line;

(2) the mission statements (two levels up);

(3) command relationships;

(4) initial planning graphics;

(5) the call sign(s) and frequencies of all supported units; and

(6) a time check.

CHAPTER 7

COMBAT SEARCH AND RESCUE AND DOWNED HELICOPTER PROCEDURES

GENERAL

1. Combat Search and Rescue (CSAR) is the detection, location, identification and rescue of downed aircrew in hostile territory, in crisis and in war, and when appropriate, isolated military personnel in distress, who are trained and equipped to receive CSAR support, throughout a theatre of operations. Canada does not have trained CSAR helicopter aircrew to conduct CSAR missions. This Chapter is intended to give an overview of NATO coalition CSAR operations and responsibilities. In the event that Canadian aircrews are downed during coalition operations, they must know these procedures, if they are to be rescued by CSAR forces.

2. Search and Rescue (SAR) is a national responsibility and is normally limited by the respective national Search and Rescue Regions (SRR). CSAR is provided to support operations throughout the NATO area of responsibility and is not limited by SRRs or national boundaries. The scope and scale of CSAR operations vary widely. While CSAR operations typically focus on the rescue of downed aircrew, they may also be conducted to rescue other isolated military personnel in distress, at the direction of the Coalition Commander. The scope and scale of CSAR operations may require forces ranging from a single asset to complex task forces involving assets from several components.

3. In operations outside the NATO area, by a NATO joint combined force committed to Peace Support Operations, the commander of the Allied Joint Force (AJF) will need to organize a SAR/CSAR capability within the designated area of responsibility. However, it should be noted that SAR within the territory (including its territorial waters) of any country is a sovereign right and a primary responsibility of that country. Coalition commanders must ensure that international agreements, local laws, regulations, policies and host nation SAR capabilities are taken into account when establishing procedures within the PSO’s area of responsibility.

COMMAND AND CONTROL

4. The Joint Task Force Commander normally exercises command authority for CSAR through a designated Component Commander (CC), usually the Air Component Commander (ACC). The ACC will establish a Combined Joint Rescue Coordination Centre (CJRCC) within the component's operation centre. The Joint Task Force Commander normally exercises OPCON over CSAR forces; however, certain national CSAR forces will be made available under TACON.

COORDINATION

5. The CRCC will coordinate the execution of the CSAR plan on behalf of the coalition commander. The plan must include the area of responsibility, an assessment of the threat, and participating forces. Also, a communications plan must be developed in conjunction with Op Os. The CRCC should be staffed by specialists from contributing nations and the component commands.

6. The CRCC coordinates inter-service/national rescue requirements. It provides a liaison function to the plans section of the air operations centre ensuring that CSAR inputs are made to the Air Tasking Order (ATO), Special Instructions to Airmen (SPINS), the Airspace Coordination Plan (ACP) and the Communications Plan (COMPLAN). The CRCC coordinates CSAR operations and liaises with relevant national RCCs. Each national/component commander will designate operations centres and controllers to liaise and coordinate CSAR requirements.

SUPPORT

7. The primary vehicle for recovering survivors is normally a helicopter. In addition, other naval, land or air force resources may be required to assist in detection, coordination, location authentication, protection, and rescue. These assets may be constituted into a comprehensive force package. Dedicated CSAR helicopters should be capable of extended range operations, must be able to operate in a threat environment and be capable of:

a. survivor location, authentication and rescue;

b. carrying rescue personnel and related equipment;

c. low level night operations;

d. accurate, independent navigation;

e. secure communications;

f. IFF; and

g. self-protection.

LOCATION AIDS

8. Aircrew, and others expecting to use the CSAR system should, must be equipped with a Personal Locator Beacon (PLB) that enables the rescue system to quickly and accurately locate their position and in addition, provide a communication and authentication capability. Other essential equipment required to aid in rescue includes evasion charts and signalling devices such as flares, a compass, flash/strobe lights and a signal mirror.

CSAR PROCEDURES

9. Procedures unique to CSAR include:

   a. preparation of an Isolated Personnel Report (ISOPREP) (see para 13) and an Evasion Plan of Action (EPA);

   b. accurate location of the survivor(s), prior to committing CSAR resources into a threat environment; and

   c. survivor authentication using ISOPREP or other means.

10. CSAR operations are normally conducted in 6 phases. These are as follows:

   a. proactive mission planning;

   b. notification;

   c. search (if required);

   d. mission planning;

   e. execution; and

   f. mission completion.

11. Detailed procedures for mission planning and survivor rescue procedures should be included in theatre SOPs and SPINS.

TRAINING

12. The training of aircrew in CSAR procedures is a national responsibility. In Canada, the focus of training is on individual survival training. Aircrew deployed on coalition operations where a high threat is expected, need individual training in the following areas:

   a. knowledge of CSAR procedures (including ISOPREPs);

   b. understanding of the EPA procedures and SPINS;

   c. the sequence of action after a ditching or forced landing;

   d. operation of a PLB and authentication procedures;

   e. knowledge of combat survivor skills;

   f. pick-up site selection and preparation;

   g. recovery procedures;

   h. prior to departure, individuals deploying to a NATO area of operations should receive appropriate enviromental survival training, specific to that region; and

   i. appropriate conduct after capture training should be provided.

ISOLATED PERSONNEL REPORTS (ISOPREPS)

13. **Preparation**. An ISOPREP contains information, which is used to verify the identity of downed aircrew, in a threat environment for CSAR purposes. All aircrew, and any personnel who accompany them, must have a completed ISOPREP on file prior to flying their first mission into a hostile area. In the event of the downing or crash of an aircraft, the agency responsible for providing CSAR capabilities will be immediately informed of the event by telephone. The ISOPREPs and the crew's Evasion Plan of Action (EPA) will then be transmitted to the CSAR agency. The Intelligence Section will normally be responsible for holding ISOPREPs on file.

14. ISOPREPs contain the following information:

a. surname, first name, middle initial;

b. service number;

c. rank;

d. element (i.e. Canadian Air Force);

e. nationality;

f. birth date (year/month/day);

g. obvious marks (scars or other distinguishing features, noting size and location);

h. blood group;

i. height in feet and inches;

j. colour of eyes;

k. colour of hair;

l. date the form was filled out (year/month/day);

m. wing/unit;

n. a four-digit number than can be easily recalled (do not use birth date, last four digits of service number or numbers in a pattern such as 1234);

o. signature; and

p. four statements about the individual and a photo.

PROCEDURES IN THE EVENT OF DOWNED HELICOPTERS

15. Normally, squadron helicopters will be operating within flying range of the squadron location and in a low threat environment. It is the responsibility of the squadron to attempt the recovery of downed aircrew and helicopters, prior to requesting CSAR resources. CSAR operations are controlled by higher headquarters and are normally only used in high threat, combat situations. The following paragraphs detail NATO helicopter squadron responsibilities as per ATP-49(B).

16. Pre-mission Planning. Prior to departing on a combat mission in a high threat area, the Aviation Mission Commander (AMC) will brief the aircrews on downed helicopter procedures. Information that will be briefed shall include:

a. the location of RV points for downed aircrew;

b. the procedures for providing assistance for downed helicopters;

c. identification and CSAR procedures;

d. identifying on-call supporting units that will provide aircraft recovery and security for the downed helicopter;

e. procedures for destruction of downed helicopters and equipment to prevent enemy capture; and

f. ensuring that ISOPREPs are filled out for all aircrew on the mission.

17. The procedures used in the recovery of downed helicopters are based on the location of the helicopter, the capability of the enemy to hinder recovery operations, and the capability of the aerial force to recover the downed helicopter. In the division rear area, the enemy has little influence on the recovery, therefore defensive recovery procedures may not be required. If the downed helicopter is near the FLOT, or in an area where there is no established FLOT, the enemy has the capability to influence the recovery, therefore defensive recovery procedures must be used. The most difficult area in which to recover a downed helicopter is within enemy held terrain. The recovery procedure over enemy terrain may also require the suppression of enemy ground forces. If recovery teams and equipment are available, and can act immediately, the recovery is more likely to be accomplished. All of the actions listed may not be required during the recovery operation. Each action must be carefully evaluated to determine the most effective procedure for the situation. Aviation units must pre-plan the recovery procedure for each situation and be prepared to execute the plan quickly. The following are actions that may be required in the event of a downed helicopter:

a. **The AMC Should**:

(1) determine the extent of damage and/or injuries through direct communication or reconnoitring;

(2) report the situation and the location and request deployment of an Aircraft Battle Damage Repair (ABDR) team to the downed helicopter site, or request assistance as the situation dictates;

(3) attempt the evacuation of personnel, only if it does not degrade the mission accomplishment, nor endanger the recovery aircraft;

(4) when required, request and assist in the control of suppressive fire; and

(5) advise downed aircrew of the action to be taken and continue the mission;

b. **The AC Of The Downed Helicopter Should**:

(1) administer first aid as necessary;

(2) if possible, report the situation to the AMC;

(3) if capture of the helicopter by the enemy is likely, prepare it and all sensitive equipment for destruction;

(4) employ survival radio, PLB and visual signalling devices to aid in locating downed aircrew;

(5) establish defensive positions around the recovery site;

(6) if not immediately evacuated, proceed to a pre-planned pick-up point or follow the pre-planned escape and evasion plan; and

(7) assist as necessary in aircraft battle damage repair actions and in evacuation of the aircraft/personnel from the down site; and

c. **Actions By The Squadron**. The Squadron HQ of the downed helicopter and the Squadron Maintenance Flight should be prepared to accomplish the following actions upon notification, if the tactical situation permits:

(1) Arrange for appropriate forces to provide security for the downed aircrew and helicopter.

(2) Dispatch an ABDR team and equipment to the downed helicopter site for aircraft recovery.

(3) Based on the ABDR team assessment, and the tactical situation, initiate one of the following actions:

(a) complete repairs necessary to fly the helicopter for return to action;

(b) apply temporary repairs to allow a one-time flight from the downed helicopter site to a repair facility;

(c) perform airlift recovery of the downed helicopter; or

(d) cannibalize critical, and easy to remove, components and destroy the helicopter.

(4) When the helicopter cannot be recovered, authorize the helicopter to be destroyed, with the CO’s approval.

CHAPTER 8

TACTICAL FORMATION PROCEDURES

GENERAL

1. This chapter describes the tactical formation procedures that should be used in helicopter operations and covers formation structure, spacing and flight procedures.

2. Tactical formation procedures and techniques must ensure safe and effective control of the section, element and formation in a potentially hostile environment. The best structure of a formation should be considered from Unit →PZ→LZ→HA→Unit. Each phase will have its own factors that must be considered which may result in each having a different formation and spacing. Any procedures must be flexible enough to allow adjustment due to variations in terrain, weather, visibility, aircraft configuration and formation size.

3. The formation must ensure that it allows for protection of the element or section. This can take the form of mutual support from aircraft weapon systems, overlapping arcs of observation, or adequate manoeuvring space for each helicopter. The formation should be planned so that if one helicopter is engaged, the others are not engaged at the same time. A proper analysis of each mission must take into account all factors to for proper formation design.

SPACING

4. Tactical formations are inherently vulnerable because numerous helicopters occupy a small volume of space and time. Their noise, visual, electronic and heat signatures make them easier to acquire than a single helicopter. Closely spaced formations have the following problems:

a. they are easier to pick up with the naked eye because of the cluster effect and any formation design will seem to be symmetrical against a natural background;

b. the enemy is able to engage all helicopters in a single attack, whether from an airborne or ground threat;

c. there is an increased risk of collateral damage if preceding helicopters are hit;

d. they reduce the ability of individual helicopters to manoeuvre because of the risk of collision with other helicopters in the formation;

e. reduced arcs of fire and effective ranges of the formation weapons systems by the near coincident fires;

f. areas of observation are more coincident with each other, increasing the chance of not detecting a threat; and

g. the chance of all helicopters flying over or within range of a single threat are increased, thereby allowing all helicopters to be easily engaged.

5. A widely spaced formation has its own inherent problems:

   a. loss of control and coordination by element/section leads;

   b. loss of mutual support from aircraft weapon systems;

   c. loss of visual contact during times of reduced visibility or NVG operations;

   d. formation cannot be given adequate support if escorted by AH or fighter support; and

   e. greater time and coordination required to close up the formation for landing.

6. The spacing that can be used can range from 3 rotors, for low illumination NVG formations where the cover of darkness will allow for the closer formations, up to 1000 metre spacing for open terrain, single element or section, day operations.

7. Since no single spacing covers all contingencies, the mission commander or element/section lead(s) must assess each situation and route segment to determine the best spacing for the mission.

8. There are three general categories of spacing:

   a. **Close**:

      (1) Although not recommended for day operations, no closer than 5 rotors between helicopters in a section and 10 rotors between section leads in an element formation; and

      (2) Night operations, 3 to 5 rotors between helicopters in a section and 10 rotors between section leads in an element formation.

   b. **Loose**:

      (1) Day operations, 5 to 10 rotors between helicopters in a section and 300 metres (20 rotors) between section leads in an element formation; and

      (2) Night operations have the same spacing as for day. The use of this spacing is dependent on the illumination and the ability to maintain proper spacing from the preceding helicopter.

   c. **Extended**:

      (1) Day operations, 10 rotors to 1000 metres between helicopters in a section and 300 metres to 1000 metres between section leads in and element; and

      (2) Night operations will not usually utilize this type of formation unless specific procedural separation (left and right corridor) is used in which case the loose spacing would only refer to spacing between section leads.

9. Spacing between elements will be two minutes if sequencing into the same LZ or 30 seconds (1500 metres) spacing between element leads if landing at the same time in the same LZ or if separate LZs are used for each element.

TYPES

10. How a formation is structured is dependent on similar factors that dictate the spacing requirement namely, terrain, threat, number of helicopters, section spacing, lighting, and aircraft configuration. The basic structure of a formation is a section, two helicopters working in unison. This reduces the command and control requirements of the mission commander or element lead as section leads are responsible for their wingman. It also simplifies downed aircraft procedures, lead change and bump plans. To as great an extent as possible, elements should be designed with even number of helicopters, so the section format is maintained.

11. In flight, the two formation types to be used for day operations are Trail and Battle, or a combination of both. Night operations utilize Trail. In Trail formation, helicopters fly within the confines of an area 45 degrees on either side of a line astern position.. The number 2 helicopter in a section manoeuvres within this area to make the best use of terrain and observation. This is best used in close or rolling terrain or over heavily vegetated ground. Battle formation has helicopters flying approximately line abreast in Loose or Extended spacing to allow for mutual support but each helicopter can make maximum use of terrain. This is used for open, flat terrain where visibility is unrestricted. Figure 8-1 illustrates these two formation types.

12. Combinations of these formations for day operations are simply “Trail” and “Section Leads in Battle”. For situations where a tight, fixed formation may be required because of an attached escort, the element lead can designate further “Section Leads Trail Heavy Left/Right” etc. Examples of these can be found in Figure 8-2. Formations combinations for night operations are "Trail" and "Section Leads Trail Heavy Left/Right" as for day.

13. For each formation type, section leads take their spacing off the preceding lead while each wingman takes their spacing off their respective leads. This greatly reduces the slinky effect that can occur if each helicopter in a formation spaces off the preceding helicopter. As the formation becomes tighter, night formation, this effect is somewhat reduced.

PZ, LZ AND HA FORMATIONS

14. The formation choices for the LZ, PZ and HA are dependent on the following factors; environment (snow, dust, etc.) size, number of helicopters, terrain/slope and threat. The formation for the PZ and LZ must be considered by the ALO for each mission, dependent on the site the LUC has chosen. Although the standard is Line Abreast Right, this must not be the automatic choice without consideration being made to the following factors:

a. the formation prevents all except the two outboard door guns to be utilized in the event of enemy attack;

b. arcs of observation are reduced;

c. straight line formations are easy targets for air attack; and

d. trail helicopters have to close in to land, resulting in extra manoeuvring at the critical portion of the flight, especially on NVGs.

15. Chapter 5 illustrates various formations that can be used for the PZ and LZ. Each has its own benefits of either mutual support, best use of the terrain or maximum number of helicopters without conflict. The standard that must be kept is that the troops will approach from either the 12 o'clock position or the 3 o'clock position where the FE will have eyes on them at all times as illustrated.

16. Holding Area formation is a simple square with all helicopters pointed inwards. This allows the best 360 degree observation plus all door guns are able to be used for mutual support. It also provides reduced walking distance if the element lead requires face to face communications with personnel and enhances the capability to communicate via visual signals within the formation. Chapter 5, Figure 5-6 illustrates this set up with arcs of responsibility.

COMMUNICATIONS

17. An effective formation plan must always take into account the threat of EW and ECM. Pre flight briefings and SOPs should alleviate the requirement for radio transmissions. The optimum aim is to develop NORDO procedures and eliminate radio communications. The following is a guideline for communications discipline:

a. strict adherence to orders and timings will minimize the requirement for communications and coordination;

b. short and accurate transmissions when required;

c. maximum use of codewords and tactical call signs during radio communications will reduce the chances of disclosing information; and

d. minimizing the use of transponder, DME, Doppler and rad alt may aid in reducing the electronic signature of the formation.

WEAPONS USAGE

18. Within a formation, tight discipline must be adhered to with respect to defensive weapons usage. The formation lead is responsible for briefing the rules of engagement (ROEs) for each mission. (See Chapter 4 for Weapon Control and Fire Commands, and Door Gun Fire Control Orders).

FLIGHT PROCEDURES

19. The requirement to separate and conceal helicopters in the field means that certain conventional formation procedures must be modified for use in the tactical environment.

20. **Start and Check In Procedures**. Because of the physical separation, concealment or dispersion of helicopters and the restrictions in the use of radio communications, some method of visual NORDO form up must be formulated. Start times will generally be left to individual aircraft captains as determined by the time to ready helicopters and move to the form up/join up point. The formation or section leads should endeavour to visually determine that all helicopters are accounted for to obviate the requirement for radio check ins.

NOTE

During peacetime operations, radio check in will be done on primary inter plane for flight safety purposes.

21. **Join Up**. Minimal time should be spent in proximity to the squadron or flight location when assembling the formation or its elements because of the danger of disclosing secure locations. The safest and most expedient join up procedure consists of individual helicopter departures with a form up at the PZ, Holding area or Staging areas. If at all possible, airborne RV should be avoided, especially at night.

22. **Lead Change**. Lead changes are not normally planned; however, the briefing must detail an alternate lead and actions in the event that communications failure, emergencies or enemy action make it a requirement to change lead.

23. **En Route**. The en route portion of the formation consists of that portion of the corridor/route, which lies between the PZ and LZ. The formation/element lead must ensure that the navigation and manoeuvring of the formation/element makes the best use of the terrain, weather, and tactical situation. The lead helicopter must manoeuvre in such a manner as to allow the remainder of the formation/element to take up positions for mutual support (defensive) and maintain spacing. While smooth aircraft control will enable the lead to attain the best aircraft performance and those of his wingman, this does not preclude manoeuvring the formation/element for defensive clearing turns where deemed necessary.

24. **Mutual Support**. The type of formation or disposition of helicopters will be determined on the basis of two factors. First, the type of terrain and available cover. Second, the desired amount of visual observation or mutual support. In general, within a section, lead is responsible for clearing the area directly ahead from 9 o'clock to 3 o'clock. The wingman clears the area from 3 o'clock to 9 o'clock through the 6 o'clock position. The 6 o'clock position can be cleared by executing random clearing turns or spacing out to the maximum. Within an element the areas of observation are similar due to the increased spacing that can occur but in Trail formation, only the last helicopter will execute clearing turns to check the 6 o'clock position. Element leads should brief the observation depending on the terrain, formation and spacing that is chosen for the mission or parts of the mission.

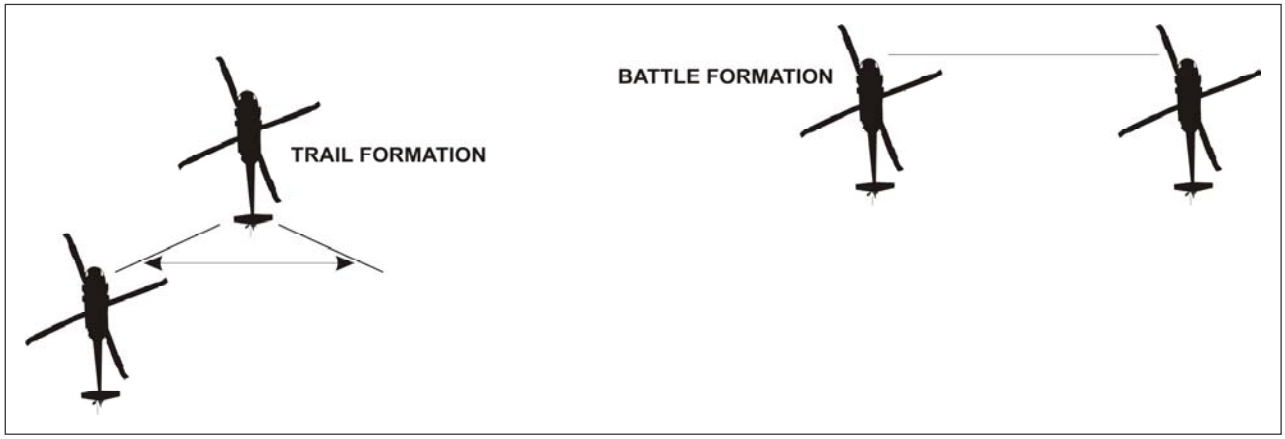


Figure 8-1: Basic Section Formations

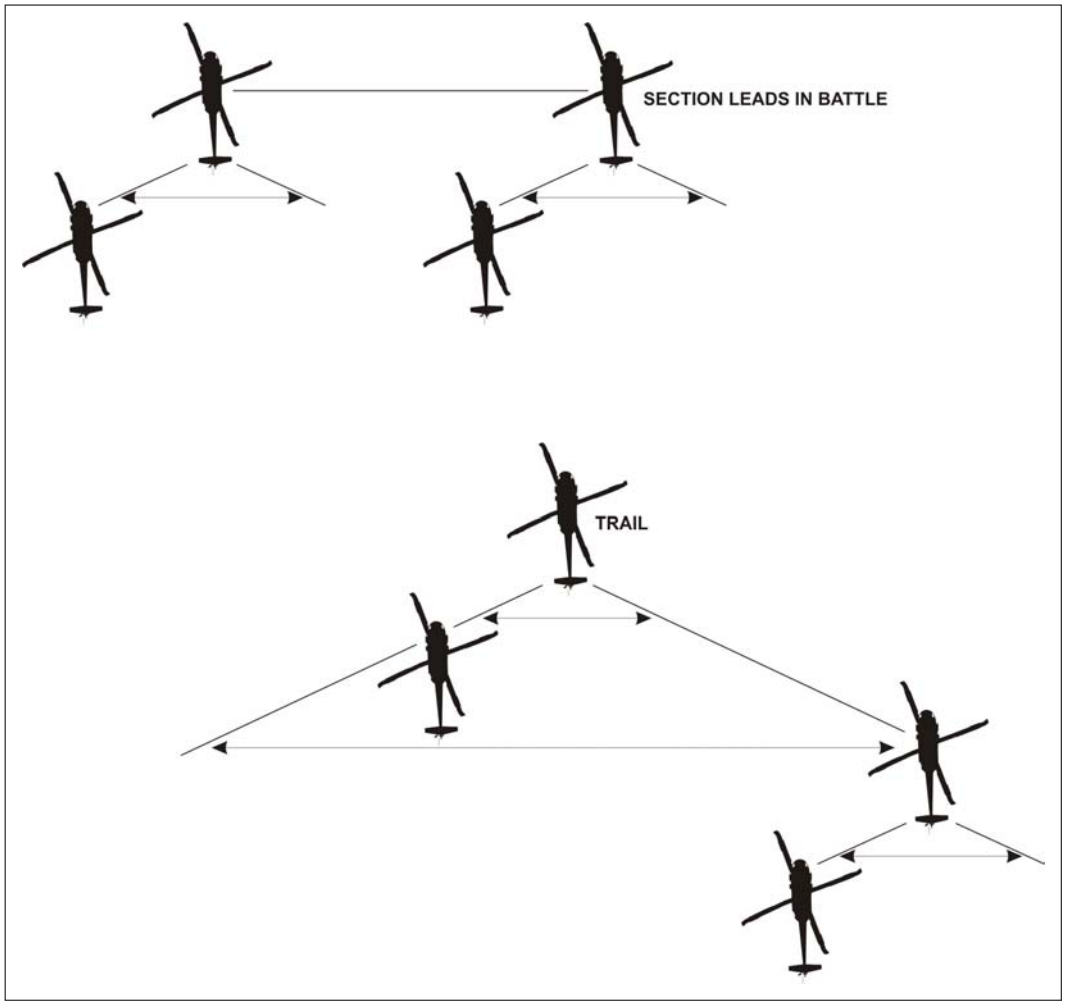


Figure 8-2: Formation Combinations (Element)

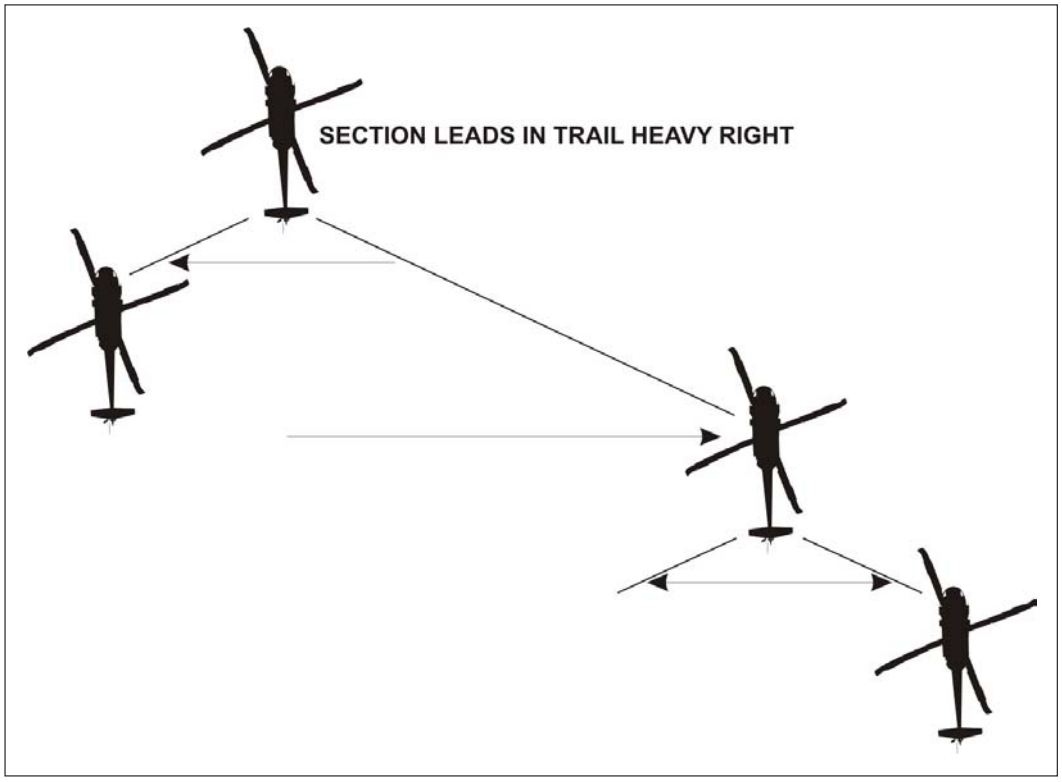


Figure 8-2: Formation Combinations (cont'd)

25. **Approach To Landing**. On approaching the LZ, the lead helicopter should initiate a slow deceleration to ensure the helicopters within the section are in a position to carry out a tactical approach while maintaining the maximum use of the terrain for cover. This may require that the element slow from an en route "contour" tactical flight technique to an NOE type profile. Care must be taken to avoid slowing the formation too quickly and increasing the time required for the approach, or stepping up of the formation on final. Once the lead helicopter has identified the landing point, lead should proceed directly to that point with the remainder of the formation/element proceeding to their landing points as soon as they are identified. The ideal approach will terminate with all helicopters within the formation/element touching down at approximately the same time. This procedure reduces the formation's vulnerability during that time in which it is least manoeuvrable.

26. **Departure**. The departure from the LZ should normally be in the sequence of landing; however, in the event that this is not possible the formation/element lead may detail a departure route with a join up procedure or independent recovery. Sections should depart together to maintain integrity. Hesitation of any one helicopter during this manoeuvre may delay the landing sequence for the following formation/element.

TACTICAL FORMATION TERMINOLOGY

NOTE

All examples in this annex are based on four helicopter element using the formation call sign - "WOLF blue formation".

EVENT	LEAD'S CALL	REPLY	REMARKS
Check in	"WOLF blue RADIO CHECK FM	"Blue 2" "Blue 3" "Blue 4"	
Frequency Change	"WOLF blue - Lead-Go pre-set 3"		Lead waits 5 seconds before transmitting on pre-set 3
Taxi (Training only)	"X Tower-WOLF blue lead plus 3-Lead in Airframe... WOLF blue in ... etc-Taxi"		
Take off (Training only)	"X Tower-WOLF blue Take-off"		Lead takes off on timing.
Join up	"WOLF blue formation – Lead-Rejoin at RV "DOG" figures 3.	"Blue 2" "Blue 3" "Blue 4"	
Formation Changes	Wolf Blues go Section Leads in Battle	"Blue 2" "Blue 3" "Blue 4"	All formation changes should be pre briefed based on tactical situation.
Formation Lead Change	“Wolf blue 2-Lead-Take the lead”	"Blue 2"	WOLF blue 2 acknowledges and moves forward on lead
	“Wolf blue 2 has the lead”		WOLF blue 2 acknowledges and moves forward on lead
Dispersal Procedure	“Blue formation – Lead-Lead's heading is 090, disperse – Go”	"Blue 2" "Blue 3" "Blue 4"	The formation disperses on the word "GO" Safe altitude and vertical separation are established.

Table 8-1: Tactical Formation Terminology

ADVANTAGES	DISADVANTAGES
Battle	
1. Wingmen have time for navigation and lookout.	1. Large heading changes are complex.
2. Helicopters can fly low, yet maintain good lookout.	2. Unplanned manoeuvres normally require verbal communication to coordinate.
3. Threat presented with a broad frontage, with little depth which offers shorter engagement time for ground threats.	3. Narrow routes or corridors may be difficult to negotiate.
4. Less predictable flight path for sections or elements of the formation.	4. Visual contact may be difficult to maintain in hilly terrain, adverse weather, or at night.
5. Risk of collision during hard manoeuvres is low.	5. Inappropriate for slow helicopters, or helicopters with under slung loads (USLs).
6. Provides optimum mutual support.	6. Difficult for embeded/attached escorts to defend all elements.
Trail	
1. Can route close to obstructions and around known threat defences.	1. Acquisition from ground or air made easier by closer spacing and a more predictable flight path.
2. Simple to coordinate with escorts.	2. Concentration on manoeuvring within the formation may degrade lookout in turns or during manoeuvres.
3. Formation integrity more easily maintained in poor visibility, adverse weather, and/or night conditions or in hilly terrain.	3. Close formation particularly risky because of the large IR signature, restrictions to manoeuvrability, and risk of collateral damage within the formation from threat weapons.
4. Threat areas crossed on a narrow front.	4. Poor mutual support.
5. Unplanned manoeuvres are more easily accomplished without verbal communications.	

Table 8-2: Relative Advantages - Formation Types

CHAPTER 9

AIRCRAFT SURVIVABILITY

FUNDAMENTALS

1. Helicopters operate throughout the entire battlespace during the conduct of their assigned missions. Aircraft survivability encompasses a vast array of disciplines. There is a tendency to think of aircraft survivability as only focusing on defensive electronic warfare systems (DEWS), whereas the complete picture of aircraft survivability covers everything from terrain flight to aircraft weapon systems to defensive systems.

2. Although there are certain procedures and techniques that aircrew can employ to accomplish their mission and survive, it must be understood that success depends upon the interaction of the combined arms team. More specifically, survivability is a function of training, equipment, tactics and intelligence.

3. In order to apply the proper countermeasures, it is essential that all personnel involved in an operation know the capabilities and limitations of the threat weapons they may encounter and how these weapons will be employed. They must also be aware on the order of battle of both the enemy and friendly forces. With this information, the mission planning can cover the survival countermeasures, which will achieve the greatest success. Known threats to aviation forces in land operations are:

a. air defence weapons (small arms, anti-aircraft artillery, and air defence guided missiles);

b. tank main armament;

c. anti-tank guided missiles;

d. field artillery;

e. tactical aircraft;

f. armed helicopters;

g. electronic warfare; and

h. NBC warfare.

COUNTERMEASURES

4. **Use of Terrain**. The most effective countermeasures that can be employed are the use of terrain flight techniques. This countermeasure allows the aircrew to operate without being detected by either electronic or visual means.

5. By using the available terrain to mask the helicopter from observation, the aircrew can operate without being detected or engaged by threat weapons. The effectiveness of this technique depends to a great extend upon a knowledge of where threat forces are deployed and the availability of terrain making features. When performing terrain flight,

the crew must be aware of the surrounding environment and minimize the aircraft signature. The proper use of terrain folds and shadow will prevent glint from rotors, canopy or metal. Utilization of overgrowth or bare ground must be assessed depending on the cover it provides from the threat. Skylining can be prevented by the proper use of terrain background. When flying less than approximately 40 knots consideration must be given to the rotor wash signature that may develop from blowing dust or snow. Detailed reconnaissance is required to ensure the route provides the best means of concealment. This reconnaissance may be with a map or if the situation allows, flying as much of the actual route as possible.

6. **Exposure Time**. If it becomes necessary to operate at altitude or over terrain that restricts masking of the helicopter, time of exposure must be minimized. This time should not exceed the acquisition and engagement time capability of threat weapons. Following a period of exposure, the helicopter should descend to a safe altitude of a masked position. This procedure should prevent successful engagement of the helicopter by threat weapon systems. Repeated exposure over the same spot should be avoided. If it is determined that the enemy has detected helicopter's position, the helicopter should move to another position over a route which is masked to the enemy. This measure reduces the enemy's chance of placing artillery fire on the helicopter or engaging with air defence weapons.

7. **Predictability**. When moving about the battlefield, it is essential that alternative routes, landing zones and observation positions be identified. This provides the aircrew with flexibility required to avoid engagement by unanticipated threat systems or area artillery saturation. Also, movement of helicopters should be accomplished in small groups using multiple routes to the objective(s).

8. **Communications**. Communication interception and radio jamming can jeopardize a pending or ongoing aviation operation. Information can be obtained from aircrew failing to follow proper radio security procedures. As a countermeasure, detailed planning, briefings and SOPs will reduce radio communications. Secure radio and non-electronic systems like markers or smoke may still be used but these too are be subject to observation and interrogation.

9. **Relocation**. The enemy continually conducts reconnaissance to detect targets of opportunity on which artillery and aerial fire can be directed. Aviation units must use their mobility to relocate frequently from positions within the main battle area. This requirement also applies to aviation support detachments like FARPs, located within the forward divisional area.

10. **NBC Protection**. With the occurrence of chemical and biological warfare on the rise, there is a good chance that operational areas may become contaminated. An essential countermeasure to this threat is to equip both aircrew and ground support personnel to operate in a contaminated environment. Basic guidelines for the decontamination of helicopters can be found in Chapter 13.

11. **Suppression of Enemy Air Defence (SEAD)**. Countermeasures must be employed which will degrade or destroy the enemy's air defence capability. Aviation must depend on artillery, tactical air support and escort armed/attack helicopters for SEAD. Electronic jammers, flares and chaff can be used to degrade the performance of air defence systems.

12. **Air to Air Tactics**. During the conduct of an aviation operation it is likely that a helicopter may encounter enemy helicopter or fighter aircraft. Air to air tactics can be considered prior to the mission to increase survivability if such a situation arises. The CH146 has limited capabilities in this area.

13. **Standoff Technique**. The enemy should be engaged beyond the effective range of their weapons. Similarly, flight routes should be planned, when possible, to remain outside the range of enemy weapon systems. This requires intelligence on typical or suspected employment locations and detailed knowledge on weapon capabilities and limitations.

14. **Aircraft Survivability Equipment (ASE)**. Each of the above procedures enhances survivability but even greater success can be achieved when fitted with ASE. Items of equipment that are available on the CH 146 include:

a. low reflective infra-red paint;

b. infra-red suppression systems;

c. flare dispensing system;

d. infra-red jammers;

e. radar warning receiver;

f. missile launch/approach detector;

g. optical warning laser detector; and

h. armour protection for aircrew and vital components.

AIRCRAFT SURVIVABILITY EQUIPMENT (ASE)

15. **General**. There are two methods of countering any threat to helicopter operations: Passive and Active. Each has its own benefits and drawbacks and must be used in concert with each other to ensure the highest probability of survival. The three functions of EW are described below:

a. **Electronic Countermeasures**. ECM is the division of EW involving the use of electromagnetic or directed energy to attack personnel, facilities, and equipment for the purpose of degrading, neutralizing, or destroying enemy combat capability. ECM includes actions taken to prevent, or reduce, the enemy's effective use of the electromagnetic spectrum through jamming, destruction, and electromagnetic deception. ECM also includes the

employment of weapons using either electromagnetic or directed energy as the primary destructive mechanism. These weapons might include lasers, radio frequency, or particle beams. Finally, ECM includes using sources of electromagnetic energy as the primary means of terminal weapons guidance to damage or destroy personnel, facilities, or equipment. ASE employed to defeat the ES systems include chaff, flares, radar jamming, and IR jamming;

b. **Electronic Protective Measures**. EPM is the part of EW involving actions taken to protect personnel, facilities, and equipment from effects of friendly or enemy EW actions that may degrade, neutralize, or destroy friendly combat capability. To minimize their vulnerability to ECM, EPM should be considered for all battlefield systems deriving operational capabilities through the use of the electromagnetic spectrum. Included are optical, electronic, IR, and radar target acquisition, non-cooperative target recognition systems, and smart weapons systems' sensors, fuses, guidance, and control components. ASE employed systems include antenna design, signature reduction, IR absorbing paint, etc;

c. **Electronic Support Measures**. ESM is the division of EW involving actions tasked by, or under the direct control of, an operational commander. The ESM's responsibilities are search for, intercept, identify, and locate sources of radiated electromagnetic energy for immediate threat recognition in support of EW operations and other tactical actions, such as threat avoidance, homing, and targeting. Electronic Support (ES) focuses on surveillance of the electromagnetic spectrum in support of the commander's immediate decision making requirements for the employment of EW or other tactical actions, such as threat avoidance, targeting, or homing. ESM is normally provided by organic intelligence and sensing devices based on EW technology integrated into other weapon systems, or assets from other echelons capable of providing combat information to the supported command. The purpose of ESM is to ensure ECM and EPM applications receive the input needed to operate effectively. (Examples of ESM include battlefield systems that; execute direction finding operations, detect and identify enemy emissions or other electromagnetically-measured signatures that enable immediate exploitation, locate high value targets for electronic attack, or provide threat avoidance information). ASE systems include radar, laser, and IR missile detecting sets; and

d. **Aircraft Survivability Equipment Philosophy**. The role of ASE is to reduce the vulnerability of our helicopters, allowing aircrews to accomplish their immediate mission and to survive. The methodology for achieving survivability is supported by the ASE philosophy, a five-step approach to ensure that aircrews are able to accomplish their mission. These five steps include the following, in order of least cost and most effective to the most cost and least effective:

(1) **Tactics** (electronic protection). Proper tactics reduce exposure times to enemy weapons. NOE and contour flight limits line of sight exposure times and places the helicopter's radar, IR, and

optical signature in a cluttered environment. Nap Of the Earth (NOE) tactics, combined with ASE protection, allow tactical helicopters to survive and perform its mission. ASE protection is severely degraded when the helicopter is not flown in a tactical manner (sky lining);

(2) **Signature Reduction** (electronic protection). These measures are implemented through engineering or design changes. Engineering changes include; modifying canopy shape, adding exhaust suppressers, and coating the helicopter with low IR reflective paint. Signature reduction alone greatly increases survivability. Without signature reduction, ASE effectiveness is degraded and, in some cases, erased. Signature control is also influenced by the aviator choosing how much signature to expose to the threat;

(3) **Warning** (electronic support). The next step in the ASE philosophy, is to provide warning to aircrews when they are about to be engaged, allowing time to react. Examples include radar and laser detecting sets, and IR missile warning systems;

(4) **Jamming and Decoying** (electronic attack). When aircrew must stay on station despite warnings, there is a requirement for countermeasures capable of jamming, and/or decoying the fire control or guidance systems of threat weapons. Chaff, flares, and radar and IR jammers provide this type of protection; and

(5) **Aircraft Hardening** (vulnerability reduction). This step provides for ballistic tolerance, redundant critical flight systems, and crashworthy features, to assist in minimizing the damage to a helicopter after it has been hit.

THREAT CONSIDERATIONS

16. This section is not designed to be system specific in nature, rather it is to provide a general knowledge of threat systems, which can be applied on a case by case basis.

a. **Threat Engagement Sequence**. All weapon systems must complete a series of events, called an engagement sequence, to actually have an effect on the target (aircraft). Missing any step in the engagement sequence forces the threat engagement sequence to be started over again. Weapon systems sensors must:

(1) detect;

(2) acquire;

(3) track;

(4) launch and guide (or fire and ballistics); and

(5) assess damage;

b. **Example Threat System**. The five factors that are required to compute an Anti-Aircraft Artillery (AAA) fire control solution are: range, azimuth, elevation, velocity, and time of flight. If one of these factors is incorrect, the AAA system will not hit the target;

c. **Target Acquisition**. The threat must detect, acquire, track (establish fire control solution), and fire at the aircraft. The time of flight of the projectile must be determined. The threat must predict where the aircraft target will be (within a few metres) as the ordnance travels to a point in space and time;

d. **Threat Avoidance**. Tactics, signature reduction, warning, jamming and decoys are the tools available to preclude a successful threat engagement. If hit, you may have to rely on aircraft hardening;

e. **Detection, Acquisition, and Tracking**. The difference between detection and acquisition, versus tracking is very important. In detection and acquisition, the threat weapon system does not have enough refined data to facilitate firing at the aircraft. The threat weapon system must track the aircraft long enough to acquire range, azimuth, elevation, and velocity, to determine the time and position of firing. Indications of search or acquisition activity may provide the aircrew time to initiate a response. Tracking indications alert the aircrew to an immediate action requirement, such as masking, employing ASE decoys, or executing evasive manoeuvres;

f. **Engagement Envelope**. All threat systems are confined by physics. Each threat system has a minimum and maximum effective altitude and range. These numbers are computed against a cooperative engagement (non-manoeuvring aircraft, blue sky background, flat terrain, steady velocity, etc.). The effective envelope for a threat system is based upon a 50 percentile. That is, at the maximum (or minimum) effective range (or altitude), the weapon system is able to hit the target one out of two times. As the target progresses further into the threat envelope, the probability of a first shot kill increases. As the target progresses further outside the threat envelope, the probability of being hit decreases, until the target has reached a point where it is impossible to be hit;

g. **Decreasing The Probability Of A Hit**. Aircrews have the ability to make the engagement more difficult for the threat. A stationary target allows the threat to adjust each shot from the previous shot, until it hits the aircraft. A moving, constant velocity target provides a more difficult engagement procedure. A prediction can be made from the previous shot and adjustments imposed to enhance accuracy. The most difficult engagement is the moving target that varies range, altitude, elevation, and velocity. This makes prediction nearly impossible, since four factors are changing at differing rates; and

h. **Threat Weapon Sensors**. There are four major types of threat weapon sensors. These may be man portable, or transported by land, sea, or aerial platforms. It is important to determine the actual sensor type, and guidance package for each threat, and understand their inherent capabilities and limitations. (For in-depth information concerning particular threat weapon systems, the Squadron or Brigade Electronic Warfare Officer or Intelligence Officer should have the information). The four major types of threat weapon sensors are radar, IR, laser and DEW, and optical/EO:

(1) **Radar**. Direct threat radar weapons require line of sight to hit the target. Direct threat radar weapons are either fire controlled AAA or for missile systems command, semi-active radar homing, active radar homing, track via missile, or ground aided seeker. Radar weapons must detect, acquire, track, launch and guide (or fire a ballistic solution), and assess damage. Radar systems have trouble with ground clutter. To pick out targets from ground clutter, radar systems can detect movement though the use of moving target indicator, Doppler (continuous wave radar), or Pulse Doppler. Modern radar systems can track the movement of the aircraft, while some systems also detect the movement of rotor blades. A few older radar systems had blind speeds (called a Doppler notch), where they could not detect an aircraft flying a specific speed towards or away from the radar. Modern radar systems cancel blind speeds. Radar systems can be detected, avoided, decoyed, jammed, and destroyed by direct and indirect fires;

(2) **Infra-red**. All IR direct threat weapons require line of sight to be established prior to launch and the in-flight missile must maintain line of sight with the target until impact (or detonation of the proximity fuse). IR missiles require the operator to visually detect the target and energize the seeker before the sensor acquires the target. The operator must track the target with the seeker caged to the line of sight until it is determined that the seeker is tracking the target and not any background objects (natural or man made objects include vehicles, the sun, or reflected energy of the sun off clouds, etc.). The IR sensor is also susceptible to atmospheric conditions (haze, humidity), the signature of the aircraft and its background, flares, decoys, and jamming. GenerallyIR systems are:

(a) difficult to detect prior to launch (passive sensor);

(b) difficult to predict where they may be located (portability);

(c) difficult to respond to (short time of flight after launched); and

(d) difficult to hard kill (requires shooting at an in-flight missile);

(3) **Laser and Directed Energy Weapons**. These weapons really fit two distinct categories: laser guided or aided weapons and pure laser/directed energy weapons. Laser guided, or aided weapons, are those who use the laser to perform ranging, tracking, or guiding functions for conventional explosive missiles or projectiles. Pure laser/directed energy weapons use Laser and other forms of directed energy to inflict damage to the aircraft or its sensors, including the eyes of the aircrews. Pure laser/directed energy weapons are not required to burn a hole in the target to destroy it (although these weapons are reaching that capability). Simply igniting fuel vapor near vents or burning through fuel lines are effective, as well as glazing the cockpit glass so the aircrew cannot see out. Inherently, laser/directed energy weapons are short duration, hard to detect, extremely hard to decoy or jam, and hard to kill. Fortunately they must rely upon line of sight, certain atmospheric conditions, and are somewhat short range, at present; and

(4) **Optical/Electro-Optical**. Optical/EO sensors are used as either the primary or secondary sensor for all weapon systems. Although they rely upon line of sight, they are, with very few exceptions, completely passive. They are limited by human eyes, atmospheric conditions, distance, operator movement, and in many cases, by darkness. The optical/EO sensors are most difficult to detect and seldom can be decoyed; however, they can be jammed by obscurants, and when located, can be hard killed.

AIRCRAFT SURVIVABILITY EQUIPMENT SYSTEMS

17. **Aircraft Signature Reduction**. The CH 146 is painted with non-reflecting, IR absorbing paint. The Infra-Red Suppression System (IRSS), when installed, reduces the IR signature by suppressing hot exhaust gases. The radar and IR signature of helicopters is least when viewed from the front with the maximum IR signature coming from the rear quadrants. The maximum radar signature on the other hand is from the side aspects, increasing substantially with cargo doors pinned open. The aircrews have the ability of decreasing the signature exposed to threats by changing the aspect of the aircraft.

18. **Defensive Electronic Warfare Suites (DEWS)**. The CH 146 DEWS provides for radar and omni-directional IR jamming for IR directed threats depending on the specific equipment mounted. The aircraft signature reduction capabilities include both non-reflective IR absorbing paint and IRSS, which suppresses hot exhaust gases.

19. **Situational Awareness**. The CH 146 can be equipped with radar warning receivers (RWRs) and laser warning receivers which provide the aircrew with alerts of radar or laser activity. Aircrew use the cues from these systems to change modes of flight (contour to NOE) or to increase vigilance by actively seeking terrain features for masking.

20. **Active Countermeasures**. Countermeasures assist the aircrew in buying time when masking terrain is not readily available, and the aircraft must manoeuvre to masking terrain or move outside the threat range. IR threats can be jammed by the flare equipped dispenser. Radar threats can be decoyed by use of the dispenser loaded with chaff.

21. **Counter-Measures Dispenser System (CMDS)**. The CMDS is operated manually or automatically through interface with other countermeasure systems. The flares provide protection against IR directed missile systems. When dispensing flares, the CMDS reduces or eliminates the enemy's ability to hit and destroy aircraft by use of IR guided missiles.

22. **Electronic Warfare Officer (Sqn EWO)**. For DEWS to provide effective protection during a mission, configuration settings must be optimized for the threats encountered. The EWO assist the S Ops O/AMC in mission planning for aircraft survivability during mission accomplishment. He must be aware of the threat and the best countermeasures against such threats.

EVASIVE MANOEUVRES

23. When an enemy threat from a given direction is detected, the pilot must execute immediate evasive action. These actions include descending, turning or increasing airspeed or a combination of all three to place a barrier between the helicopter and the source of the threat.

24. Although quick reaction is important, the normal constraints of terrain, aircraft operating limits and pilot ability must be considered so that the manoeuvre can be executed safely. Because of the lower altitudes generally flown under operational conditions, any descent deemed necessary during evasive manoeuvres should be carried out with full throttle. The key to manoeuvring is to place an obstacle between the helicopter and the source of enemy fire.

25. The specific evasive manoeuvre required will depend on the type of hostile fire encountered. In most engagements, an immediate turn will be required by the pilot. The type and direction will depend on the threat that is encountered. For two sections of helicopters operating as an element, the sections should turn in opposite directions to force the enemy to choose which to engage. Once the element has split, the section that is engaged will have to carry out further manoeuvring which will yet again, result in the section splitting. This splitting not only causes the enemy to choose targets, it also reduces the chance of single munitions damaging multiple helicopters in close formation. Figures 9-1 and 9-2 show examples of possible situations and reactions.

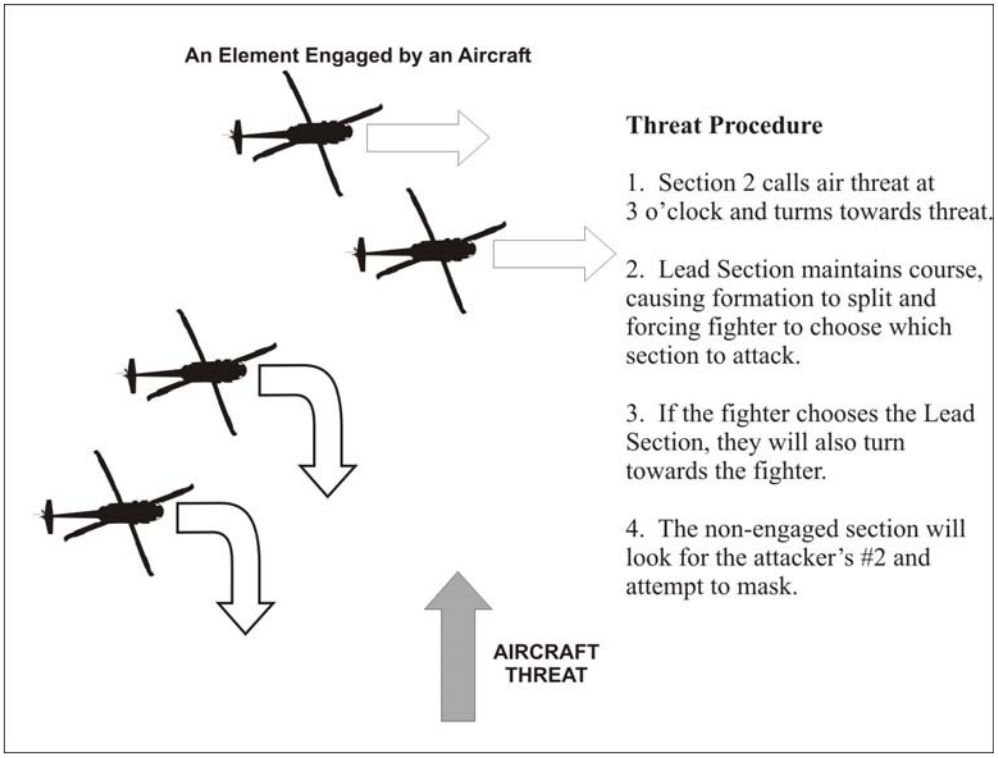


Figure 9-1: Element Initial Reaction

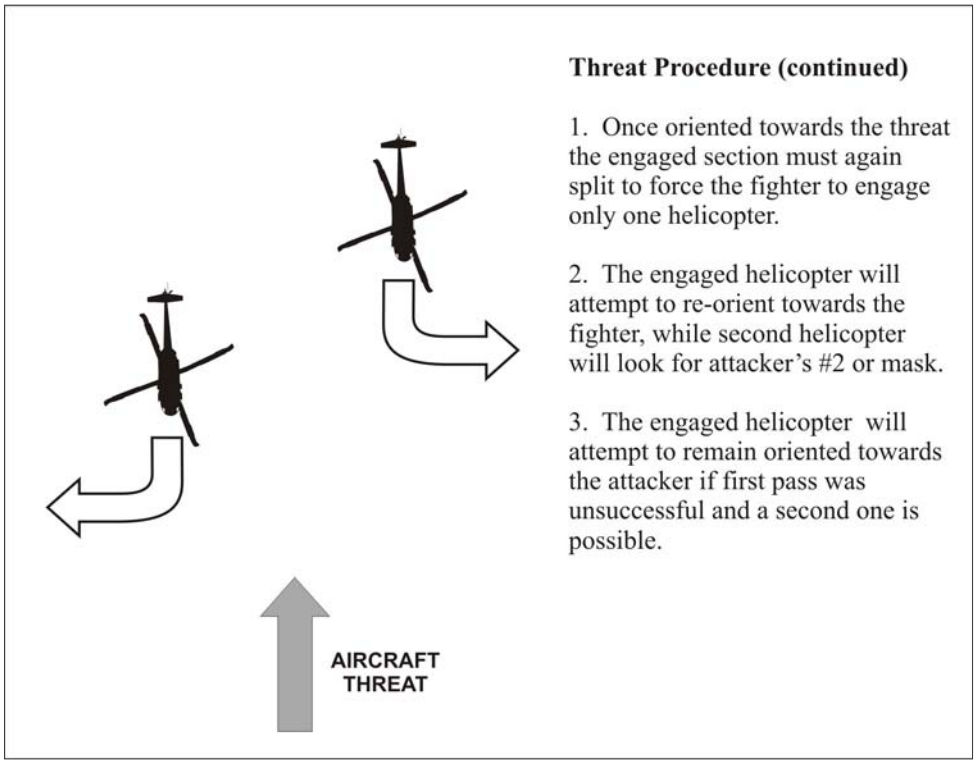


Figure 9-2: Section Initial Reaction

26. Some recommended actions are given below for various weapon systems:

a. **Tanks and Small Arms**. Immediately turn away from the fire and fly towards an area for concealment. If concealment is unavailable, sharp turns of unequal magnitude and at unequal intervals and small changes in altitude will provide the best protection until you are beyond the effective range of hostile weapons. If the situation permits, employ immediate suppressive fire via aircraft mounted weapons or call for fire;

b. **Large Calibre Anti-Aircraft Fire (Radar Controlled**). If the helicopter is equipped with a radar jammer, maintain aircraft orientation toward the threat radar, deploy chaff, and mask the helicopter. If the helicopter is not equipped with a radar jammer, execute an immediate 90 degree turn. After turning, do not maintain a straight line of flight or maintain the same altitude for more than ten seconds before initiating a second 90 degree turn. An immediate descent to NOE altitude will reduce the danger;

c. **Fighters**. When in an area where threat fighters are known or suspected to be operating, fly the helicopter at NOE altitude as much as possible. Upon sighting a fighter, try to mask the helicopter or land. If the fighter is alone and executes a dive, have the helicopters split, turn toward the attacker and descend. This manoeuvre will cause the fighter to choose a target and increase his attack angle. Depending on the dive angle, it may be advantageous to turn sharply and manoeuvre away once the attacker is committed. The fighter will then have to break off his attack to recover from the manoeuvre. Once the fighter breaks off his attack, manoeuvre the helicopter to take advantage of terrain, vegetation, and shadow for concealment. If none is available and a re-attack is likely, fly to stay within the turn radius of the fighter until alternative action is possible. If the fighter has launched a missile, the use of chaff/flares to delay enemy radar and missiles launched must be considered. Be prepared to evade the fighter's wingman with similar techniques;

d. **Heat Seeking Missiles**. Try to keep helicopter heat sources away from the threat. If a missile is sighted, turn the tail of the helicopter away from the missile and mask the helicopter. Descent to NOE flying. Newer generation missiles track at closer to the Ultra Violet (UV) range and are all aspect tracking, therefore the proper use of flares and masking is a must;

e. **Anti-tank Guided Missiles**. These missiles can be either wire guided or laser guided. Some missiles fly relatively slowly and can be avoided by rapidly repositioning the helicopter which in the case of the wire guidance may cause the wire to break. As with all threats, masking is the best countermeasure. If terrain or vegetation is not available for masking attempt to get out of range by flying directly away from the missile and vary the flight path in an attempt to topple the missile;

f. **Artillery**. Depart the impact area and determine NBC requirements; and

g. **Radar Guided Missiles**. If the helicopter is equipped with a radar jammer, maintain aircraft orientation toward the threat radar. Manoeuvre the helicopter to break the line of sight to the radar source while simultaneously activating chaff (if available).

OPERATIONAL EMPLOYMENT CONSIDERATIONS

27. Aircraft survivability functions must be included throughout mission planning, rehearsal, execution, and recovery operations. Mission planning begins with the receipt of the warning order. It continues through mission execution, including the after-action review. It is important to plan and implement aircraft survivability functions when receiving the mission and enemy situation. ASE and EW must be considered in all phases of mission planning. The level of planning involved is always predicated on the time, information, and personnel available. OPLANs and Op Os for military operations are extensive in scope and contain information that serves as a baseline for most unit operations.

28. The generation of the Op O begins upon receipt of the enemy and friendly situation, the mission, and the commander's intent. ASE planning starts with Op O / Frag O development. The enemy and friendly situations are defined with the emphasis on the EW capabilities of both, and their ability to find, fix, jam, deceive, disrupt, or destroy each other. Once the situation is clearly defined, the mission is analyzed to evaluate the risk to friendly forces, while accomplishing the mission within the prescribed guidelines. After the threat assessment is complete, risk reduction techniques are specified in the execution instructions. These techniques may require the lifted unit commander's approval if the mission constraints need to be altered significantly from the original intent. The next step is to determine support for ASE and the command and signal guidance necessary to accomplish the EW phase of the mission.

29. During the execution of the mission it is important for aircrews to be familiar with the ASE situational awareness displays and the expected threat indications. Some actions must be performed without delay. When the visual indications reveal a gun or missile being fired at the helicopter, or the ASE indicates a radar track or launch, the aircrew has limited time to perform an action preventing the helicopter from being engaged. Crew coordination of evasive manoeuvre performance must be rehearsed, and standardized terminology, such as "missile three o' clock, break right," used to avoid confusion. There are situations when evasive manoeuvring is not required, such as during radar search or acquisition. Three distinct reactions to threat engagements are:

a. indication (determine immediate actions);

b. evasive manoeuvre (when masking terrain is not readily available); and

c. actions on contact (decision to continue or abort mission).

30. Formation types, and spacing intervals, should be selected to provide all helicopters the necessary manoeuvre space for hostile fire avoidance. Standardized terminology, such as “chalk two breaking right...missile” or “chalk three breaking left...tracers at nine o’ clock,” should be used to alert the flight to your actions. Briefings should include evasive formation break up procedures and the method for reforming after breaking the engagement. It is important to communicate your ASE indications to other helicopters in the formation, since you may be the only helicopter receiving indications, due to terrain, narrow radar beam, altitude, or maintenance problems.

31. Final consideration is to rehearse the actions on contact and flight profiles for each operation. This would ensure that the actions and reactions of each helicopter and section are well known by all. This can then be discussed within the crew to ensure that lookouts and cockpit reactions are coordinated.

CHAPTER 10

SEARCH AND RESCUE OPERATIONS

INTRODUCTION

1. Although Search and Rescue (SAR) Operations are a secondary task for Tactical Helicopter Squadrons, the opportunity to conduct these types of operations exists in peacetime and combat situations. Therefore, the ability to plan and conduct such missions is essential for both planners and operators. This chapter addresses the planning considerations for the conduct of SAR Ops, and the basic techniques for conducting searches over land and water. Due to the fact that SAR Ops are not a common task, this Chapter goes into specific details to ensure that all pertinent planning and execution points are covered.

2. Each and every SAR mission is unique, therefore, the planning must be based on flexibility and have the ability to react to last minute changes and varying situations. This usually occurs on site and must be addressed by the Aircraft Captain. Squadron Ops normally serves as a point of contact and planning for the initial portion of the mission, after an aircraft has departed the unit squadron operations is less in the execution loop and assumes a support posture for the mission (crew rotation or maintenance action), etc.

PRE FLIGHT PROCEDURES

3. Each crewmember has a specific duty with respect to pre flight planning of a SAR mission. Although many of the tasks are similar to those carried out for a tactical mission, they vary sufficiently to warrant repeating.

4. **Aircraft Captain**. In addition to normal trip preparation, the AC should:

   a. contact RCC/Search Master (SM)/Ops for the situation report and search briefing;

   b. liaise with the crew and plan the departure time;

   c. brief the crew on the situation and tasks;

   d. ensure all crew members have appropriate clothing; and

   e. obtain spotters as required, and ensure that they are briefed on their duties, the area of operation and that they have appropriate survival equipment with them.

5. **First Officer**. In addition to normal trip preparation, the first officer should:

   a. obtain the weather briefing;

   b. attend the search briefing;

   c. ensure necessary publications are on board the helicopter;

d. ensure the carrying of complete map coverage of the en route and search areas; and

e. ensure pre search preparation of maps and crew familiarity with:

(1) topography;

(2) spot heights;

(3) obstructions,

(4) hazardous areas; and

(5) MOCAs for en route operating areas, etc.

6. **Flight Engineer**. In addition to normal trip preparation, the FE should:

a. attend the search briefing;

b. ensure suitable aircraft equipment is carried to permit an Remain Over Night (RON) at a location with minimal facilities; and

c. ensure that if SAR Techs are carried, their equipment is properly located and tied down.

7. In many instances, non aircrew personnel will be used as spotters for extended searches. In this case, the spotters must be alert, well rested, and made to feel an integral part of the crew. It must be stressed that prompt, accurate sighting reports must be made over the intercom and the object must be kept in sight while continuing to advise the pilot on the location of the object while the helicopter is being manoeuvred toward the site. Prior to any mission utilizing non aircrew for spotters, a complete briefing shall be conducted which includes as a minimum, the following points:

a. description of objects (ie. type, size, colour, number, etc.);

b. signs to watch for (i.e. smoke, burnt out areas, broken trees, signals, distortions, reflections, etc);

c. scanning techniques;

d. reporting procedures and use of intercom including the clock method for directing pilots to an object;

e. rotation schedule; and

f. aircraft familiarization, including emergency equipment and procedures.

IN FLIGHT PROCEDURES

8. During the en route phase of the flight, the aircraft captain should utilize this time to ensure the crew is prepared for the mission, all pre search checks are carried out and the cockpit and cabin are organized. The aircraft captain/first officer shall:

a. establish communications with the RCC/SM and advise ETA for the search area;

b. monitor all relevant guard frequencies and frequencies that may be used by the missing aircraft, and be alert to both modulated and unmodulated signals;

c. maintain a skeleton log to ensure that a complete resume of all activities is available for debriefing the RCC/SM; and

d. select the appropriate starting point to enable aircraft to be established on an initial search track before commencing the search.

9. Prior to entering the search area, the aircraft captain/first officer shall carry out the following pre search procedures:

a. prior to entering the assigned search areas, slow the helicopter to search speed, and establish the helicopter at search altitude;

b. ensure the spotters are in position;

c. carry out the functional intercom check;

d. set the RAD ALT to search height; and

e. ensure the spotters are aware of search distances by pointing out obvious landmarks on either side of the helicopter at the assigned distance. This should also be done periodically during the search and after each spotter rotation.

10. The flying pilot should discuss speeds and altitudes with the crewmembers and be prepared to change the speeds and altitudes, as required, in order to maximize search effectiveness.

11. The search procedure and area assignment, as detailed by the RCC/SM shall be followed unless the on scene situation dictates otherwise. When it is not possible to carry out the initial task as assigned, the RCC/SM is to be contacted for a new assignment. If contact is not possible, and in the aircraft captain's judgement, the intent of the task may still be achieved with a different procedure, a new procedure may be adopted and the RCC/SM advised when contact is possible.

12. Once established in the search, the aircraft captain/first officer shall:

a. maintain communications with the RCC/SM as directed, by reporting at least once per hour;

b. maintain a weather watch for the search area, destination, and alternates, for the total flight period;

c. update search information and brief all crewmembers;

d. investigate all sightings to the satisfaction of the spotter/SAR tech;

e. request an RCC/SM check of all suspected crash sites against records of known crash locations;

f. pass a Notice Of Crash Location (NOCL) message to RCC/SM if the object is located;

g. maintain an accurate track by visual pinpointing, heading, GPS or other navigational aids, depending on availability and weather;

h. monitor aircraft fuel to ensure sufficient for RTB or alternate;

i. calculate and update the latest time for leaving the search area; and

j. log all significant sightings, unsearched areas and adverse weather conditions to permit a complete debriefing by the RCC/SM at mission end.

13. Once the decision has been made to exit the search area or the area tasked has been searched, the aircraft captain shall:

a. advise the crew on departure from the search area;

b. advise the RCC/SM of the departure and ETA to base;

c. brief the RCC/SM on the area covered, significant observations, weather in the search area, estimate of effectiveness of coverage, and any other information which may be of assistance; and

d. debrief the crew.

SEARCH PROCEDURES

14. Searches can be divided into two broad categories, visual and electronic. While NVG and FLIR searches would seem to fall somewhere between the two, for the purposes of this chapter NVG and FLIR will be considered visual searches. The type of search to be used, depends on many factors and is normally decided by the aircraft commander or search master if one is involved. Initial searches are normally along the track or intended track of the missing/distressed vehicle, or begin at a reported location. Subsequent searches are then conducted in areas of high probability until search termination.

VISUAL SEARCH PATTERNS

15. Experience has shown that the most reliable way (and thus the primary method) of following a visual search pattern is by map reading with visual reference to the ground, using the AMS as a backup. When appropriate scale maps are not available or the terrain/

conditions make navigating by map impractical, the CH 146 Avionics Management System (AMS) can be used as a primary means of navigating the search pattern.

16. The commonly used visual search patterns and their typical employment are listed below:

a. **Track Crawl (TC)**:

(1) search target is missing and intended route of target is primary lead;

(2) often the first search action taken for missing aircraft / vessels;

(3) advantages: rapid coverage of highest probability track; minimal planning reqr; and

(4) disadvantages: presumes good knowledge of targets actual track.

b. **Creeping Line Ahead (CLA)**:

(1) consistent coverage of a desired search area;

(2) often used when info concerning a target is limited to a point of origin and intended destination, and actual target location may be either side of a direct track due to navigational error, poor weather, etc;

(3) advantages: consistent, thorough coverage of area; simple to plan and navigate; and

(4) disadvantages: does not distinguish between high and low probability zones within a search rectangle, thus may be inefficient when time is critical.

c. **Expanding Square (ES)**:

(1) used for a concentrated search of small areas where approximate or last known position is available;

(2) may be modified to an expanding rectangle with long legs running in the suspected direction of travel;

(3) advantages: prioritize high probability last known position (LKP); and

(4) disadvantages: difficult to plan & navigate; AMS does not lend itself to easily backing up an ES search.

d. **Contour Search (CS)**:

(1) normally used only in mountainous areas or valleys;

(2) advatanges: permits consistent coverage in mountainous areas and valleys; and

(3) disadvantages: thorough spotting normally only possible from one side of helicopter at a time.

17. Search height, airspeed, and track spacing varies depending upon visibility, terrain, and weather conditions. The chart below can be used as a guideline for determining search parameters, however conditions on scene will often require modifying these guidelines. If a SAR Tech is on board, he should be consulted as to what search parameters should be used.

Over Land				
Terrain	**Altitude** (ft AGL)	**Visibility** (nm)	**Spacing** (nm)	**Remarks**
Open to Lightly Wooded	1,500 1,000 500	3 1 1/2	6 2 1	Initial coverage Second coverage Third coverage
Moderate to Heavily Wooded	1,500 1,000 800	3 1 or 2 1/2	6 2 or 4 1	Initial coverage Second coverage Third coverage
Contour Searches	500 ft intervals	n/a	n/a	
Night NVG	As per day visual searches above			
Night Unaided	3,000 2,000	5 5	10 10	2,000 ft above highest peak in mountainous regions.
FLIR Search	As determined by FLIR field of view; see FLIR section later in the chapter			
Notes: 1. Visibility refers to the search visibility (how far from the helicopter spotters are searching), not weather limits. 2. Note that track spacing is always double the search visibility, to avoid searching the same area with spotters on each side of the helicopter.				

Table 10-1: Search Height, Airspeed And Track Spacing

18. Due to the difficulty of spotting individual survivors in open water, the following table lists guidelines for modifying search altitudes when conducting such a search.

19. **Track Crawl (TC) Search Pattern** (Fig 10-1). The track crawl search pattern is the one normally used when an aircraft is reported overdue. It consists of rapid and reasonably thorough coverage on either side of the intended track of the missing aircraft.

20. The search aircraft proceeds along the intended track of the missing vehicle, from its last known position to its intended destination, then returns on a parallel track at double the assigned search visibility to one side of the original track. This procedure is repeated outbound on the opposite side of the original track, again at double the assigned search visibility.

Over Water	
Conditions	**Altitude**
Survivors without a raft or dye marker	Below 500'
Survivors in a raft without a dye marker or signalling device	800' - 1,500'
Survivors with dye marker	1,000' - 2,000'
Survivors with signalling device	1,000' - 3,000'

Table 10-2: Search Altitude For Search Over Water

21. In Fig 10-1, the allotted search altitude is 1,500 feet AGL, and the search visibility is one and one-half miles. The search aircraft flies the pattern as shown.

22. The CH 146 AMS is well suited for assisting with track crawl searches. The parallel offset feature can be used to program the track bar for offsets to either side of the intended track, at offset ranges up to 20 nm.

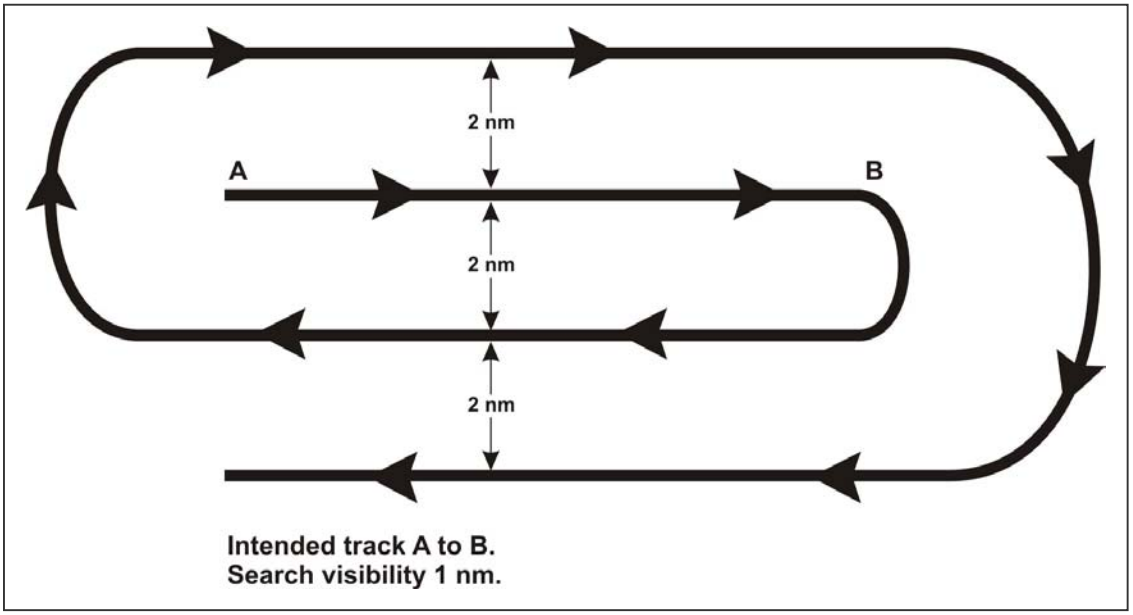


Figure 10-1: Track Crawl

23. **Creeping Line Ahead (CLA) Search Pattern** (Fig 10-2). The search aircraft proceeds to a corner of the appointed square within the search area, and then, flying at the specific altitude, searches the area while maintaining parallel tracks. The first parallel track is at a distance equal to the search visibility from the edge of the search area. Successive tracks are flown parallel to, but at twice the assigned search visibility from each other.

24. While the best method of navigating a CLA search is visually with the pattern plotted on a suitably scaled map (1:250, 000 JOG maps are usually well suited), the CH 146 AMS is capable of assisting in conducting CLA patterns. As with the TC search, LRN "Flight Plan" mode should be used, with the parallel offset feature used to generate successive tracks. Only two way points are required in the flight plan (those defining the first leg), and way point sequencing should be set to "Manual".

25. In Figure 10-2, the search height is 1,500 feet AGL and the search visibility is one mile, the search aircraft will fly the pattern as shown.

26. Following the completion of each leg, the non flying pilot simply selects the next way point (flight plans cycle to the first waypoint upon reaching the last) and increases the offset. Note that successive offsets are in opposite directions (e.g. L2.0, R4.0, etc.).

27. Also note that the end of the leg will be indicated by the No. 1 bearing pointer passing 90 degrees relative bearing, and the distance display indicating the offset distance; with parallel offsets entered, the distance display should never reach 0.0.

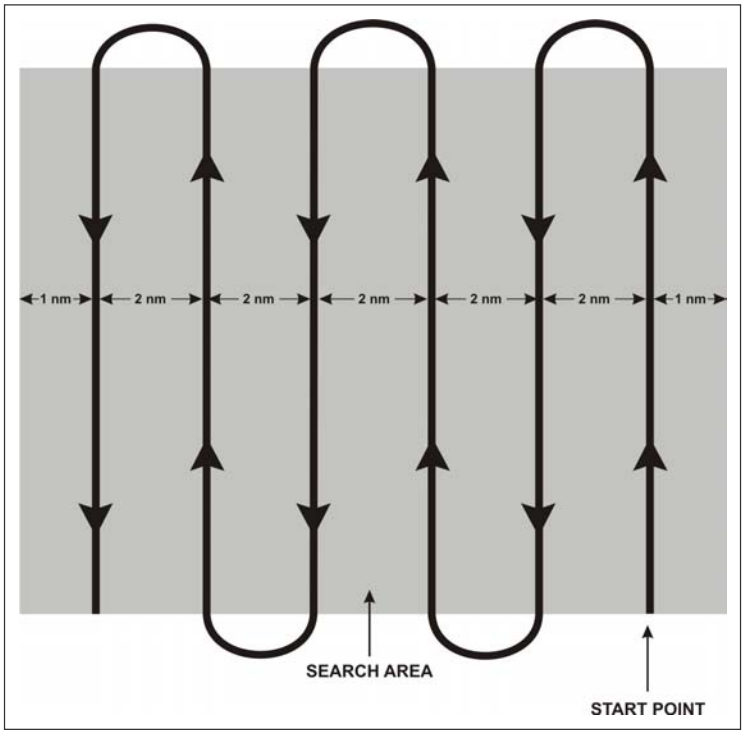


Figure 10-2: CLA Search

28. Each track may be flown in SAS or ATT mode. Placing the HSI in LRN and selecting TER (Terminal Mode) will show 1 NM for full scale deflection of the track bar, which is appropriate for this scale of navigation. When flying in SAS mode, flying the track bar for the desired track and cross checking the track on the appropriate map will give a very accurate track search. To reduce pilot workloads and increase the ability of the flying pilot to visually search, ATT mode may be used, coupled in LRN and IAS modes. When the desired track is achieved, couple the NAV and IAS modes and set the appropriate IAS using the Fore-Aft Beep Switch. Now the flying pilot has only to adjust the collective to maintain the desired search altitude. When the turn point for the next track is reached, engage HDG mode and turn 90E to intercept the next track. Select "NEXT WPT" from the Flight Plan Menu and then apply the appropriate offset and then NAV mode can be re-engaged to intercept the next track of the search pattern. These methods are only aides to navigating using an appropriate map as your primary means of conducting the search.

29. **The Expanding Square (ES) Search Pattern** (Fig 10-3). To conduct an ES search, the aircraft flies directly to a given point (often a last known position) and then proceeds on a track (normally upwind) to a point at a distance equal to twice the assigned search visibility. From that point, the aircraft is flown on tracks at right angles to each other, at a distance apart of twice the search visibility. The length of the track is increased by twice the search visibility on every second track.

30. In Figure 10-3, the search visibility is one mile, and therefore track distances are 2, 4, 6 miles etc.

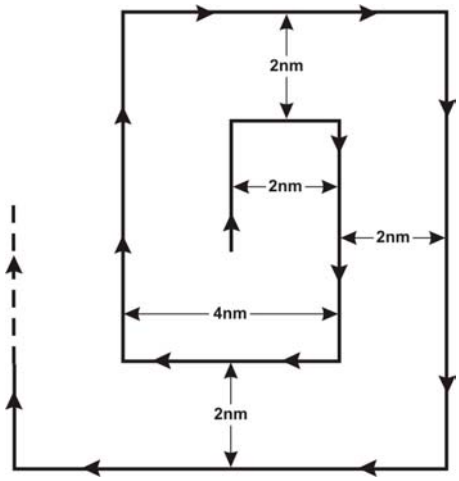


Figure 10-3: Expanding Square

31. The ES pattern requires close attention to navigation, especially during the first several tracks. Carefully plotting the pattern on an appropriately scaled map makes this task much easier.

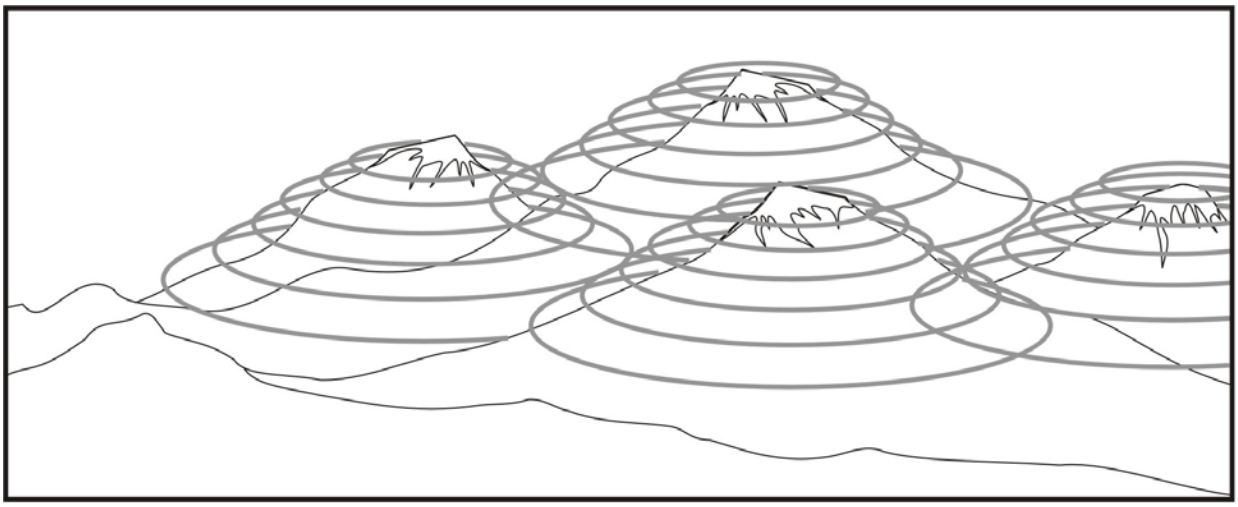
32. At present there is no navigation feature which provides much assistance with ES patterns without extensive waypoint entry.

33. **Contour Search Pattern** (Fig 10-4). This pattern is used when sharp changes in elevation make the use of other search patterns impractical. Vertical features such as peaks and valley walls are searched at a series of altitudes beginning at the top and working down.

34. This pattern requires an overall reconnaissance of the search area to identify vertical features that will be searched one at a time. When the area contains peaks of uniform height, it is possible to search this high ground by using creeping lines before the contour search is begun.

35. The starting altitude for a contour search should be the highest elevation possible on the feature. The search then continues downward. In certain cases, the search may be commenced at a lower altitude to burn off fuel and decrease aircraft weight prior to searching higher elevations.

36. CFACM 60-2605 Airlift Operations, SAR, contains much additional information on the planning and execution of mountain searches.



NOTES

1. Where possible, contours should be flown at constant altitude levels.
2. Depending on conditions, helicopters, or power-limited aircraft should commence contouring at lower altitudes to allow fuel burn-off to decrease aircraft weight, thus giving better performance at the subsequent higher altitudes.

Figure 10-4: Contour Search

FLIR SEARCH TECHNIQUES

37. The FLIR on the CH 146 has a limited capability when used in conjunction with the search techniques used above. During a search some FLIR limitations are:

a. narrow field of view that will not cover visibility ranges during track crawls;

b. objects remain within the field of view for only a short period of time; and

c. placement of the FLIR monitor does not allow for continuous monitoring during times of high pilot workload.

38. Taking these limitations into account, the FLIR is very useful for surveillance of known objects and for use in very localized searches of small areas. The helicopter must be flown very low and slowly using a narrow track spacing; e.g. search for a missing person in a small wooded area. The FLIR is also useful for investigating objects spotted during a search and as an aid for navigation at night when the crew is not NVG equipped.

39. If your helicopter is FLIR equipped, the following are some techniques that may be used to improve the effectiveness of the FLIR during a search:

a. select the "AUTO LEVEL" feature to "OFF". Then increase the offset until the screen becomes all white or black, depending on polarity. This allows only objects which are outside the selected temperature range to show up on the screen; i.e. person;

b. during periods of high pilot workloads, have someone that cannot otherwise be used as an effective spotter monitor the FLIR screen; and

c. align the FLIR along the track and remember to apply any drift to keep the FLIR oriented along the desired track.

ELECTRONIC SEARCH PATTERNS

40. The electronic search beacons currently in use in Canada can be divided into four broad categories:

a. crash position indicator (CPI);

b. personal locator beacon (PLB);

c. aircraft fixed emergency locator transmitter (ELT); and

d. shipborne emergency position indicating rescue beacon (EPIRB).

41. The CPI is usually jettisoned on impact and begins to operate automatically. Normally, the PLB must be operated by a survivor. The ELT and EPIRB usually have both automatic and manual activation systems. Military beacons typically operate on the UHF distress frequency of 243.0 MHz, while civilian beacons typically operate on the VHF distress frequency of 121.5 MHz. Some beacons operate on both freqs simultaneously.

42. New beacons designed to operate on 406.0 MHz are now available, and will be used in both military and civilian applications. The CH 146 is equipped with a 406 MHz direction finding capability. However, little operational experience exists with this capability at present. The 406 MHz DF information is presented on the No. 2 bearing pointer when:

a. bearing pointer no. 2 is set to DF mode on the HSI Mode page;

b. radio No. 2 is NOT set to DF mode on the Comm Settings page; and

c. a 406 MHz signal is being received as indicated by the A406 RX@ annunciator light below the HSI.

43. All ELTs have a continuous battery drain once they are activated. Therefore, it is essential that all search planning be based on saturation searching the high probability areas as rapidly as possible.

44. The standard visual search patterns are applicable to beacon searches, with the following modifications:

a. effective electronic searches can be carried out under all weather conditions at normal cruise speeds;

b. the ELT can be activated in the air or on the ground while still attached to the aircraft, and can be used for airborne intercepts. This factor must be considered when searching for CPI equipped; and

c. the ground position of an ELT may cause false on-tops and bearings to be encountered. Repeating a search procedure may help to confirm an on-top indication.

ELECTRONIC SEARCH PATTERN PROCEDURES

45. A CLA or TC search pattern should be employed for ELT or beacon searches. Maximum track spacing should be used initially for a rapid sweep of the probable area, followed by a further sweep with tracks reduced in spacing by half the original track spacing. In the area of highest probability, the track spacing can be further decreased by continuing the process of reducing by a half the former track spacing with each successive sweep. In mountainous areas, the search pattern should be arranged to cut the ridgelines at right angles if possible.

46. **Aural Homing Procedure**. As the AN/ARC-210 DF feature currently requires a strong signal in order to provide accurate DF steers, an alternate procedure is required when, during the CLA or TC pattern, a signal is detected aurally but no reliable DF information is available. The aural homing procedure should be used in this circumstance. When attempting to DF a weakening signal, it may be beneficial to select squelch OFF.

47. Figure 10-5 illustrates the Aural Null Homing procedure. When a signal is first heard, the aircraft's position is plotted on the search map as point A. The aircraft continues on its current track until the signal is lost, at which point the aircraft's position is plotted as point B.

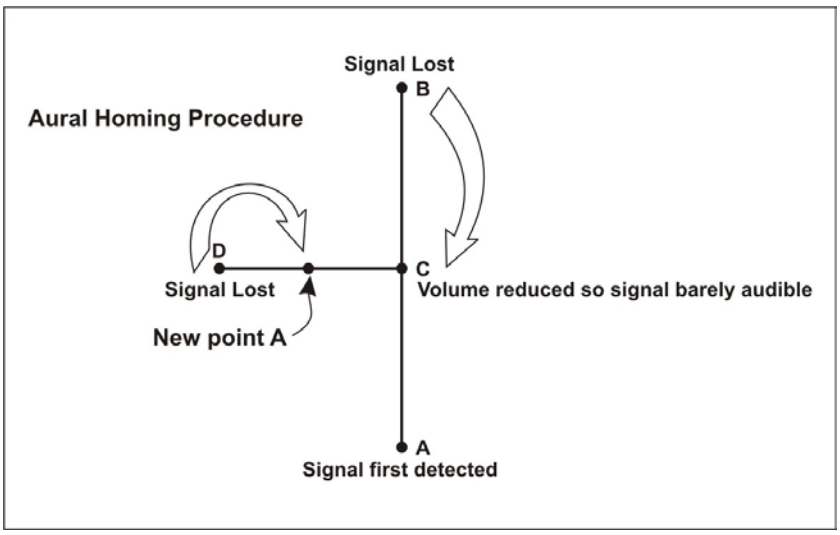


Figure 10-5: Aural Null Homing Procedure

48. The midpoint between points A and B is marked point C, and the aircraft flies to point C. At point C the volume on the receiving radio is reduced until the signal can barely be heard, and a track 90 degrees to the original A-B track is taken (left or right). If the signal does not grow stronger, this course is reversed and commenced again at point C.

49. The course from C is flown as the signal grows stronger and then weakens, until it cannot be heard at that volume setting. The aircraft position is then plotted as point D.

50. The entire procedure is now repeated, but using C to D in place of A to B. In this manner the signal is progressively homed using only aural detection.

51. The CH 146 is well suited to assisting with an Aural Homing procedure.

52. Sector Search Pattern (Fig 10-6). While not strictly an electronic search pattern, the sector search is well suited to providing quick coverage in all directions about a high probability area, given little or no visual references.

53. For over water searches, the first leg (Leg 1) is in the direction of the target's estimated drift. Upon reaching the desired search radius, a right hand 120 degree turn is executed until intercepting the inbound track, Leg 2. After passing the search centre and proceeding outbound to the selected search radius on Leg 2, another right hand 120 degree turn is executed. Leg 3 is intercepted and flown in the same manner as Leg 2. A subsequent search can be commenced using a 30 degree offset (either left or right) from the original Leg 1.

54. The CH 146 is well suited to assisting with sector search patterns. LRN Direct To mode is useful when set to the centre of the sector search.

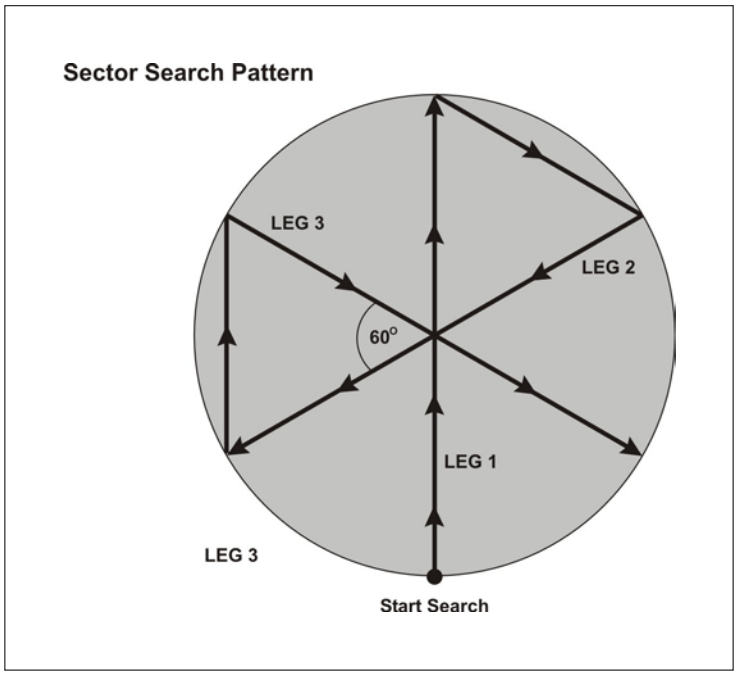


Figure 10-6: Sector Search Pattern

SEARCH OBJECT RECOVERY

55. Once the search object is located RCC/SM must be notified via a NOCL message. In some cases, the aircraft locating the search object may not be the best resource to effect the actual recovery. Decisions of this nature and reallocation of appropriate resources will be directed by RCC/SM.

56. When formulating a recovery action plan, the Aircraft Commander should not necessarily attempt manoeuvres for which the crew may not be trained (i.e. over water hoisting, boat hoists). In making the plan, the AC should seek advice as required from RCC, SM, on board SAR TECH. The decision to hoist vice land should be carefully weighed considering urgency of the situation, crew training and experience levels and safety of the recovery personnel/resources.

CHAPTER 11

TACTICAL LANDING SITE PREPARATION

AIM

1. The aim of this chapter is to describe the selection criteria and systems for marking helicopter landing sites for day and night operations.

INTRODUCTION

2. The selection criteria and systems of marking helicopter landing sites for day and night operations described in this chapter represent the ideal situation. At times it may necessary to accept reduced criteria, however the ultimate decision will rest with the helicopter commander or formation leader. In future, the dimensions may require alteration as new types of helicopter are introduced. All slopes and dimensions are IAW NATO standards.

TERMINOLOGY

3. The following terms are frequently used in this Chapter:

a. **Cleared To Ground Level**. To ensure a safe landing, it is essential that solid obstacles and inflammable and loose material be cleared; the term "cleared to ground level" is used to indicate this. It is not necessary to clear grass up to 0.3 m (1 ft) high that might cover a level field unless a fire risk exists. (See Note); and

b. **Hard Surface**. The centre of the landing point, where the helicopter lands, must be solid enough to bear its weight. The term "hard surface" is used to indicate this situation.

NOTE

If ground obstructions cannot be cleared, some helicopter operations can be carried out without the helicopter actually landing. The same dimensions of clearing and ground markings are required, and the helicopter will hover above the obstructions that prevent it from landing. Every effort should be made by the ground troops to improve the landing point surfaces to enable the aircraft to land.

LANDING SITE DIMENSIONS

4. The size of the landing site will depend on the number and size of landing points within it and the dispersion required between landing points based on the tactical situation. Supported units must either comply with helicopter unit requirements or coordinate a reduced size of LS before an operation starts. The criteria provided in Figures 11-1 to 11-5 represent the minimum dimensions of each landing point.

Helicopter units will designate Size 1, 2, 3, 4, or 5 Circular Landing Points to be utilized by their units for specific operations. Numerous considerations, such as helicopter type, unit proficiency, nature of loads, climatic conditions and day or night operations may apply to the size of the landing points used. In the absence of information from the helicopter unit, a Size 5 Landing Point will be chosen. The minimum recommended distance between landing points within a landing site where no consideration is given to dispersion between helicopters is as follows:

a. **Size 1** - 25 m;

b. **Size 2** - 37 m;

c. **Size 3** - 50 m;

d. **Size 4** - 80 m; and

e. **Size 5** - 100 m.

NOTE: Distances are measured from centre to centre.

APPROACHES

5. Ideally, approaches should be obstruction-free with exit paths into wind. The criteria below represent the minimum required to permit full flexibility in helicopter operations. Approaches, which do not meet these criteria, may be acceptable depending on the nature of the operations undertaken; i.e. in light wind conditions a single approach and reciprocal exit may be acceptable. However, when these criteria cannot be met, the helicopter unit must be consulted:

a. **By Day**. Within the selected approach and exit paths, the normal maximum obstruction angle to obstacle should not exceed six degrees as measured from the edge of the cleared to ground level area to a distance of 500 m (maximum obstacle height 52 m (170 ft)) (see Figure 11-7). This limit may be waived at the discretion of the pilot.

b. **By Night**. The selected approach and exit paths should contain a sector of not less than 16 degrees in azimuth as measured from the edge of the cleared to ground level area. The width of the approach and exit paths should not be less than the width of the area of the landing site cleared to 0.6 m. Less than 50 m will not be acceptable, and more than 100 m is not necessary. Within the selected approach/exit paths, the maximum obstruction angle should not exceed four as measured from the edge of the cleared to ground level area to a distance of 3000 m (maximum obstacle height 210 m (690 ft) (see Figure 11-7). However:

   (1) When the primary methods ("T" or inverted "Y") of marking the landing site are used (see Figure 11-6) the maximum obstruction angle on the approach and exit paths of obstacles is four degrees (or 1 in 16).

(2) When a glide path indicator is used, the obstruction angle is increased to six degrees and should be extended to the range of the indicator, or 3000 m whichever is greater, and cover the projection angle of the indicator in azimuth.

(3) There are no restrictions on the obstruction angle to obstacles, other than those within the approach and exit paths. However, prominent obstructions in the area of the landing site not marked on the map as such must be reported to the helicopter unit.

SURFACES

6. The surface of the centre of the landing point must be even and sufficiently firm to allow a fully loaded ground vehicle (e.g. 3/4 ton for Reconnaissance Helicopter, 4 tons for Light Transport Helicopter and 10 tons for Medium Transport Helicopter) to stop and start without sinking. The whole landing point must be cleared of any loose material or piles of dust/sand that could be blown up by the rotors of the helicopter. Landing points with sandy or dusty surfaces should be stabilized or covered by an agreed method. Any snow on any landing point should be packed or removed to reveal any hazardous objects and reduce the propagation of blowing snow; a marker is essential to provide a visual reference for depth perception and also reduce the effect of whiteout.

SLOPE OF THE GROUND

7. Ideally, the ground on the landing site should be level. Where there is a slope, it should be uniform. If the following criteria cannot be met, the use of the landing site must be confirmed by the helicopter unit:

a. **By Day**. Slope should not exceed seven degrees (or 1 in 8) in any direction if the helicopter is to land. However a greater slope may be acceptable for hover operations.

b. **By Night**. A reverse slope, as viewed from the approach path, is not normally acceptable. Forward and/or lateral slope should normally not exceed three degrees.

NOTE

When coordination with the helicopter unit is possible, these angles of slope may be exceeded, based on the capability of the helicopter.

CONCEALMENT

8. A landing site in close proximity to the Forward Line of Own Troops (FLOT) should be masked from enemy ground and electronic observation. The selection of approach and exit routes should also be based on the availability of good masking features.

MARKING OF LANDING SITES AND LANDING POINTS

9. Landing sites and points should be marked when circumstances allow. Marking should be kept to the minimum and only displayed when actually required, in order not to disclose positions to the enemy.

a. **Displays of Markers**. There is a danger of insecure markers being dislodged by the downwash from the helicopters and causing damage by being sucked up into the rotor or engine. Therefore, panels should be avoided and lights should therefore be firmly secured, or removed before the helicopter hovers above them.

b. **Methods of Marking**. Some minimal methods of marking the landing site by day and night are illustrated in Fig 11-6.

VISUAL IDENTIFICATION OF LANDING SITES

10. Identification of landing sites may be effected by one of the following methods:

a. **Coloured Smoke, Flashing Lights, or Pyrotechnics**. To prevent deception by the enemy, the following identification sequences should be used:

(1) ground unit releases smoke, etc, on request;

(2) the helicopter pilot states the colour he has seen; and

(3) the ground unit confirms that the colour is correct; and

b. Pre-arranged display of Marshallers, Figures, Letters or Light Codes.

DESIGNATION OF LANDING ZONES AND SITES

11. Landing zones are designated by colour or codeword. Landing sites are designated by LZ colour or codeword/prefix and number. Where unit landing zones are large, the numbering of landing sites can be grouped by geographical or sub-unit areas. Thus the landing sites in one squadron/flight area may be known as RED 30, RED 31, RED 32, etc, and in another area the landing sires may be designated RED 40, etc.

RADIO AIDS

12. Whenever radio communication and electronic aids (including air traffic control facilities) are located at a landing site, antennae should be offset from the landing site to prevent the enemy from fixing on the location of the site within electronic devices. Only essential communication for control of helicopters at the landing site should be used.

COLOURED LIGHTS

13. Red lights are reserved for the indication of obstacles.

NIGHT OPERATIONS

14. **Night Tactical Landing Light System (Unaided Vision)**:

a. At night, approaches to a tactical landing site require the use of a tactical landing light system. Such a system must be capable of providing the aircrew with visual cues that will aid in determining alignment with the approach axis, angle of descent, rate of closure and provide a ground hover reference. The source of light may consist of hand-held lights, beanbag lights phosphorescent tubes, etc. Regardless of the type of light source used, it must be capable of being secured so that the wind force of the helicopter will not cause it to be extinguished. If a battery-powered light is used, it is desirable that each light yield approximately the same light intensity. A white light provides the best light source for a tactical landing site system.

b. The two recommended tactical landing light systems are the "T" and the "inverted Y" (see Figure 11-6). Both systems provide the visual cues required to execute a safe approach to a tactical landing site. Other systems requiring fewer lights may be used as an emergency system as situations dictate; however, no less than two should ever be used. Viewing of one light causes an apparent motion of the light and results in false interpretation by the aircrew. Also important is the separation between the lights. If only two lights are used, a minimum separation of 5 m (paces) is required.

c. Prior to arriving at a landing site where a tactical landing light system is employed, it is essential that the aircrew know which system is being employed. The aircrew should receive such information from the supported unit in the pre-mission briefing or by radio from the ground party responsible for setting up thesystem.

d. The glideslope indicator used in land operations must cast three separate coloured beams of light: amber (top beam), green (center beam), and red (bottom beam). Any variation of the colour coding must be clearly briefed to visiting aircrew.

15. **Landing Light System for Night Vision Devices**:

a. The use of night vision devices can offer tactical advantages and reduce or remove the need for landing light systems. A number of factors will, however, govern the operational requirement for ground lighting:

(1) ambient light levels;

(2) visibility;

(3) numbers of helicopters;

(4) mission requirements; and

(5) carriage of underslung loads;

b. In general terms, a single helicopter moving troops may not require a landing aid if light levels and visibility are adequate, whereas large scale operations may. Supported units should liaise with aviation units at an early stage of the planning process to determine the operational requirement.

c. The intensity of most electric lights used in ground landing light systems is too bright for light amplification devices such as NVGs. To use ground lights when the aircrew are equipped with NVGs, it will be necessary to reduce light emission to an appropriate level. If these modifications are not carried out, the performance of the NVGs will seriously be reduced. When a "T" or an "inverted Y" tactical landing light system is provided, the aircrew will use it in the same manner as when conducting an approach with unaided vision.

HELICOPTER LANDING SITE REPORT

16. Reports providing information on helicopter landing sites should be submitted in the HELLSREP format as per WUSOP 705.03.

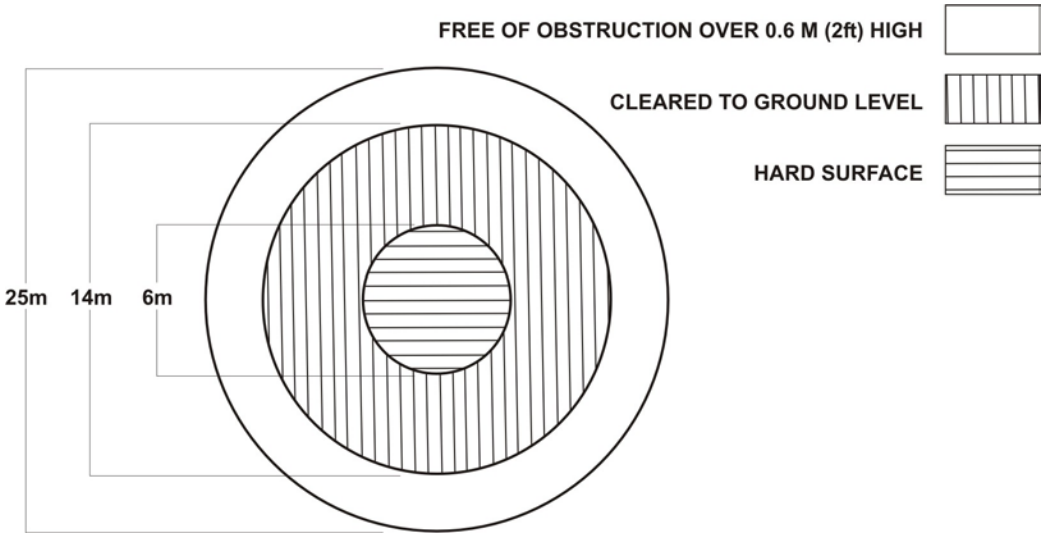


Figure 11-1: Size 1 Landing Point Circular

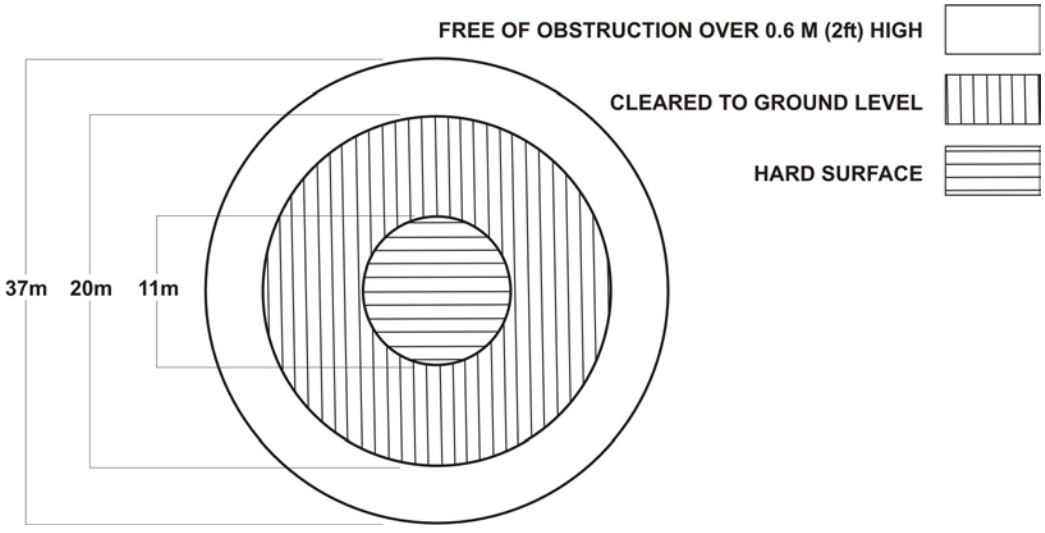


Figure 11-2: Size 2 Landing Point Circular

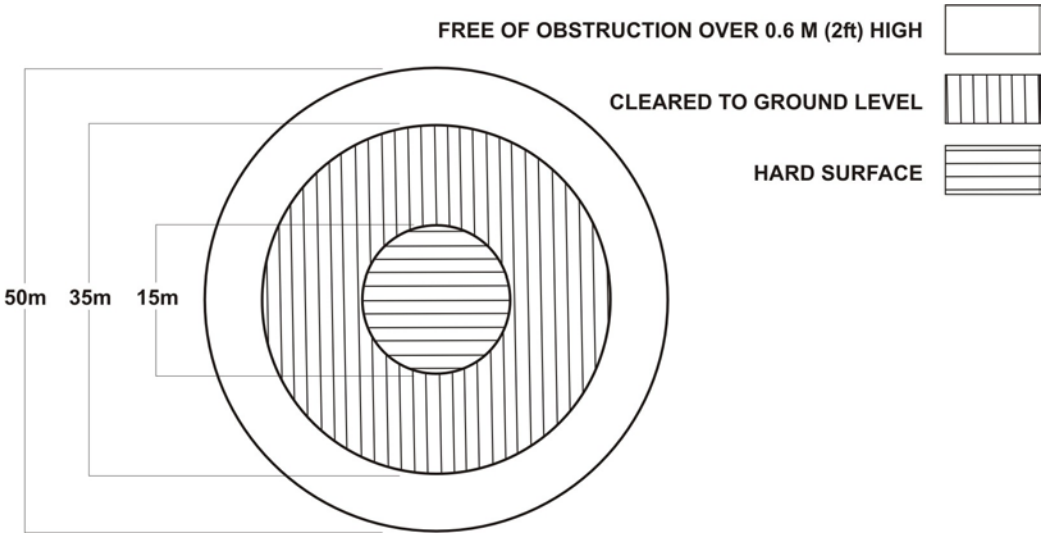


Figure 11-3: Size 3 Landing Point Circular

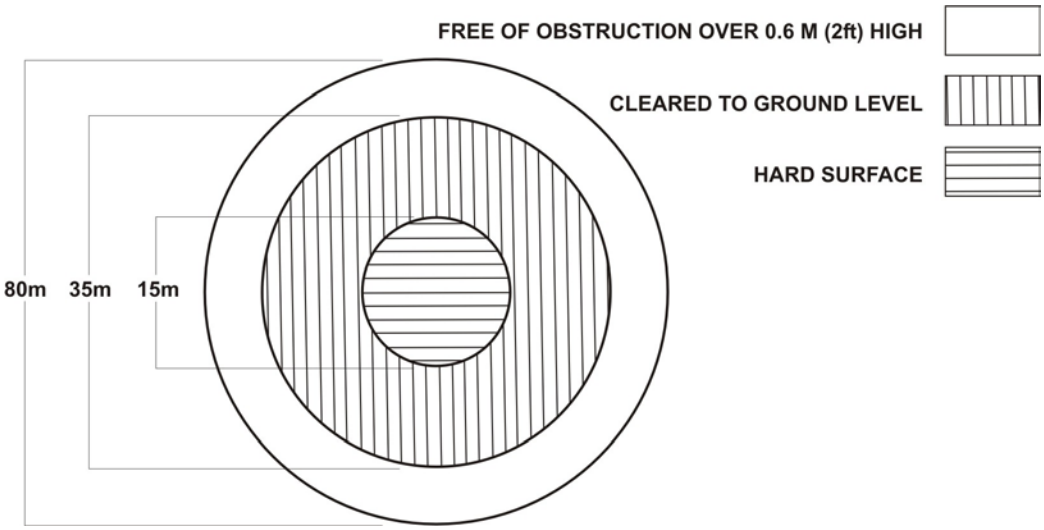


Figure 11-4: Size 4 Landing Point Circular

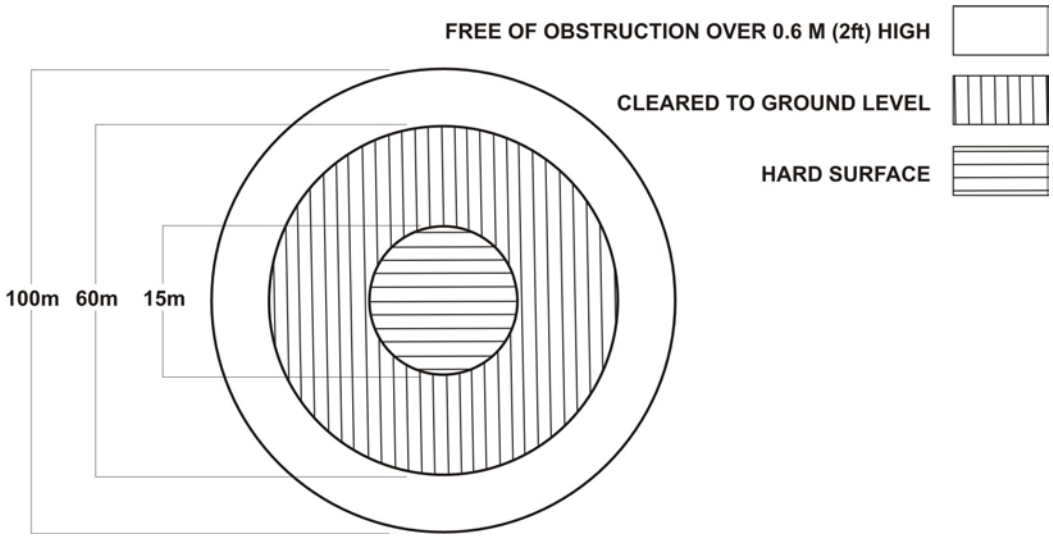


Figure 11-5: Size 5 Landing Point Circular

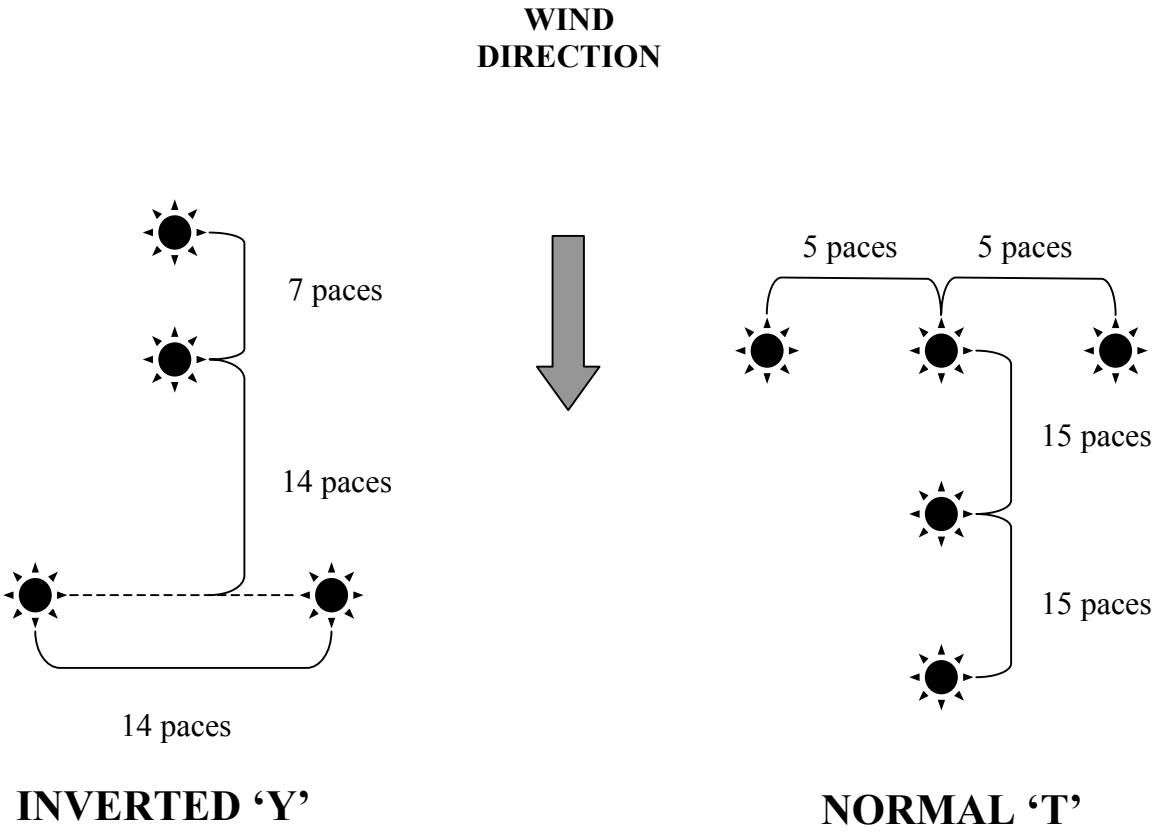
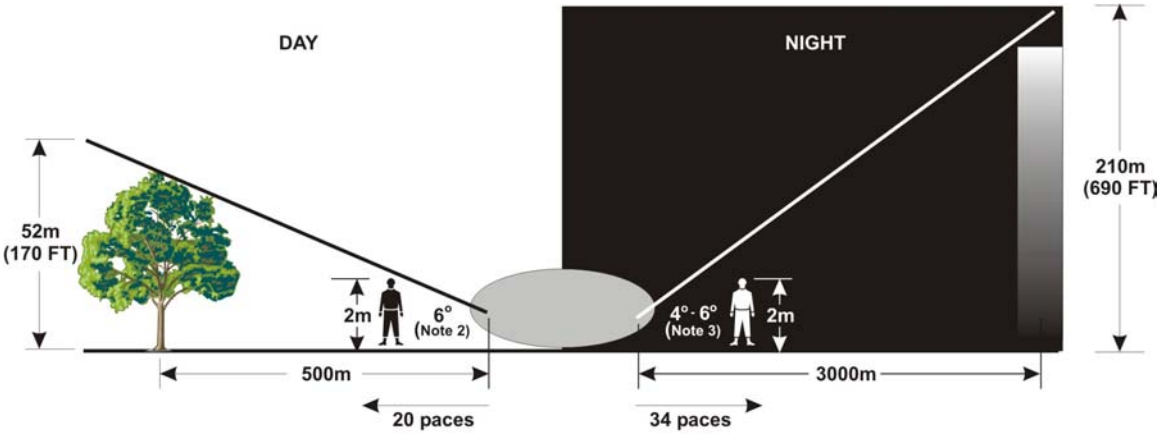


Figure 11-6: Night Landing Aid Dimensions



NOTES

1. The obstruction angle is measured from the point where the landing or take-off paths intersect the stipulated "cleared to ground level" area of the landing point.
2. By day the obstruction height cannot exceed an approach angle of 6 degrees out to 500 m from the landing point.
3. By night the obstruction height cannot exceed an obstruction angle of 4 degrees out to 3000 m from the landing point unless a glide slope indicator is used when the obstruction angle can be 6 degrees.
4. Pilot may intercept the glide slope at any height.
5. Warning. Sight for ground level at the touchdown point.

Figure 11-7: Landing Point Obstruction Angle on Approach and Exit Paths - Day and Night.

CHAPTER 12

FARP OPERATION TACTICAL SOPS

EQUIPMENT

1. Two HLVW Bowsers will be place on line, with one in reserve, if possible.

SITE SELECTION

2. The following factors should be considered in selecting a FARP site:

   a. use tree lines, vegetation, terrain folds, and reverse slopes for masking;

   b. do not co-locate the FARP with a tac CP or a Holding Area; and

   c. consider the following:

      (1) the number and type of helicopters to be refuelled;

      (2) the minimum spacing reqrs between refuelling points is 30 m;

      (3) adequate obstacle clearance for safe takeoff and landings; and

      (4) designated arrival, departure and holding areas.

WORK PRIORITIES

3. The priorities of work in setting up a FARP are:

   a. **Security**:

      (1) establish a perimeter and prepare fighting positions and range cards as required;

      (2) sweep the site for demolitions or anti helicopter obstacles;

      (3) recce the site for appropriate refuelling and rearming points; and

      (4) set up crew served weapons;

   b. **Communications**. Upon arrival, the FARP must establish communications with the Squadron CP or Alternate CP, giving a SITREP, estimated time of operation, and a helicopter landing zone report. These communications will be secure.

   c. **Set Up**:

      (1) determine the positions for refuelling and rearming points; and

      (2) position vehicles into final parking locations;

d. **Vehicle Maintenance**. Perform preventative maintenance checks and services on vehicles.

e. **Camouflage**. Camouflage all vehicles and equipment.

f. **Other Maintenance**. Perform other maintenance on equipment and weapons as required and time permits.

g. **Resupply**. Resupply as required fuel, ammunition and vehicle POL.

h. **Mess, Personal Hygiene and Rest**. Accomplished as mission allows.

RADIO SECURITY

4. The FARP will have operational VHF/FM and VHF/AM radios. These radios are used only as directed by the mission orders, or in the following circumstances:

a. when resupplies are requested;

b. the site is compromised;

c. the FARP is not operational as planned; and

d. a serious incident occurs in the FARP, i.e. an aircraft accident or fire.

5. Outbound helicopters can relay critical messages from the FARP to the Sqn CP or Tac Base as required. This prevents enemy detection of the FARP by radio transmissions.

HELICOPTER PROCEDURES

6. **Landing**:

a. When 5 kms out from the FARP, the lead helicopter or AMC will make a call in the blind on the secure frequency stating that helicopters are inbound. An example would be “56 (FARP) this is 29 plus three on Dog”. This is telling the FARP that four helicopters are on Dog route. This alerts the FARP and other helicopters of his intentions. The FARP does not reply unless the area is not secure or safe. Terms which violate operational security will not be used; for example “helicopters”, “inbound”, “outbound”, or “FARP”; and

b. Helicopters will be flown tactically within 3 kms of the FARP. Approaching hels must maintain visual contact with departing helicopters.

7. **Positioning**:

a. FARP personnel will use standard hand and arm signals to assist pilots in positioning helicopters into refuelling and rearming points;

b. door guns will be in the stowed and safe prior to marshalling into refuelling or rearming points; and

c. pilots will position helicopters at the refuelling points so that the refuelling nozzle is on the right side of the helicopter.

REFUELLING PROCEDURES

8. **Safety**:

a. Fuel handlers will ensure they are grounded before commencing refuelling;

b. For static discharge hazard, do not remove clothing within 15 m of refuelling operations or near a flammable vapour-air mixture;

c. Fuel soaked clothing will be rinsed with water before removal;

d. **Hot Refuelling**:

(1) ensure 25 m separation exists between refuelling points;

(2) ensure that armament systems are SAFE;

(3) stabilize the helicopter and deplane all passengers at least 18 m from the helicopter before conducting refuelling operations. No transmissions are permitted, but monitor all communications. Pilots secure all electrical equipment;

(4) the FE will deplane and man the refuelling point fire guard once passengers are clear of the helicopter;

(5) await a “thumbs up” from the pilot before the refuelling team approaches the helicopter;

(6) ground the nozzle to the rod and bond to the helicopter;

(7) the pilot(s) will monitor fuel flow and give a thumbs up or down depending on whether the fuel gauge is reading an increase. Within 50 lbs of required load, the pilot will place left hand at right shoulder and once the fuel load is achieved, make a lateral movement with his hand (and forearm). The point controller will relay this to the nozzle man;

(8) the refueller will disconnect the refuelling nozzle and cap it, replace the helicopter fuel port cap, and return the nozzle to the closed position and disconnect the grounding wire;

(9) the pilot will indicate to the refuelling point controller that the passengers/refuelling crew can proceed to/from the helicopter using intercom or "thumbs up" signal;

(10) satisfied that everybody is ready, the refuelling point controller will signal the refuelling crew to move out (reverse "move in" signal). He will then direct all passengers and crews back into the

helicopter. When used, ICS communications will be disconnected at this time; and

(11) the refuelling point controller will direct the helicopter away from the refuelling point using standard marshalling signals as required; and

e. **NVG Procedures**. The following outlines the procedures to be followed when conducting HCCR with NVGs:

(1) **Groundcrew Unaided**:

(a) the procedures that apply to the HCCR conducted under NVG operations are the same as those conducted under unaided flights;

(b) aircrew are to ensure that the helicopter is visible to the groundcrew at all times, especially during the helicopter's final approach to the refuelling area; and

(c) hand signals used by air/groundcrew are to be seen by both parties;

NOTE

Markers, marshalling wands and lights on the bowser must be NVG compatible and visible to both groundcrew and aircrew, i.e., green light.

(2) **Groundcrew Wearing NVG**s. The differences in the conduct of HCCR when the groundcrew are wearing NVGs are as follows:

(a) during the approach:

i. anti-collision lights: OFF;

ii. NVG pos lights: BRIGHT; and

iii. IR Searchlight: As required;

CAUTION

Caution should be exercised when using the IR searchlight to avoid shining it into the eyes of ground personnel; the potential exists to severely degrade marshaller's NVGs and thus render him ineffective.

(b) on short final: NVG position lights: DIM;

(c) during refuelling:

i. NVG position lights: DIM; and

ii. IR Searchlight: OFF;

(d) hand signals used by air/groundcrew are done with a NVG compatible light (i.e., IR light) which can be seen by both parties; and

(e) the refuelling area should be situated in a low light environment.

EMERGENCIES

9. The following are the emergency procedures to be followed during HCCR ops:

a. **Fuel Spill or Fuel Leak**. Should a fuel spill or a fuel leak occur:

(1) all refuelling operations shall cease;

(2) the refuelling point controller or the fireguard will advise the pilot by intercom or by using the standard marshalling signal for fuel spill or will tell the pilot; and

(3) the refuelling point controller or refueller will investigate the cause of the spill and assess corrective action and whether refuelling is to continue. The pilot will be advised accordingly of need to shut down the helicopter or to vacate the refuelling area for HCCR; and

NOTE

Fuel spills must be cleaned up. In ground terrain this may not be possible and hence because of the contamination the refuelling point must be moved.

b. **Fire**. In case of fire:

(1) the refuelling point controller or the fire guard will advise the pilot by intercom or by using the standard marshalling signal for aircraft on fire or will tell the pilot;

(2) fuel delivery shall immediately cease;

(3) the fire safety or extinguisher man will combat the fire. His prime concern will be the protection of human life;

(4) if the fire is at the helicopter or delivery end of the fuel line, the refuelling controller will advise the pilot to shut down the helicopter and evacuate. The refueller will not disconnect the fuel nozzle from the helicopter. The refuelling equipment operator will stop the delivery of fuel at the source;

(5) if the fire is elsewhere in the refuelling point and free of the helicopter, the refuelling point controller will direct the refueller to

free the helicopter; then, the refuelling point controller will marshal the helicopter away from the refuelling point; and

(6) the refuelling point controller or fire guard will assume direction of fire fighting activities until the arrival of more effective fire fighting services.

CHAPTER 13

NBC DECONTAMINATION OF HELICOPTERS

GENERAL

1. The aim of this chapter is to provide guidance on the decontamination of helicopters affected by nuclear fallout or biological or chemical agents. The probability of conducting operations in a Biological and Chemical Warfare (BCW) environment has become more likely within the past decade and planning must be done to ensure that operations can be maintained, even if at a reduced operational tempo.

2. Helicopter operations may be threatened directly or indirectly by the use of nuclear, biological or chemical (NBC) weapons. Following the employment of such weapons, large areas of terrain and the air immediately above may become contaminated and remain so for extended periods. The extent to which helicopters may continue to operate successfully in a contaminated environment will depend on measures taken to clean them.

PLANNING

3. As part of the planning process the CO will assess the likely threat, including the risk of exposure to contamination. He will seek to avoid exposure or reduce the hazard, and maximize operational capability by determining the levels of aircrew protection and establishing procedures for the decontamination of helicopters and equipment. The following factors should be considered:

a. intelligence on existing or likely threats;

b. meteorological information;

c. the time for which aircrew and support personnel must wear protective ensembles and the effect of productivity;

d. the type of mission;

e. the capabilities of unit NBC personnel;

f. the external support available from chemical units;

g. the decontamination assistance available from the supported unit;

h. the support available to detached elements; and

i. the designation of a decontamination site.

4. **Decontamination Principles**. The principles are to decontaminate:

a. as soon as possible;

b. only what is necessary;

c. as close as possible to the forward operating location; and

d. equipment and personnel according to operational priorities.

5. Detection and alarm equipment will usually provide adequate warning of many nuclear and chemical threats to helicopter sites, although it may take some time to assess the precise nature and likely duration of the contamination. Detection equipment for biological agents is at an early stage of development and procedures for detecting and identifying these threats can be lengthy. When the helicopter is airborne, visual detection of certain liquid agents is possible using chemical sensitive paper attached to the windscreen of the helicopter and chemical alarms may also be provided. No standoff detection capability is currently available.

6. A helicopter has the advantage of flying around or above known contaminated areas and may even fly through them at speed suffering little effect. Speeds in excess of 90 knots and terrain clearance of more than 50 feet will reduce the risk from vapour hazards. Landing in a contaminated area, however, will result in wholesale contamination of the helicopter through the re-circulation of soil by the rotor wash, especially if the site is dusty. As far as possible, dust free landing sites should be selected. A low speed, low level reconnaissance of the site may provide an indication of surface conditions and permit alarm systems to detect the presence of agents in suspension. Hovering may be necessary in order to use point sampling devices, but in this event sampling may have to be restricted to the use of detector paper because rotor downwash will inhibit the collection of air samples using such devices as vapour detector kits. During terrain flight, areas of heavy vegetation should be avoided because vapour is dispersed less quickly where the wind is blocked. Open areas or high ground afford the best opportunity to evade this hazard. Areas where artillery rounds have impacted should also be avoided as the enemy may have employed Biological or Chemical munitions. The presence of healthy, unprotected personnel could indicate a safe landing area.

7. There are four possible means by which helicopters may be exposed to contamination:

a. **Attack On The Ground**. To minimize the effect of an attack, the following pre attack precautions should be taken, when possible, whenever the helicopter is shut down on the ground:

(1) park close to and downwind of trees and buildings;

(2) close doors and windows; and

(3) cover windows with specialist NBC protective material. Some agents can cause minor cracks or distortions in plexiglass in about 10 minutes.

b. **Attack While Airborne**. Flight through liquid falling to the ground is extremely unlikely but flight through a vapour hazard may take place. Aircrew and passengers should wear individual protection and, when possible, doors and windows should be closed.

c. **Landing On Contaminated Ground**. Contamination on the outside of the helicopter should be limited to the underside of the helicopter. If troops are picked up, they should be assumed to be contaminated.

d. **Carriage Of Contaminated Troops**. Flying with doors and windows open will increase the rate of weathering if carrying contaminated troops. Protecting the floor with covers will aid subsequent decontamination but tears in the fabric could increase the risk of contamination behind floorboards and may present a flight safety hazard.

DECONTAMINATION

8. **Levels Of Decontamination**. Once a helicopter is contaminated it is difficult to decontaminate it completely. The tactical situation and the availability of spare helicopters will determine the degree of decontamination attempted. The goal of the helicopter unit will be to reduce the hazard during a period of sustained operations but it is likely that aircrew, troops and support personnel will have to continue to wear individual protection. This may, however, reduce operational effectiveness and jeopardize flight safety. Only specialist decontamination units, usually established in the rear area, will be able to conduct sufficiently thorough decontamination to permit the removal of protective clothing. There are three levels of decontamination to be considered:

a. **Immediate Decontamination**. The purpose of immediate decontamination is to save lives and minimize casualties. Initial effort will, therefore, be concentrated on personnel. It may be necessary to continue to operate helicopters for a short period in a dirty condition before they too can be subjected to decontamination procedures. In this event, all who may come into contact with contaminated helicopters must be suitably attired and made aware of the conditions they face. Routine flight and ground operations with rotors turning help to decontaminate exterior surfaces of the helicopter. The wind and warm temperatures generated by the engines help to dislodge particles and expedite the evaporation of chemical agents. Complete decontamination of surfaces by evaporation, however, is not possible because some agents may remain in the paint.

b. **Operational Decontamination**. To enable operations to be sustained for longer periods it will be necessary for units to carry out operational decontamination of helicopters in order to reduce further risks to personnel. Unit commanders should select sites dedicated to the decontamination of helicopters and organize them to take account of helicopter type, mission, terrain and wind conditions. Care must be taken to ensure that removed contaminants can be contained in a suitable area. If necessary, operational decontamination may be accomplished in two stages as follows:

(1) **Stage 1 (Spot Decontamination)**. Selected areas of the helicopter are likely to be touched by personnel (steps, doors, handles, entrances, floors, refuelling caps) may be spot decontaminated to limit the possible spread of contaminants. Plexiglass windows may be flushed with water to prevent cracking. Unit aircrew and support personnel should ensure the availability of fuel, soap and water so that spot decontamination may be carried out during operations.

(2) **Stage 2 (Surface Decontamination)**. As soon as time and resources permit, all external and accessible internal surfaces may be decontaminated. The primary concern is to spray wash contaminants from the helicopter exterior and, as a minimum, the internal cabin floor. Depending on operational requirements, spray down may be accomplished with engines running or shut down.

c. **Thorough Decontamination**. During protracted operations, weathering and decay will reduce contamination levels significantly and following operational decontamination, attempts to further reduce contamination levels may not be worthwhile. Thorough decontamination is a lengthy process, the aim of which is to reduce contamination to the lowest possible levels, thus permitting the partial or total removal of individual protection and the continuation of operations with minimum degradation. It is unlikely that this level of decontamination will be attempted during hostilities. Thorough decontamination of helicopters is accomplished at sites in the rear area established by specialist chemical units. Aircrew must exercise care within the site by minimizing air taxi and landing at the designated point. Personnel from the helicopter unit will carry out the decontamination with technical assistance from specialists.

9. **Site Requirements**. The decontamination site must be capable of accommodating the appropriate helicopter type in the required numbers. It should be relatively secure but close enough to refuelling and rearming points to permit a reasonable quick turn round if required. The site should have sufficient terrain flight routes within 2 to 3 kilometres to facilitate entry and exit. A slight slope to the terrain is desirable but must remain within helicopter limits. It is preferable to sequence groups of helicopters through the decontamination site to prevent arriving or departing helicopters interfering with decontamination operations. Depending on the personnel and resources available, it may be possible to cleanse several helicopters simultaneously. Caution must be observed when decontaminating armed helicopters to ensure safety procedures are observed. Areas should be provided for aircrew to rest and to change individual protection equipment. Following thorough decontamination, aircrew need not wear full protective equipment if the operational area is known to be hazard free.

DECONTAMINATION PROCEDURES

10. Equipment will vary but large quantities of water will invariably be required. The most common decontamination procedure is to wash the helicopter with hot soapy water followed by a clear water rinse, avoiding spraying water on electrical components. Water pressure should be adjusted to avoid damaging the helicopter. Hot air, if available should be directed onto sensitive components that cannot be washed. Only approved cleaning compounds should be used to decontaminate a helicopter.

11. Helicopters can be contaminated with radioactive dust, biological agents and persistent and non persistent chemical agents. Radioactive dust is relatively easy to remove by sweeping and wiping and biological agents do not survive long on helicopter surfaces. The main area of concern is the decontamination of chemical agents, in particular persistent agents. Persistent agents are normally wet and adhere to many surfaces of the helicopter. There are several types of decontaminants available for general use on all vehicles, many of which are caustic and may damage helicopter components. DS2, Super Tropical Bleach (STB) and sodium hypochlorite are not considered safe. STB corrodes metal components and the helicopter skin. Safe decontaminants are C1, water, hot water with diluted soap mixtures, hot air, RSDL and POL products (JP4). These decontaminants should be used in the following manner for immediate and operational helicopter decontamination:

a. **Method**. In order to prevent damage to the helicopter, the following decontaminants are used in the manner described below:

(1) aviation fuel is to be used to decontaminate the airframe and certain parts as determined by maintenance personnel. (Note that JP4 removes the agents, but does not neutralize them),

(2) hot soapy water is to be used to decontaminate the windshield, windows and the cargo area,

(3) some chemical cleaners can be used to decontaminate the airframe and externally mounted armaments,

(4) wiping with clean rags is to be used to decontaminate instruments and the flight controls, and

(5) hot air (from Herman Nelsons) is to be used to vapourize and dry both contaminants and decontaminating agents in the cockpit and cargo areas. (Note that the hot operating temperatures in the engine compartment area will have already vapourized most chemical agents).

b. **Immediate Decontamination Procedures**:

(1) **Step 1**. The helicopter lands and is shut down (remaining at flight idle in hostile conditions).

(2) **Step 2**. A decontamination agent disperser applies a quick spray of chemical decontamination agent to externally mounted armaments.

(3) **Step 3**. A decontamination team member quickly washes the fuselage with warm soapy water (or JP4 if water is limited).

(4) **Step 4**. Another team member rinses off the helicopter with water (armaments last).

(5) **Step 5**. A tech conducts a brief lubrication and a safety check (replacing 3-way detector paper as required).

(6) **Step 6**. The helicopter hovers, or is towed, to a clean area.

(7) **Remarks**:

(a) A downwind holding area for waiting helicopters may be required.

(b) In Step 1, the 3-way detector paper on the helicopter is checked to verify whether the helicopter requires decontamination. If decontamination is not required, Steps 2 and 3 are omitted.

c. **Operational Decontamination Procedures**:

(1) **Step 1**. The helicopter lands and is shut down.

(2) **Step 2**. Two team members commence wiping the airframe with chemically wetted cloths or JP4 (do not apply chemicals to rubber seals or windows).

(3) **Step 3**. Another team member applies warm soapy water to helicopter, beginning with the windshield and working top to bottom.

(4) **Step 4**. The helicopter is rinsed with water,

(5) **Step 5**. A tech enters the helicopter and wipes down the instruments with dry cloths and washes the seats and floor. The tech must perform individual decontamination before entering the helicopter and touch only what is necessary.

(6) **Step 6**. The tech exits the helicopter and hot air is used to dry the interior.

(7) **Remarks**. All personnel shall maintain complete protection when acting as part of the decontaminating crew, no matter how detailed the decontamination process.

CHAPTER 14

RECONNAISSANCE AND TACTICAL SECURITY

GENERAL

1. **Roles**. Tactical aviation's rapid, terrain independent air mobility helps create tactical opportunities for land force commanders at all echelons. These opportunities allow commanders to operate inside the enemy's decision cycle and force the enemy to make decisions that will disrupt initial plans. Tac avn units can provide crucial information by performing reconnaissance and tactical security operations. By effectively using aviation assets, the manoeuvre commander takes the initiative away from the enemy and conducts combat operations on his own terms.

2. **Missions**. The primary mission of a reconnaissance (recce) flight is to conduct reconnaissance, and screening missions. The flight extends the reconnaissance and screening capabilities of the armoured recce squadron by providing aerial reconnaissance support during offensive, defensive, delaying, and transitional operations. Tac avn recce provides timely combat information concerning the enemy, terrain, and weather throughout the area of operations and early warning against enemy observation or attack. Tac avn also augments land forces when conducting guard operations. Other missions that the recce flight normally performs are information gathering, surveillance, and target acquisition (through ERSTA); direction and control of fire, airmobile security, convoy security, and assisting in land units' passage of lines. A recce flight may be placed under operational control (OPCON) or tactical control (TACON) of land force units for specific missions, usually limited by time.

3. **Organization**. The composition of the recce flight is identical to that of a UTTH flight, with the addition of mission specialists and ground station operators for electro-optical (EO) sensor equipped helicopters. The flight organization is as fols:

   a. **Flight Headquarters**. The flight headquarters consists of the Flight Commander (Flt Comd), the Deputy Flight Commander (D/Flt Comd), the Flight Warrant, a vehicle driver/Sig Op, and an EO sensor ground station operator (if the flight is deployed independently). The Flt Comd is responsible for the command, control, employment, and operations of the flight. The Flight Warrant coordinates external support such as supply, rations, personnel, medical, and vehicle maintenance and supervises virtually all field operations in the deployed area.

   b. **Recce Sections**. Each recce section consists of two helicopters. Each section is led by an experienced aircraft captain and includes the normal helicopter crewing; including pilots, flight engineers and mission specialists for EO sensor equipped helicopters.

4. **Capabilities and Limitations**. Recce helicopters possess many capabilities and some limitations, which must be understood for their effects to be maximized. EO sensor equipped UTTHs enhance survivability by allowing increased detection capabilities at safe standoff ranges. The following is a list of capabilities and limitations of recce hels:

a. **Capabilities**.

(1) provides combat information;

(2) enhances command, control, communications and intelligence;

(3) provides tactical security, when augmented by direct/indirect fire support;

(4) enables a quick reaction over a wide area of operations;

(5) provides lines of communication and surveillance;

(6) provides target identification and target designation;

(7) assists in airmobile and aerial resupply during rear area security type missions;

(8) a high degree of manoeuvrability;

(9) demonstrated flexibility in changing battlefield situations; and

(10) adds depth in all reconnaissance and tactical security type missions.

b. **Limitations**.

(1) operations in adverse weather or zero visibility conditions is limited;

(2) recce capability at night is slightly reduced;

(3) operations in an NBC environment are less effective;

(4) security in field locations is little to non existent against enemy attack;

(5) continuous 24 hours a day operations are not feasible; and

(6) refuelling requirements reduce helicopter station time.

COMMAND AND CONTROL

5. Command and control relationships between land force and tactical aviation organizations is explained in B-GA-441-000/AF-000, *Tactical Helicopter Operations*. While the Tactical Helicopter Squadron will normally be grouped under OPCON to a Brigade or a Brigade Group, the Recce Flt will normally be grouped under TACON to the Brigade Recce Squadron for specific missions, such as screens, guards, etc.

6. **Command Positions**. For the most part, the positions and responsibilities of members of the recce flight are similar to those of a UTTH flight. The differences arise from the complexity of some of the missions and tasks, and the requirement of a detailed knowledge of the ground tactical plan. Recce aircrew need to have a broad based knowledge of the doctrine and tactical procedures of the land forces, in particular, those of armoured recce and field artillery.

a. **Flt Comd**. The Recce Flt Comd has the immediate responsibility for tactical employment of the flight. The Flt Comd commands and controls the Recce Flt while accomplishing all assigned missions. Given the complexity of the aircraft systems (especially in EO sensor helicopters), extensive coordination requirements, limited planning and rehearsal time, and limited number of mission planning stations, the Flt Comd should use available assets and personnel in mission planning and execution. During tactical operations, the Flt Comd may command the flight from either the air (as the AMC), or from the ground, during periods when continuous operations dictate.

b. **Aviation Mission Commander (AMC)**. The designation of an AMC is a command responsibility when two or more helicopters work together as a section or a flight. This responsibility includes ensuring that aircrew adhere to mission briefing parameters and handling tactical, administrative and logistical interface with supported units. The wide range of responsibilities and tempo of coordination for support and integration of fire support demands that the AMC delegate responsibilities among the aircrew members in the Flight, based on their individual skills and experience. If not delegated, the complexity of the duties in a combat situation can easily lead to task saturation and significantly reduce the flight's combat effectiveness. The AMC commands and controls the flight during a tactical mission. The AMC will:

(1) interface with higher and supported units for receipt of missions;

(2) provide detailed guidance to recce aircrew in the planning phase;

(3) choose the section/flight course of action (COA) upon contact with the enemy, and control the execution of the COA;

(4) area of operations;

(5) coordinate indirect fire and close air support;

(6) coordinate with attack helicopters (if available) and/or land forces for target/battle hand over;

(7) update higher commanders on the current situation and submit required reports;

(8) synchronize arming and refuelling operations for maximum effectiveness and mission accomplishment;

(9) ensure combat information is disseminated properly both during and after the mission; and

(10) conduct the mission debrief and after action report (AAR).

c. **Section Leads**. Section leads are responsible to the Flt Comd/AMC for the tactical employment of their section. Size is determined, based on the nature of the mission, but is normally two helicopters. Section lead selection should be based on tactical experience. The section lead duties include:

(1) accomplishing the assigned mission;

(2) overall responsibility for mission planning at the section level;

(3) conducting mission brief for section level missions, if directed;

(4) tactical control of the section, such as determining formations, aircraft survivability equipment (ASE) configuration settings, movement techniques, assigning and prioritizing tasks, developing the situation, choosing courses of action, and method and execution of weapons employment;

(5) interfacing with higher and supported units; and

(6) being prepared to assume responsibility as the AMC.

7. **Command and Control Facilities**. The facilities used will depend on the situation as well as the organization of the reconnaissance assets. A Recce Flight and will have a Flight CP for planning and coordination. Refer to WUSOPs for more detailed information.

8. **Command and Control Communications**.

a. **Purpose**. Communications are essential to any helicopter operations. Fundamental to reconnaissance and tactical security is the reporting of combat information. This information is of interest to other manoeuvre units as well as to brigade or division staff and requires widest dissemination possible, either directly or indirectly. Helicopters frequently operate over long distances, wide frontages, extended depths, and great distances from the controlling headquarters. Communications must be redundant and long range to meet these internal and external requirements.

b. **Means**. As found in WUSOP 202 - Signal.

EMPLOYMENT

9. **General**. This section describes the employment of the Recce Flight and sections in the execution of their primary missions, reconnaissance and tactical security. In addition to conducting reconnaissance and tactical security missions, the flight enhances and conducts special purpose operations across the full spectrum of land force operations. This includes offensive, defensive, delaying and transitional ops, which are detailed later in this chapter.

10. **Organization**. The employment of helicopter reconnaissance and tactical security assets, within Canadian doctrine, falls into two categories. The first is to provide a flight of recce helicopters in support of current operations requirements, while the second, and more probable employment scenario, would be a section of helicopters in support of a Battle Group. The basic breakdown of helicopters remains the same as a UTTH flight (section or flight of helicopters). If the option exists to have multiple sections available for a given mission, the decision on what resources to allocate is made during the mission planning process. Doctrinally, recce helicopters normally operate in sections of two, either independently, or supporting a larger formation.

a. **Section**. A section of two helicopters uses the lead/wingman concept for mutual support. The lead helicopter is primarily responsible for the reconnaissance and the wingman for the protection of the helicopter conducting the reconnaissance and tactical security mission. Another section would then conduct relief on station, if the situation dictates. Scenarios that favour using teams of two, instead of an element, are:

(1) close terrain that does not allow full standoff capability;

(2) threat that is mostly dismounted; and

(3) widely separated areas of interest or other reconnaissance objectives.

b. **Element**. Using two sections in an element allows for a wider frontage to be covered. Helicopters still maintain contact with other element members and provide mutually supporting fields of observation. The element lead rotates helicopters to and from the FARP as required. Situations that favour the use of multiple sections are:

(1) open terrain that makes use of standoff capability;

(2) a threat that is mostly mechanized or armour;

(3) wider frontages with multiple areas of interest; and

(4) employment periods greater than 1.5 hours.

RECONNAISSANCE MISSIONS

11. **Purpose**. Reconnaissance is a mission undertaken to obtain information about the activities and resources of an enemy or about the meteorological, hydrographic, or geographic characteristics of a particular area. Reconnaissance is a focused collection effort that produces combat information, and is performed before, during, and after other combat operations to provide information used by the squadron or land force commanders to confirm or modify the plan.

12. Tactical helicopters gather and report the information on which the CO/Flt Comd or land force commander bases plans, decisions, and orders. Reconnaissance missions are divided into three categories: route, zone, and area. Helicopters may be assigned any combination of the three categories of reconnaissance. In most mission profiles, integration of ground and air assets provides mutual reinforcement. For example, ground forces may augment recce helicopters if the terrain offers concealment from aerial observation. The distance the helicopter operates from the supported unit (i.e., supported land force unit, main body, or both) is generally forward enough to provide the land force time to manoeuvre before enemy direct fires can be brought into effect.

13. A primary consideration is the ability of the helicopters to maintain communications with their land force counterparts and flight or squadron headquarters. The flow of information between recce helicopters and land force troops increases the efficiency of the reconnaissance and survivability of each asset. When performing a recce mission, helicopters remain in contact with the flight or squadron's CP, or the supported unit's CP. ERSTA information is also passed into the ISTAR system through ground stations.

14. Reconnaissance missions focus on reconnaissance objectives and set strict criteria for engagement and developing the situation in conjunction with land force forces and supporting fires. Supporting fires include indirect fire (mortars, artillery), direct fire support, helicopter fire support and CAS. SEAD (lethal and non lethal) and EW assets should also be considered and employed whenever available. These assets support the recce helicopters during reconnaissance operations. Their availability is essential to the success of the mission.

15. **Fundamentals**. Reconnaissance is conducted according to six fundamentals, described in detail as fols:

a. **Focus On The Reconnaissance Objective**. The objective may be a terrain feature, a locality, or an enemy force. Helicopter recce must focus on the objective and position itself to retain freedom of manoeuvre;

b. **Report All Information Rapidly and Accurately**. Information that initially appears unimportant may become valuable when used with other information. Knowing that an enemy force is not in one location can be just as important as knowing it is in another. Reconnaissance reports must be relayed in a timely manner for the information to be useful to the commander;

c. **Gain and Maintain Enemy Contact**. Contact reduces the enemy's ability to achieve surprise. Once contact is made, it is not broken, unless permission is obtained from the supported unit. Recce helicopters may be the first friendly force that establishes contact with the enemy. Once the helicopters establish contact, a contact report is transmitted ASAP. The CO/Flt Comd should be continually updated on the tactical situation. Recce helicopters may maintain visual contact from a great distance, in the case of EO sensor equipped helicopters, or they may engage with available indirect or direct fire. The degree of contact desired is determined before the mission begins;

d. **Ensure Maximum Reconnaissance Forces Forward**. The maximum number of intelligence gathering assets and their capabilities are involved in the reconnaissance effort. Tac hel reconnaissance is most valuable when it is providing essential battlefield information. In order to do this, it must be positioned as far forward as terrain factors allow. It operates at a distance that can be supported by CS and CSS assets;

e. **Develop The Situation Rapidly**. When the enemy situation is vague or unknown, recce helicopters deploy to gather information for the supported commander. Immediately on gaining enemy contact, deploy to cover, maintain observation, and report and develop the situation. They develop the situation based on the assigned mission or the directions of the supported commander; and

f. **Avoid Becoming Decisively Engaged**. Helicopters in the tactical environment must move to survive. They obtain information by stealth. The AMC/section lead manoeuvres to avoid decisive engagement. Once engaged, reconnaissance helicopters will lose some capability to continue the reconnaissance. Therefore, engagements during reconnaissance operations consist only of those actions required to prevent decisive engagements and to continue the reconnaissance mission.

16. **Planning Considerations**. The AMC/section lead verifies the location of the FARP, its active times, and POL availability during mission planning. The squadron is responsible for all FARP operations in support of the recce flight's mission. Refuelling and rearming times and the requirement to maintain continuous operations dictate the FARP's location.

17. **ASE/EW considerations** must be part of the mission planning process to minimize risks while accomplishing the mission. The mission profile can also minimize risk. Detailed terrain analysis of the map and available photographs for the selected route, as well as positions of observation, go a long way towards protecting the helicopters and aircrew during missions.

18. **Capabilities**. Tac aviation's ability to conduct reconnaissance is a function of the enemy situation (especially enemy air defense artillery and direct fire systems), terrain in the area of operations, weather conditions, and the logistical support availability. A flight of eight reconnaissance helicopters can:

a. recce two routes simultaneously, depending on the threat level;

b. conduct a zone recce on 8-10 km wide zone (dependent on terrain and availability of an EO sensor); or

c. conduct a zone recce at an average rate of 10 km/hr (terrain dependent).

TYPES OF RECONNAISSANCE

19. There are three types of reconnaissance at the flight level: by stealth, in force, and dismounted. The AMC/ Section Lead may use any method or combination of methods to accomplish the reconnaissance mission under the considerations of the mission planning process, and the land force commander's intent and guidance. Aerial reconnaissance may also include conducting coordinated reconnaissance forward of land force troops. When conducting reconnaissance forward of land force troops, detailed coordination must take place to prevent fratricide. The three types are detailed as fols:

a. **Reconnaissance By Stealth**. Recce helicopters use this technique in most reconnaissance efforts. It is characterized by:

(1) the need for rapid reconnaissance;

(2) the use of aircraft long range sensors to acquire targets/recce objectives at the maximum standoff distance;

(3) use of onboard video imagery to capture the combat information;

(4) low probability of enemy ADA threat;

(5) the need to clear the area forward of the land force troops to accelerate the reconnaissance tempo; and

(6) the requirement to maintain reconnaissance over extended distances. Circumstances and/or terrain may preclude the use of land force troops to execute missions, forcing the reconnaissance helicopters to maintain a presence in an area of operation.

b. **Reconnaissance In Force**. This method is aggressive and bold, and is predominantly used by armed/attack helicopters, although it is possible that recce hels could be used, if provided with the augmentation of firepower.

(1) When conducting reconnaissance in force, the flight places direct and/or indirect fire on positions the enemy is suspected of occupying. The intent of this action is to cause the enemy to disclose his presence by moving or returning fire. Reconnaissance by fire may be used when:

(a) the situation meets strict engagement criteria;

(b) time is an important factor;

(c) encountering obstacles that could be overwatched by an enemy;

(d) an enemy position is suspected; and

(e) enemy locations are known.

(2) This technique has advantages and disadvantages. It is more advantageous with a poorly disciplined enemy that will likely react when engaged. The disadvantages of reconnaissance by fire are the obvious loss of surprise, exposing the location of the firing force and the possibility of becoming decisively engaged. It also requires more frequent FARP rotations.

(3) The lack of organic firepower in a recce flight, as well as the desire to remain undetected from the enemy, emphasizes the use of indirect fire as the primary means of engagement.

c. **Dismounted Reconnaissance**. The aircraft commander may direct aircrew to conduct dismounted reconnaissance in extreme circumstances when information is required on a specific reconnaissance objective. This technique is time intensive, can place the helicopter in a vulnerable position, and does not make the best use of aircraft systems.

TECHNIQUES

20. There are four basic techniques for conducting a reconnaissance mission: observation, overwatch, movement, and reporting as follows:

a. **Observation**. Observation is continuous and is performed by all aircrew. If the helicopter is EO sensor equipped, crews integrate the sensor monitor into their observation technique (in either Day TV or FLIR mode), which includes the ability to cover the area behind the helicopter. Aerial observation techniques are used to detect, identify, locate, and report pertinent combat information. Aircrew use terrain flight techniques and varying airspeeds to evade detection and accomplish the mission;

b. **Overwatch**. Overwatch is the observation of the helicopter that is moving. The overwatching (observing) helicopter, in its concealed position, continues to observe the area ahead, as well as the moving helicopter. Primarily, the observing helicopter enhances the survivability of the moving helicopter by alerting the section member of an enemy sighting or suspicious activity. If the enemy is contacted, the observing helicopter can assist by providing suppressive fire with door guns, or by calling for indirect fire;

c. **Movement**. Recce helicopter pilots use low level, contour, and NOE terrain flight modes based on the probability of enemy contact and available terrain. Section movements are conducted using Battle and Trail formations; and Leapfrog, Caterpillar and Snake movement techniques.

See Figure 14-1 for some examples of these movement techniques. They grouped into two categories and are defined as fols:

(1) **Movement Between Rear And Forward Areas (Low Threat)**.

(a) **Battle Formation**. This formation is used for helicopters moving rapidly over the battlefield, when enemy contact is unlikely or when speed is required to evade the enemy. It requires that helicopters in the section fly loose or extended line abreast at the same relative speed and altitude; and

(b) **Trail Formation**. This formation is the one normally used for transit when speed is essential and the probability of enemy contact is low. It requires the lead helicopter to move constantly. The number 2 helicopter moves freely from side to side, maintaining observation over the lead helicopter; and

(2) **Movement Within Forward Areas (High Threat)**.

(a) **Leapfrog**. This technique is normally used when enemy contact is expected. It is a slower movement technique and requires the observing and moving helicopters to occupy successive positions that offer observation. The trail helicopter leaps over the lead helicopter's position while the lead helicopter observes for the moving helicopter. The length of the bound depends on the terrain, visibility, and the effective range of the weapon system (normally the C6 door gun(s));

(b) **Caterpillar**. The lead helicopter moves tactically from bound to bound, similar to the leapfrog technique, except that the number 2 helicopter moves forward to take up the lead's position. Once the number 2 approaches lead's position, the lead moves into the next tactical (bound) position. Since enemy contact is expected, movements are slow and deliberate; and

(c) **Snake**. This movement is similar to Caterpillar, except that both helicopters move continuously. The lead helicopter slowly "snakes" tactically through the low ground with the number 2 following behind, while maintaining observation over the lead;

d. **Reporting**. Reports of direct visual observation are the most important and timely combat information available. Therefore, Contact Reports must be accurate, concise, and timely. Reports of no enemy sightings are equally as important as actual enemy sightings. With EO systems, enemy and terrain information can be transmitted electronically, if in range of a Ground Station;

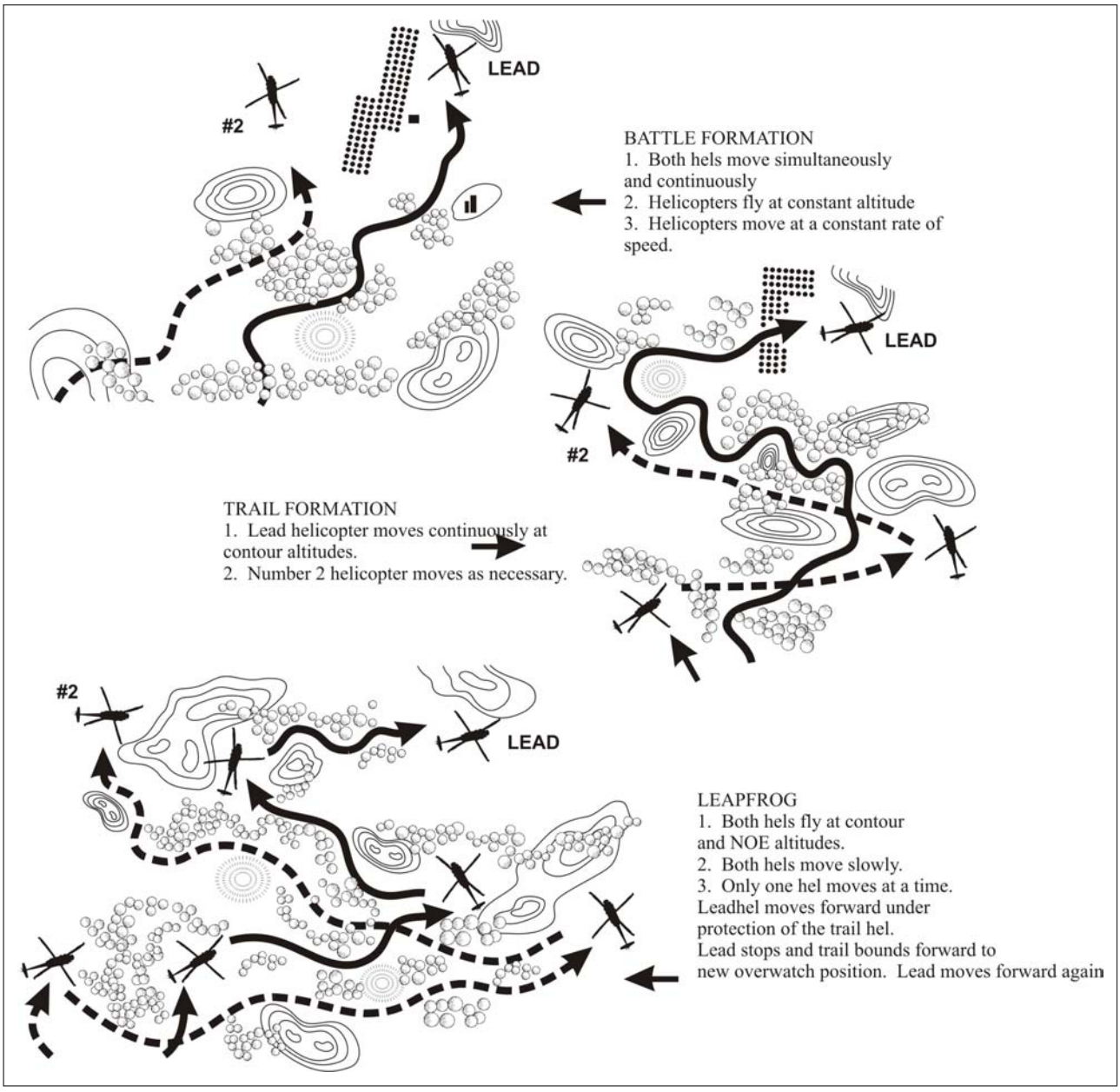


Figure 14-1: Movement Techniques

e. when tasked to conduct reconnaissance operations, the reconnaissance flight can split its area into zones for each section. Use of GPS waypoints and Long Range Nav on the HSD to visually define the reconnaissance zone simplifies the reconnaissance effort. Use of the EO sensor, to identify areas of interest (and register targets, if required) at maximum standoff, and overwatch of section members adds depth to the zone;

f. coordination and continuous communication between avn and armd recce forces is required to prevent the possibility of fratricide; and

g. because of its ability to conduct long range observation, the recce flight is placed forward, or if possible, to the flanks of armd recce troop(s), adding depth to the land force commander's zone. To increase the operational tempo, the flight focuses its reconnaissance effort on areas that impede the movement of land force troops (battalion avenues of approach or likely enemy reconnaissance/infiltration routes).

ACTIONS

21. **Actions on Contact**.

a. Actions on enemy contact are a series of steps the flight or section takes when it encounters an enemy force or situation that warrants/demands action. Actions on contact are important because they allow the flight to maintain its tempo of operation by rapidly developing the situation and taking action before the enemy can gain the initiative and force the tactical helicopters to react. At flight and section level, actions on enemy contact consist of four steps:

(1) take cover and send a Contact Report;

(2) maintain contact;

(3) choose a course of action; and

(4) recommend or execute a course of action.

b. While the section that makes contact executes actions on contact, the AMC must continue to manoeuvre the remainder of the helicopters to ensure a clear picture of the enemy situation across the entire front is being manned by the flight. The fol steps demonstrate the actions taken by the section in contact and the corresponding actions at the flight level.

c. **Deploy to Cover and Report**:

(1) **Section Actions**. The section that makes initial contact with the enemy immediately deploys to terrain that affords both cover and good observation. If necessary, the section directs fire to suppress the enemy, and then deploys to a covered position and reports.

(2) **Flight Actions**. All other section leads monitor the contact report. The AMC assesses the information and manoeuvres to a position to monitor the action. The flight must not, however, lose focus on the reconnaissance mission that was initially tasked.

d. **Maintain Contact and Develop the Situation**:

(1) **Section Actions**. The section in contact further identifies the threat. The section manoeuvres to determine the enemy's size, composition, and orientation, and the exact location of the weapon systems. The section may also use reconnaissance by fire to determine the enemy's tactical intentions, if such assets are available. The recce flight AMC needs to establish indirect/direct fire control measures in advance, in order to control fire support. To determine if the enemy can be supported by any other forces, the section should search for enemy flanks and all adjacent terrain, as well as identify good counterattack routes into the flanks or rear of the enemy. Once the section lead determines the extent of the situation, a follow up SITREP is sent.

(2) **Flight Actions**. The AMC will most likely tell the sections not in contact to continue reconnaissance to a designated phase line to develop the situation across the entire front assigned to the flight. By doing this, the flight can determine if there are any other enemy forces in the area that will affect the situation. The sections not in contact will establish hasty observation posts along the designated phase line oriented on likely enemy locations or avenues of approach.

e. **Choose a Course of Action**.

(1) **Section Actions**. Once the enemy situation has been developed, the section lead selects the best course of action within the land force commander's intent, the concept of operations and the section's capabilities. Resuming the mission as soon as possible is normally the higher priority when choosing a COA. The possible courses of action may be hasty attack, bypass, hasty screen, or coordinating a supported attack with the other available land force or air assets.

(a) **Hasty Attack**. The section lead can opt to conduct a hasty attack if the target meets the engagement criteria for the mission and the section possesses sufficient dedicated fire support to defeat the enemy quickly. In most cases the section does not have the capability to defeat an enemy in prepared positions and is normally under specific instructions not to become decisively engaged.

(b) **Bypass**. If the section chooses to remain undetected and continue the reconnaissance mission, the team may manoeuvre to bypass the enemy. The section lead must receive the AMC's permission (either verbally or as stated in the Op O) to bypass any enemy forces.

(c) **Hasty Screen**. If the section cannot conduct a hasty attack and cannot bypass, it establishes a hasty screen and maintains contact through observation. The section concentrates on maintaining contact with the enemy and fixing it in place with indirect or possibly direct fire until additional support arrives.

(d) **Support A Hasty Attack By Another Section**. The section in contact may support a battle handover for a hasty attack by another section or AHs, if available.

(2) **Flight Actions**. The AMC must approve or reject the recommended course of action, based on its effect on the flight mission. The overriding considerations in selecting a COA are the intent of the CO/land force commander and the flight's ability to complete the mission with minimum or no losses. The decision to conduct a hasty attack requires the AMC/section lead to conduct hasty attack planning. This planning should consist of:

(a) selecting a position that would allow for calling in supporting fires;

(b) defining the area to be engaged;

(c) defining the target;

(d) determining the method of engagement;

(e) establishing criteria for success;

(f) establishing a trigger point;

(g) establishing control measures for direct/indirect fire planning;

(h) coordinating CAS, artillery, etc;

(i) planning the battle handover;

(j) coordinating the change to CSS requirements, i.e., adjust the relief on station rotation, etc; and

(k) de-conflicting direct and indirect fires with land force troops.

ROUTE RECONNAISSANCE

22. A route reconnaissance is conducted to obtain information about a specific route and all adjacent terrain from which the enemy could influence movement along the route. The reconnaissance may be oriented on a road, an axis, an air route, or a general direction of advance or attack, and is usually conducted as part of a zone reconnaissance. The mission is best accomplished by employing recce sections with land force recce teams (either Armd or Inf). The sections and land force teams gather information about the designated route and all adjacent terrain from which an enemy could engage friendly forces with direct fires. Helicopter sections begin the operation and reconnoitre adjacent terrain to the front, flanks, and rear providing early warning, uncover ambushes, and provide overwatch so that the land force recce team can concentrate on conducting a reconnaissance of the route. The section may periodically dismount to physically inspect key terrain, if the situation allows. Command of the route reconnaissance will normally be assigned to the land force commander, since they remain permanently on station. Figure 14-2 shows the flight graphics for a route reconnaissance.

a. **Critical Tasks**. The critical tasks for a route reconnaissance are:

(1) reconnoitre all terrain the enemy can use to dominate movement along the route;

(2) reconnoitre all terrain within the zone, and assist land force troops with urban areas;

(3) locate sites for constructing hasty obstacles to impede enemy movement;

(4) reconnoitre all defiles along the route for possible ambush sites, and locate a bypass;

(5) locate a bypass around urban areas, obstacles, and contaminated areas;

(6) find and report all enemy that can influence movement along the route; and

(7) report route information;

(8) critical points along the route identified as checkpoints;

(9) intelligence information on the route and enemy situation;

(10) any constraints or restrictions;

(11) expected weather conditions for the time of movement;

(12) type of unit or vehicles expected to use the route, if applicable; and

(13) time of day or night that the route will be used, if applicable;

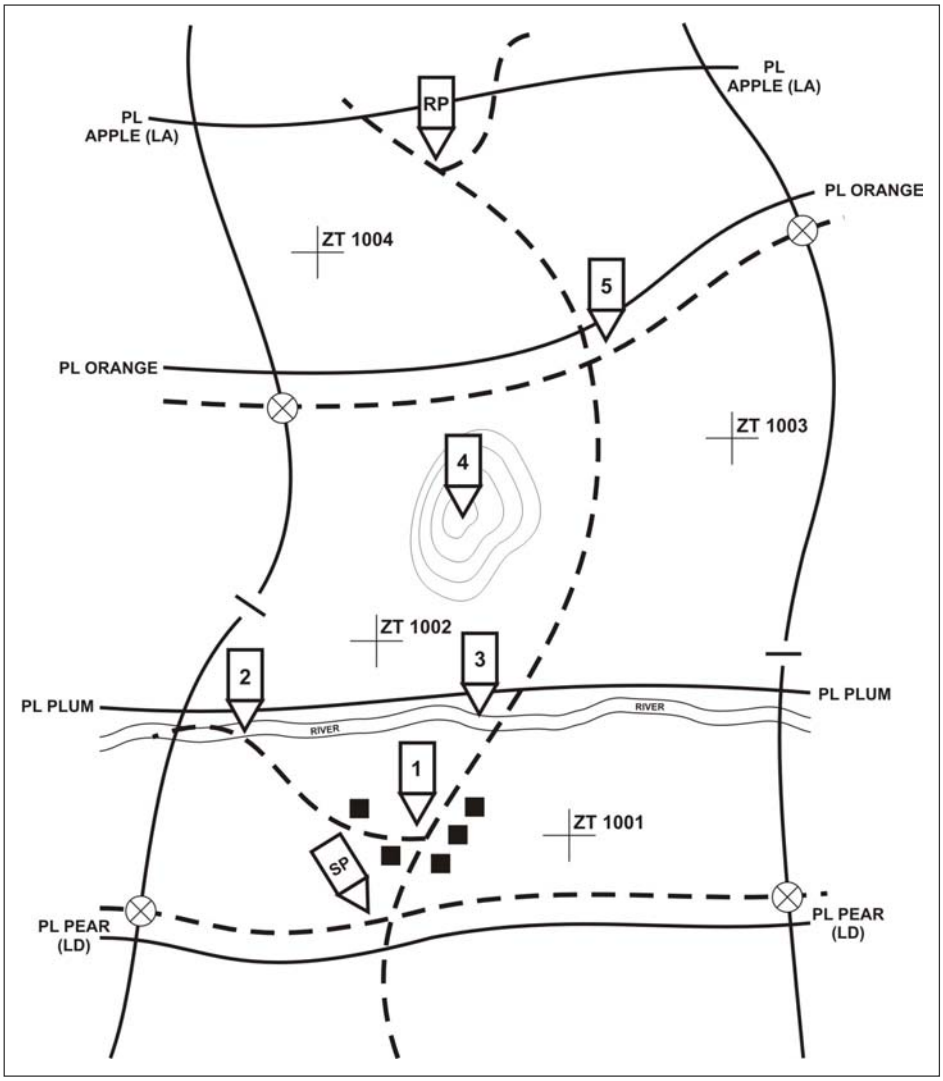


Figure 14-2: Route Reconnaissance

b. **Accurate Reporting**. All sections and land force recce units should keep records on all routes reconnoitred. Several methods are acceptable for recording this information. One method is to assign each key terrain feature (bridge, fording site, bypass site) a number on the map and detail the intelligence information on a separate work sheet. This method ensures completeness and simplicity and reduces map clutter;

c. The use of an airborne video cassette recorder or a real time video downlink to record areas of interest along the route, provides superior combat information to the requesting headquarters. If the VCR is used, planning must be made to return the tape to the requesting headquarters, and aircrew must use a standardized video reconnaissance techniques to clearly associate terrain with the targets portrayed on the video image. The use of real time transfer of data to the EO or ISTAR ground station greatly speeds up the process of information transfer, allowing the land force commander to make quick, timely decisions, based on real time information; and

d. **Air Route Reconnaissance**. The principles of an air route reconnaissance are the same as for a route reconnaissance except that the areas of interest are different. Aviation forces moving along an air route are primarily concerned with the location of enemy forces, ease of navigation, suitability of landing sites and zones, and hazards to flight. Hazards to flight include suspected enemy air defense locations, mountainous areas, wires, large bodies of water, open terrain, and other natural and man made features.

ZONE RECONNAISSANCE

23. A zone reconnaissance is a directed effort to obtain information concerning all routes, obstacles (to include chemical or radiological contamination), terrain, and enemy forces within a zone defined by boundaries. The boundaries of a zone are restrictive, unlike those of an area reconnaissance, which are permissive. Recce sections require permission from the land force to extend their reconnaissance outside of the zone's boundaries. It is the most time consuming of the reconnaissance missions. The purpose may be to find the enemy or suitable avenues of approach for the main body. A zone reconnaissance is normally conducted when information on cross country trafficability is desired or when the enemy situation is in doubt. Every route within the zone must be reconnoitred unless otherwise directed. The zone to be reconnoitred is defined by lateral boundaries, a line of departure (LD), and an objective.

a. **Critical Tasks**. Certain tasks must be accomplished during a zone reconnaissance unless specifically directed otherwise by the land force commander. Based on time and the commander's intent, the land force commander may direct the reconnaissance towards specific information only. The critical tasks for a zone reconnaissance are listed below:

(1) find and report all enemy forces within the zone;

(2) recce specific terrain within the zone and assist land force recce with urban areas; and

(3) report reconnaissance information;

b. **Non Critical Tasks**. If time and the situation permits, the following tasks should also be completed:

(1) recce all terrain within the zone;

(2) find suitable covered and concealed air avenues of approach;

(3) determine significant adverse weather;

(4) locate a bypass around urban areas, obstacles, and contam areas;

(5) inspect and classify all bridges, overpasses, underpasses, and culverts within the zone;

(6) locate fords and crossing sites near all bridges in the zone; and

(7) locate all mines, obstacles, and barriers in the zone within its capability and assist land force units in their clearance;

c. **Planning Considerations**. The recce flight, normally conducts a zone reconnaissance by employing helicopter sections in concert with land force recce troops. That being said, sections can perform the zone reconnaissance with or without support from armd recce assets. The land force recce commander assigns boundaries between sub units to specify zones of responsibility. Sectors should be near easily recognizable terrain features such as roads, streams, and prominent structures. After establishing zones, the unit designates an LD and specifies a crossing time. Phase lines, contact points, coordination points, and checkpoints ease essential coordination between adjacent units or sub units. Phase lines (PLs) are established as needed to control and coordinate forward movement, and can be used to ensure that sections advance at a controlled rate through the zone. Failure to keep reconnaissance forces abreast may result in the bypass of enemy forces, envelopment by enemy forces, or engagement of friendly forces. Like boundaries, PLs should generally follow features that are easy to recognize, particularly for night operations or periods of limited visibility (smoke, haze, fog). Contact points are designated on boundaries to ensure physical coordination between adjacent forces. Contact points are designated at:

(1) points that ensure proper coverage of the zone;

(2) critical points (i.e., a route crossing from one troop sector into another); and

(3) points that ease movement, lateral coordination of fires or positions, passage of lines, or logistical support;

d. helicopters report crossing PLs but do not stop unless ordered to do so. Once the operation begins, the enemy may be alerted. Forward momentum should be maintained to gain and maintain enemy contact and to keep the enemy off balance. The zone is systematically reconnoitred from the LD to the objective or LOA. Figure 14-3 shows the graphics for a recce flight zone reconnaissance;

e. if enemy contact is made, sections maintain contact, report, and develop the situation. Reconnaissance forces may be instructed to bypass, engage and destroy, or maintain contact until an attack helicopter or ground manoeuvre unit arrives to engage. The squadron may direct specific engagements/bypass criteria for the recce flight. To ensure continuity of effort, the CO or the Flt Comd designate the forward movement of the operation and tells each section what to do after mission completion. If no follow on mission is given, the sections should be assigned objectives on dominant terrain to maintain surveillance and ensure enemy situation in zone remains as reported;

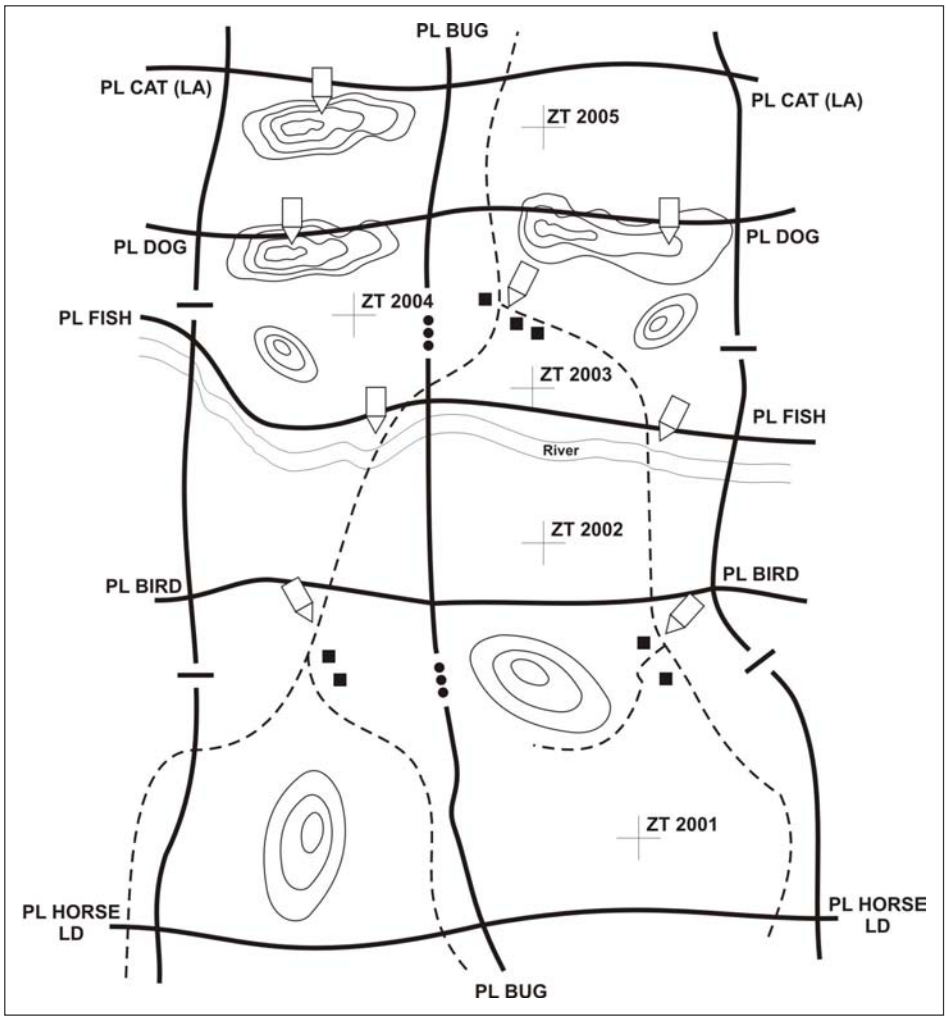


Figure 14-3: Zone Reconnaissance

f. generally, when working with armd recce troops, the recce flight will perform a well coordinated zone reconnaissance at a safe standoff distance behind the mutually supported recce troop and will reconnoitre lateral terrain not accessible by ground vehicles;

g. the AMC uses multiple sections to conduct a zone reconnaissance. Section leads are assigned the responsibility for planning the reconnaissance within the given sectors. They select the method of reconnaissance, the mode of terrain flight, and movement technique based on the intelligence available with specific emphasis on hazards to navigation and enemy air defence. Starting with the LD, the sections reconnoitre each zone in a systematic manner based on terrain and the width of the zone;

h. zones are divided into various sub zones. Self-imposed boundaries designate areas of responsibility when more than one section is deployed abreast. Phase lines assist in controlling movement in order to ensure that reconnaissance forces remain abreast; and

i. before departing on the mission, the section lead selects significant checkpoints for examination and plans a route between the checkpoints, using terrain and vegetation to conceal the helicopter's movements. The section lead also coordinates to ensure any specific tasks for support of the land force commander are integrated into the reconnaissance plan. Specific tasks that may be assigned to a recce flight while working with armd recce may include:

(1) reconnoitring terrain not easily accessible to vehicles;

(2) rapidly checking key points in the zone;

(3) locating and reporting the flanks of enemy forces encountered by air or land force scouts;

(4) locating, reporting, and bypassing obstacles and enemy positions; and

(5) providing tactical security on the far side of obstacles, while land force forces reconnoitre and clear them.

AREA RECONNAISSANCE

24. The purpose of an area reconnaissance is to gather intelligence or to conduct surveillance of a specified area. The target may be key terrain, a farm, a bridge, a ridgeline, a wooded area, a proposed assembly area, a landing zone , or other features that will be key to an operation. The specified area to be reconnoitred is designated by boundary lines enclosing the area. Mission analysis will determine the movement technique the reconnaissance section will use to reach the area and the method by which the area will be systematically reconnoitred. The recce section also reconnoitres dominant terrain outside the specified area from which the enemy can influence friendly operations:

a. **Critical Tasks**. During an area reconnaissance, the following critical tasks apply, unless directed otherwise:

(1) recce specific terrain within the area and dominant terrain outside the specific area from which the enemy can influence friendly operations;

(2) report reconnaissance information; and

(3) find and report all enemy within the area;

b. **Non Critical Tasks**.

(1) recce all terrain within the area and assist in the reconnaissance of urban areas;

(2) determine significant adverse weather;

(3) locate a bypass around urban areas, obstacles, and contaminated areas;

(4) inspect and classify all bridges, overpasses, underpasses, and culverts within the area;

(5) locate fords and crossing sites near all bridges in the area; and

(6) locate all mines, obstacles, and barriers in the area within its capability and assist ground units in their clearance;

c. **Planning Considerations**. Rapid movement to the objective is important, but the main consideration usually is security. Avoidance of known enemy locations and enemy surveillance is imperative. Primary and alternate routes to the objective area are therefore selected based on security and speed. Terrain flight techniques are used to move to the area. The assigned area is treated like a zone reconnaissance, and the area is normally enclosed in a boundary. Upon completion of the reconnaissance, the flight departs the area following a different route;

d. The primary difference between a zone and an area reconnaissance is the nature (restrictive vs. permissive) of the boundaries. A zone reconnaissance has restrictive boundaries, which define the recce section's mission area. Because of this, a zone reconnaissance does not have an implied task to reconnoitre dominating terrain that is outside of the zone. The boundaries of an area reconnaissance are permissive and allow the section greater freedom in selecting their ingress and egress routes. The flight may move to and reconnoitre one large area or several small, dispersed areas. An area reconnaissance may be performed behind friendly lines or behind enemy lines, although the latter would require additional resources in the form of attack helicopters and supporting fires to reasonably accomplish the mission. Emphasis is normally placed on reaching the objective area quickly. The flight usually moves over several routes to reduce mission execution times and increase survivability;

e. The Flt Comd may divide the area into smaller zones with designated objectives for each respective section. The flanks of the overall objective area are secured first; reconnaissance efforts may then be focused inward. Recce sections may establish a screen on the flank to provide tactical security for the reconnaissance forces. Helicopter crews may also have to dismount and physically reconnoitre a specific area. Figure 14-4 shows the graphics for an area reconnaissance; and

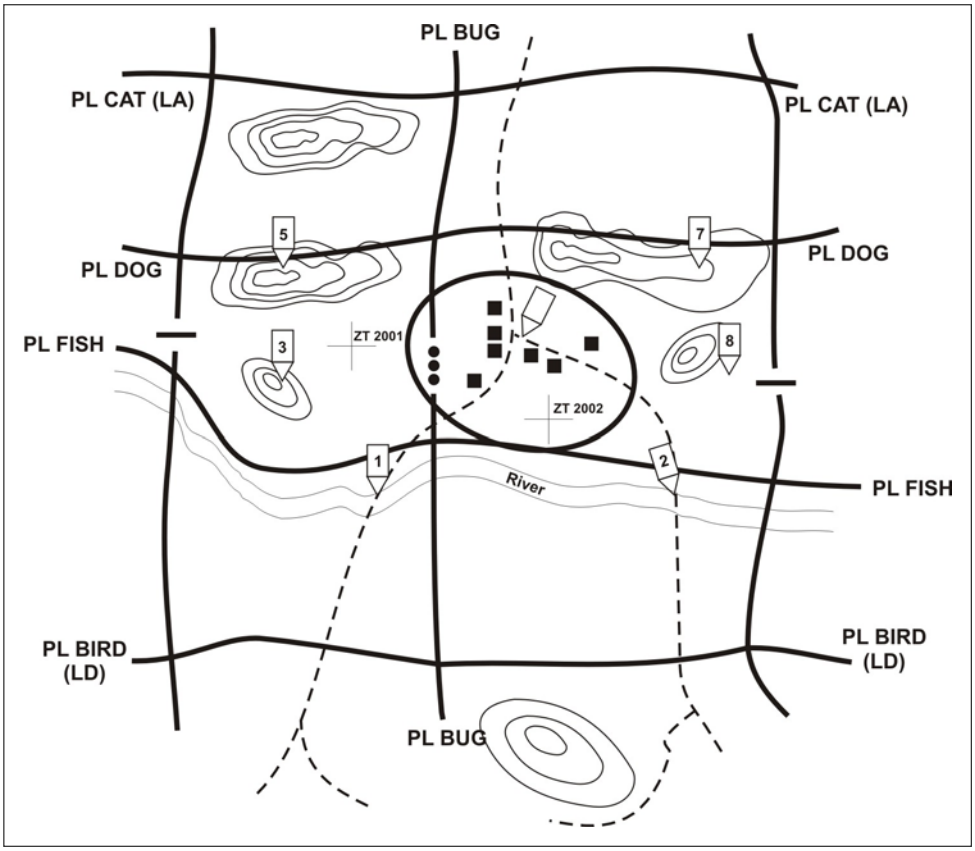


Figure 14-4: Area Reconnaissance

f. Long range observation should be used whenever possible to reduce the enemy's ability to determine the reconnaissance objective. If a flyover is required in a hostile environment, aircrew must be able to collect the desired information rapidly while flying over an area only once, if possible, but never from the same direction twice.

LANDING ZONE / PICK-UP ZONE RECONNAISSANCE

25. An LZ/PZ reconnaissance is an area reconnaissance performed to determine the suitability for airmobile operations of a designated area. Principal concerns are determining if enemy forces are present and in a position to bring direct fires onto the LZ/PZ, while evaluating the physical characteristics of the area. This reconnaissance is often performed as a sub task during airmobile security missions. An LZ/PZ reconnaissance looks for predetermined, specific intelligence requirements. The AMC assigned this mission should receive, as a minimum, information on the land force's objective and other actions after landing, time of the airmobile, and the number and type of helicopters in each lift. Recce sections assigned to evaluate the LZ/PZ should create a sketch of the area with pertinent information included (see figure 14-5). While conducting the reconnaissance, sections evaluate and make recommendations on the following tactical considerations:

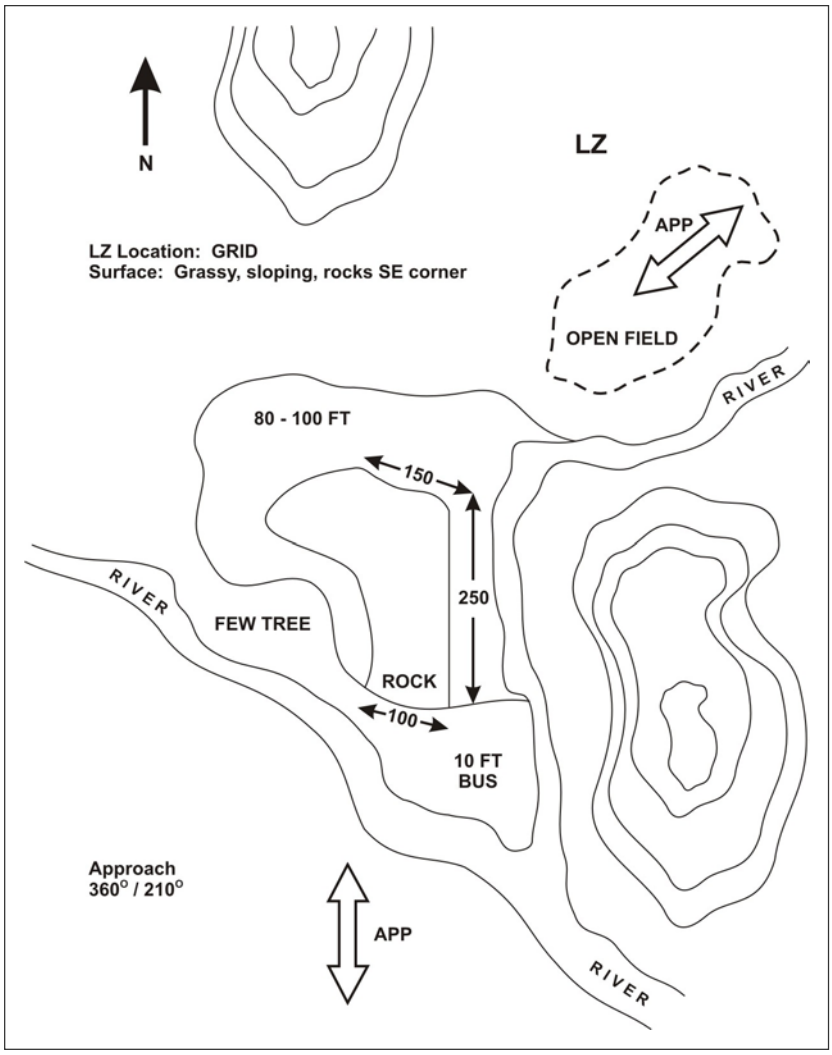


Figure 14-5: Landing Zone Diagram

a. **Mission**. Evaluate whether the LZ/PZ will facilitate the unit's ability to accomplish the mission from or at that location;

b. **Location**. Assess whether the LZ/PZ meets the AMC's intent for distance from the objective;

c. **Security**. Recommendations are made on the force that will be required to provide security during the airmobile;

d. **Technical** characteristics of the LZ/PZ to be evaluated:

(1) size of the available landing area;

(2) obstacles and hazards in the landing area and vicinity;

(3) ground slope of the landing area; and

(4) altitude and surface condition of the landing area.

e. If the section can determine specific requirements, recommendations are made on these additional technical requirements:

(1) approach and departure directions;

(2) landing formations;

(3) suitability for heavily loaded helicopters; and

(4) number and type of helicopters that LZ/PZ can support; and

f. If meteorological conditions observed during the reconnaissance are expected to be present during the airmobile, then section can assess the impact of the following meteorological factors:

(1) ceiling and visibility;

(2) density altitude; and

(3) winds.

TACTICAL SECURITY MISSIONS

26. **Purpose**. Tactical security missions are conducted to gather information about the enemy and to provide early warning, reaction time, manoeuvre space, and protection for the main body. These operations are characterized by reconnaissance to reduce terrain and enemy unknowns, gaining and maintaining contact with the enemy to ensure continuous information flow, and providing early and accurate reporting of information to the protected force. Tactical security msns include screen, guard, and area security msns.

27. Tactical security operations are defined by both the degree of protection offered to the main body and the physical characteristics of the operation. Due to the lack of organic firepower, tac avn will need to be supported by dedicated direct or indirect fires in order to accomplish the missions that involve guarding or area security. To effectively support the land force for these missions, a minimum of a section of helicopters is required, although for sustained operations, a full flight of recce hels would be required.

a. **Screen**. The primary purpose of a screen is to provide early warning to the main body. Based on the higher land force commander's intent and the screen's capabilities, it may also destroy enemy reconnaissance and impede and harass the enemy main body with indirect and/or direct fires. Screen missions are defensive in nature and are largely accomplished by establishing a series of observation posts and conducting patrols to ensure adequate surveillance of the assigned sector. The screen provides the protected force with the least protection of any tactical security mission.

b. **Guard**. A guard force accomplishes all the tasks of a screening force. Additionally, a guard force prevents enemy observation of and direct fire against the main body. A guard force reconnoitres attacks, defends, and delays as necessary to accomplish its mission. A guard force normally

operates within the range of main body indirect fire weapons. The main body commander assigns the guard mission when he expects contact or has an exposed flank that requires greater protection than a screen provides.

c. **Area Security**. Area security is a form of tactical security that includes reconnaissance and tactical security of designated personnel, airfields, unit convoys, facilities, main supply routes, lines of communications, equipment, and critical points. An area security force neutralizes or defeats enemy operations in a specified area. It operates in an area delineated by the headquarters assigning the area security mission. It screens, reconnoitres, attacks, defends, and delays as necessary to accomplish its mission. Area security operations focus on the enemy, the force being protected, or a combination of the two.

FUNDAMENTALS

28. The recce flight conducts tactical security operations according to five fundamentals. These fundamentals are briefly discussed below.

a. **Orient on the Main Body**. A tactical security force operates between the main body and known or suspected enemy units. The AMC manoeuvres the helicopters to positions to provide screening support to the main body commander's scheme of manoeuvre. The screen should be positioned to remain between the main body and the enemy force. This distance should be based upon the relative vulnerability of the main body and the expected enemy rate of advance. As a rule, main body required preparation time, multiplied by the expected enemy rate of advance in kilometres per hour equals the minimum distance to position the tactical security force. If this distance cannot be achieved then additional combat power and an extensive obstacle plan may be required;

b. **Perform Continuous Reconnaissance**. A tactical security force performs continuous reconnaissance to gain all possible information about the enemy and the terrain within the assigned area of operations. A recce flight operating independently, will normally operate on an 8 to 10 km front;

c. **Provide Early and Accurate Warning**. Early warning of enemy activity includes accurate reports about the enemy's size, composition, location, movement, and special equipment. This gives the main body commander the time and information needed to seize the initiative and choose the time and place to engage the enemy; and

d. **Provide Reaction Time and Manoeuvre Space**. A tac avn force operates as far from the main body as possible. It screens within range of the main body artillery to maximize its ability to employ long range indirect fire to gain time and manoeuvre space for the main body commander to concentrate combat power.

e. **Maintain Enemy Contact**. Once gained, contact is maintained to ensure a continuous flow of combat information. Contact is never broken unless specifically directed by the land force recce commander.

29. **Planning Considerations**. The main body commander should give the tactical security force comd the following critical items of information to facilitate planning:

a. **Dimensions Of The Tactical Security Mission**. Normally depicted on graphic overlay.

b. **Minimum Reaction Time Required**. Allows the tactical security force commander to determine if the depth of the tactical security zone is sufficient to accomplish the mission. It also determines how long the tactical security force must delay before falling back to successive phase lines.

c. **Minimum Sized Enemy Force Which Must Be Detected**. This allows the recce commander to determine the required density of the screen.

30. The Flt Comd follows general planning principles in preparing for a tactical security mission, and determines the resources required to perform the mission. He specifies the area of the tactical security zone and the time the force must be effectively established with battalion size avenues of approach into the identified area. The depth of the area should provide enough distance for the main body to react in minimal time. The flight must not establish its initial tactical security too close to the main body, but within range of the main body artillery. The initial screen also follows advantageous terrain for observation of avenues of approach. It is delineated by a phase line and is located behind control measures such as Fire Support Coordination Lines (FSCLs).

31. Consideration must be given when assigning tactical aviation its own terrain. ASE/EW considerations must be part of the mission planning process to minimize risks while accomplishing the mission. Limited visibility conditions and weather may affect aviation's ability to cover a zone/sector. On the other hand, there are times when land force units are limited by mobility, terrain, vegetation, or time, and aviation is the only asset capable of conducting the mission.

32. The Flt Comd, in conjunction with the recce force commander, must determine the width and depth of the tactical security to be performed, and establish a rear boundary between the main body and the tactical security force. The flight may initially assume responsibility for the area between the main body and the tactical security force. The flight may conduct a zone reconnaissance from the main body to the initial screen line and then maintain tactical security between the tactical security force and the screen line. The main body may be required to conduct patrols or establish observation posts (OPs) near their positions. All units must plan and coordinate in detail their subsequent rearward movement and passage of lines.

33. Unique requirements posed by the mission may require assets not organic to the screening unit. The flight may need land force assets, and/or combat support assets to effectively perform the mission.

34. Artillery fire is planned and the emplacement of man made obstacles is coordinated in order to impede the enemy's advance. The combination of artillery fire and natural and man made obstacles allows the flight to impede enemy lead forces, maintain contact, and avoid decisive engagement. The flight may also continue reconnaissance forward to identify enemy second echelon and follow on forces. Upon contact, the flight focuses its effort on the destruction of enemy reconnaissance forces by direct and indirect fires before the enemy can penetrate the initial screen line.

SCREENS

35. **Fundamentals**.

a. **Purpose**. The primary purpose of a screen is to provide early warning to the main body through the communication of real time combat information. This gives the protected force reaction time and manoeuvre space to orient to meet the threat. The screen provides the protected force with the least protection of any tactical security mission. Aviation assets can screen forward, to the flanks, or to the rear of a stationary main body and to the flanks or to the rear of a moving main body. Screening operations are not performed forward of a moving force because that would be an advance guard or zone reconnaissance. Based on the higher land force commander's intent, the recce flight may be required to impede and harass the enemy with available supporting fire and, within its capabilities, destroy or repel enemy reconnaissance forces without becoming decisively engaged. See figure 14-6 for screen locations;

b. A recce flight may conduct screen operations independently or as an integral part of a larger unit's task organization. When participating in guard operations, tac avn normally screens or conducts zone reconnaissance as part of a larger force's guard mission;

c. **Critical Tasks**. For the recce flight conducting a screen mission are:

(1) maintain continuous surveillance of all battalion sized avenues of approach into the sector;

(2) destroy or repel all enemy reconnaissance forces within capabilities and as directed by higher land force commander;

(3) locate the lead forces of the enemy order of battle and determine their direction of movement; and

(4) maintain contact with the forces, report their activities, and harass the enemy while displacing;

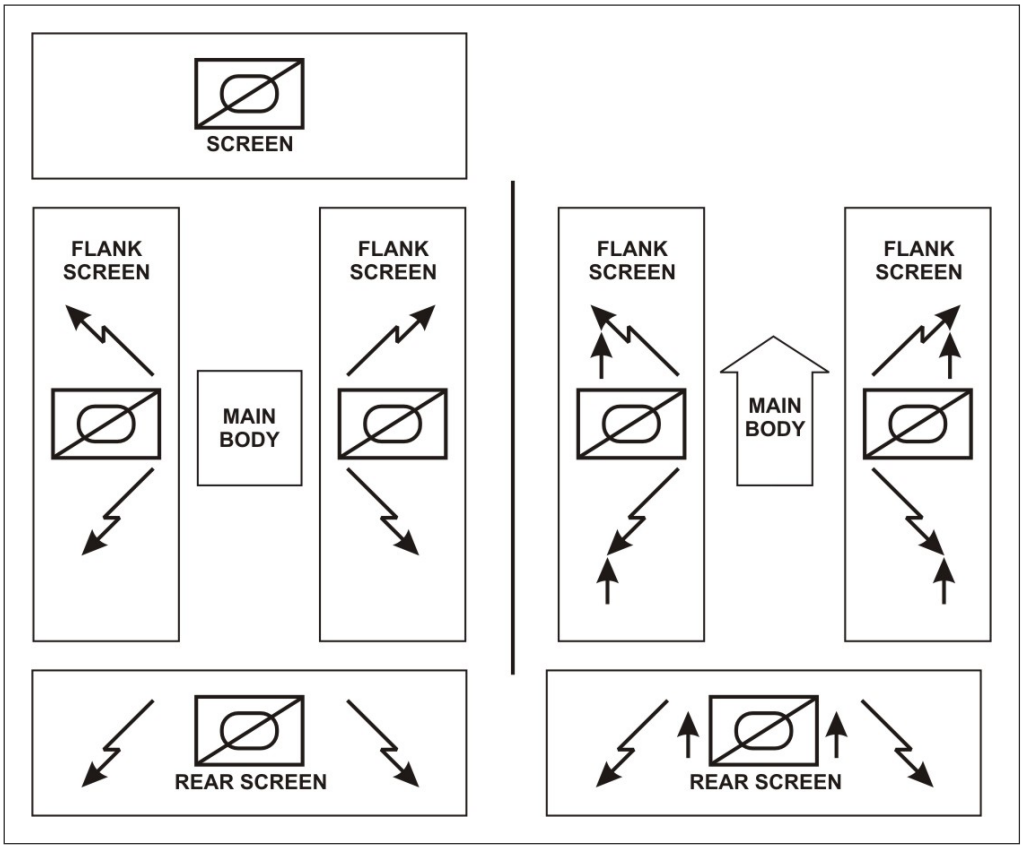


Figure 14-6: Stationary and Moving Screen Locations

d. **Flight Planning Considerations**. The Recce Flt Comd plans his concept using the following critical considerations:

(1) **Aircraft Rotation**. Based on the rotation method selected by the Squadron CO, the Flt Comd determines methods of rotating aircraft to sustain an aerial screen. One must consider all aspects of the mission; time required for the mission, aircraft availability, and relief on station; and

(2) **Organization**. The Flt Comd organizes the flight into sections, based on the CO's guidance, the likelihood of enemy contact, the size of assigned sector, the duration of the mission, and aircraft availability;

e. **Coordination**. The Flt Comd ensures that the location of attack helicopters (if operating in the area), FARPs, supporting fires, and holding areas are known by all aircrew. The AMC coordinates his concept closely with the land force(s) and must pay particular attention to OP locations, artillery positions, and the land force scheme of manoeuvre. Coordinating the air passage of lines when operating forward of land force troops is essential;

f. **Displacement to Subsequent Screen Lines**. As the enemy situation threatens the tactical security of the screening force, reports are sent and requests are made for movement to the next screen line. Staggered movement off the screen line permits identification of the flanks and rear of attacking forces. The screening force commander usually decides when to move from a screen line, however, the main body commander decides when the screening force may move behind the rear boundary phase line. Prompt, accurate reporting is essential to prevent decisive engagement. Maximum use is made of surveillance, acquisition, and aircraft sensors, if available;

g. **Positioning of C2 and CSS Assets**. The AMC positioned to best control the screen. Normally, this is at a vantage point from which one can move freely, maintain communications with both higher and subordinate commanders and best influence the battle.. FARPs are placed forward to facilitate rapid turnaround of helicopters supporting the screen, and CSS assets must prepare for extended operations as necessary;

h. The three main types of screen that are performed are the stationary screen, and the moving screen, and the rear area ops screen;

i. **Stationary Screen**.

(1) **Successive Screen Lines**. Successive screen lines are located one behind the other on the battlefield and provide the screening force manoeuvre space. A stationary screen is accomplished by establishing successive screen lines. These lines enable the screening force to observe the identified avenues of approach throughout the flight's area of operations. Each aviation section should be assigned no more than three battalion size avenues of approach. A screen line may consist of OPs placed along a PL overwatching avenues of approach into an area. OPs may be mounted or dismounted from both air and land force assets. If the factors of COPPED dictate, armd recce troops may dismount from their vehicles and establish OPs. If OPs are used, air and land force reconnaissance forces actively patrol between them. Patrols recce areas that cannot be observed from an OP;

(2) **Initial Screen Line**.

(a) The most secure method of establishing an initial screen line is to conduct a zone reconnaissance from the rear boundary to the initial screen line. When units reach the general trace of the screen line, they reconnoitre and change it as required. They also select positions for good observation. Reconnaissance forces seek to remain undetected while reporting enemy forces and engaging them with indirect fires at maximum range. Artillery fire is planned along with both natural and man made obstacles to

impede the enemy's advance. The combination of obstacles and coordinated fires allows tactical aviation to impede enemy lead forces, maintain contact, and avoid decisive engagement. This gives the main body reaction time and manoeuvre space to effectively engage the enemy. The flight may also continue reconnaissance forward to identify enemy second echelon and follow on forces. Upon contact, the flight focuses its efforts on the destruction of enemy reconnaissance forces by direct and indirect fires before the enemy can penetrate the initial screen line;

(b) as enemy pressure threatens the tactical security of the screening force, or the movement of the main body dictates, the flight reports and requests to move to the next screen line. Reconnaissance forces rapidly move from a screen line while maintaining visual contact with the enemy. Staggered movement off the screen line permits the identification of the flanks and rear of attacking forces. This procedure ensures that gaps occurring during movement are quickly closed. The procedure is repeated as necessary. The main body commander decides when the screen force is no longer necessary and allows the screening force to conduct follow on missions. For this reason, the screen force commander must be prepared to conduct guard operations. Maximum use is made of ERSTA and night observation equipment; and

(c) the recce flight conducts a screen for a stationary force when the main body commander is preparing for future tactical operations. During the planning and preparation phases of battle, the main body commander may choose to remain stationary. The flight may be assigned screen operations when land force forces are preparing for defensive or offensive operations before actual movement begins. Initial occupation of a unit battle position may also require screening activities;

(3) tac avn assets are task organized by the AMC to accomplish the screen mission. The AMC assigns sections to occupy the screen and establishes a rotation to maintain continuous surveillance. If relief on station from other helicopters is required, the AMC coordinates with the relieving unit to determine the technique to be used. Relief is carried out either by individual helicopter or by section. In each case, the AMC for the screening force links up with the incoming AMC and communicates the current friendly positions, enemy situation, and plan for relief;

(4) When contact is made the section responds by immediately by a contact report and maintains contact. SITREPs update the Flt Comd on the tactical situation. This gives the main body commander time to manoeuvre the land force units to engage the enemy. If directed, the section may use indirect fire support to destroy or repel the enemy's reconnaissance forces; and

(5) Recce hels make maximum use of cover and concealment and employ supporting fires to harass and impede enemy forces. Each screen is situated to maximize the section's ability to maintain observation of the battlefield. The section leads work together to ensure that fields of view overlap to prevent the enemy from passing unnoticed. Routes to and from succeeding screen lines should provide good cover and concealment. Cover may be difficult to obtain along a route, but concealment is required. During movement, the teams ensure that visual contact with the enemy is continuously maintained;

j. **Moving Screen**. A moving screen is conducted when the main body is moving either for offensive or transitional operations. The Flt Comd determines the technique of screening a moving force based on terrain, the manoeuvre force commander's intent, and the flight's orientation. The manoeuvre force commander assigning the screening mission provides the parameters of the screen and the times and locations the screen is to be established. He also identifies the unit or units to be screened and provides the higher headquarters graphics (operations overlay and control measures). The two types of moving screens are flank and rear as fols:

(1) **Flank Screen**.

(a) The moving flank screen is the most difficult screening mission. Forces screening on the flank of a moving force move on a route parallel to the axis of the main body movement. The Flt Comd defines the area to be initially screened and subsequent screen lines designating the last line as the rear boundary. Land forces then occupy a series of observation posts (OPs) on the screen line parallel to the route of advance. Armd recce forces can be used for this mission. The forward helicopter maintains contact with the forward element of the lead forces on the near flank of the main body, ensuring that the main body and the screening unit maintain contact at all times. When operating with armd recce troops in a moving flank screen mission, recce helicopter sections are well suited to maintain contact with the main body and to perform reconnaissance forward of the land force units. The section must be aware of the distance of the land force troops from the main body (while

maintaining contact with them) to prevent the over extension of the screen;

(b) The most forward OP is positioned abeam of the rear of the leading battalion/task force and the subsequent OP(s) are arrayed along the length of the main body. Movement along the flank screen line may be controlled using one of three methods: Caterpillar (successive bounds), Leapfrog (alternate bounds), and Snake (continuous). The most secure technique, Caterpillar, is one in which the trail helicopter moves to the lead helicopter's forward observation position and then observes lead's movement forward to the next tactical bound. This method works best when the main body is moving slowly. A less secure technique, Leapfrog, may be used when the main body is moving faster. It involves the trail helicopter passing by the lead helicopter to take up a position described by the lead helicopter. The screening force may move continuously, using a technique similar to a hasty zone reconnaissance in depth, along the main body's flank. This method, Snake, is the least secure and least preferred in high threat areas; and

(c) A recce flight screening the flank of a moving unit plans a line of OPs and prepares to occupy each, in turn, as the main body advances. If possible, the helicopters reconnoitre out to the maximum range of supporting fires. Except for these procedures, the mission is planned and conducted the same as a stationary screen;

(2) **Rear Screen**. Screening the rear of a moving force is essentially the same as a stationary force. As the protected force moves, the flight occupies a series of successive screen lines. Movement is regulated by the requirement to maintain the time and distance factors desired by the main body commander. Sectors and responsibilities are assigned as in the stationary screen. Sections may assume the screen during land force troop movement. In a rear screen, a unit may move to subsequent screen lines without enemy pressure as long as it remains within friendly artillery range and can effectively screen the rear; and

k. **Rear Area Operations Screen**. During rear area incursions conducted by enemy forces, certain parts of the flight may conduct a screen. The purpose of this operation is to maintain contact with and contain the enemy while friendly units manoeuvre to engage and destroy the rear threat. In this role, helicopter forces may guide friendly quick reaction forces and/or assist in the attack and destruction of the enemy force.

GUARDS

36. **Guard Missions**.

a. **Purpose**. A guard mission protects the main body from enemy observation, direct fire, and surprise attack. A guard force reconnoitres, screens, attacks, defends, and delays to destroy enemy reconnaissance forces and to disrupt the deployment of enemy first echelon forces. It accomplishes all the tasks of a screening force. A guard operation is normally conducted within the range of friendly artillery. The intent of the main body commander in assigning the mission determines the nature and extent of attachments required. The primary tasks of recce helicopters is to perform zone reconnaissance, screen, or hasty attack missions. Armd recce troops involved in the guard mission perform the same missions, but also conduct advance to contact, defend, and delay missions. The guard mission requires the squadron to fight the enemy. A guard mission may be conducted to the front, rear, or flanks of the main body.

b. **Missions**. The three types of guard missions are advance, flank, and rear.

(1) **Advance Guard**. An advance guard force is offensive in nature. It finds and defeats enemy units along the axis or route of advance and prevents surprise and premature deployment of the main body. As a member of an advance guard, the tac avn deploys forward in a zone or a route reconnaissance;

(2) **Flank Guard**. As a flank guard, the flight performs the same tasks as it does for a stationary force. However, a flank guard for a moving force advances systematically to a series of BPs or OPs parallel to the main body's axis of advance and clears the area between its route and the main body, as the main body advances. The guard force orients on enemy battalion sized avenues of approach. Flank guard activities are primarily reconnaissance oriented. Recce hels can be integrated as part of the guard force by screening between and in front of battle positions as they are established. Recce hels may also be used to reconnoitre the area between the guard force and the main body, maintaining contact with both forces and freeing the land force flank guard to concentrate on its battle position tasks; and

(3) **Rear Guard**. The flight performs the same tasks for a moving force as it does for a stationary force. During the advance of the main body, the rear guard detects and defeats enemy units that threaten the rear of the protected force. It conducts a delay without contact at a distance prescribed by the main body commander. The delay operation is normally within friendly artillery range and is oriented away from the main body's rear on the same axis of advance. The flight’s primary role is to screen the guard force as it

delays, while the main body advances. Recce hels screen forward or between BPs and may reconnoitre the area between the rear guard and main body.

c. Guard missions can be conducted in two situations: in support of a stationary force (stationary guard), and in support of a moving force (moving guard).

d. **Stationary Guard**. A stationary guard is performed when the main body is not moving. It may be conducted to the front, rear, or flanks of the main body but is normally conducted to the front. Since the force is not moving, the technique for the guard is the same for the three areas. As part of a stationary guard, the flight deploys forward of a designated PL, usually within friendly artillery range, and conducts reconnaissance and screening operations. The main guard force does not displace behind the designated PL without the permission of the main body commander. As a rule of thumb, a PL designating the rear of the flight's area should be farther from the main body than the effective range of enemy direct fire weapons (roughly 4,000 metres). The flight conducts a zone reconnaissance from the rear to the BPs or OPs, reconnoitres the BPs or OPs, and establishes a screen line. It provides reaction time for the main guard force and, consequently, the main body. The flight determines the enemy's disposition, destroys enemy reconnaissance forces if possible, and assists the main guard unit in forcing the enemy to deploy. It also disrupts the enemy's forced deployment and guides the main body reaction forces for the counterattack.

e. **Moving Guard**. Moving guard operations may be conducted to the front, flank, and rear of the main body. The differing techniques and tasks for these are described below:

(1) **Advance Guard**. An advance guard for a moving force develops the situation to the front along specific routes or axes to prevent surprise or premature deployment of the main body. It conducts its planning in a way similar to zone or route reconnaissance, but will usually have a more lenient engagement criteria. An advance guard must have artillery coverage to be effective. While the main body is in an advance to contact, the advance guard develops the enemy situation by fighting to gain intelligence. Primary emphasis is on early development of the enemy situation in the area of the main body's route or axis of advance.

(2) **Flank Guard**. As a flank guard, the flight performs the same tasks for a moving force as it does for a stationary force. However, the flank guard for a moving force advances systematically to a series of BPs. It moves along a designated route parallel to the main body's axis of advance and clears the area between its route of advance and the main body. Flank guard activities are primarily

reconnaissance oriented. During a flank guard, tac avn can be used to screen between the guard force and the main body. It can also be used to screen forward of the guard force during the movement to battle positions. In both situations tac avn uses the techniques for an advance to contact forward of a moving force (a zone reconnaissance moving to successive screen lines). Figure 14-7 shows the flight conducting a flank guard for a moving force.

(3) **Rear Guard**. The flight performs the same tasks for a moving force as it does for a stationary force. However, it must periodically move rearward to stay within the range of the main body's artillery.

f. **Recce Flight's Critical Tasks**.

(1) perform reconnaissance along the main body's axis of advance;

(2) maintain continuous surveillance of enemy battalion size avenues of approach;

(3) maintain contact with the lead combat element of the main body;

(4) reconnoitre the zone between the main body and the guard force battle positions; and

(5) defeat, repel, or fix enemy recce or ground forces before they engage the main body with direct fire.

g. **Planning Considerations**. The guard mission must indicate the type and level of protection required. Because guard forces are expected to force and disrupt enemy deployment, they normally operate on narrower fronts than screening forces. A commander directing a guard mission must consider the requirement to clear the area between the main body and the units' guard designated positions. The guard force may need additional assets to clear this area while keeping enough combat power forward to protect the main body. Avn units may have field artillery in support. This assistance depends on the amount of artillery support available and the type and level of protection required by the commander who assigns the guard mission. Normally, tac avn units occupy BPs across the most likely avenues of approach. They do not withdraw to successive positions without the permission of the main body commander. The guard force commander may direct movement to successive screen lines. Sections within the flight will often have different missions. For example, one section may screen a less vulnerable zone while the remaining sections screen an area with major avenues of approach.

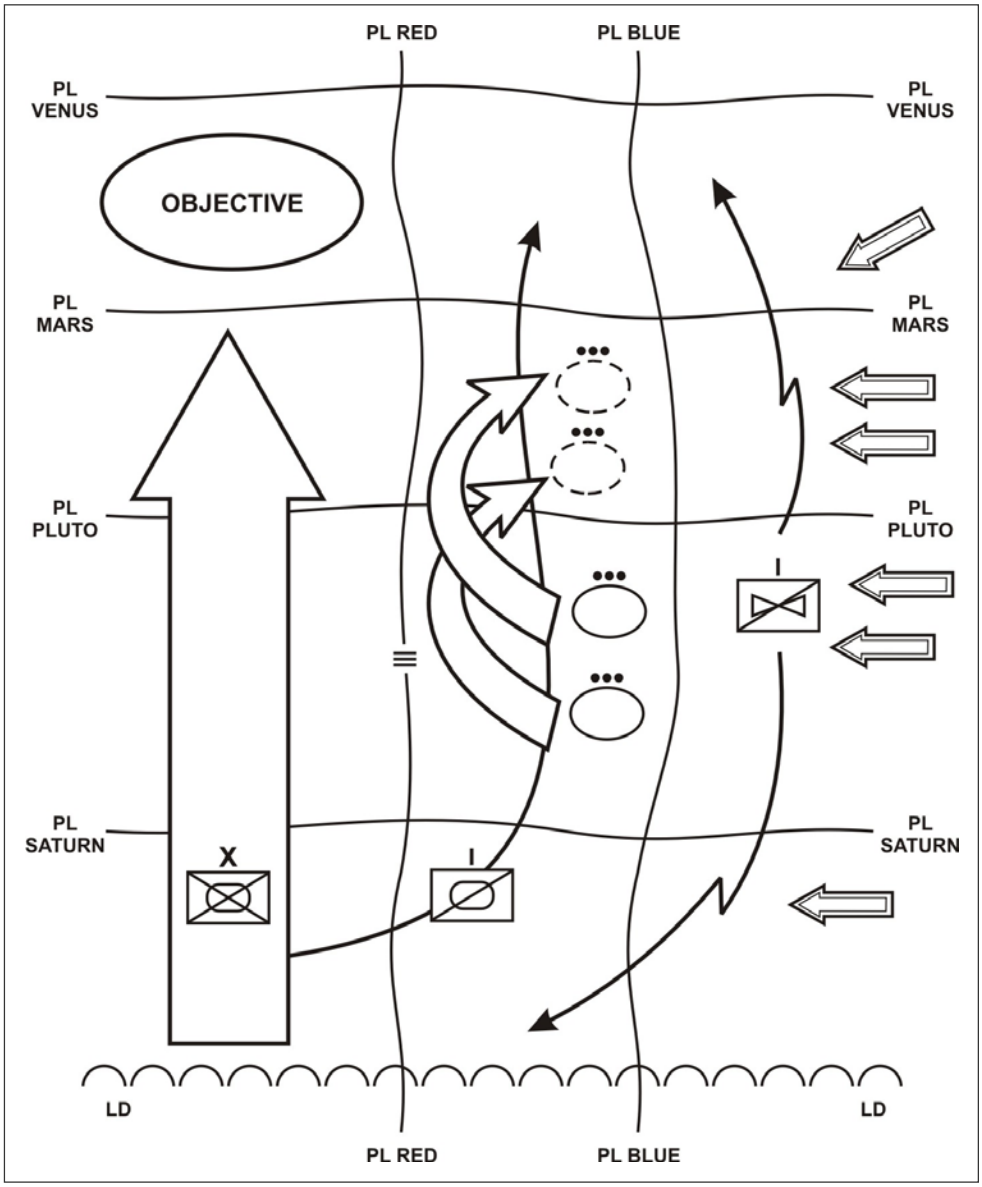


Figure 14-7: Flank Guard for a Moving Force

AREA SECURITY

37. **Fundamentals**.

a. **General**. An area security force performs screen or guard missions to protect forces within a specified area. The area is defined by the headquarters' assigning the area security mission; and

b. It is commonly employed following airborne, airmobile, or other forced entry operations. It is also used extensively in stability operations and support operations and will become the norm for operations on the non

linear, non contiguous battlespace. Area security should be used to provide early warning to any isolated force that cannot tie its flanks into a friendly unit.

ROUTE SECURITY

38. Route security is performed to provide early warning and reaction time to forces moving along, or dependent upon, a route or lines of communications.

CONVOY SECURITY

39. Convoy security is a variation of route security that is performed when conducting security for the entire route is not feasible. This may be because of the length of the route, strength of enemy forces, or the limitations of available tactical security assets. The integration of air and land forces during convoy security operations works best. Tac avn may conduct limited route reconnaissance in conjunction with a zone reconnaissance forward of the land recce forces, which are better suited for escort. Tac Avn may additionally conduct a flank and rear screen as the convoy moves along the route.

OFFENSIVE OPERATIONS

40. The Griffon, equipped with ERSTA and crewed with AOP and FAC qualified crews can support offensive operations.

41. **Hasty Attack**.

a. A hasty attack is an attack for which a unit has not made extensive preparations. It is conducted with the resources immediately available to maintain the momentum or to take advantage of the enemy situation. The objectives are to overwhelm the enemy quickly and seize the initiative. Speed is paramount, and if momentum is lost, the hasty attack can fail. An attack with speed, audacity, and boldness can offset the lack of thorough preparation;

b. A hasty attack depends on timely and accurate information as well as speed. When contact is made, commanders must immediately evaluate their chances of success, and situational information must be passed to higher headquarters. Possible courses of action include enveloping or bypassing enemy forces or reinforcing the attack;

c. When the attack begins, the AMC employs available direct and indirect fires to develop the situation. recce hels provide battlefield information and situation updates on which the land force commander can base immediate decisions concerning the attack. It provides suppressive fires for a manoeuvring land force unit and tactical security to the attacking force through early warning;

d. When planned AH assets arrive, recce hels return to their reconnaissance and tactical security missions and continue to provide information about alternate attack routes and aerial or land force envelopment routes; and

e. The helicopter mission commander can orchestrate most of the fire support assets used in a hasty attack. In the hasty attack, Tac Avn primarily provides information to the land force commander and then orchestrates firepower and manoeuvre.

42. **Deliberate Attack**.

a. A deliberate attack is usually necessary when the defender is well organized and cannot be turned or bypassed. A deliberate attack is planned and carefully coordinated with all concerned forces based on thorough reconnaissance, evaluation of all available intelligence and relative combat strength, analysis of all courses of action, and any other factors affecting the situation. It has a scheme of manoeuvre and an integrated fire support plan. In the initial phase of the attack, both sides employ all firepower, to include field artillery and armour. Due to the vulnerability of accurate fires, AMCs must plan to use maximum standoff ranges, and hours of darkness, when engaging well established enemy defensive positions. Tac avn units would not normally conduct deliberate attacks on their own. The tactical security efforts of tac avn are oriented towards protecting the attacking force from flank and rear area attacks in an economy of force role. It allows the land force to mass most of his forces in the deliberate attack. Surveillance of possible enemy LZs is included in the surveillance role;

b. The intelligence available to a land force commander will determine how the attack is planned and initiated. Because the primary attack route could be modified before the attack begins, situational development is essential. After the initial phase of the attack begins, recce hels can identify weak points. As the attack continues, immediate reports from recce hels enable the main body commander to direct his attack at the most vulnerable points. If a feint becomes more successful than the main attack, the AMC relays this information to the supported land force commander and can direct forces to the newly defined main attack area;

c. If the initial phase of the attack succeeds and friendly forces breach the enemy defenses, and the threat is deemed low enough, then helicopters can move through the penetration and outward on the flanks where the enemy is weak and fragmented. Recce hels also locate counter attacking enemy forces, C2 centers, logistical centers, and other priority targets to be engaged. After these have been located, recce hels employ indirect fire to destroy them. When AH assets are available, the AMC identifies and hands over the targets to the attack forces. Recce hels then resume their reconnaissance of other targets in the area; and

d. **Night and Limited Visibility Attack**.

(1) An attack at night or during limited visibility provides several advantages to the attacker. Surprise and deception are enhanced and opportunities that are impractical during daylight conditions may succeed. Concentration and movement of forces are more difficult to detect and remain concealed longer. The availability of helicopter assets is carefully weighed during consideration of these attacks. Tac avn assets are more survivable at night due to the reduced effectiveness of enemy direct fire weapon systems. With ERSTA and NVG HUD, the CH 146 has a good night operational capability; and

(2) Planning for night attacks begins as early as possible to allow for daytime preparation and to incorporate sleep plans. The plan is kept simple to facilitate execution. Control measures at night are usually more restrictive than those used during daylight conditions. Route reconnaissance and marking of the direction of attack facilitate rapid execution.

43. **Reconnaissance In Force**. A reconnaissance in force is a limited objective operation. It is conducted by a larger than squadron force to obtain information and to locate and test the enemy's disposition, strength, and reaction. As the name implies, a reconnaissance in force is an action to develop battlefield intelligence and to reduce uncertainties about the enemy. Initially, as part of the force, the recce flight conducts a zone reconnaissance to update the recce force commander. The flight may also screen the movement of the force. If enemy contact is made, tac avn assets continue reconnaissance to find weaknesses or to develop the situation. The augmenting forces must have the firepower, mobility, and agility required for this role. Reconnaissance in force is normally assigned when:

a. limited information about the enemy is available; and

b. the recce commander desires more specific information on the enemy and when this information cannot be gathered by any other means.

44. The command and control function for a reconnaissance in force is similar to that for any other operation. However, a reconnaissance in force is characterized by violent, high tempo actions that are integrated and coordinated throughout the entire effort. Engineering assets in a mobility role may augment units. Armour and infantry units make up the main force, and field artillery assets provide flexible direct support to the force. Air defence assets may also augment to enhance the overall air defence effort of the force. When enemy contact is established, recce helicopters can direct and secure movement of the main force. They call for and adjust fires and assist engineer and air defense forces in support of the main force.

45. **Raid**. A raid is an attack into enemy held territory for a specific purpose other than to gain or hold terrain. Given the shift in Canadian doctrine towards manoeuvre warfare, this is a mission that might be undertaken more often in the future. It usually ends with a planned withdrawal when the assigned mission has been completed. A recce flight may be assigned the raid mission (if supported by direct or indirect fires) or it may provide reconnaissance and tactical security for the raiding force. Helicopters seldom accompany a land force as it moves to the objective, rather they usually link up at the objective. Recce missions during a raid include:

a. reconnoitring air routes for raiding aircraft;

b. screening airmobile forces en route to objectives;

c. providing area security while airmobile forces board helicopters for the withdrawal;

d. controlling preparatory fires on objectives before airmobile forces arrive; and

e. screening raiding forces while at the objective by identifying enemy reinforcement attempts.

46. **Feint**. A feint is a limited attack to divert an enemy's attack or to deceive the enemy as to the friendly force's intentions. Doctrinally, brigade and smaller units conduct feints before or during a main attack to deceive the enemy. To succeed, the feint must appear as a serious attack. Additional feints are conducted to cause the enemy to reveal its defensive posture and disrupt its decision making cycle. These feints reduce the resistance that the attacking force will encounter. The recce flight normally conducts recce operations during a feint, however, the situation may require the flight to engage targets more aggressively than normal, if fire support augmentation is available. The flight’s primary mission will be to screen the flanks and rear of the force conducting the feint or, less likely, it moves to join operations in the main attack area.

47. **Demonstration**. A demonstration serves the same purpose as a feint, but it differs in that it does not involve contact with the enemy. The objective of a demonstration is to deceive and confuse the enemy as to the real intentions of the attacking force. For a demonstration to succeed, the enemy must observe the demonstrating force's operation and be deceived by it but not actively engage the force. The nature of a demonstration allows for the use of decoys, simulations, and tactically inoperable equipment to portray additional strength. Tac avn will normally employ heavy volumes of indirect fires and an increase in air traffic to perform a demonstration. It may also be used to provide tactical security for a demonstrating force or to conduct reconnaissance to assess the enemy reaction. Tac avn’s principal role in a demonstration may be to be seen and heard conducting operations in a given area. A recce flight may also assist in the simulation of an airmobile operation, but it will seldom conduct a demonstration as a whole unit. The force commander should assess the risks for this operation as he would for a feint.

DEFENSIVE OPERATIONS

48. Defensive operations are fought in the three primary sectors of the battlefield: Deep, Close and Rear areas. Although it's possible for the CH 146 to operate in the deep area, comds must consider the fol factors before assigning them to perform specific msns:

a. lack of effective organic firepower for engaging close in enemy targets, and for self protection in air combat situations;

b. limited range and combat radius compared to AH helicopters; and

c. minimal ballistic protection for aircrew, and none for aircraft systems.

49. **Close Operations**. The two stages of the defensive battle are the covering force battle, and the main defence battle. 1 Wing Tactical aviation units conduct close operations in support of the main defence battle only.

a. **Main Defensive Battle**. The decisive battle is fought in the main defensive area. Tactical security forces will have developed the situation to slow the enemy and buy time for the main body. The battle handover includes a passage of lines and a shift of responsibilities from the covering force to the main battle commander. This handover must occur quickly and efficiently to reduce vulnerability. The principal duty of recce hels is to provide tactical security during the handover phase as it helps to ensure an orderly handover. Specific missions may include:

(1) securing the flanks and rear of the main body;

(2) coordinating direct and indirect fires within the main battle area;

(3) countering enemy airborne operations into the main battle area; and

(4) maintaining lines of communication and supply in the main battle area by conducting recce and tactical security along the routes.

REAR AREA OPERATIONS

50. **Fundamentals**.

a. **General**. Tac avn gives land force commanders a highly mobile and flexible combat force able to respond to enemy incursions in the rear areas. As the commander's most mobile means to gain and maintain contact, tac avn units might be tasked as part of a tactical combat force able to respond to enemy incursions;

b. As the battlefield becomes less linear, rear area operations must be anticipated. Rear battle planning should be included in all tactical plans. Rear combat operations rarely come in places of our choosing. Information can be confusing, even contradictory, as to the location and size of the enemy force;

c. Even though enemy and friendly lines may not be clearly discernible, rear operations will occur in and around base clusters, logistics sites, and storage facilities. From a battle command viewpoint, it will be fought much like a close battle. The possibility of fratricide during rear battle places a premium on all control measures. However, the fluid nature of the rear battle does not lend itself to static control measures. Based on the enemy's actions and friendly response, contingency control measures can be developed and distributed as part of the planning process and activated as appropriate, based on the situation. This planning should include air routes, indirect fires reference points and location of known, or planned land force unit locations; and

d. The variety of possibilities that may be encountered does not favour any one way to conduct rear operations. The situation will dictate how tac avn can best be employed.

DELAYING OPERATIONS

51. A delay is normally conducted as part of a defensive battle. The intent of a delay is to gain time while the destruction of the enemy is of secondary importance. The integration of tac avn is crucial to a successful delay operation. The firepower (when calling for direct and indirect fire) and mobility of tac avn units allows the recce flight to bolster any delay through providing depth during the movement of land force troops, and helping the land force commander see the entire battlefield. Integrating combined arms with an extensive obstacle plan enhances the effectiveness of the delay. The delaying force must simultaneously:

a. preserve the force by not becoming decisively engaged;

b. preserve freedom to manoeuvre;

c. maintain operational coherence;

d. cause the enemy to deploy and react to successive attacks; and

e. maintain contact with the enemy.

52. Tac avn accomplishes several of the missions identified above during their normal recce missions. Aviation compliments the land force by controlling long range fires as the friendly forces disengage and move to alternate or successive positions. They maintain surveillance of high speed avenues of approach to ensure that the delaying force is not bypassed or encircled.

53. UTTH helicopters are often used to move light infantry forces to alternate and successive positions. A recce flight can support these operations by conducting an aerial route reconnaissance. They also provide tactical security for the airmobile forces and conduct PZ/LZ reconnaissance and tactical security missions.

TRANSITIONAL PHASES

54. Offensive, defensive and delaying operations are often linked by one or more transitional phases. These phases are never carried out in its own right, rather its execution must lead to the active prosecution of one or other of the Operations of war. Tactical aviation can participate in the following transitional phases; advance to contact, withdrawal and relief.

55. **Advance To Contact**.

a. An advance to contact gains initial ground contact with the enemy or regains lost contact. Armoured reconnaissance performs the advance to contact like a zone reconnaissance. Unlike a zone reconnaissance, the effort focuses on finding the enemy force, developing the situation early, and preventing the premature deployment of the main body following the recce units. Terrain reconnaissance is conducted as necessary to support the intent of locating the enemy. As a result, advance to contact proceeds much faster than a zone reconnaissance;

b. The land force conducting an advance to contact as an independent force, organizes itself with a covering force, guards (advance, flank and rear), and a main body. Tactical aviation facilitates speed and mobility by using recce helicopters to reconnoitre with the leading land force troops or to screen along exposed flanks;

c. The advance to contact terminates when the unit reaches the objective or limit of advance without enemy contact, or upon contact with an enemy force. The flight attempts to gain contact with the smallest amount of resources possible. This is normally a recce section performing reconnaissance for their flight. Actions on contact occur rapidly to defeat the enemy force within the section's capability, and prevent unnecessarily deploying other assets. Should the enemy prove to be too strong, the force establishes a hasty defense, delays, or conducts close reconnaissance as appropriate within the intent of the higher commander. Follow on main body forces then deploy, conduct battle handover, and assume the fight;

d. Using indirect fire, CAS and AH fire support, recce sections can harass and impede enemy forces to preclude their influence on the main body. Griffon ERSTA helicopters can direct land forces to the vicinity of enemy units and can support those land forces units through observation, AOP and FAC.. If the main body is directed to bypass the enemy after initial contact, tac avn is ideal in the economy of force role, and can maintain surveillance and contain small forces until follow on forces arrive to destroy them; and

e. For continuous or sustained operations, a FARP may move with the flight to reduce helicopter turnaround time.

56. **Withdrawal**. Withdrawals are conducted to extract subordinate units from combat, adjust defensive positions, or relocate the entire force. A withdrawal occurs when a force in contact with the enemy disengages itself in accordance with the will of its commander. The force may withdraw to continue the defense in depth or to perform a different mission. There are two types of withdrawal; in contact, or out of contact with the enemy:

a. when in contact with the enemy, the unit depends on fire and manoeuvre to break the contact, then withdraw; and

b. when out of contact with the enemy, the unit depends on speed of execution and deception. If the unit is not under attack then the withdrawal is not under pressure.

57. Tac avn performs the same missions during a withdrawal operation as they would during a delay. In addition to recce operations, tac avn provides the force commander with battlefield intelligence in the form of SITREPs. They assist the land forces in passage of lines and battle handover. Tac avn can also coordinate fire support and CAS. Aviation assets may also be included in deception and tactical security operations in support of the withdrawal.

58. **Relief Operations**. This occurs in situations where combat activities are taken over by one force from another.. The types of relief are relief in place, forward passage of lines, rearward passage of lines, and retirement. Tac avn can play a role in all of these missions:

a. Relief operations are undertaken when forces:

(1) are unable to continue with their mission;

(2) are required for operations in another area;

(3) have accomplished their mission;

(4) are due for rotation to avoid exhaustion; and

(5) are not suitable to accomplish the new task;

b. **Relief In Place**. A relief in place is a coordinated operation between two units that transfers responsibility for fighting an enemy force from one unit to another in the close in battle. It is designed to maintain continuity of the combined arms fight and protect the operational capability of both forces involved. A clear SOP allows units to quickly establish the necessary coordination to preclude a loss of momentum in the attack. The control measures used are simple and standardized. In the conduct of air and land force operations, the air and land force troop commanders often pass an enemy force in contact to another. Relief in place governs this process in terms of close coordination, fire support, and mutual understanding of responsibilities. Whenever the situation permits, face to face linkups between individuals should be made;

c. **Passage Of Lines**. A passage of lines is an operation in which one force moves either forward or rearward through another force to gain or break contact with the enemy. The passing force is particularly vulnerable during a passage of lines as personnel may be overly concentrated, stationary fires may be temporarily masked, and the passing unit may not be properly dispersed to react to enemy actions. Reconnaissance and coordination ensure that the passage is conducted quickly and smoothly. A passage of lines may be conducted to:

(1) envelop an enemy force;

(2) pursue a fleeing enemy;

(3) continue an attack or counterattack;

(4) pass forward or withdraw reconnaissance units; and

(5) pass forward or withdraw a covering force or main battle area forces;

d. Tac avn frequently conducts a passage of lines as a part of reconnaissance, screening, and airmobile security operations. It may also assist the passage of lines of the land force recce troops;

e. When tac avn is involved in a passage of lines, timely and specific coordination before the operation is essential. The most desirable method is a face to face exchange of information. As a minimum, the exchange of information should include:

(1) the period of time required for the passage;

(2) the locations of passage points along the FEBA or FLOT;

(3) the disposition and scheme of manoeuvre of friendly units;

(4) the enemy situation in sector, to include air activity;

(5) the types and numbers of hels to make passage, if applicable;

(6) the methods of communication, to include frequencies and nets, visual and back-up communications, and recognition signals;

(7) the control of friendly supporting fires, to include restrictive fire support coordination measures and AD weapon control status;

(8) friendly unit locations;

(9) the ADA weapon/control status;

(10) alternate passage lanes; and

(11) the contingency plan if stationary and/or passing units are attacked during passage;

f. **Forward Passage Of Lines**. Forward passages are normally executed when an attack is to be continued with fresh or more suitable forces, or when the advancing force has to take possession of suitable terrain in order to continue the battle;

g. During a passage of lines, tac avn may conduct a reconnaissance of the passage points, initiate and maintain liaison, and conduct screening operations. Recce helicopters can aid the in-place force or the attacking force with providing tactical security in the form of indirect fire. During reconnaissance operations for preparation for a forward passage of lines, tac avn covers routes to, through, and beyond the area of passage. It also includes existing unit locations and proposed positions. Care must be taken not to compromise unit locations and intentions during passage;

h. **Rearward Passage Of Lines**. This operation occurs when one force passes through the defensive position of another. A rearward passage of lines may be conducted:

(1) as part of a delaying operation;

(2) as a means or changing the type of force facing the enemy;

(3) when terrain can be abandoned;

(4) as a means of relieving a force unable to continue with its mission; and

(5) as part of a withdrawal operation;

i. When helicopters return from a recce mission, they perform a rearward passage of lines in the same manner as other manoeuvre units. The flight must ensure contact is maintained with the enemy during a rearward passage of lines. Contact points should be located along the designated passage PL. This allows the stationary unit (either aviation or land force units) to provide overwatching fires. Contact points should be at easily identifiable terrain features such as road junctions or towns; and

j. **Planning Considerations**. The Flt Comd prepares a tentative plan for the relief mission to be executed, and analyzes terrain and the higher commander's intent. The Flt Comd places additional emphasis on the factors listed below:

(1) **Organization**. When possible, unit integrity is maintained to provide better command and control;

(2) **Order of Advance**. An order of advance is prescribed based on the number of passage points and degree of tactical security required. The enemy situation and the terrain also influences the order of advance and the priorities on who moves when;

(3) **Security**. Recce flight helicopters assist in a passage of lines by screening between the enemy and the passing force to provide early warning and limited protection. Noise, light, and radio discipline must be enforced; and

(4) **Command and Control**. The techniques of command and control depend on the number of passage points. Ideally, multiple passage points are established to facilitate decentralized control. Commanders of units involved in the passage of lines must decide how they can best influence the action and then position themselves accordingly.

CHAPTER 15

DIRECTION AND CONTROL OF FIRE

GENERAL

1. Qualified helicopter aircrew can direct and control many types of fire support, including field artillery, mortars, naval gunfire, Close Air Support (CAS), and armed and attack helicopters.

2. CH 146 direction and control of fire missions consist of:

   a. Air Observation Post (AOP); and

   b. Forward Air Controller (FAC).

AOP MISSIONS

3. A helicopter AOP can conduct the following tasks:

   a. engagement of targets by observation and adjustment of fire;

   b. assistance in the execution of fire plans;

   c. target registration;

   d. battlefield surveillance; and

   e. target identification and designation.

MISSION BRIEFING REQUIREMENTS

4. Sqn Ops will brief the crew on most aspects of the mission, including the tactical situation; however, the following information must be obtained from the supported unit:

   a. the location of field artillery and/or mortar units[1];

   b. the allotment of guns and ammunition;

   c. assignment as an Authorized or an Ordinary OP[2];

   d. the task, including the identity of the troops being supported;

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[1] It is likely that this information will either not be available at this briefing, or will change during the flight, therefore, it is advisable to confirm the location of the firing unit when the mission is initiated.

[2] An Authorized Observer is one who has been given a special allocation of fire units, ammunition, and target numbers, usually for a specific operation. An Ordinary Observer is one who has not been given any special authority to engage targets with fire units other than the battery.

e. communications instructions and frequencies; and

f. fire support coordination measures[3].

5. This information is usually passed by radio and updated throughout the mission. At the initial squadron briefing, a representative from the Brigade's Direct Support Field Artillery Regt may attend to provide more detailed information on the fire support plan.

RESPONSIBILITIES

6. The responsibilities of AOP aircrew are:

a. directing fire onto targets;

b. being familiar with the zone of observation so accurate fire can be brought onto the target(s) when required;

c. ensuring that communications are maintained with the supported unit, the artillery unit and the sqn or flt CP;

d. reporting tactical information;

e. target identification and designation; and

f. maintaining surveillance over the observation zone or target area.

PREPARATION FOR THE ENGAGMENT OF TARGETS

7. Once the fire mission ground briefings have been received the following factors should be considered:

a. **Selection Of A Tactical Observation Area, to include**:

(1) good observation of the target area;

(2) restricted exposure to enemy artillery and AD weapons systems;

(3) sufficient manoeuvre space to conduct AOP flying tactics;

(4) good terrain and/or vegetation backdrop to prevent sky lining;

(5) position of the sun; and

(6) obscuring factors to the field of view;

b. **Flight Restrictions**. Altitudes and methods of flight are restricted by enemy air forces and AD systems. Flight restrictions may also be caused

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[3] See B-GL-371-002/FP-001, *Field Artillery Vol. 2*, for more details on all fire missions. This publication can be found in the Army Electronic Library (AEL), on the LFDTS or DAD web sites.

by friendly air activities, airspace control measures, AD measures and the disposition of field artillery and mortars;

c. **Target Identification**. It is the AC's responsibility to ensure that:

(1) the location, type and size of the target is accurately identified;

(2) the type of engagement is achieved;

(3) the location of friendly troops close to the engagement area is known and avoided; and

(4) suitable ref points for ground/air target indication are coord; and

d. **Target Location**. Fire support units depend on accurate target grids to bring fire onto the target as soon as possible. The target acquisition and designation features of ERSTA give the CH 146 far better equipment than has ever been available to determine target grids. Through GPS and the target range finder, accurate 10 figure target grid references can be given to the fire support units. This should result in minimal adjustments of fire before calling for Fire For Effect (FFE).

TARGET APPRECIATION AND PLAN

8. The aim of the fire support mission must be clearly understood, whether it is undertaken on the initiative of the hel crew or at the direction of the supported land force unit. The aim can normally be determined by the type of category of the target as fols:

a. neutralization;

b. mobile;

c. adjustment for future engagement;

d. registration; or

e. destruction.

9. The following factors affect a fire mission:

a. **Time**. The sooner that FFE can be brought onto the target, the less time the enemy has to take evasive action. The call for FFE is affected by the degree of adjustment, the degree of accuracy required (which is dictated by the type of target, i.e. armd vehs, troops in the open) the number of guns and the type of munitions used. The greater the number of guns firing and the larger the munitions used, the less accurate the adjustment;

b. **Position Of Friendly Forces**. The relative positions and movements of friendly forces influence the degree of adjustment and the type of ammunition. For safety reasons, the danger close procedure may have to be utilized;

c. **Position Of The Target**. The ground in the vicintiy of the target influences the selection of:

(1) the position of the opening round;

(2) the number of guns to be used in the adjustment;

(3) the size of the bracket;

(4) the type of ammunition; and

(5) the trajectory (high or low angle);

d. **Nature, Size and Attitude of the Target**. The size of the target, its attitude and its ability to move for protection influences:

(1) the type of ammunition;

(2) the number of guns;

(3) the degree of adjustment and the number of guns used for FFE; and

(4) the method of distributing FFE on the target;

e. **Weather**. Weather may influence the type of ammunition used;

f. **Visibility**. Poor visibility may affect the type of rounds used for adjustment (i.e., the need for WP); and

g. **Surprise**. Surprise results in a greater degree of effect than if there is too much time taken in adjustment before FFE.

CREW COOPERATION

10. The pilot flying the helicopter must position it best for the mission specialist to acquire, identify and engage the target. All fire orders to the guns, corrections and adjustments should be copied by another crew member. Crew cooperation with four crew members is important to the success of the mission. Each must know what their specific duties are.

AIDS TO OBSERVATION OF FIRE

11. Several aids to observation are available to aircrew:

a. EO systems can be used to determine the impact location of the first round, but since these systems restrict the field of view, the pilots' eyes may be more likely to see the first burst(s);

b. To insure seeing the initial burst(s), the pilots should divide the area of observation around the target between themselves;

c. The drift of the smoke or dust from a shell burst may indicate whether a round that was off the observer to target line was beyond or short of the target, or it may reveal the whereabouts of a round, which has burst out of sight. It may also indicate the direction and strength of the wind in the target area. Under certain conditions (i.e., frozen ground or high winds), HE delay is of assistance as the dust thrown up by the burst tends to linger and gives a better indication of the location of the burst;

d. When dealing with a lost round, the AOP must consider the crew's experience and the location of friendly elements with respect to the target. The AC should take corrective action based on confidence of the target location, the accuracy of fire on previous missions, whether the lost round was an initial round or a subsequent round, and the urgency of the mission. When a round is lost, positive action must be taken. The AOP can initiate a number of corrective procedures including:

(1) a data check throughout the system, starting with the target location data and the call for fire;

(2) a request for a white phosphorus (WP) round or a smoke round;

(3) repeat the round; or

(4) an end to the mission and a new mission; and

e. The crew should request "SPLASH" to avoid unnecessary exposure during adjustments. The guns report "SPLASH" 5 seconds prior to the burst of the round(s).

AREA NEUTRALIZATION WITH HIGH EXPLOSIVE

12. **Introduction**. The neutralization of an area with HE is the most common type of artillery engagement. Its procedure is the basis for all other missions. It is undertaken in situations where the enemy is actively interfering, or is likely to interfere, with the operations of friendly forward troops. For effective neutralization, a quick engagement is normally required.

13. **High Explosive Point Detonating (HEPD)**. HEPD is the basic shell and fuze combination for adjustment and for FFE against targets.

14. **Adjustment**. Adjustment is carried out until a short bracket is achieved or a target round is observed. FFE is ordered at the split of the short bracket or at the data, which produced the target round. At the split of the short bracket, it is often advisable for the observer to establish the Mean Point Of Impact (MPI) of the fire unit, by ordering "ONE ROUND FIRE FOR EFFECT".

15. **FFE**. After the MPI has been adjusted, the target shall be engaged with FFE until the aim of the engagement has been achieved.

16. **Termination of The Engagement**. At the termination of the engagement, the AOP shall order the target recorded, if required, and end the fire mission by ordering "End Of Mission", followed by the results of this engagement.

17. **Procedure**. An example of a Call For Fire (CFF) from a helicopter AOP to a Canadian field artillery battery follows:

SER	AOP'S SEQUENCE OF ORDERS	EXAMPLE OF AN AOP FIRE MISSION CFF
1	***AOP'S IDENTIFICATION***	"2, THIS IS HOTEL 22.
2	***WARNING ORDER***	FIRE MISSION BATTERY. OVER."
3	***LOCATION OF TARGET***	"GRID 158346, ALTITUDE 100.
4	Direction	DIRECTION 1240.
5	***DESCRIPTION OF TARGET***	MACHINE GUNS IN RAVINE, RADIUS 25.
6	Type of Engagement	ADJUSTING ZP 2230.
7	Trajectory	HIGH ANGLE.
8	Ammunition	3 ROUNDS, TIME IN EFFECT.
9	Distribution of Fire	CONVERGE.
10	At My Command	AT MY COMMAND.
11	***METHOD OF ADJUSTMENT OR ORDER FOR FFE***	2 GUNS, ADJUST FIRE. OVER"
NOTE: ***OBLIGATORY ORDERS ARE UNDERLINED.***		

Figure 15-1: Example of an AOP's Fire Orders for an Area Neutralization

FAC MISSIONS

18. A helicopter borne FAC conducts the mission exactly the same as a ground FAC; however, the helicopter affords flexibility in finding a good vantage point for the target.

19. A FAC mission can be tasked (pre-planned) by the Tactical Air Control Party (TACP) or can be in addition to a mission being conducted by the helicopter (immediate), when a target is found. For a pre-planned FAC mission, the hel crew needs to know:

a. a description of the target;

b. the location of the target;

c. the position of friendly forces;

d. the position of enemy forces;

e. the recommended type of ordnance;

f. frequencies and callsigns of the CAS aircraft; and

g. the type, number and timings for the CAS aircraft.

20. The FAC:

a. coordinates a rendezvous with the CAS aircraft;

b. analyzes the target by noting its geographical limits and the locations of any friendly ground units that may be affected by the air strike;

c. plans the CAS mission (inbound and breakaway restrictions); and

d. makes contact with the lead CAS aircraft.

21. The CAS pilot on first contact with the FAC gives the following information:

a. aircraft call-sign/mission number;

b. number and type of aircraft;

c. position and altitude;

d. ordnance;

e. play time; and

f. abort code.

22. The FAC must give the following information as part of the FAC briefing to the CAS pilot:

a. the distance and/or direction to the target from the IP and PUP;

b. the target description (including size and mobility), elevation and location;

c. the target designation methods (i.e., laser, WP);

d. the location of enemy forces and anticipated enemy AD systems;

e. friendly forces' locations, including the FAC's position;

f. any attack restrictions, including egress routes;

g. the type of ordnance;

h. final clearance for attacking the target; and

i. remarks, including threat weapons and locations, SEAD, abort codes and hazards (i.e., wires, towers).

TACAIR Briefing Form (9-Line)

(Omit data not required. Do not transmit line numbers. Units of measure are standard unless otherwise specified. *Denotes minimum essential in limited communications. Bold denotes readback items when requested.)

Terminal controller:" _____ (Aircraft Call Sign) , this is _____ (Terminal Controller) "

***1. IP/BP:"** _____ "

*2. Heading:" _____ (IP/BP to Target) "(magnetic)

Offset:" _____ "(Left/Right)

*3. Distance:" _____ (IP-to-target in nautical miles/BP-to-target in meters) "

*4. Target Elevation:" _____ "(in feet MSL)

*5. Target Description:" _____ "

***6. Target Location:"** _____ "
(Latitude/longitude or Grid Coordinates or Offsets or Visual

7. Type Mark:" _____ (WP, Laser, IR, Beacon) " Code:" _____ (Actual Code) "

Laser to Target Line:" _____ " Degrees

***8. Location of Friendlies:"** _____ "

Position Marked by:" _____ "

9. Egress:" "

In the event of a beacon request, insert beacon bombing chart line numbers here.

_____

Remarks (As Appropriate):" _____ "
(Threats, reactions, danger close, attack clearance, SEAD, abort Codes, Hazards)

Note: For AC-130 employment, Lines 5,6, and 8 are mandatory briefing items. Remarks should also include detailed threat description, marking method of friendly locations (including magnetic bearing and distance in meters from the friendly position to the target, if available.) Identifiable ground features, danger close acceptance.

Time on Target:" _____

or

Time to Target:" Standby _____ plus _____ Hack."

Figure 15-2: NATO Standard CAS Briefing Form

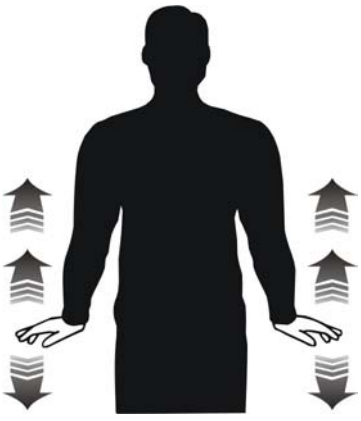
CHAPTER 16

MARSHALLING

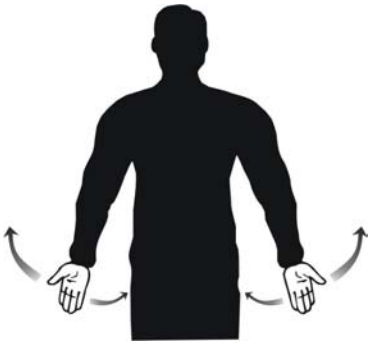
GENERAL

1. **General marshalling signals for all aircraft**. The following marshalling signals conform to STANAG 3117. All of these signals conform to ICAO Signal Standards, except where detailed.

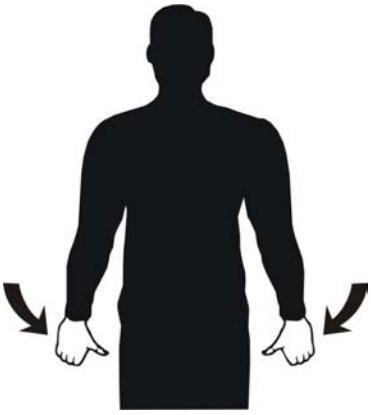
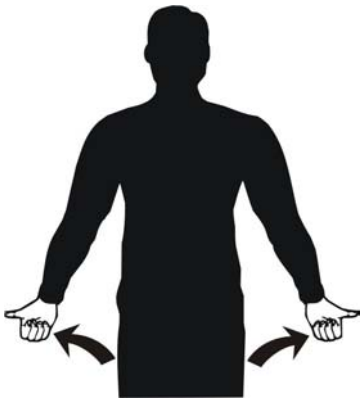
1. **AFFIRMATIVE (I WILL COMPLY OR I UNDERSTAND)** **DAY:** Hand raised, thumb up **NIGHT:** Same as day signal with wand held as extension of the arm. **AIRCREW:** One Flash of Flashlight. **CONFORMS TO ICAO SIGNAL - 'ALL CLEAR'**	 **A-1**
2. **NEGATIVE (NOT CLEAR OR I WILL NOT COMPLY)** **DAY:** Arm held out, hand below waist level, thumb turned downward. **NIGHT:** Same as day signal with wand held pointing down. **AIRCREW:** Flashlight Steady "ON". **NO ICAO SIGNAL**	 **A-2**

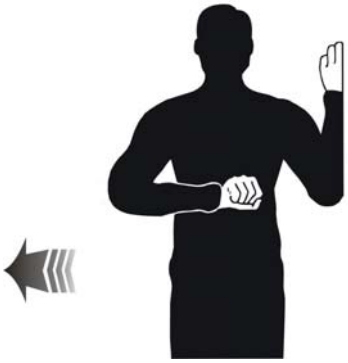
3. **THIS WAY** **DAY:** Arms above head in vertical position with palms facing inward. **NIGHT:** Same as day signal with wands held vertically and held as extension of the arms. **CONFORMS TO ICAO SIGNAL**	 **A-3**
4. **PROCEED TO NEXT MARSHALLER** **DAY:** Right or left arm down, other arm moved across the body and extended to indicate direction to next marshaller. **NIGHT:** Same as day signal with wands held as an extension of the arms. **CONFORMS TO ICAO SIGNAL**	 **A-4**
5. **SLOW DOWN** **DAY:** Arms down with palms toward ground, then moved up and down several times. **NIGHT:** Same as day signal with wands held horizontally. **CONFORMS TO ICAO SIGNAL**	 **A-5**

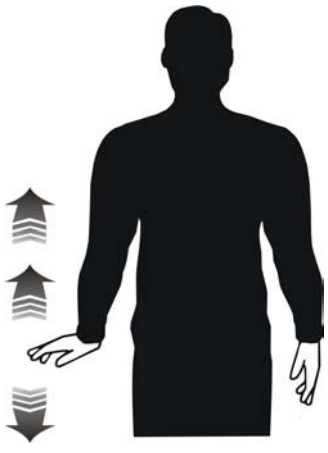
6. **TURN TO LEFT** **DAY:** Point right arm downward, left arm repeatedly moved upward and backward. Speed of arm movement indicating rate of turn. **NIGHT:** Same as day signal with wands held as extension of the arms. ***NOTE: Signals A-6 & A-7 are used for spot turns for hovering helicopters** **CONFORMS TO ICAO SIGNAL**	 **A-6**
7. **TURN TO RIGHT** **DAY:** Point left arm downward, right hand repeatedly moved upward and backward. Speed of arm movement indicating rate of turn. **NIGHT:** Same as day signal with wands held as extension of arms. ***NOTE: Signals A-6 & A-7 are used for spot turns for hovering helicopters** **CONFORMS TO ICAO SIGNAL**	 **A-7**
8. **MOVE AHEAD** **DAY:** Arms a little apart, palms facing backwards and repeatedly moved upward-backward from shoulder height. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **A-8**

9. **STOP** **DAY:** Arms crossed above the head palms facing forward. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **A-10**
10. **MOVE BACK (ALSO USED TO PULL AIRCRAFT UTILIZING ARRESTING WIRE)** **DAY:** Arms by sides, palms facing forward, swept and upward repeatedly to shoulder height. **NIGHT:** Same as day signal with wands held as extension of the arms. **CONFORMS TO ICAO SIGNAL**	 **A-11**
11. **TURNS WHILE BACKING** **TAIL TO LEFT** **DAY:** Point right arm down and left arm brought from overhead vertical position to horizontal position, repeating left arm movement. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **A-12**

12. **TURNS WHILE BACKING** **TAIL TO RIGHT** **DAY:** Point left arm down and right brought from overhead, vertical position to horizontal forward position, repeating right arm movement. **NIGHT:** Same as day signal with wands held as extension of the arms. **CONFORMS TO ICAO SIGNAL**	 **A-13**
13. **REQUEST/CLEARANCE FOR PERSONNEL TO APPROACH AIRCRAFT** **DAY:** A beckoning motion with either hand at eye level. **NIGHT:** A continuously flashing light. **CONFORMS TO ICAO SIGNAL**	 **A-14**
14. **REQUEST BY MARSHALLER TO MOVE PERSONNEL TOWARD AIRCRAFT** **DAY:** Left hand raised vertically overhead, palm towards aircraft. The other hand lowered, palm facing inwards. **NIGHT:** Same as day signal but only the raised wand illuminated and flashing. **NO ICAO SIGNAL**	 **A-15**

15. **PERSONNEL APPROACH THE AIRCRAFT** **DAY:** Either hand raised vertically overhead, palm toward aircraft. The other hand indicated to personnel concerned and gestures toward aircraft. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **A-16**
16. **INSERT CHOCKS** **DAY:** Arms down, fists closed, thumbs extended inwards, swing arms from extended position inwards. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **A-17**
17. **REMOVE CHOCKS** **DAY:** Arms down, fists closed, thumbs extended outwards, swing arms outwards. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **A-18**

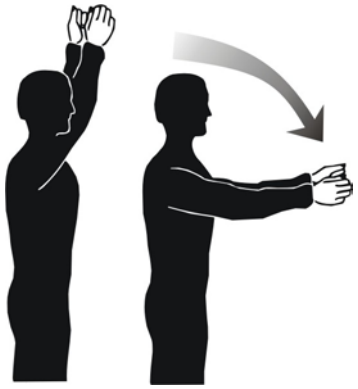
18. **DOWN LOCKS/ UNDERCARRIAGE PINS INSTALL** **DAY:** Left arm bent vertically in front with fist clenched, right arm bent horizontally in front with fist clenched and held motionless at left elbow. **NIGHT:** Same as day with addition of wands. Perpendicular to aircraft. **NO ICAO SIGNAL**	 **A-19**
19. **DOWN LOCKS/ UNDERCARRIAGE PINS REMOVE** **DAY:** Left arm bent vertically in front with fist clenched, right arm bent horizontally in front with fist clenched at left elbow. Right fist moves horizontally away from left elbow. **NIGHT:** Same as day with addition of wands. **NO ICAO SIGNAL**	 **A-20**
20. **GROUND ELECTRICAL POWER SUPPLY INSERT** **DAY:** Hands above head, left fist partially clenched, right hand moved in direction of left hand with first two fingers extended and inserted into circle made by fingers of the left hand. **NIGHT:** Same as day signal with left wand held vertical and right wand held horizontal. **NO ICAO SIGNAL**	 **A-21**

21. **GROUND ELECTRICAL POWER SUPPLY DISCONNECT** **DAY:** Hands above head, left fist partially clenched, right hand moved away from left hand withdrawing first two fingers from circle made by fingers of the left hand. **NIGHT:** Same as day signal with left wand held vertical and right wand held horizontal. **NO ICAO SIGNAL**	 **A-22**
22. **START ENGINE(S)** **DAY:** Left hand overhead with appropriate number of fingers extended to indicate the number of the engine to be started, and circular motion of right hand at head level. **NIGHT:** Similar to the day signal except the wand in the left hand will be flashed to indicate the engine to be started. **CONFORMS TO ICAO SIGNAL**	 **A-25**
23. **SLOW DOWN ENGINE(S) ON INDICATED SIDE** **DAY:** Arms down, with either right or left arm moved up or down, palm facing down, indicating that left or right side engines respectively should be slowed down. **NIGHT:** Same as day signal with one wand moved horizontal to ground. **CONFORMS TO ICAO SIGNAL**	 **A-26**

24. **CUT ENGINES** **DAY:** Either arm and hand, level with shoulder, with hand moving across throat palm down. **NIGHT:** Same as the day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **A-27**
25. **FIRE** **DAY:** Make rapid horizontal figure of eight motion at waist level with either arm, pointing at source of fire with the other. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **A-28**
26. **TAILWHEEL LOCK** **DAY:** Wrists together overhead, opened to form in a V, then closed suddenly. **NIGHT:** Same as day signal with wands used as extension of hands. **NO ICAO SIGNAL**	 **A-29**

27. **ABANDON AIRCRAFT** **DAY:** Simulate unfastening seat belt and shoulder straps and throwing them up and off. **NIGHT:** Same as day signal with wands held as extension of arms. **NO ICAO SIGNAL**	 **A-35**
28. **TAKE OFF** **DAY:** Arms extended horizontally sideways beckoning upwards. **NIGHT:** Same as day signal with wands held as extension of arms. **NO ICAO SIGNAL**	 **B-1**
29. **HOVER** **DAY:** Arms extended horizontally sideways, palms downwards. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **B-2**

30. **VERTICAL MOVEMENT - MOVE UPWARDS** **DAY:** Arms extended horizontally sideways beckoning upwards, with palms turned up. Speed of movement indicates rate of ascent. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **B-3**
31. **MOVE TO LEFT** **DAY:** Right arm extended horizontally sideways in direction of movement and other arm swung over the head in same direction in a repeating movement. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **B-4**
32. **MOVE TO RIGHT** **DAY:** Left arm extended horizontally sideways in direction of movement and other arm swung over the head in same direction in a repeating movement. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **B-5**

33. **CLEAR** **DAY:** Both arms extended on same side above shoulder level in direction clear to fly off. **NIGHT:** Same as day signal with wands used as extension of arms. **NO ICAO SIGNAL**	 **B-6**
34. **WAVE OFF** **DAY:** Waving of arms over the head. **NIGHT:** Same as day signal with wands held as extension of arms. **COMFORMS TO ICAO SIGNAL**	 **B-8**
35. **LANDING DIRECTION** **DAY:** Marshaller stands with arms raised vertically above head and facing towards the point where the aircraft is to land. The arms are lowered repeatedly from a vertical to a horizontal position, stopping finally in the horizontal position. **NIGHT:** Same as day signal with wands held as extension of hands. **CONFORMS TO ICAO SIGNAL**	 **B-9**

36. **MOVE DOWNWARDS** **DAY:** Arms extended horizontally sideways beckoning downwards with palms turned down. Speed of movement indicates rate of descent. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **B-10**
37. **REMOVE BLADE TIE-DOWNS** **DAY:** Left hand above head, right hand pointing to individual boots for removal. **NIGHT:** Same as day signal with wands held as extension of arms. **CONFORMS TO ICAO SIGNAL**	 **B-11**
38. **ENGAGE (ROTOR(S)** **DAY:** Circular motion in horizontal plane with right hand above head. **NIGHT:** Same as day signal with wands held as extension of arms. **NO ICAO SIGNAL**	 **B-12**

39. **HOOK UP LOAD** **DAY:** Rope climbing motion with hands. **NIGHT:** Same as day signal with wands held as extension of hands. **NO ICAO SIGNAL**	 **B-13**
40. **WINCH DOWN** **DAY:** Left arm horizontal in front of body, fist clenched, right hand with palm turned downwards making downward motion. **NIGHT:** Same as day signal with wands held horizontally, perpendicular to aircraft. **NO ICAO SIGNAL**	 **B-14**
41. **CUT CABLE** **DAY:** Right arm extended forward horizontally, fist clenched, left arm making horizontal slicing movements below the right fist, palm downward. **NIGHT:** Same as day signal with wands used as extension of arms. **NO ICAO SIGNAL**	 **B-15**

42. **SPREAD PYLON** **DAY:** Bend elbow across chest, palm downward. Extend arm outward to horizontal position keeping palm open and facing downward. **NIGHT:** Same as day signal with wands used as extension of arms. **NO ICAO SIGNAL**	 **B-16**
43. **COMMENCE FUELLING/ CLEAR TO COMMENCE FUELLING/ PRESSURE ON** **DAY:** Helo crew member makes circular motion with right hand. **NIGHT:** Helicopter crew member makes circular motion with flashlight, ground crew member uses wand. **NO ICAO SIGNAL**	 **B-18**
44. **READY TO DISCONNECT AND RETURN HOSE** (When made by helicopter crew member) and **RETURN HOSE** (when made by ground crew) **DAY:** Helicopter crew member/ ground crew member makes vertical motion of hand. **NIGHT:** Helicopter crew member makes vertical motion of flashlight. **NO ICAO SIGNAL**	 **B-19**

45. **FUEL LOAD IS CLOSE TO BEING REACHED** **DAY:** Right hand is held across the chest at the left shoulder indicating that the required fuel load is close to being reached. This signal is normally followed by the signal, **Stop Refuelling**. **NIGHT:** Same as day signal with wands held as extension of hands. **PILOT:** Pilot's Flashlight Steady "ON". (During HCCR Ops, at the pilot's initiative, following the commencement of refuelling). **NO ICAO SIGNAL**	
46. **STOP REFUELLING** **DAY:** Right hand is waved laterally repeatedly. Unless in an emergency, this signal normally follows the signal**, Fuel Load is Close to Being Reached**. **NIGHT:** Same as day signal with wands held as extension of hands. **PILOT:** Pilot's Flashlight Steady "ON", moved laterally in repetition. (During HCCR Ops, following Fuel Load is Close to Being Reached Signal). **NO ICAO SIGNAL**	
47. **FUEL SPILL** **DAY:** Right hand is drawn across the forehead with the left hand extended and pointed toward fuel spill. **NIGHT:** Same as day signal with wands held as extension of hands. **NO ICAO SIGNAL**	

MARSHALLING HELICOPTERS DURING SLINGING OPERATIONS

2. **General**. All marshallers shall know the current NATO standard marshalling signals applicable for helicopter slinging operations and any supplementary Canadian signals designed for 1 Wing slinging operations.

3. **External Loads**:

a. A marshaller and at least one hook-up person should be provided for each helicopter when attaching external loads.

b. The hook-up person will ensure the discharge of static electricity from the helicopter before attaching the load. The marshaller must be positioned in sight of the helicopter pilot and will direct the helicopter until it is directly over the load. The Flight Engineer (FE) will direct the pilot by onboard verbal communications to both augment the marshaller when approaching the load and then become the primary means of providing directions, once the helicopter is positioned over the load. The hook-up person will hook-up the load to the helicopter hook.

c. after hooking up the load, the marshaller will indicate to the pilot that the load is attached. The hook-up person will ensure that the hook is properly closed and will guide the slings until the slack is taken up to ensure that they do not foul the load; and

d. when the slings are seen to be taught and correctly fitted, the hook-up person will move a safe distance away, (about 20 metres to the right side of the helicopter, where the FE is positioned to see the personnel move away). When the load is clear of the ground and the marshaller is satisfied that it is secure and properly suspended, an "affirmative" (all clear) signal shall be given to the pilot.

4. **Night Operations**:

a. When possible, marshallers shall examine the landing site during daylight hours, prior to conducting night ops.

b. Lighting devices will be required by the marshallers to display signals to the aircrew. The intensity of these lights will vary depending on the means of vision (i.e. unaided or with NVGs) used by the aircrew.

c. Reference lighting for external load operations will be provided by the supported unit.

d. **Personnel**. There must be strict movement of personnel on the ground during NVG ops as personnel without NVGs will not be adequately able to see the position of the helicopter. The optimum situation is to have

both the marshaller and the hook-up person equipped with NVGs. The marshaller will use red chemical lights as marshalling wands.

e. **Lighting**. During all NVG helicopter operations, there must be strict light discipline in the LZ/PZ. As the helicopter approaches the pickup point, only the load to be picked up will be marked with a red chemical stick. The helicopter may have no visible exterior lights "ON" during the operation, except for the IR searchlight and essential internal cockpit lighting. The FE will illuminate the cargo hook with a handheld flashlight during hook-up. When personnel not conducting the hook-up are not equipped with NVGs, the helicopter shall operate with navigation lights on "DIM" as a minimum and the position where the load is to be dropped will be identified by a red chemical light. If there is more than one drop-off point in the LZ, the marshaller must indicate which drop-off point is to be used by pointing to the required spot.

f. **Helicopter Unit**. The helicopter unit may issue special instructions on hook-up procedures, if necessary, to deal with unusual situations.

5. **Emergencies**. In case of an emergency the helicopter may need to land quickly, avoiding the load. The helicopter will normally attempt to land to the left of the load; consequently, the hook-up person should clear to the right as soon as possible, as shown in Figure 16-1, or as briefed for an unusual situation.

6. **Multi-Helicopter Slinging Operations**. In situations when more than one helicopter operates in one PZ/LZ, coordination is essential. The distance between pickup points should never be less than 35m, but may be more, depending on the terrain, obstacles and aircraft characteristics. The use of aviation LOs to coordinate pickup is an efficient means of ensuring control and coordination, if unforeseen changes occur to the plan.

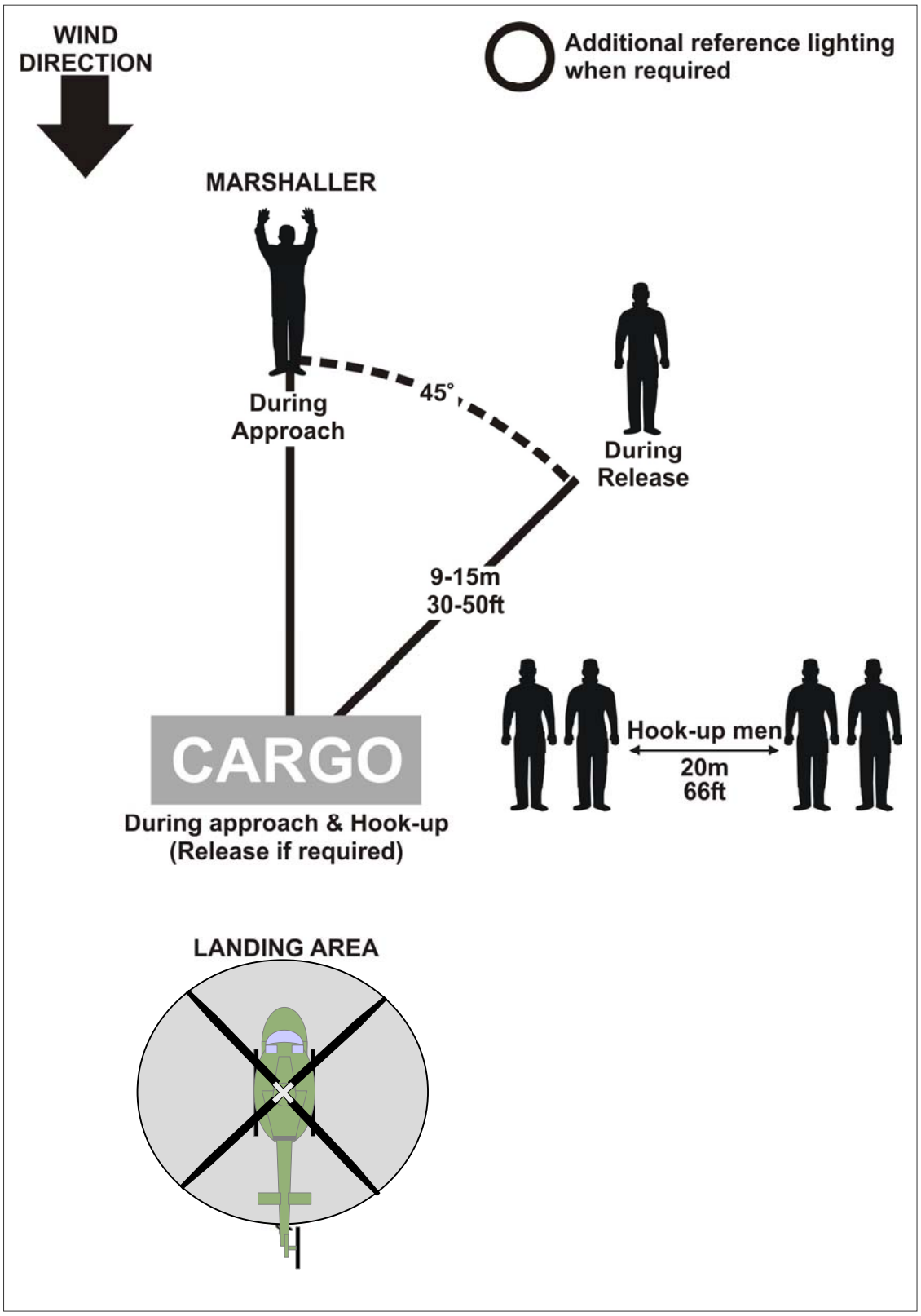


Figure 16-1: Position of Helicopter Marshaller and Hook-up/Release Personnel

ABBREVIATIONS AND ACRONYMS

AA	Assembly Area
AAA	Anti-Aircraft Artillery
AAR	After Action Report
AAAD	All Arms Air Defence
AAH	Anti-Armour Helicopter
AAM	Air-to-Air Missile
ABCCC	Airborne Command, Control and Communications
ABCA	America, Britain, Canada and Australia
ABDR	Aircraft Battle Damage Repair
AC	Aircraft Captain/Aircraft Commander
Ac	Aircraft
ACA	Airspace Control Authority
ACC	Air Component Commander
ACL	Allowable Cabin/Cargo Load
ACM	Airspace Control Measures
ACO	Airspace Control Order
ACP	Air Control Point
ACS	Airspace Control System
AD	Air Defence
ADC	Air Defence Commander
ADA	Air Defence Artillery
ADTB	Army Doctrine Tactics Board
AFC	Airmobile Force Commander
AFV	Armoured Fighting Vehicle

AGM	Air to Ground Missile
AGL	Above Ground Level
AH	Attack Helicopter
AI	Area of Interest
ALO	Air Liaison Officer
AMC	Aviation Mission Commander
AMO	Aircraft Maintenance Organization
AMS	Avionics Management System
AMSFOR	Airmobile Security Forces
AMRAAM	Advanced Medium Range Air-to-Air Missile
AO	Area of Operations
AOP	Air Observation Post
AOC	Area Operations Centre
AOCC	Air Operations Coordination Centre
ARH	Armed Reconnaissance Helicopter
ASAP	As Soon As Possible
ASE	Aircraft Survivability Equipment
ASOC	Air Support Operations Centre
ASC	Airspace Control
ASRAAM	Advanced Short Range Air-to-Air Missile
AT	Anti-Tank
ATC	Air Traffic Control
ATGM	Anti-Tank Guided Missile
ATO	Air Tasking Order
AUC	Aviation Unit Commander

AUW	All-Up Weight
AWACS	Airborne Warning And Control System
BC	Battery Captain
BDR	Battle Damage Repair
BDZ	Base Defence Zone
BP	Battle Position
BSA	Brigade Support Area
C2	Command and Control
CAS	Close Air Support
CATO	Concealed Approach and Take Off
CCP	Coordination Control Point
CEOI	Communications Electronic Operating Instructions
CFSA	Corps Forward Support Area
CL	Coordination Level
CLA	Creeping Line Ahead
C&L	Command and Liaison
CMDS	Counter Measures Dispensing System
CO	Commanding Officer
COMD	Commander
COMJAM	Communications Jamming
COMSEC	Communications Security
COPPED	Cover, Obstacles, Position of fire, Position of observation, Enemy, Distance
COSCOM	Corps Support Command
CP	Command Post

CRSA	Corps Rear Support Area
CS	Close Support
C/S	Call Sign
CSA	Corps Support Area
CSAR	Combat Search and Rescue
CSS	Combat Service Support
C2	Command and Control
C3	Command, Control & Communications
DA	Density Altitude
D/AMC	Deputy Aviation Mission Commander
DC	Dangerous Cargo
DCO	Deputy Commanding Officer
DEWS	Defensive Early Warning Suite
DF	Direction Finding
DISGP	Division Service Group
DME	Distance Measuring Equipment
DP	Decision Point
DS	Direct Support
DSA	Divisional Support Area
DTC	Data Transfer Cartridge
DTG	Date Time Group
EA	Engagement Area
ECM	Electronic Counter Measures
ECCM	Electronic Counter-Counter Measures
ELINT	Electronic Intelligence

ELT	Emergency Locator Transmitter
EMCON	Emission Control
EO	Electro-Optical
EP	Electronic Protection
EPIRB	Emergency Position Indicating Rescue Beacon
EPM	Electronic Protection Measures
ERSTA	Electro-optical Reconnaissance Surveillance and Target Acquisition
ES	Electronic Support
ESM	Electronic Support Measures
ETA	Estimated Time of Arrival
EW	Electronic Warfare
EWO	Electronic Warfare Officer
FAA	Forward Assembly Area
FAADS	Forward Area Air Defence System
FAC	Forward Air Controller
FARE	Forward Area Refuelling Equipment
FARP	Forward Arming and Refuelling Point
FC	Fire Coordinator
FCO	Fire Control Order
FCM	Fire Control Measures
FE	Flight Engineer
FEBA	Forward Edge of the Battle Area
FFA	Free Fire Area
FFE	Fire For Effect

FLET	Forward Line Enemy Troops
FLIR	Forward Looking Infra-Red
FLOT	Forward Line of Own Troops
FOB	Forward Operating Base
FOO	Forward Observation Officer
FRAG O	Fragmentation Order
FS	Fire Support
FSCC	Fire Support Coordination Centre
FSCL	Fire Support Coordination Line
FSE	Fire Support Element
FSO	Fire Support Officer
GPS	Global Positioning System
GPMG	General Purpose Machine Gun
GS	General Support
HA	Holding Area
HAZMAT	Hazardous Material
HCCR	Hot Closed Circuit Refuelling
HELACK	Acknowledgement to Helicopter Request Message
HELLSREP	Helicopter Landing Site Report
HELQUEST	Helicopter Request Message
HELTASK	Helicopter Tasking Message
HF	High Frequency
HIDACZ	High Density Airspace Control Zone
HLVW	Heavy Logistics Vehicle Wheeled
HLS	Helicopter Landing Site

HTH	Heavy Transport Helicopter
HUD	Head-Up Display
HUMINT	Human Intelligence
HVQK	Have Quick (frequency modulation)
IAS	Indicated Air Speed
IFF	Identification Friend or Foe
IFR	Instrument Flight Rules
IFV	Infantry Fighting Vehicle
IGE	In Ground Effect
IMC	Instrument Meteorological Conditions
IIMC	Inadvertent Instrument Meteorological Conditions
IMINT	Image Intelligence
IO	Intelligence Officer
Info Ops	Information Operations
IP	Initial Point
IPB	Intelligence Preparation of the Battlefield
IR	Infra-Red
IRSS	Infra-Red Suppression System
ISB	Initial Staging Base
ISTAR	Intelligence, Surveillance, Target Acquisition and Reconnaissance
JAAT	Joint Air Attack Team
JC2IS	Joint Command and Control Information System
JFACC	Joint Force Air Component Commander
JFC	Joint Force Commander
JSEAD	Joint Suppression of Enemy Air Defences

JTF	Joint Task Force
KIAS	Knots Indicated Air Speed
LD	Line of Departure
LDO	Laser Designator Operator
LEP	Light External Pintle
LEPC	Light External Pintle Connector
LLAD	Low Level Air Defence
LLTR	Low Level Transit Route
LO	Liaison Officer
LOC	Lines of Communications
LOH	Light Observation Helicopter
LP	Landing Point
LPH	Light Pintle Head
LRSU	Long Range Surveillance Units
LS	Landing Site
LSVW	Light Support Vehicle Wheeled
LTL	Laser to Target Line
LUC	Lifted Unit Commander
LUH	Light Utility Helicopter
LZ	Landing Zone
MANPADS	Man Portable Air Defence System
MBT	Main Battle Tank
MCL	Maximum Combat Load
MEZ	Missile Engagement Zone
MLH	Medium Lift Helicopter

MLRS	Multiple Launch Rocket System
MLVW	Medium Logistics Vehicle Wheeled
MOPP	Mission Oriented Protective Posture
MPS	Mission Planning Station
MRAAM	Medium Range Anti-Armour Missile
MRAAW	Medium Range Anti-Armour Weapon
MSO	Maintenance Support Officer
MSR	Main Supply Routes
MTH	Medium Transport Helicopter
NAI	Named Areas of Interest
NBC	Nuclear, Biological, Chemical
NEO	Non-combatant Evacuation Operation
NFA	No-Fire Area
NFL	No-Fire Line
NOCL	Notice Of Crash Location
NOE	Nap of the Earth
NORDO	No Radio
NVD	Night Vision Device
NVG(s)	Night Vision Goggle(s)
OGE	Out of Ground Effect
OIC	Officer In Charge
OOTW	Operations Other Than War
OP	Observation Post
OPCOM	Operational Command
OPCON	Operational Control

Op O	Operations Order
PA	Pressure Altitude
PGM	Precision Guided Munition
PIR	Priority Intelligence Requirement
PL	Phase Line
PLB	Personal Locator Beacon
POC	Point(s) of Contact
POL	Petrol, Oil and Lubricants
PSO	Peace Support Operations
PUP	Pull Up Point
PZ	Pick-up Zone
QRF	Quick Reaction Force
RAH	Reconnaissance Attack Helicopter
RAS	Rear Area Security
RCC	Rescue Coordination Centre
RFL	Restrictive Fire Line
RLWR	Radar Laser Warning Receiver
ROA	Restricted Operations Area
ROE	Rules of Engagement
RON	Remain Over Night
ROZ	Restricted Operations Zone
RP	Replenishment Point
RPV	Remotely Piloted Vehicle
RRB	Relay Rebroadcast Station
RSO	Range Safety Officer

RT	Radio Telecommunications
RTB	Return To Base
RV	Rendezvous
RLWR	Radar Laser Warning Receiver
SA	Safety Assistant
SAAFR	Standard use Army Aircraft Flight Route
SAM	Surface to Air Missile
SAR	Search and Rescue
SC	Special Corridor
SEAD	Suppression of Enemy Air Defence
SHORAD	Short Range Air Defence
SIC	Subject Indicator Code
SIF	Selective Identification Feature
SIGINT	Signals Intelligence
SMM	Standard Manoeuvre Manual
SOI	Signal Operating Instructions (see also CEOI)
SOP(s)	Standard Operating Procedure(s)
SPINS	Special Instructions
TA	Target Acquisition
TACAIR	Tactical Air Support
TAC CP	Tactical Command Post
TACOM	Tactical Command
TACON	Tactical Control
TACP	Tactical Air Control Party
TAI	Target Areas of Interest

TAMS	Tactical Air Movement Section
TC	Transit Corridor
TH	Transport Helicopter
TI	Thermal Imagery
TMRR	Temporary Minimum Risk Route
T/O	Take-Off
TO&E	Tables of Organization and Equipment
TOW	Tube-launched Optically-tracked Wire-Guided
TR	Transit Route
TTPs	Tactics, Techniques and Procedures
TUA	TOW Under Armour
UAV	Unmanned Aerial Vehicles
UH	Utility Helicopter
UMS	Unit Medical Station
UTTH	Utility Tactical Transport Helicopter
VNE	Velocity Not to Exceed
VTOL	Vertical Take Off and Landing
WCO	Weapon(s) Control Order
WCS	Weapons Control Status
WFZ	Weapons Free Zone
WP	White Phosphorus

GLOSSARY

AEROMEDICAL EVACUATION (MEDEVAC). The timely, efficient movement and en route care by medical personnel of wounded and injured personnel from the battlefield and other locations to medical treatment facilities.

AIRCRAFT CAPTAIN/ AIRCRAFT COMMANDER (AC). The aircrew member designated by competent authority as being in command of an aircraft and responsible for its safe operation and accomplishment of the assigned mission. (AAP-6).

AIRMOBILE OPERATION. An operation in which combat forces and their equipment move about the battlefield in aircraft, normally helicopters, under the control of a ground force commander, to engage in ground combat. (ADTB).

AIR MOVEMENT. Air transport of units, personnel, supplies and equipment including airdrops and air landings. (AAP-6).

AIR OBSERVATION POST (AOP). An airborne position from which military observations are made, or fire directed and adjusted, and which possess appropriate communications. (AAP-6).

AIR SUPPORT OPERATIONS CENTRE (ASOC). An agency of a tactical control system, collocated with a corps headquarters or an appropriate land headquarters, which coordinates and directs CAS and other tactical air support.

AIRSPACE COORDINATION AREA (ACA). A three-dimensional block of airspace that provides lateral and altitude separation between aircraft and other fire support assets, and is established by a brigade or higher.

AIRSPACE CONTROL ORDER (ACO). When all airspace requests have been correlated and conflicts resolved, the Air Component Commander will promulgate the Airspace Control Order. Airspace Control Measures (ACMs) and procedures are normally in force for the period of validity of the ACO. (See ATP-40).

ANTI-ARMOUR HELICOPTER (AAH). A helicopter armed primarily for use in the destruction of armoured targets. Also called ‘anti-tank helicopter’. (AAP-6).

ARMED HELICOPTER. A helicopter fitted with weapons or weapon systems. (AAP-6).

ASSAULT AIRCRAFT. Powered aircraft, including helicopters, which move assault troops and cargo into an objective area and which provide for their resupply. (AAP-6).

ATTACK HELICOPTER (AH). A helicopter specifically designed to employ various weapons to attack and destroy enemy targets. (AAP-6).

AVIATION. Helicopters and other battlefield aerial vehicles, together with their organic support, employed in land operations.

CASUALTY EVACUATION (CASEVAC). The movement of casualties to initial treatment facilities and/or to medical facilities in the combat zone.

CATERPILLAR MOVEMENT. Tactical movement in which the forward element waits for the rear element to move to its position, before continuing its advance.

CHALK COMMANDER. The commander of all troops embarked under one chalk number. (AAP-6).

CHALK NUMBER. The number given to a complete load and to the transporting carrier. (AAP-6). (See also 'Serial').

CLOSE FORMATION. Formation spacing normally three to five rotor disc diameters at night and not less than 5 rotors during the day between aircraft in a section and ten rotors between section leads in an element measured between tip-path planes between aircraft.

COMBAT AIRLIFT/ TACTICAL TRANSPORT. The air movement of combat personnel, supplies and/or cargo over short or medium distances, normally in the brigade AOR;

COMBAT SEARCH AND RESCUE (CSAR). The detection, location, identification and rescue of downed aircrew in hostile territory in crisis and wartime, and when appropriate, isolated military personnel in distress, who are trained and equipped to receive CSAR support, throughout the theatre of operations. (STANAG 7030).

COMMAND AND LIAISON (C&L). C&L is the rapid transport of commanders, staff, and liaison officers to save time in battle procedure and to provide commanders with an aerial perspective of their area of operations.

COMMUNICATIONS ASSISTANCE. The assistance to communications by means of radio rebroadcast, radio relay, airborne command post or the physical delivery of operational material by helicopter (aerial dispatch).

CONTOUR FLIGHT. A flight technique designed to take advantage of terrain cover, while enabling the pilot to maintain en route airspeeds ranging from 60 to 120 KIAS. Flown at relatively constant altitudes AGL, between 15 and 50 feet, the flight path is varied to make use of the available ground, obstacles and/or vegetation.

CONTROL. See "Operational Control", "Tactical Control".

COORDINATION ALTITUDE. An altitude that separates air operations from aviation operations, normally expressed in feet, AGL.

COUNTER-MOBILITY. All actions taken to restrict the capacity of movement of the opponent.

CREWMAN. A member of the helicopter crew who travels in the cargo/passenger compartment in certain Helicopters. His duties include taking charge of the chalk troops from emplaning to deplaning.

DIRECTION AND CONTROL OF FIRE. The airborne adjustment of both indirect and direct fire. These fires can come from artillery, mortars, naval guns, close air support aircraft or armed/ attack helicopters.

ELEMENT. A sub-component of a large formation normally comprised of two or more sections with a designated lead having responsibilities in conjunction with the formation's operation, but subordinate to the formation leader. Elements should normally be composed of helicopters with similar capabilities.

EXTENDED FORMATION. Formation spacing normally ten rotors to 1000 metres between aircraft in a section and 300 to 1000 metres between section leads in an element.

F-HOUR. F-Hour is the time at which the first helicopter crosses the Forward Line of Own Troops (FLOT) in a cross-FLOT operation.

FIRE SUPPORT COORDINATION LINE (FSCL). A line established by the appropriate ground commander to ensure coordination of fire not under his control but which may affect current tactical operations. The FSCL is used to coordinate fires of air, ground or sea weapons systems using any type of ammunition against surface targets.

FORMATION LEADER. The individual given responsibility for the planning and conduct of the operation of the formation as a whole.

FORWARD AIR CONTROLLER (FAC). A qualified individual, who from a forward position on the ground or in the air, directs the action of combat aircraft engaged in close air support of land forces.

FREE FIRE AREA (FFA). A specific, designated area into which any weapons system may fire without additional coordination with the establishing headquarters.

H-HOUR. The specific time at which an operation or exercise commences or is due to commence. It is also the time at which the Line of Departure is crossed by the leading elements in an attack.

HELICOPTER. See Anti-armour Helicopter;

a. Armed Helicopter;

b. Assault Aircraft;

c. Attack Helicopter;

d. Observation Helicopter;

e. Reconnaissance Helicopter;

f. Transport Helicopter; or

g. Utility Helicopter;

HELI-BORNE OPERATION. An operation in which helicopters act in support of a formation, unit or organization to accomplish the movement of troops, supplies and/or equipment.

HELICOPTER LANDING SITE. A site within a landing zone containing one or more landing points.

HELICOPTER MUTUAL SUPPORT. The support provided by one helicopter for another helicopter(s) during a mission.

HIGH DENSITY AIRSPACE CONTROL ZONE (HIDACZ). An area of intense ground operations over which friendly aircraft may be at risk from friendly air defence weapons. A HIDACZ is requested by a land force commander who then controls all the air activity within it.

HOISTING. Lowering or raising troops or cargo by means of a winch or hoist under the control of a helicopter crew member. (Also known as 'Winching' - NATO).

HOOK-UP MAN. The person responsible for attaching the external load and for controlling the take-up of strain of the load slings.

HOUR. See F-Hour;

a. H-Hour;

b. L-Hour; or

c. Y-Hour.

IDENTIFICATION, FRIEND OR FOE (IFF). A system using electromagnetic transmissions to which equipment carried by friendly forces automatically responds, for example, by emitting pulses, thereby distinguishing themselves from enemy forces. (AAP-6). (See also ‘Selective Identification Feature’).

JOINT AIR ATTACK TEAM (JAAT). A coordinated attack involving a combination of aviation and CAS aircraft, supported by field artillery or naval gunfire.

LANDING LIGHT SYSTEM. Lighting equipment on the ground to assist approach and landing.

LANDING POINT. A point within a landing site where one helicopter or vertical take-off and landing aircraft can land. (AAP-6).

LANDING SITE. A site within a landing zone containing one or more landing points. (AAP-6).

LANDING ZONE (LZ). Any specified zone used for the landing of aircraft. (AAP-6).

LEAPFROG MOVEMENT. Tactical movement in which like elements are moved successively through or by one another along the axis of movement of supported forces. (STWG).

L-HOUR. In airmobile operations, the time at which the first helicopter of the heliborne assault wave touches down in the landing zone (LZ).

LOGISTIC TRANSPORT. The aerial transport of defensive stores, commodities and combat supplies either directly to the user or to delivery points where ground logistic units can store or deliver them.

LOH. See Observation Helicopter.

LOOSE FORMATION. Normally five to ten rotor disc diameters between aircraft in a section and 300 metres between section leads in an element measured between tip path planes between helicopters.

LOW LEVEL FLIGHT. A flight technique that generally conforms to a straight line and is flown at a constant altitude ASL and constant airspeed, normally in excess of 80 KIAS. Altitude AGL varies from 50 to 250 feet depending upon the variations in terrain clearance.

LOW LEVEL TRANSIT ROUTE (LLTR). A temporary corridor of defined dimensions established in the forward area to minimize the risks to friendly aircraft from friendly air defence or surface forces.

MANOEUVRE. The employment of forces through movement in combination with speed, firepower or fire potential, to attain a position of advantage in respect to the enemy.

MARSHALLER. A person who directs the ground movement of aircraft by the use of hand and arm or light signals.

MEDEVAC. See **"**AEROMEDICAL EVACUATION".

MULTI-ROLE HELICOPTER. A Helicopter that is specifically designed to carry out more than one role.

NAP OF THE EARTH (NOE) FLIGHT. Flight technique is designed to make the maximum use of the available terrain masking features. Airspeed varies from translational to 60 KIAS at 15 feet (AGL). The slower airspeeds enable the pilot to maintain minimum obstacle clearance while attaining maximum cover from vegetation, topography and other visual obstructions. This profile may be most appropriate for operations in close proximity to the enemy, high threat environments, or, on approach and departures from areas under observation.

NO FIRE AREA (NFA). An area into which no fire or effects are allowed. The two exceptions are when the establishing headquarters allows fire on a mission by mission basis or when a friendly force is engaged by an enemy located within the NFA, and the commander returns fire in self-defence

NO FIRE LINE (NFL). A line short of which artillery or ships do not fire, except on request or approval of the supported commander, but beyond which they may fire at any time without danger to friendly troops.

OBSERVATION HELICOPTER (OH). A helicopter used primarily for observation and reconnaissance but which may be used for other roles. (AAP-6).

OPERATIONAL COMMAND (OPCOM). The authority granted to a commander to assign missions or tasks to subordinate commanders, to deploy units, to reassign forces, and to retain or delegate operational and/or tactical control as may be deemed necessary. It does not of itself include responsibility for administration or logistics. May also be used to denote the forces assigned to a commander. (AAP-6).

OPERATIONAL CONTROL (OPCON). The authority delegated to a commander to direct forces assigned so that the commander may accomplish specific missions or tasks which are usually limited by function, time, or location; to deploy units concerned, and to retain or assign tactical control of those units. It does not include authority to assign separate employment of components of the units concerned. Neither does it, of itself, include administrative or logistic control. (AAP-6).

OPERATIONS OTHER THAN WAR (OOTW). An operation during peacetime and conflict that does not necessarily involve armed clashes between two organized forces

PAYLOAD. The sum of the weight of passengers and cargo that an aircraft can carry. (AAP-6).

RADIUS OF ACTION. The maximum distance a ship, aircraft, or vehicle can travel away from its base along a given course with normal combat load and return without refuelling, allowing for all safety and operating factors. (AAP-6).

RAPID REFUELLING. A means of refuelling helicopters with engines running and rotor(s) running or stopped.

RAPPELLING. Descent by a rope or tape from a helicopter and controlling such descent by a friction device applied by a descending individual or by a helicopter crew member. (Also known as ‘Abseiling’).

READY POSITION. In helicopter operations, a designated place where a helicopter load of troops and/or equipment waits for pick-up. (AAP-6).

RECONNAISSANCE. Reconnaissance is a mission undertaken to obtain information by surveillance or other detection methods, about the activities and resources of an enemy.

RECONNAISSANCE HELICOPTER. A helicopter designed primarily for reconnaissance operations.

RESTRICTIVE FIRE AREA (RFA). An area with specific restrictions and in which fire that exceeds those restrictions is not delivered without coordination with the establishing headquarters.

SECTION. A section normally constitutes two aircraft operating together in formation, one designated as "lead" and the other as "wingman". As a sub-component of a larger formation, the section lead may be given responsibilities or tasks for his section, but remains subordinate to the formation lead.

SECURITY. The condition achieved when designated information, material, personnel, activities and installations are protected against espionage, sabotage, subversion and terrorism. (AAP-6).

SELECTIVE IDENTIFICATION FEATURE (SIF). Airborne pulse type transponder that provides automatic selective identification of aircraft in which it is installed, to friend-or-foe identification installations, whether ground, shipboard, or airborne. (AAP-6). (See also 'Identification Friend or Foe').

SERIAL. An element or a group of elements within a series which is given a numerical or alphabetical designation for convenience in planning, scheduling and control (AAP-6). (See also 'Chalk Number').

SNAKE MOVEMENT. A type of caterpillar movement in which both elements are continuously on the move.

SPECIAL OPERATIONS. An operation conducted outside the normal combat and OOTW missions and tasks usually associated with tactical helicopter operations.

SPECIAL CORRIDOR (SC). An area established specifically to accomplish the special routing requirements of specific missions. (ATP-40).

STANDARD USE ARMY AIRCRAFT FLIGHT ROUTE (SAAFR). A route established below the coordination altitude to facilitate movement of helicopters in the forward area in direct support of ground operations. (ATP-40).

SURVEILLANCE. The systematic observation of the battle space by visual, aural, electronic, photographic or other means to detect, track and report enemy movements, strengths and avenues of approach.

TACTICAL AIR MOVEMENT SECTION (TAMS). Personnel who are concerned with organization and control of loading within a pick-up zone/site.

TACTICAL CONTROL (TACON). The detailed and, usually, local direction and control of movements or maneuvers necessary to accomplish missions or tasks assigned. (AAP-6).

TACTICAL REFUELLING. Refuelling during operations normally conducted away from a fixed facility.

TACTICAL SECURITY. The measures necessary to deny information to the enemy and to ensure that a force retains its freedom of action and is warned or protected against an unexpected encounter with the enemy or an attack. (AAP-6).

TACTICAL TRANSPORT. See combat airlift.

TARGET ACQUISITION (TA). The detection, identification and location of a target in sufficient detail to permit the effective employment of weapons. (AAP-6).

TERRAIN FLIGHT. Flight close to the earth's surface during which airspeed, height and/or altitude are adapted to the contours and cover of the ground in order to avoid enemy detection and fire. (AAP-6). This includes - low flying, contour flying and Nap of the Earth (NOE) flying.

TRANSPORT HELICOPTER (TH). A helicopter used primarily for the carriage of troops and/or equipment. (Also called 'Cargo Helicopter', i.e. CH 47. See also 'Utility Helicopter') Transport Helicopters are designated according to their maximum all up weight, as follows:

Light	6-7.99 tonnes;
Medium	8-10.99 tonnes
Heavy	11 tonnes and over (AC 225 (Panel X))

TRANSIT CORRIDOR (TC). A bi-directional corridor in the rear area. (Air traffic control is not normally provided). (ATP-40).

TRANSIT ROUTE (TR). A temporary, bi-directional corridor of defined dimensions, established in the forward area to minimize risks to friendly aircraft from friendly Air Defence. The dimensions are mission specific and the centre line will be defined in the ACOs by a series of points.

UTILITY HELICOPTER (UH). A multi-purpose helicopter capable of lifting troops but may be used in command and control, logistics, casualty evacuation or armed helicopter role. (AAP-6).

WEAPON(S) CONTROL ORDER (WCO). The order which promulgates the Weapons Control Status. (See WCS).

WEAPONS CONTROL STATUS (WCS). Weapons control of AD weapons systems is expressed as a status declared for a particular area and time. It defines the degree of freedom to be afforded to AD weapon systems. AD weapons systems that are able to engage targets in volumes of airspace allocated to friendly air activity automatically adopt a specified restrictive WCS in the appropriate engagement arcs regardless of the fact that a more permissive WCS might apply to them.

WEAPONS FREE. In air defence, a weapon control order imposing a status whereby weapons systems may be fired at any target not positively recognized as friendly. (AAP-6).

WEAPONS HOLD. In air defence, a weapon control order imposing a status whereby weapons systems may only be fired in self-defence or in response to a formal order. (AAP-6).

WEAPONS TIGHT. In air defence, a weapon control order imposing a status whereby weapons systems may be fired only at targets recognized as hostile. (AAP-6).

Y-HOUR. In airmobile operations the time at which the first helicopter in the first wave departs the pick-up point or pick-up zone (PZ).