

# **Registration Document**



**REGISTRATION PURSUANT TO  
SECTION 7 OF THE ENVIRONMENTAL  
ASSESSMENT ACT, 2000**

**INVOLVING**

**USE OF LONGER-RANGE PRACTICE MUNITIONS  
AT 5 WING GOOSE BAY PRACTICE TARGET AREA**

**REQUIRING THE ADDITIONAL  
TRANSFER OF ADMINISTRATION & CONTROL  
OF PROVINCIAL CROWN LAND TO  
HER MAJESTY THE QUEEN IN RIGHT OF CANADA**

**DEPARTMENT OF NATIONAL DEFENCE**

**3 December, 2001**

## REGISTRATION FORM

**NAME OF UNDERTAKING:** Use of updated practice laser-guided munitions at 5 Wing Goose Bay Practice Target Area, requiring the addition of a public safety exclusion zone.

**PROPOSER:**

(i) **Name of Corporate Body:**

Department of National Defence (DND)

(ii) **Address:**

Goose Bay Office  
National Defence Headquarters  
Ottawa, Ontario  
K1A 0K2

(iii) **General Manager:**

Name: Mr. Frank Young  
Official Title: General Manager  
Telephone Number: (613) 996-7060

(iv) **Principal Contact Person for Purposes of Environmental Assessment:**

Name: Mr. Maurice Pigeon  
Official Title: Environment and External Relations (GB 3)  
Telephone Number: (613) 992-8463  
Facsimile Number: (613) 996-7162  
Email: pigeon.ma@forces.ca

## TABLE OF CONTENTS

1.0	INTRODUCTION	4
1.1	Identification of the Proponent	4
1.2	Nature of the Undertaking	4
	1.2.1 Background	4
	1.2.2 Previous Environmental and Administrative Processes	5
1.3	The Undertaking	6
1.4	Need for the Undertaking	6
1.5	Alternatives to the Undertaking	7
1.6	Schedule for the Undertaking	7
2.0	DESCRIPTION OF THE UNDERTAKING	8
2.1	Introduction	9
2.2	Current and Future Usage	10
2.3	Environmental Protection Procedures	10
2.4	New Environmental Considerations	10
2.5	Probability of Failure	11
	2.5.1 Risk Assessment	11
2.6	Geographic Considerations	12
2.7	Timeframe for Operational Activity	12
2.8	Access	13
	2.8.1 Communicating with Civil Aviation	14
2.9	Amended Military Flight Procedure at the PTA	14
2.10	Consequence of Type 3 Ground Impact	14
	2.10.1 Impact conditions and Residue	15
3.0	ENVIRONMENTAL ASSESSMENT	16
3.1	Geomorphology	16
3.2	Vegetation	18
3.3	Wildlife	19
3.4	Assessment of Valued Ecosystem Components Vulnerability	20
3.5	Conclusion	20
4.0	HUMAN LAND USE ACTIVITIES	22
4.1	Land Use Study Approach	22
	4.1.1 Notification, Discussions and Consultations	22
4.2	Aboriginal Land Issues	23
	4.2.1 Review of Aboriginal Land Use within the Study Area	23
4.3	Non-Aboriginal Land Use within the Study Area	23
5.0	ENVIRONMENTAL MANAGEMENT	24
5.1	General	24
5.2	Identification of the Safety Exclusion Zone	24
5.3	Control of Land Access to the Safety Exclusion Zone	25
5.4	Control of Air Access to the Restricted Airspace	26

5.5	Managing Laser Guided Munitions Incidents	26
	5.5.1 Potential Fire Risk	26
	5.5.2 Site remediation	26
5.6	Project Related Options	27
5.7	Project Related Documents	27
6.0	CONCLUSION	29
7.0	APPROVAL OF THE UNDERTAKING	29
8.0	FUNDING	30
8.1	Signature	30

## **LIST OF APPENDICES**

Appendix A	Description of Air-launched bombs
Appendix B	The Evolving Military Threats, Technology and Training Requirements
Appendix C	Defining the Safety Exclusion Zone
Appendix D	Land Use Studies commissioned by DND (separate document)

## **GLOSSARY AND LIST OF ABBREVIATIONS**

1 CAD	1 Canadian Air Division
DND	Department of National Defence
GBU	Guided Bomb Unit
Lease Agreement	Transfer of Administration and Control of Crown Land to Her Majesty the Queen in Right of Canada (Province of Newfoundland and Labrador, 1995)
LGB	Laser-Guided Bomb
LLTA	Low Level Training Area
MCC	Military Coordination Center
MOU	Memorandum of Understanding
PGM	Precision Guided Munitions
PTA	Practice Target Area
RAF	Royal Air Force

## **1.0 INTRODUCTION**

### **1.1 Identification of the Proponent**

The Department of National Defence (DND) is the responsible authority for foreign military training activities conducted at 5 Wing Goose Bay. As signatories to agreements with the Government of Canada, air forces from foreign nations are authorized to conduct flying training in Canada. An implementation arrangement, known as a Memorandum of Understanding (MOU), identifies specific requirements and other terms and conditions relating to the training of the international participants at 5 Wing Goose Bay. The original MOU took effect in 1986 and was renewed for another ten-year term in 1996.

DND considers the enclosed undertaking an important element to ensure that 5 Wing facilities remain viable to the training requirements of the participating air forces - it is initiating this undertaking at their request.

### **1.2 Nature of the Undertaking**

#### **1.2.1 Background**

Flying training at Goose Bay averages 5,000 - 6,000 low level flights per year during the April to October flying season. Low-level flight training involves activity below 1000 feet and as low as 100 feet above all obstacles and is confined to a designated training area over the interior of the Quebec-Labrador peninsula. Figure 1.1 illustrates the lower portion of the training area, the entirety of which measures 130,000 square kilometres (the size of England). There is only one community (Churchill Falls, population 800) within the training area and it is protected from disturbance by a 10-nautical mile radius exclusion zone. A dozen small communities are situated some forty kilometres or more from the training area perimeter; members of these communities practice traditional hunter/gatherer harvesting activities within the training area during different periods of the year.

Seventy "camera targets" are dispersed throughout the LLTA; these are mock-up structures simulating enemy installations. Crews navigate between selected targets, often flying in river valleys and below natural ridge lines (terrain-masking) to avoid radar detection. They conduct simulated attacks using on-board cameras to verify their accuracy - no weapons or stores are launched against camera targets.

Aircrew have the opportunity to conduct weapons training through the release of non-explosive practice weapons onto defined targets within the confines of a four nautical mile radius tactical air weapons range, commonly referred to as the Practice Target Area (PTA). Inside the PTA, DND has outlined a simulated airfield, complete with mock runways, infrastructures and weapon systems for visual reference (see Figure 2). Practice attacks are conducted within the PTA using an assortment of non-explosive ordnance, including the Mark 80 series of inert free-fall "dumb" (or General Purpose, GP) bombs, ranging in weight from 250 to 2000 pounds. Since 1988, allies have also trained at the PTA utilizing an early version of "smart" bombs; these consist of dumb bombs, with specialized kits attached, enabling them to be guided to a target that is being illuminated by a laser designating device.

Technical information on the nature of the training activity, various practice weapons and their characteristics, is contained in a series of Appendices at the end of this document, as listed in the Table of Contents.

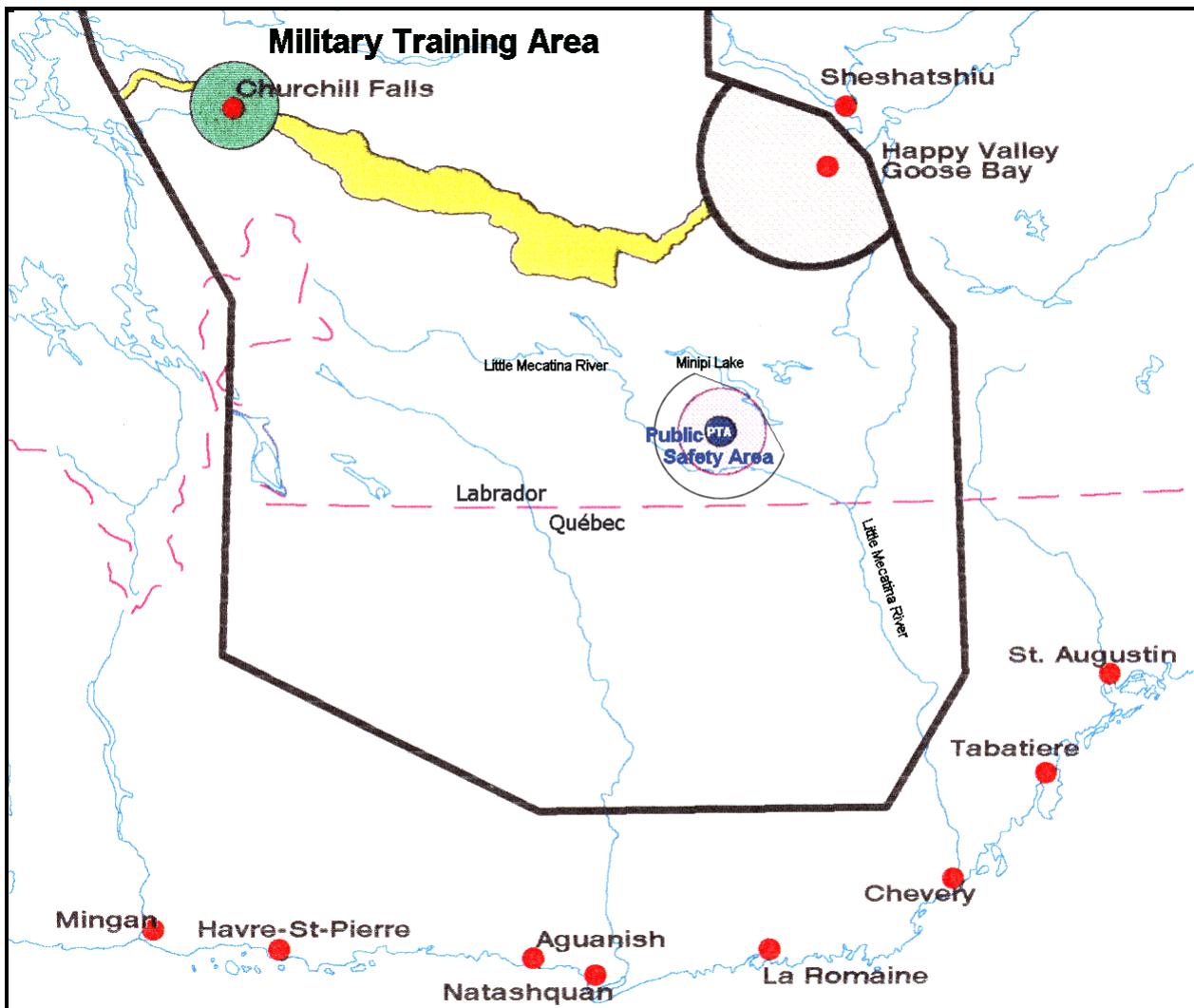


Figure 1.1. Lower portion of Military Training Area, including Public Safety Area

### 1.2.2 Previous Environmental and Administrative Processes

The whole of the training activity described above was referred to an independent environmental assessment panel for a public review under the federal Environmental Assessment and Review Process Orders guidelines. The Department of National Defence published an **Environmental Impact Statement (EIS) on Military Training Activities in Labrador and Quebec** (DND 1994), which provided the basis for subsequent technical and public hearings throughout the affected region. In 1995, the Government of Canada accepted the principal findings and recommendations of the panel, thus authorizing the continuation and controlled expansion of the activity.

Also in 1995, a **Transfer of Administration and Control of Crown Land to Her Majesty the Queen in Right of Canada** (Province of Newfoundland and Labrador Document No. 106234) formalized the establishment of the PTA lands as a “tactical air weapons range” under the administration and control of DND. This document, hereinafter referred to as the **Lease Agreement**, sets out the terms and conditions that apply to the use of those lands.



**Figure 1.2: Practice Target Area (PTA) Simulated Airfield**

The authority to use lasers on Canadian Air Force ranges rests with 1 Canadian Air Division (1 CAD) Headquarters in Winnipeg, (A3 Operational Plans). A Laser Safety Survey Report of the 5 Wing Practice Target Area was issued in January 1999.

### **1.3 The Undertaking**

The advent of technological advancements in “smart” bomb design and capability, combined with a change in their tactical employment, are resulting in a corresponding adjustment to the training activity in Goose Bay. The newer version of practice guided-bombs are much more accurate, heavier and have larger wing surfaces. Because they are also launched from a higher altitude, they have the capability to glide considerably farther than the current designs. Although all ground impacts will continue to be confined within the existing PTA, the remote possibility of a “worst case” failure may result in a practice bomb gliding out to a maximum of 16 nautical miles from the point of release. To allow for this contingency, an equivalent public safety exclusion zone of approximately 2000 square kilometres is required beyond the existing PTA perimeter.

### **1.4 Need for the Undertaking**

The undertaking represents an individual element within an overall training activity, all of which have been approved under the previous environmental panel review (DND 1994). It is not a new activity, but rather, an enhanced technological capability of an existing system that now calls for additional precautionary measures, or mitigation, to ensure public safety. The requirement for DND to control access to the public safety exclusion zone will entail an amendment to the existing Lease Agreement with the Government of Newfoundland and Labrador.

Allied air forces are increasingly making use of newer-generation laser-guided bomb munitions, such as the ones used in Afghanistan to destroy “selected” targets. They are comprised of the heavier bombs (up to 2000 lb), with a more advanced guidance system (known as Paveway III). These are generally

launched from a higher altitude and at a much longer distance from the target. To develop and retain their combat-readiness, crews need to train regularly in the use of this type of practice weapon.

Tactics are determined by the aircraft flight characteristics, and the capabilities of its weapons. Aircrew must gain experience in handling their aircraft with a full weapons load (simulated weapons) because the flight characteristics of the aircraft are considerably different with the extra weight.

### Important Notes

Appendices A and B provide some information on the assortment and capabilities of the various weapons that are based on what are known as general purpose (GP) “dumb” bombs – these have been in service use for more than 50 years. For ease of reference, and only for the purpose of this document, these will be referred to as **Type 1 bombs**. The enhancement of these bombs with an early version of laser guidance system (Paveway II) will be termed **Type 2 bombs**. Laser-guided bomb (LGB) munitions with the improved Paveway III package will be identified as **Type 3 bombs**. **Unless otherwise specified, all references to bombs or munitions in this document signify inert (non-explosive) “practice” munitions, as only they are authorized for use in the PTA.**

### Distance Conversion Table

The following conversion table may facilitate understanding equivalent distances expressed in nautical miles (military), statute miles (civilian) and kilometers (metric) found throughout this document.

Kilometres	10	0	20
Nautical Miles	5	0	10
Statute Miles	5	0	10

**1 nautical mile = 1.15 statute mile = 1.85 kilometres**

## 1.5 Alternatives to the Undertaking

The viability of the training program conducted at Goose Bay is entirely dependent on DND’s ability to offer facilities and services that continue to satisfy the evolving requirements of participating air forces. Due to continuing fiscal constraints and the competitive marketplace, it is also important that their training goals be met in a cost-effective and comprehensive manner. The inability of a particular air force to train in a crucial aspect of their operation could compromise the overall training value of their program in Goose Bay, and thus lead to an investigation of alternative training venues elsewhere in the world.

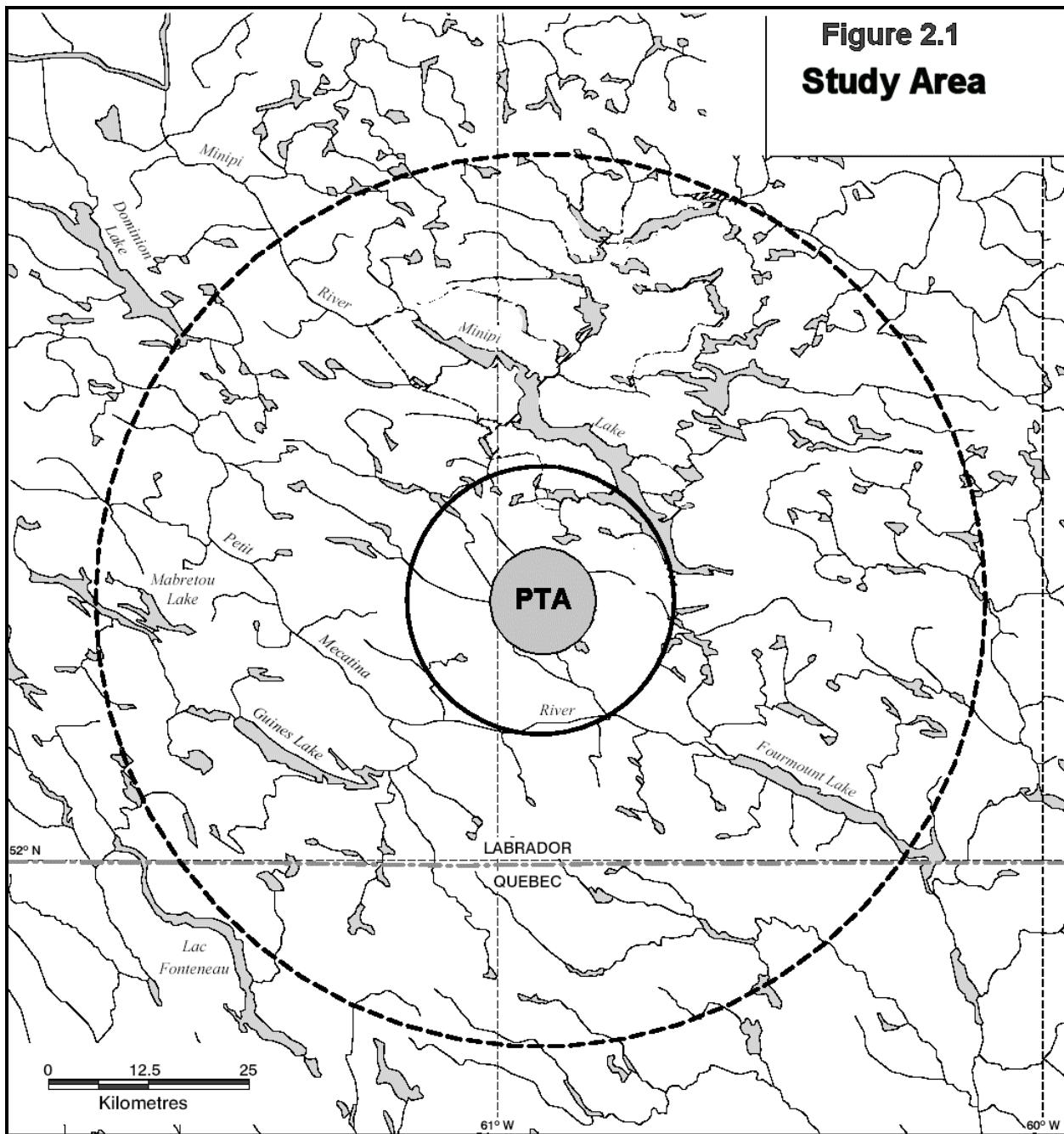
The employment and socio-economic benefits accruing from the allied training have been well documented in the 1994 EIS, and more recently, in studies sponsored by the Institute for Environmental Monitoring and Research. Over the past several decades, and for the foreseeable future, the military activity at Goose Bay represents an economic mainstay for the region.

## 1.6 Schedule for the Undertaking

Training in the use of newer-generation laser-guided bombs is scheduled to commence as early as April 2002, with the arrival of Royal Air Force detachments at Goose Bay. No physical construction is required to implement the undertaking. Arrangements will need to be finalized with Transport Canada officials and DND approving authorities to implement and publicize access restriction provisions. Once in operation, there will be an ongoing requirement for the Safety Exclusion Zone for the duration of the military training program at 5 Wing.

## 2.0 DESCRIPTION OF THE UNDERTAKING

A study area, encompassing a radius of 30 nautical miles from the centre of the PTA, was established to focus the environmental assessment. Almost twice the size of the safety exclusion zone, it affords visibility to activities and conditions lying beyond the current scope, but which may eventually come into play. This is particularly important in the context of aboriginal land interests as well as current and future economic developments in the general area by non-aboriginal interests.

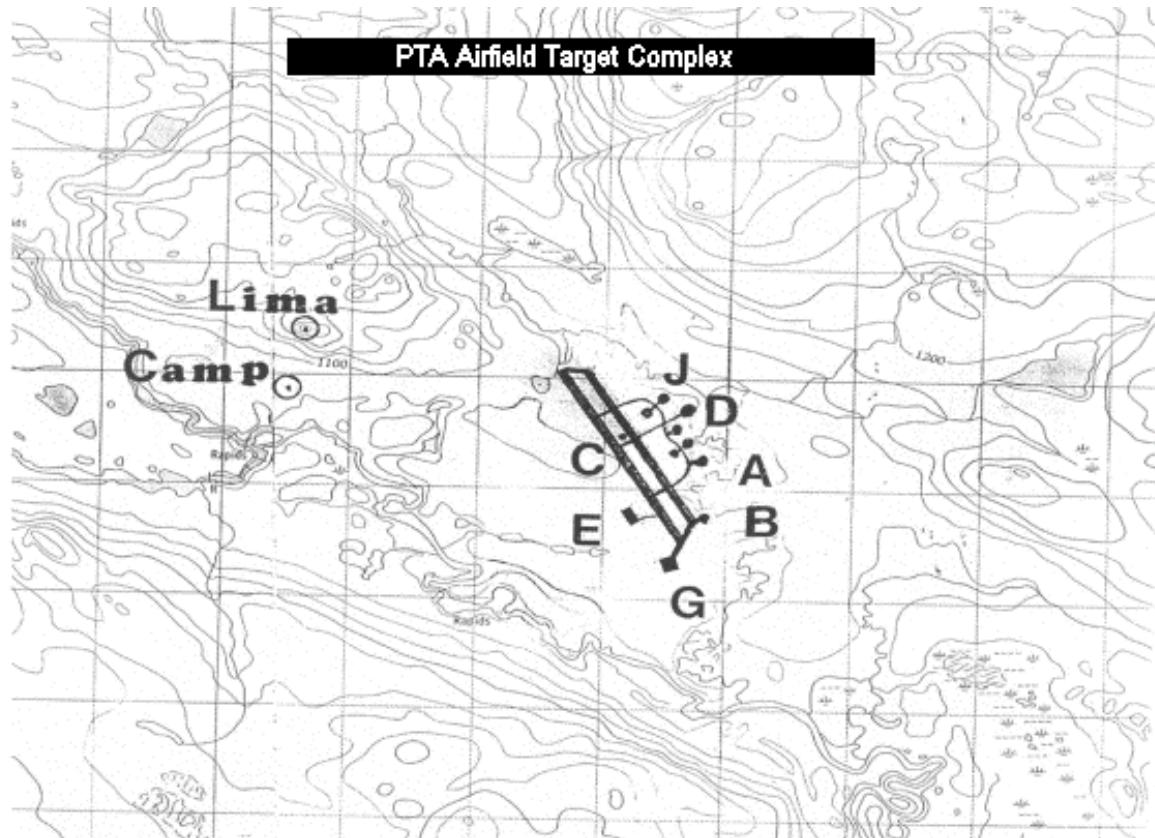


## 2.1 Introduction

Much of the training conducted at Goose Bay since the 1980s has focused on low level flying. Such tactical employment of aircraft provided a degree of security to the crews by being able to evade radar detection. Developments in airborne and ground-based anti-aircraft detection and weapons systems are increasingly denying such an advantage to low flying jet aircraft. Appendix B explains in greater detail the evolving military challenges and the accompanying technological efforts to offer solutions. As those changes take place, military training must adapt to the newer requirements.

At present, Type 2 munitions are authorized for release onto existing targets within the PTA (shown on Figure 2.2), but only from lower altitudes. The 1 Canadian Air Division armament license strictly defines the flight parameters limiting aircrew delivery options. Flight envelopes were calculated to ensure that the impact point would remain within the confines of the PTA in the event of a failure. As well, training crews may release 500, 1000 and 2000 pound inert free-fall Type 1 bombs. To obtain DND authorization for the use of the newer Type 3 munitions, which will involve release altitudes up to 20,000 feet, a public safety exclusion zone must first be established.

The establishment of such a zone does not entail the construction of an additional training area or a range, as both are already in existence. Practice weapons will not be released into this zone and no weapons testing will be conducted. No roads or access routes will be constructed.



**Figure 2.2 1:50,000 Map of Impact Area – Minipi Lake 13 C/7  
Also showing Lima observation hill and DND overnight shelter**

## **2.2 Current and Future Usage**

The addition of Type 3 munitions is not expected to result in an increase in bomb drops at the PTA. Over the last few years, an average of 300-400 of the “500 lb or more” Type 1 and 2 bombs have been dropped on the PTA. As yet, only the Royal Air Force (RAF) has indicated a requirement for Type 3 training, and that it plans to release approximately 70 of these over the coming training season. While only the RAF has this munition at the present time, any future increase in Type 3 drops will likely be accompanied by a decrease in Types 1 and 2. Bombs will only be directed at the same targets, and due to their greater accuracy, should impact even closer to the centre of the PTA than current Types.

## **2.3 Environmental Protection Procedures**

The undertaking will also not require any significant changes to existing mitigation, communications or coordination procedures. DND maintains a comprehensive mitigation program to safeguard the environment throughout the training area. In particular, an active monitoring program is in place to identify sensitive locations on the ground arising from human or wildlife activities. Information is gathered from ongoing surveys, tracking of wildlife based on satellite and radio collars, community liaison programs and the publication of contact information to advise 5 Wing officials of activity within the training area. Allied crews are notified by the Military Control Centre of sensitive locations which are declared “out of bounds” for flight activity. The protective area around most sensitive sites is a 2-1/2 nautical mile radius. DND further monitors the flight tracks flown by the crews, in comparison with the published closure areas, to verify the compliance of flight crews to the environmental restrictions imposed on their activity.

These environmental activities are conducted in cooperation with federal and provincial wildlife officials and the Institute for Environmental Monitoring and Research (IEMR). An annual program is designed in consultation with these organizations and with interested aboriginal groups and is made publicly available. An average of \$1.5 million is used to support this program, with the funds originating primarily from the allied nations training in Goose Bay.

Arrangements are also set out in the Lease Agreement for DND to conduct an annual cleanup of the target zone in the PTA. This activity is conducted under the inspection of the provincial Government Services Centre, which ensures that fuel storage, waste management and the removal and burial of practice ordnance meet provincial standards.

## **2.4 New Environmental Considerations**

Since the PTA itself is already established as an impact area, and will remain the only impact area, there are no incremental environmental factors associated with the use of Type 3s. The impact craters will be graded and restored as part of the annual clean-up and maintenance operation at the site. The possibility of a Type 3 ricochet on impact is a very remote occurrence, given the soil composition at the impact point and the trajectory of the device. More information is available on the geomorphology at the PTA in section 3.

While the design of the safety template may orient (or channel) aircraft traffic to a certain extent, the shift from low level operations to medium or high altitudes to conduct the weapon release will result in a net reduction in potential noise effect on human activity and the environment.

## 2.5 Probability of Failure

Under normal release and operating conditions, laser-guided munitions from any range or altitude will strike the designated target with an accuracy of within a couple of feet of the target. However, there exist rare occasions when the bomb may malfunction, usually as the result of any of the following:

- Paveway kit Optical Detector failing to capture reflected laser energy from the target,
- failure within the guidance and control section and, or,
- failure of the folding wing system.

Specific details on technical performance and reliability of military weapons are generally classified information. Knowledgeable industry sources have indicated, however that only one in approximately one thousand Type 3s may demonstrate some form of failure. Of those that fail, in excess of ninety percent impact the ground within an eight hundred meter radius of the planned target. This suggests a highly remote probability of a ground impact outside an eight hundred meter radius of the target (in the order of 1 in 10,000).

The above probability does not allow for pilot or operator error. Although empirical data is not readily obtainable, the human factor (as opposed to the technical) will, in this instance, be the more likely cause of failure and could be attributed to:

- improper application of laser code settings (which negate sensor operation),
- poor lasing technique,
- releasing the weapon outside of optimum release parameters, and, or,
- misidentifying the aim point on the target or targets to be attacked.

In an attempt to obtain at least an expert indication of actual results of combined human and technical system accuracy and reliability, a request was made to Royal Air Force officials at Headquarters No 1 Group in the United Kingdom for a statement that could be placed in the public domain to assist in making a risk assessment. The following response was received:

*“However, we requested the Air Warfare Centre (an agency that analyses RAF LGB weapon releases) to assess its data base for the Paveway III LGB, which is a GBU-24 export version, and provide the results for the last 12-months. In analysing the results the Air Warfare Centre uses the following criteria: a 'Hit' is within 50ft; a 'Near Miss' is greater than 50ft but less than 200ft and a 'Far Miss' is any unknown result or a weapon impacting outside 200ft from the designated point of impact. Operational LGB releases are assessed using Battlefield Damage Information/Assessment and LGB scores from training releases are provided by instrumented weapons Ranges. The Paveway III operational and training results from the Air Warfare Centre database for the last 12 months were all within the 'Hit' category (i.e. 100% within 50ft).”*

(signed : Wing Commander R.C. Whitworth Buckinghamshire, 23 November, 2001)

### 2.5.1 Risk Assessment

Based on this information, and since all the laser targets are located at the centre of the 4 nautical mile radius PTA, it appears extremely unlikely that laser-guided munitions could impact outside of the PTA. At the expected usage rate, the likelihood of such an occurrence would be considerably less than that of

an aircraft crash somewhere within the training area – this latter event is estimated to occur, on average, twice every three years, and with much more significant consequences.

## **2.6 Geographic Considerations**

The PTA is located on a sandy plateau approximately 120 kilometers south, southwest of Goose Bay. The center of the PTA is at surveyed monument point N 5217.4 and W 6057.3 and is bounded by a circle of four nautical mile radius, representing an area of 175 square kilometers. The complete site description and survey is attached as Schedule A to the 1995 Lease Agreement. The range also consists of an area of restricted airspace known as CYR 727 that extends out to 10 nautical miles from the centre monument. Access to this area is governed by transport Canada rules outlined in the TP 1820 E Designated Airspace Handbook and is controlled by the Military Coordination Centre (MCC) at 5 Wing Goose Bay.

The procedure involved in establishing the safety template is explained in Appendix C (Defining the Safety Exclusion Zone). The resulting configuration is illustrated at Figure 2.3 and can be described as follows:

based on the current monument point at the centre of the PTA (N 52°17.4' W 60° 57.3') and circumscribing a 16 nautical mile (30 kilometre) arc:

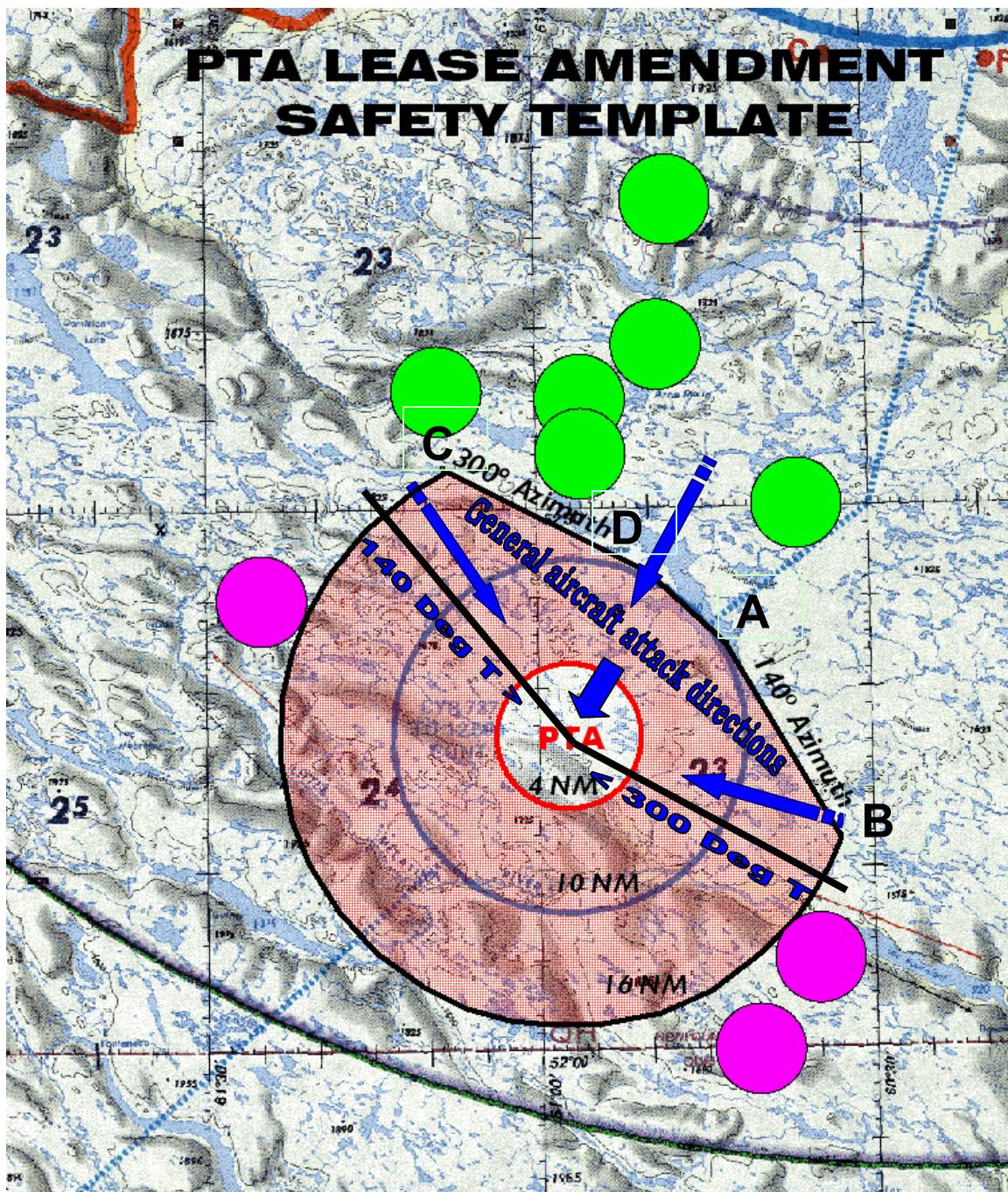
Point A	N 52° 22.5'	W 60° 43.0'
Point B.	N 52° 11.8'	W 60° 33.0', thence, clockwise via the arc to
Point C.	N 52° 32.3'	W 61° 08.5'
Point D.	N 52° 26.4'	W 60° 50.0', thence, clockwise via a 10 nautical mile arc from the monument to the first point (Point A).

The resulting perimeter of this zone is approximately 180 kilometres.

The PTA and Exclusion Zone surrounding it are uninhabited areas and are not accessible by road or rail. They are accessible by air (with authorization), and to a limited extent (due to the long distances from communities) by river and snowmobile. The coloured circles appearing on Figure 2.3 are a combination of some known or suspected land use activity identified early in the screening process. A more definitive account of land use is provided in the attached reports compiled by Jacques Whitford Environment Ltd. (JWEL 2001) and for Innu Environmental Limited Partnership (Appendix D).

## **2.7 Timeframe for Operational Activity**

The international Memorandum of Understanding governing foreign training at 5 Wing provides for “a flying training season of up to 36 weeks for each Participant within a 39 week window during the period 01 March to 30 November inclusive.” In practice, active training is generally confined to the period April to October of every year. While control of the Exclusion Safety Zone will be continually exercised, access may be constrained only during the active flying season.



**Figure 2.3 Safety Exclusion Zone (shown with selected land use sites and with aircraft approach limits)**

## 2.8 Access

Due to the nature of the training activities, DND is obligated to exercise control access to the Safety Exclusion Zone. Requests for civil access to designated danger areas are considered only for those activities which are judged essential to the common good and where the associated risk can be accepted. As a first principle, DND attempts to accommodate controlled public access if it is safe and if the defence

requirement can still be met. This may allow for joint, but not necessarily concurrent use. Special consideration may be made, notably in the areas of energy development, which represents a national interest of a high order. The same can be said of traditional aboriginal land use. Possible access arrangements are discussed further in section 5, as a mitigation measure.

### **2.8.1 Communicating with Civil Aviation**

Access to the PTA area is controlled for DND by the 5 Wing Military Coordinatin Centre (MCC). The PTA is defined as restricted airspace in the Transport Canada Designated Airspace Handbook, DAH TP 1820, for areas CYR 727 and CYR 750. The PTA has a buffer zone, identified as CYR 726 from ground level to 1000 feet AGL, with a radius of 30 nm from the centre.

All military flights into the PTA are booked with the MCC prior to take-off and are conducted in accordance with visual flight rules. All non-military air carriers are required to first request access to these areas through MCC. As such, MCC coordinates the military flying activity and also acts as a liaison with locally based civilian air carriers. Since it controls all PTA time slot “bookings”, MCC is aware of all military activity and can relay this information to non-military air carriers as required.

Operations staff at 5 Wing conducts a mass briefing for locally based air carriers annually in March, at which time all new activities relating to the military flying program and training areas are thoroughly described.

### **2.9 Amended Military Flight Procedure at the PTA**

Appendix C describes the method used to define the safety zone and also specifies that the final attack headings on the PTA target for Types 2 and 3 will be limited to approaches from the North West on headings between 140 degrees True and clockwise to the South East on 300 degrees True headings, within a range of 7 to 9 nautical miles from target, respectively. These are indicated at Figure 2.3.

### **2.10 Consequence of Type 3 Ground Impact**

In the unlikely event of a Type 3 weapon malfunction resulting in an impact within the Safety Exclusion Zone, the following components would be released to the environment:

- Bomb body:

Approximately 500 / 1000 / 2000 pounds of concrete  
2 x metal fittings for attachment to aircraft

- Laser guidance kit components:

Laser detector	Guidance Control Section
Injected molded plastics	Servomotors
Optical lenses, mirrors, glass	Thermal battery
Computer chips	Tail Wing assembly
Transistor components	Metal wings, fins and fitting

### **2.10.1 Impact conditions and Residue**

Impact conditions of Type 2s are based on 5 Wing Operations staff direct observations at the PTA target sites. The size of the impact crater depends on whether the impact was a result of a shallow or steep angle of penetration. Steep angle penetration estimated to be at 70 degrees or more usually resulted in the inert bomb becoming buried in place. Depth is estimated at .5 to 1.5 meters depending on the weight of the bomb. Surrounding area shows little displacement of earth outside of 1.0 meter in the sandy PTA soil. Shallow angle penetration estimated at less than 45 degrees usually caused more extensive surface scarring with the bomb coming to rest partly or fully clear of the ground. Shallow craters generally less than .5 meters in depth, 2.0 meters in width and 5.0 meters in length have been witnessed at the PTA. While bomb bodies often remain relatively intact, tail wing assemblies are bent or broken, but in many cases are recognizable and still attached to the bomb body. Laser detector and guidance control components located in the forward head assembly are generally unrecognizable or completely destroyed. These do not contain toxic substances.

Ground impact of Type 3s will generally result in more pronounced craters. Among the components in the head assembly is a thermal battery containing 1.4 grains of Zirconium Chromate and a heat pellet of 130 grams Potassium Percolate and /or Copper Beryllium. These components are not listed in the federal Hazardous Product Act, including the Pollutant Substances Regulations and Ingredient Disclosure List, and are not considered to pose a significant environmental risk. The main bomb body and any retrievable material will be removed from the template area for disposal at the PTA.

### 3.0 ENVIRONMENTAL ASSESSMENT

The area of interest covers south-central portion of the 1:250k NTS sheet 13C, and is comprised of 1:50k NTS sheets 13C2, 13C3, 13C6, and 13C7. The geomorphic and geological information has been derived from the topographic maps. The elevation information has been obtained from the topographic sheets as well as the Digital Elevation Terrain Data (DTED) produced for the Goose Bay Office at National Defence Headquarters. This information has been supplemented with the Labrador Forest Inventory maps corresponding to each of the 1:50k NTS sheets produced by Environment Canada. The maps were derived from the Landsat Thematic Mapper and provide information about the distribution of different types of land cover. For the sake of interpretation, some of the land cover categories have been merged. Additional information about the distribution of the different types of vegetation, as well as wildlife, has been obtained from the EIS (DND, 1994). For the Environmental Impact Statement, the area surrounding the PTA was surveyed using large-scale aerial photographs. Moreover, an archeological survey of the PTA was also conducted at that time.

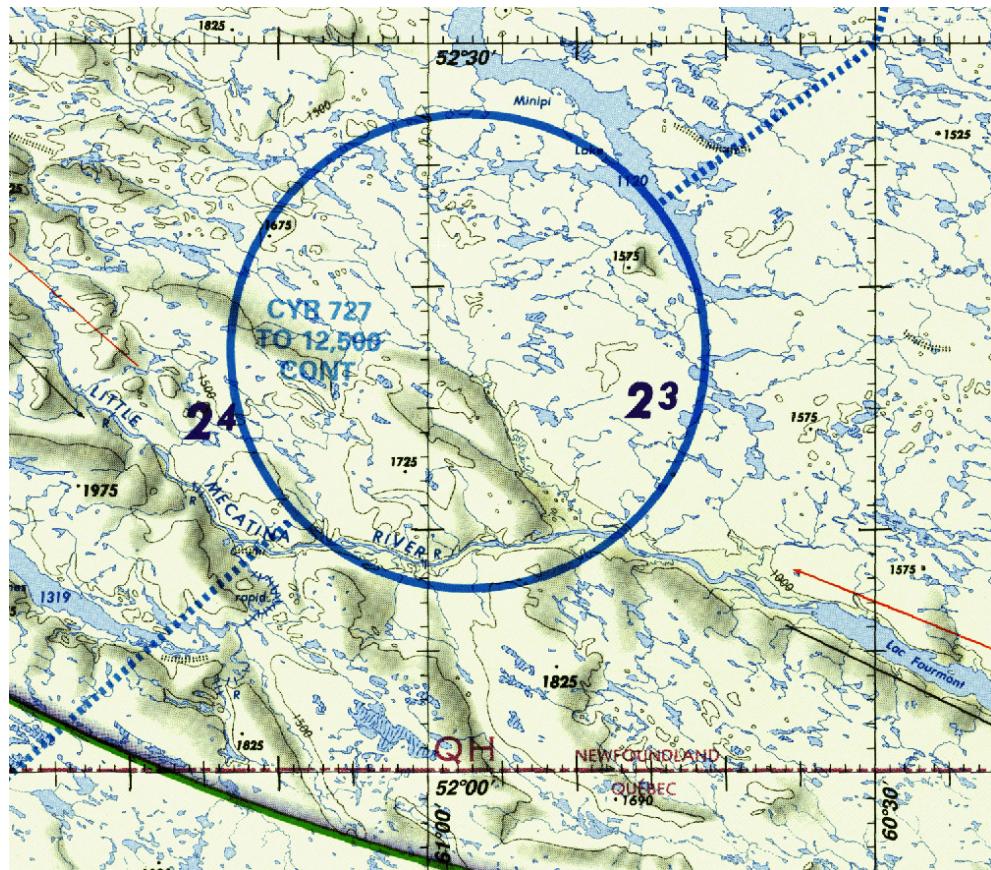
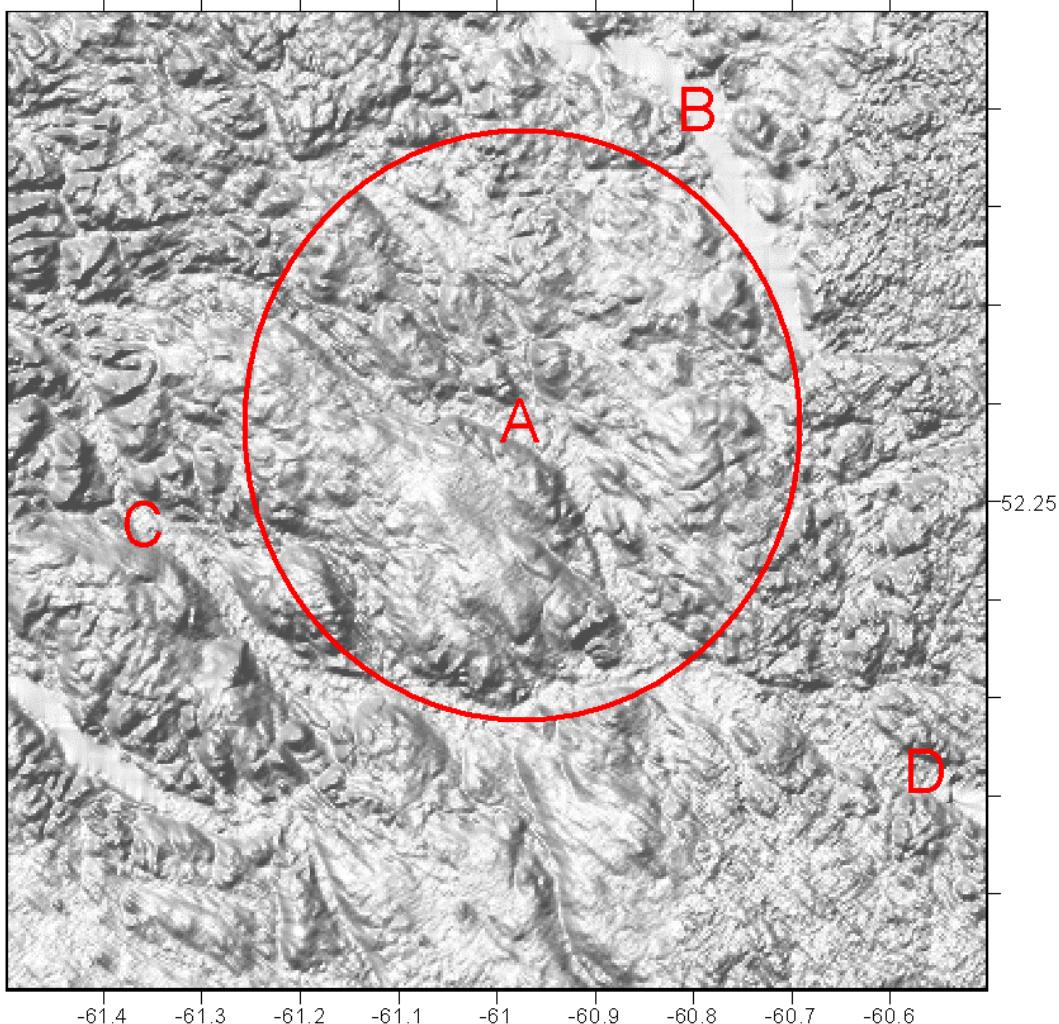


Figure 3.1 Portion of the 1:500k map showing the general geomorphic features.

#### 3.1 Geomorphology

The topography in the area of interest is undulating to hilly with relatively large flat areas covered with various types of bogs. Figure 3.1 shows the general nature of the geomorphic features in the area. By processing portions of the DTED file, a three-dimensional perspective diagram has been produced (Figure 3.2) showing the general nature of the land features. While the elevation information in DTED files is in metres, for convenience, the elevation values in this report are expressed in feet above mean sea level.

The total relief for the area of interest is less than 1000 ft. In general the geomorphic features are oriented in NW-SE direction, and most of the streams also flow to the southeast. The area is punctuated by a number of small lakes and streams flowing to and from these lakes. The main water bodies in the area consist of a meandering Little Mecatina River, and a portion of the Minipi Lake. The Little Mecatina River is present in the southern portion of the area, and it drains to the southwest into the Fourmont Lake (outside the area of interest). The PTA is relatively flat and consists of re-vegetated recent burns and barren soils.



**Figure 3.2 Three-dimensional perspective of land features. The red circle centred on the PTA has a 10nm radius. A: centre of PTA, B: Minipi Lake, C: Little Mecatina River, D: Lac Fourmont.**

The Little Mecatina River valley is relatively broad and U-shaped (Figure 3.2). The south-facing wall of the valley has moderate slope whereas the north-facing wall has relatively steep slope. The floor of the river valley is more or less flat, approximately at 1000 ft with sides reaching as high as 1600 ft. The valley floor is covered with barren soil and/ or recent burns with few exceptions where trees of different types are present.

The Minipi River is outside the area of interest, and it drains into the Minipi Lake. Only the southwestern portion of the Minipi Lake is present in the extended buffer zone. There are few minor streams that drain

from the area of interest into the Minipi Lake. Small water bodies tend to occupy relatively flat areas, and are generally surrounded with bogs of various types (these have been classified in the Labrador Forest Inventory maps as open bog, string bog, tree bog, and wet sites).

The Exclusion Safety Zone consists of relatively flat areas that are not covered by bogs, tend to be recent burns that may have grown back with vegetation, and some with barren soil and cleared lands. Most of the region is covered with thin layer of glacial soils, with few outcrops (barren rocks).

### 3.2 Vegetation

Vegetation information was also obtained from the Labrador Forest Inventory maps previously mentioned. The land cover has been classified into 25 different categories, however in this report, the original land cover classes have been merged to produce composite and more descriptive land cover types. Further, some of the information about the nature and distribution has been corroborated from the study conducted for the EIS (DND, 1994). The land cover types used in this report are as follows (the original Environment Canada land cover types are given in parentheses):

- Spruce: (Heavily Stocked Spruce/ Fir Commercial Forest; Moderately Stocked Spruce/ Fir Commercial Forest; Sparsely Stocked Spruce (Sphagnum Cover) Non-Commercial; Sparsely Stocked Spruce (Lichen Cover) Non-Commercial; Immature Spruce/ Fir; Spruce/ Fir Regeneration)
- Hardwood: (Mixed wood Mature; Hardwood mature; Hardwood Success ional; Hardwood Scrub)
- Barren Soil: (Lichen/ Barren Soil)
- Barren Rock: (Rock Barren)
- Recent Burn: (Lichen/ Recent Burn; Recent Burn)
- Bog: (Lichen Scrub/ Open Bog; Open Bog; String Bog; Tree Bog; Wet Sites)
- Cleared Land: (Cleared Land)
- Water: (Water Bodies)

The land cover types for the area of interest (Figure 3.3) was produced by mosaicing portions of the Labrador Forest Inventory maps form Environment Canada. On this figure, three circles have been drawn with radii of 4nm, 10nm and 16nm respectively. The inner circle represents the current PTA; whereas the outermost circle indicates the outer limit of the proposed safety zone around the PTA.

The predominant land cover type is spruce forest cover with varying degree of density. Within the PTA, the central portion is covered by recent burn and barren soil, whereas the forest cover is mostly confined to the southwestern portion. There are few bogs and small water bodies present in the PTA. In general, there is a greater diversity of land cover types in the river valleys, particularly the Little Mecatina River. This includes, patches of mixed-wood and deciduous forest, along with large areas of recent burn and barren soil. Since, the Little Mecatina River is shallow and meandering in nature, depending upon the amount of precipitation received in the area, various parts of the stream bed are likely to be exposed and/ or covered with sand. Based on the amount of precipitation, these sand bodies (including sand bars) contain varying degree of moisture and are likely to be shifting, and thus providing a variety of land cover types.

### 3.3 Wildlife

DND's mitigation measures are based on real-time monitoring surveys designed to locate sensitive species during the sensitivity period. During the course of a long-term research study conducted by DND on the effects of low level flying on the Osprey population, the study area was thoroughly surveyed each season between 1993 and 1998 (this study showed no adverse population-level impacts). No endangered species are found and effects wildlife populations across the study area are quite low for all species. Extensive surveys were carried out in the region to determine the presence of wildlife. It was concluded that the area in general provides poor quality habitat and thus is not capable of supporting large populations of wildlife (EIS, DND, 1994). Since then, the Goose Bay Office and its partners have conducted numerous wildlife surveys in the area for different species and have found nothing of significance in the proposed safety zone. The following summarizes the extent of surveying and monitoring carried out for various species. Inferences have been drawn from past or current studies.

Caribou - The study area encompasses the major portion of the range for the Dominion Lake herd. This herd was estimated at fewer than 200 animals in 1979 (Folinsbee1979). The surveys conducted by the Institute for Environmental Monitoring and Research during the winter 2000 found no evidence of this herd. DND monitoring surveys throughout the study area during summer months (1993-98) did not locate caribou within the study area, the closest being a solitary animal near Dominion Lake, well to the northwest of the study area. While occasional solitary animals may wander into the study area, most recent survey information suggests the herd no longer exists.

Moose - The area around the PTA provides poor quality browse, with some high and moderate quality habitat along the Little Mecatina River Valley. This area lies within the proposed safety zone but it is outside the PTA. IEMR transect survey in 2000 and DND surveys from 1995-1997 and 2001 located few Moose in the study area. Moose sensitivity period is during late winter (1 March through 15 May).

Carnivores and Fur-Bearing Animals - The PTA area and the safety zone provide few water bodies for suitable habitat. During surveys for other wildlife in the area, these fur-bearing animals have not been observed in significant numbers. Due to lack of large game and fur bearing animals in the region, the population of the carnivores is almost non-existent.

Raptorial Birds – Osprey habitat throughout the study area is low to moderate quality. Based on monitoring studies conducted by DND as part of its mitigation program, between 1995 and 1998, 2 active osprey nests are anticipated within the study area. The habitat is suitable for Bald Eagle throughout the Minipi Lake system along the northern boundary of study area and the Anne-Marie Lake system to the North. Lac Fourmont to the southeast of the study area is also suitable. One Bald Eagle nest site has been located through DND's monitoring program outside the study area, northeast of Minipi Lake.

Waterfowl and Loons - Harlequin Duck habitat is marginally suitable along Little Mecatina River, which bisects the southern portion of the study area. The DND monitoring program has revealed no known nesting areas or populations within study area. Waterfowl spring staging typically occurs from mid-April through end-May. Low numbers / densities have been found. The sensitive areas, in order of importance, are:

- Lac Fourmont - outside study area to the south-east
- Minipi lake – along northern boundary of study area
- Anne- Marie lake – north of study area
- Little Minipi Lake – north of study area

Nesting activity may occur in low density along the Minipi Lake system (June-August) north of the study area. No nesting populations have been identified through the DND monitoring program, and no significant nesting population is expected within study area. A large Black Duck moulting area is located at Lac Formont, outside the study area to the southeast. A less-important moulting area may also occur at Anne-Marie Lake, also outside the study area

Fall Migration typically occurs in September and October. No late-fall monitoring has been conducted. Potential resting/ feeding areas are along the Minipi Lake system along the northern boundary of the study area, Anne-Marie Lake to the north and Lac Fourmont to the southeast.

### **3.4 Assessment of Valued Ecosystem Components Vulnerability**

The main source of disturbance to wildlife within the training area consists of noise and visual stimuli associated with the low-level aircraft. It may also include the activities associated with the maintenance and operation of the PTA. As stated earlier, the new undertaking only involves Type 3 bombs to be delivered from higher altitudes and greater distances. This change will actually reduce the noise and visual stimuli and suggests that the total disturbance will diminish.

Given the weight of the practice weapons (500/ 1000/ 2000 pounds) and the soil composition, many of the concrete bombs are buried upon ground impact or leave a scar on the ground surface. There are no large water bodies flowing in and out of the proposed Exclusive zone. There are very few outcrops in the region of interest and thus chances of ordnance hitting and shattering are minimal.

In summary, a review of the likely interaction of the undertaking with the environment suggests that there will be no significant:

- negative effects on the health of biota including plants, animals, and fish;
- threat to rare or endangered species;
- reductions in species diversity or disruption of food webs;
- loss of or damage to habitats, including habitat fragmentation;
- discharges or release of persistent and/or toxic chemicals, microbiological agents, nutrients (e.g., nitrogen, phosphorus), radiation, or thermal energy (e.g., cooling wastewater);
- population declines;
- loss of or damage to commercial species;
- removal of resource materials (e.g., or resources; peat, coal) from the environment;
- appreciable transformation of natural landscapes;
- obstruction of migration or passage of wildlife;
- negative effects on the quality and/or quantity of the biophysical environment (e.g., surface water, groundwater, soil, land, and air).

### **3.5 Conclusion**

Based on the existing / approved usage of the PTA, it is believed that the undertaking will not pose adverse or likely environmental effects. The only direct change in the environment caused by the undertaking is the restricted public access due to the addition of the safety zone beyond the PTA perimeter for the sole purpose of providing enhanced safety for the public. While this aspect cannot be ignored, the mitigation measures proposed in section 5 should accommodate the interests and requirements of all parties.

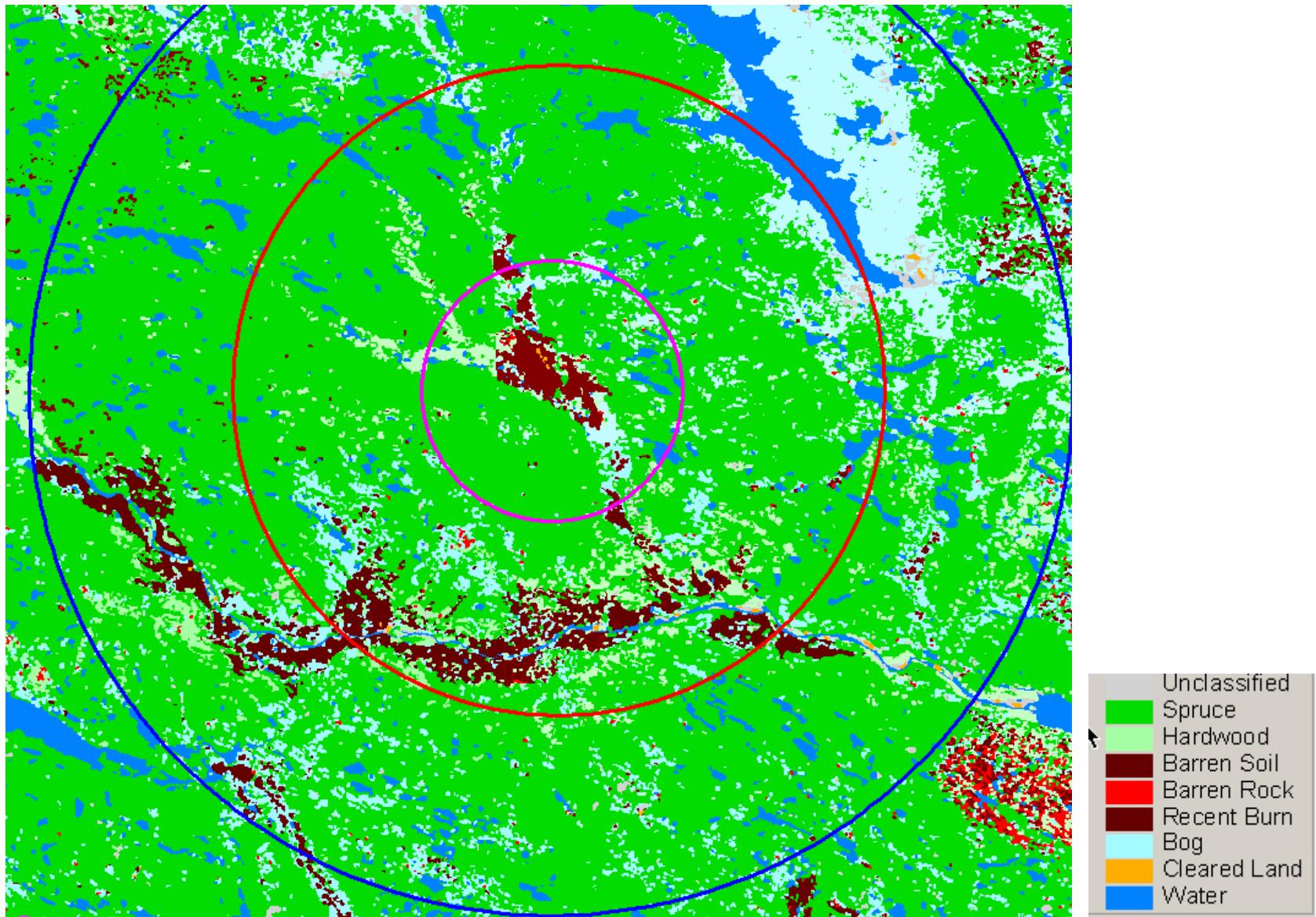


Figure 3.3 Land cover types present in the area of interest. The purple circle is 4nm in radius, the red circle 10nm in radius, and the blue circle is 16nm in radius.

## **4.0 HUMAN LAND USE ACTIVITIES**

### **4.1 Land Use Study Approach**

Concerns with respect to aboriginal and non-aboriginal land use are the central issue relating to this undertaking. Accordingly, coincident with an initial submission of intent to the Intergovernmental Affairs Secretariat in November of last year (2000), DND provided the same information package to the two aboriginal groups that may be most affected by the proposal to establish a Safety Exclusion Zone at the PTA.

To more fully and independently examine the extent of land use within the study area, and thereby determine the likely impact of the undertaking on those activities, DND obtained the services of a Goose Bay environmental consultant firm, Jacques Whitford Environment Limited (JWEL). Initially, DND anticipated that JWEL would conduct a survey of both aboriginal and non-aboriginal land use in the area. After discussing the matter with representatives of the Innu Nation of Labrador and the Mamit Innuat of Quebec, DND opted instead to financially assist both aboriginal groups in conducting their own studies of current and projected land use within the study area. Those studies were intended to assist in identifying and discussing possible mitigation approaches to minimize disruption to their traditional resource harvesting activities. Although the Safety Exclusion Zone is entirely within Labrador, the Quebec border is very close to its southern edge.

The JWEL report and that of the Innu Nation are included as a separate document annotated as Appendix D to this submission. DND was notified by letter in late October that there would be delays in providing the Mamit Innuat document; it was subsequently learned that those delays may well extend into January or February of 2002. Nevertheless, DND undertook to further discuss their findings and mitigation approaches with them at the appropriate time.

#### **4.1.1 Notification, Discussions and Consultations**

In addition to the initial notification of the two Innu groups in November 2000, two subsequent submissions were made with additional information on the undertaking, including the entire preliminary draft registration document dated January 2001. A full slide presentation and briefing on the project was also given to representatives of the two groups earlier this fall. Since the spring of this year, while tentative at first, considerable progress has been made in jointly advancing a proposal that would provide for an ongoing dialogue between the Innu Nation and DND on matters relating to the military training at Goose Bay. At least three dedicated meetings have been held in both Ottawa and Goose Bay since September 2001 to progress this initiative. DND is confident from the goodwill shared to date that an arrangement can be successfully concluded before the resumption of training in 2002.

A similar initiative is underway with the Mamit Innuat, and although not as advanced, is proving equally hopeful of success. DND hosted a meeting in Quebec City on October 3 for representatives of the Mamit Innuat, including the Chiefs of each community, to explain this undertaking and to discuss other issues of interest. Additional meetings are planned for pre-Christmas with both groups. Contact between DND and both Innu groups also involves other initiatives. In June 2001, DND invited their representatives to witness the supersonic sound measurements conducted in Cold Lake in anticipation of a possible future environmental assessment. Again in August 2001, they and other participants accepted to attend a DND symposium on ISO 14000 Environmental Management Systems in Halifax.

General public notification of this undertaking was announced and discussed at the last two Board meetings of the Institute for Environmental Monitoring and Research. In September of this year, Goose

Bay Office staff members travelled to Goose Bay to conduct public information sessions and media interviews and to personally discuss the project in greater detail with the main commercial camp operators and with Innu Nation leadership.

## **4.2 Aboriginal Land Issues**

The land comprising the Safety Exclusion Zone is the subject of comprehensive land claims negotiations affecting both the Innu Nation and the Mamit Innuat (Quebec). Negotiations with the Innu Nation are being actively pursued by the Government of Newfoundland and Labrador and the federal government; those involving the Mamit Innuat, by the Government of Quebec and the federal government. Land selection has not as yet been initiated with the Innu Nation, but DND understands that preliminary submissions of a general nature are expected shortly.

The Department of National Defence maintains approximately 70 camera target sites distributed throughout the training area in both Labrador and Quebec. Once land claims are resolved, DND will be prepared to enter negotiations with the owners of the land on which camera targets are located to arrive at a lease arrangement, or to relocate the site if necessary.

Stage 1 level archaeological studies were conducted by DND as part of the original Lease Agreement in 1995. DND has confirmed with the Provincial Archaeology Office that an archaeological assessment of the Safety Exclusion Zone would not be required (letter dated 5 March 2001).

### **4.2.1 Review of Aboriginal Land Use within the Study Area**

The Innu Nation report attached as a section to Appendix D indicates that the main potential for overlap with Labrador Innu activity is centred on the south shore of Minipi Lake during the spring ice breakup. This represents a relatively small spatial and temporal overlap within the Safety Exclusion Zone. While information from the Quebec Innu communities has yet to arrive, DND data from studies related to the Environmental Impact Statement (DND, 1994) and information since gathered within the ongoing mitigation program suggest that only relatively minor overlaps may also occur. The primary inland activity for Quebec Innu appears to be related more to late fall ventures within the northern border regions. It appears very likely that whatever overlap exists with aboriginal land use is minor and may be addressed in the context of further discussion and appropriate arrangements.

## **4.3 Non-Aboriginal Land Use within the Study Area**

The attached Jacques Whitford Environment Limited report has also concluded that few spatial and temporal overlaps exist with non-aboriginal land use activities and that there are no major concerns on the part of those who engage in those activities. No new developments or industrial activity are anticipated in the foreseeable future within or near the Safety Exclusion Zone.

## **5.0 ENVIRONMENTAL MANAGEMENT**

### **5.1 General**

DND maintains a high standard of environmental management associated with the training activities in Goose Bay. It has a guaranteed source of funding for its mitigation programs and benefits from its association with the provincial wildlife agencies of both provinces, the Institute for Environmental Monitoring and Research and other partnerships it has developed over the last ten years. During the course of 2002, DND will also achieve ISO 14001 certification of its Environmental Management System.

National Defence will continue its monitoring program of the entire training area for as long as the allied forces train in Goose Bay. Since the potential for interference with current and foreseeable land use activity is the primary environmental issue related to this undertaking, DND intends to initiate additional monitoring and mitigation measures in support of this undertaking. Particular emphasis will be placed on communication and consultation arrangements with individuals and organizations whose activities are close to or within the proposed Safety Exclusion Zone. While the size of the safety zone is quite significant, there is only minor and manageable potential for overlap.

Although somewhat deeper craters may result from Type 3 use, this undertaking will not produce any significant change at the PTA site, or in nearby waterbodies, from what is currently experienced. The PTA is already an authorized and licensed weapons impact zone cleared for the types physical impacts associated with the Type 3. Annual cleanup operations will provide for maintenance of the site.

### **5.2 Identification of the Safety Exclusion Zone**

Regulations for Canadian Forces Air Weapons Ranges provide direction for safe operations and training, including the safety of the public. These procedures include appropriate measures for marking ranges and warning the public of danger. The two standard physical markings for a range include:

- a clear-cut warning track consisting of an 8-metre wide slash mark, and
- metal signs around the perimeter to identify range boundary – 2,000 ft spacing.

DND hopes that this registration and review process will provide the public and government officials sufficient information to offer DND comments on what they consider appropriate in this regard. As the Safety Exclusion Zone is not of itself a range, and does not include a target impact area, the extent of physical marking needs to be reviewed with all affected parties. Among the relevant factors to be considered in this particular instance are the:

- remoteness and virtual inaccessibility of the area;
- limited human activity during the summer (ie active training period);
- limited possible access point locations;
- length of the perimeter (180 kilometres);
- minimal risk of an incident; and
- environmental implications of the standard marking procedures.

Clear cutting the slash line would require cutting approximately 1,226,300 sq m of virgin forest. Once cut, it may further require annual maintenance to prevent regrowth. Forest cutting and / or signage could

be reserved only to those areas where there is a potential risk of human access. This would be combined with other standard DND communications and public education measures identified in regulations.

Human ingress into the area during the summer is light and mostly limited to Minipi Lake activity to the north and east, primarily involving outfitter camp operations. Access from the other quadrants during this period is even more limited and would be confined to the Little Mecatina or Minipi river systems. The closest community is 100 kilometres south of the Safety Exclusion Zone

### **5.3 Control of Land Access to the Safety Exclusion Zone**

Public protection is imperative in the operation of DND training areas – for that reason, all reasonable and practical action is to be taken to ensure that:

- all persons entering CF military ranges are aware of the dangers to which they are subjecting themselves, and
- all unauthorized persons entering the range are aware that they are entering at their own risk.

The seriousness of the risk reasonably to be foreseen defines the extent of the caution which must be exercised in order to avoid harm to others.

Arrangements can be made to accommodate civil sector and aboriginal access to DND lands designated as ‘dangerous’. In such cases, the primacy of the operational requirement needs to be recognized and the element of risk must be acceptable to all parties. An Advisory Committee may be established to represent the principal interested parties, and hold meetings where DND can:

- present operations plan for the range for the following year;
- explain the potential dangers and why access to certain areas cannot be permitted or where it must be prohibited during certain periods what those periods are;
- coordinate controlled civil access for legitimate interest groups;
- where appropriate, present and discuss the environmental or resource management plan for the range and training area;
- determine and participate in coordinating the activities of federal and provincial agencies such as energy and mineral exploration, forest management and hunting and fishing including licensing and access procedures; and
- show what steps being taken to limit contamination of the range area, provide for public safety and educate the public.

The composition and role foreseen for such an Advisory Committee is remarkably similar to that of the Institute for Environmental Monitoring and Research. The possibility of forming a Working Group of the IEMR to perform this task will be pursued further.

An example also exists of a comprehensive ACCESS AND CO-OPERATION AGREEMENT between National Defence, the Canoe Lake Cree Nation and the Province of Saskatchewan that recognizes all the parties’ interests and the conditions under which they may utilize lands within the Cold Lake Air Weapons Range. Extensive military training exercises are conducted there, including air-to-air gunnery, air-to-ground gunnery, air-to-air combat, supersonic flight, laser targeting and live weapons drops.

Among the features of that agreement, those persons actually engaged in traditional land use on the range assume the task of posting clear signs at all points of access to their traditional land. Although not part of

this registration document, a digital copy of that agreement is included among the files on the compact disk (CD). DND will seek to engage both the Innu Nation and Mamit Innuat in pursuing a similar type of agreement in the context of the current set of bilateral discussions.

#### **5.4 Control of Air Access to the Restricted Airspace**

Measures are being initiated separately with Transport Canada and 1 Canadian Air Division to have an airspace restriction equivalent to the Safety Exclusion Zone designated and published in advance of the start of training to provide sufficient protection from errant Type 2 and 3 munitions at altitudes up to 20,000 feet. Requests by civil aviation to fly through the zone will be granted unless there is a conflict between PTA use and the civil request. Control of this airspace will continue to be exercised by the Military Coordination Centre at 5 Wing.

#### **5.5 Managing Laser-guided Munitions Incidents**

While laser target designation activity has been authorized and conducted at the PTA for several years, it has been limited to lower altitude release profiles. DND officials, under the responsibility of 1 Canadian Air Division, will ensure that all necessary range permits and procedures for higher altitude release are in place and that periodic laser safety surveys are effected to ensure that laser operations do not pose a safety hazard to military personnel or the public. Current and proposed dimensions of restricted air and land parcels are sufficient for safe operations.

##### **5.5.1 Potential Fire Risk**

A serious but unlikely environmental concern could involve a Type 3 at high terminal velocity impacting the ground, generating sufficient heat or sparks to cause a forest fire. The likelihood should be no more significant with the Type 3 than with existing stores, despite its weight, since the impact area does not offer great potential for such an occurrence. No such fires have occurred in the past. Paragraph 7 of the Lease Agreement provides for support from the Department of Government Services and Lands in such an eventuality.

DND recognizes that at certain times of the year, extreme fire hazard conditions may exist that will require cessation of this type of activity. Paragraph 8 of the Lease Agreement states that the Province “reserves the right to restrict the use of the site during extreme fire hazard conditions with coordination to be carried out by the Regional Director for Natural Resources, Goose Bay and the Base Commander, Canadian Forces Base for National Defence, Goose Bay.”

##### **5.5.2 Site remediation**

The possibility of accidental impact of a practice bomb within the “Safety Template” will be continuously monitored to ensure prompt site remediation. This will ensure that, in the event of a future cancellation of the amended Lease Agreement, DND will be able to declare the Safety Exclusion Zone free of contaminants resulting from this undertaking. Aircrew will be required to immediately submit an Occurrence Report as defined in Wing Flying Orders, 705 & 706, “Inadvertent Stores Release Reporting” for such an event. The Military Coordination Centre will investigate by helicopter to pin-point the location of the device and arrange for its removal as soon as practicable. If, after a thorough search, the location cannot be determined, the record will be annotated, in the event that a laser-guided munition is found at a later date. Records will be kept to facilitate a site inspection by provincial officials and internal audit.

## **5.6 Project Related Options**

Should it be determined that the undertaking cannot proceed, DND would be obligated to deny any request by participating nations to conduct medium or high altitude training using newer laser-guided munitions. The only option then would be to consider relocating the PTA and the safety zone elsewhere, or constructing a second PTA with corresponding safety zone. Environmental impacts for such options would be equal to or greater than those associated with this undertaking and the disruption would adversely affect the training program for three to five years.

Marginal reductions in the overall size of the Safety Template may be possible, however, the impact on the flexibility of this type of training could be eroded to the point where its value would be compromised.

In light of the discussion in sections 5.2 and 5.3, the proponent intends to limit any physical marking of the perimeter of the Safety Exclusion Zone to those known and likely access points along the perimeter, through the use of appropriate signs. Additional public communications and notification measures will be implemented, consistent with established DND procedures. DND will initiate discussions towards an Access Agreement with the primary land users identified in the land use studies.

DND welcomes public and provincial input on the extent of perimeter marking they consider sufficient and reasonable under the circumstances.

## **5.7 Project Related Documents**

The following documents provide project information relevant to the training activity, National Defence Regulations, Orders and Procedures and previous associated environmental assessments:

- An Environmental Impact Statement on Military Flying Activities in Labrador and Eastern Quebec (DND, 1994)
- Transfer Administration and Control of Crown Land To Her Majesty The Queen in Right of Canada, 01 June 1995 (Lease Agreement) between DND and the Province of Newfoundland
- Wing Flying Orders – 5 Wing
- Mitigation Orders for Foreign Military Training in Goose Bay
- Access and Co-operation Agreement Between DND, Canoe Lake Cree Nation and Saskatchewan (1997)
- Canadian Forces Technical Order C-02-040-002/TS-001 Laser Safety
- Canadian Forces Technical Order C-02-040-002/AA-000 ANSI Z136.1-1993 Safe Use of Lasers
- Canadian Forces Publication B-GL-304-003/TS-0A1 Training Safety
- Canadian Forces Publication C-07-010-011/TP-000 CF Air Weapons Ranges (DND 1997)
- 1 Canadian Air Division Range License

## 6.0 CONCLUSION

The foreign military training presence at Goose Bay has long been a “way of life” and a primary source of economic activity for the region. With time and advancing technology, the training requirements keep evolving to meet changing operational demands. Newer designs of laser-guided munitions are now becoming the weapon of choice for many air forces.

In order to provide training opportunities in the use of this type of practice munition, DND needs to establish an additional Public Safety Exclusion Zone at the Practice Target Area near Minipi Lake. Since there will be no significant ground impact within the safety zone, no adverse effects on the physical environment are anticipated. The potential for conflict with existing land use is relatively minor, both spatially and temporally, and arrangements can be made to minimize disruption.

## 7.0 APPROVAL OF THE UNDERTAKING

The following permits and approvals may be required to commence training with the updated laser-guided munitions at the 5 Wing Practice Target Area:

**Table 7.1 Permits, Approvals and Authorizations**

Permit, Approval or Authorization	Agency
<b>Federal</b>	
Release from the Canadian Environmental Assessment Act	CEAA
Designation and publication of additional airspace restriction	Transport Canada
Air Weapons Range and Laser clearance	Department of National Defence, 1 CAD
<b>Provincial</b>	
Release from Newfoundland Environmental Assessment Act	Department of Environment
Transfer of Administration and Control of Crown Land amendment	Government Services and Lands

## 8.0 FUNDING

The Department of National Defence will assume funding for this Undertaking, consistent with arrangements established in a Memorandum of Understanding with participating air forces.

### 8.1 Signature

---

Dated

---

Frank I. Young  
General Manager  
Goose Bay Office

## Appendix A

### Description of Laser-guided Bombs

Inert “dumb” bombs are essentially solid concrete bomb bodies with fixed steel tail fins for directional stability of the bomb. They provide aircrews with an accurate simulation of carriage, release and impact conditions of live weapons without the explosive effects. Laser-guided munitions are comprised of the same free-fall bombs with a specialized kit attached. This includes a “seeker” head assembly that can detect reflected laser energy from the target and relay a signal to the directional tail unit to reach the spot where the reflected laser energy is emanating. The older Paveway II uses “bang bang” guidance - ie for every correction to the desired flight path, the wings will fully deflect in one direction or the other as required. The newer version guidance package (Paveway III) has a larger wing and incorporates smarter technology, allowing for smoother guidance inputs that produce less drag on the bomb and provide more glide distance.

Four Weights

- Mk 81 – 250lb
- Mk 82 – 500lb
- Mk 83 – 1,000lb and
- Mk 84 – 2,000lb

**The Mk 82:** 500lb GP Bomb with the Paveway II Laser Guidance Unit is designated **GBU-12**

**Mk 83:** 1,000lb GP Bomb With Paveway II Laser Guidance Unit used by RAF for many years. **GBU-16**

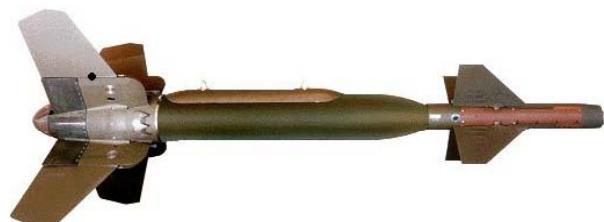
**The Mk 84:** 2,000lb GP Bomb With the Paveway III Laser Guidance Unit is designated **GBU-24**



**TYPE 1 – “DUMB” BOMB**



**TYPE 2 - Paveway II kit (GBU 12)**



**TYPE 3 - Paveway III kit (GBU 24)**

Additional information on the United Kingdom Paveway Laser-guided bomb system is found in the next four pages (courtesy of Janes Air-Launched Weapons, 1999)

## BOMBS, UNITED KINGDOM

Jane's Air Launched Weapons 33

### PAVEWAY II and III (UK) LASER-GUIDED BOMBS

#### Type

Laser-guided bombs.

#### Development

Paveway Laser-Guided Bombs, first developed in the USA in 1965, have continued with new innovations through three family generations - Paveway I, Paveway II and Paveway III. Modular design concepts were used within each generation. Common guidance and control units were adapted to the MK80 series (MK82, MK83 and MK84) general purpose bombs, with only the aerodynamic surfaces changed to meet the requirements of each size bomb. The original US Paveway Laser-Guided Bomb (LGB) became known as Paveway I in 1978 when a Production Engineering Programme (PEP) was initiated to improve the LGB capabilities. The product of the PEP became known as Paveway II. A third-generation US LGB system, designated Paveway III, started development in 1980-81. Full details of the history and development of the US, Texas Instruments (now Raytheon Defense Systems) Paveway I, II and III can be found in a separate US entry.

In the mid-1970s, the UK decided that rather than developing its own LGB series of weapons it would investigate the possibility of adapting the US Paveway system to fit the RAF stocks of 454 kg (1,000 lb) bombs. In order to meet the UK Air Staff Target 1229, joint development work in the late 1970s between Texas Instruments (now Raytheon), the Royal Aircraft Establishment (now DERA) and Portsmouth Aviation led to the introduction of modified Paveway II Guidance Kits for the UK. The resulting weapon, which is sometimes referred to as the CPU-123/B, was certified for release from Buccaneer, Harrier, Jaguar and Tornado aircraft.

The Paveway II (UK) requires the target to be designated by either airborne, ground mounted or hand-held designators. The airborne designator pod, AN/ASQ-153 Pave Spike, was developed in the US by Westinghouse (now Northrop Grumman) and was normally carried by a standoff control Buccaneer aircraft.

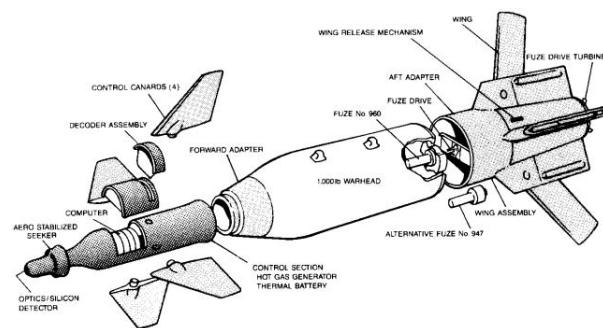
In 1989, the MultiFunction Bomb Fuze (MFBF), which was developed by Thorn EMI (now Thomson-Thorn Missile Electronics) entered service with the RAF and replaced the earlier Type M947 fuze on Paveway II. Full details of the MFBF can be found in a separate unclassified entry.

In July 1994, it was announced that the US Paveway III system had been selected for the UK's Low-Level, Laser-Guided Bomb programme, Staff Requirement (air) 1242. The requirement was for a low-level LGB system for use against aircraft shelters, bridges, and military command centres. Paveway III will be fitted to Tornado GR1 and 4, Jaguar, Harrier GR7 and the Eurofighter. Raytheon Defense Systems leads the team and the major supporting companies are: British Aerospace Systems and Equipment (BASE) which will manufacture gyros and rate sensors, Lockheed Martin will provide an improved penetrating warhead, Thomson-Thorn Missile Electronics (TME) will supply and help integrate the advanced MFBF, Portsmouth Aviation will manufacture the airfoil group and be responsible for MFBF fuze integration and provide trials management for the programme, BAe Royal Ordnance division will assist in warhead/weapon integration.

During the early integration work the Paveway III (UK) guidance and control group and the Paveway II (UK) wing assembly were fitted to a UK 454 kg Mk20 bomb. However, at the 1994 Farnborough Air Show the same two units were seen fitted to a Royal Ordnance 245 kg BROACH (Bomb, Royal Ordnance Augmented Charge) warhead. Full details of the BROACH warhead can be found in Unclassified Projects. In 1997, a Paveway III (UK) laser-guided bomb was reported with a US BLU-109 warhead, fitted to a Tornado GR.MK 1 aircraft. The Paveway III guidance unit was designated WGU-39 (D-2)/B (UK), and the airfoil group BSU-84/B.

### **Description**

The early Paveway II (UK) LGBs consisted of the following major components: MAU-269D/B Computer-Control Group (CCG), which was a modified MAU-169C/B, forward adapter ring, 454 kg (1,000 lb) Mk 13 or Mk 18 bomb, Type M947 pyrotechnic fuze, aft adapter and a Type M120 wing assembly. The MAU-269D/B CCG is a pointed, streamlined container with four moving clipped-tip delta control fins mounted on the rear half of the assembly.



Mounted on the pointed front end of the unit is a stabilised gimballed housing that has a circular wing attached to four fins. This front assembly, which contains the semi-active laser seeker, 'weather-vanes' during bomb flight and aligns approximately along the bomb flight path. The forward and aft adapters are simple machined metal devices that enable the CCG and rear wing assembly to be fitted to standard 454 kg Mk 13 and 18 bombs. These bombs are fitted with standard NATO 356 mm spaced suspension lugs and the M947 fuze is mounted in the bomb's rear fuze well. The bolt-on M120 wing assembly has four fixed, large, flip-out aerofoil surfaces arranged in a cruciform pattern. Later models of the Paveway II (UK) were fitted to improved 454 kg Mk 20 and 22 bombs equipped with the MFBF No 960. The Paveway II (UK) LGB is 3.55 m long; it has a maximum body diameter of 420 mm and with an explosive charge filling of 184 kg of Torpex weighs about 450 kg. The closed tailspan of the M120 is 0.72 m; this extends to 1.68 m once the bomb has cleared the aircraft. The weapon is credited with a maximum range of 15 km when released from an altitude of 9 km (30,000 ft).

Because of the new improved laser seeker used in the Paveway II (UK) system, the CCG section no longer has the distinctive weather-vaning nose. Instead it consists of a long light metal cylindrical tube with clear glass dome and four large, in-line, moving clipped delta control surfaces that run from the centre to the rear of the unit. The Paveway III (UK) CCG has been seen fitted to UK 454 kg Mk 20, UK lightweight BROACH and US 874 kg BLU-109 warheads. Full details of all three warheads can be found in separate entries. When fitted to the two UK warheads the Paveway II (UK) wing assembly was used, however, in the case of the BLU-109 the BSU-84/B airfoil group was used. It is unclear whether or not the BSU-84/B was the standard US item, UK modified or UK built.

When configured with the BLU-109 warhead the Paveway III (UK) LGB is 4.39 m long; it has a maximum body diameter of 370 mm and with an explosive charge filling of 240 kg of Tritonal weighs about 1,065 kg. The closed tailspan of a standard BSU-84A/B is 0.94 m; this extends to 2.0 m once the bomb has cleared the aircraft. But it is unclear if the standard version can be used on UK weapon pylons. This weapon is credited with a maximum range of 18.5 km when released from an altitude of 9 km (30,000 ft).

Guidance for all Paveway LGBs is by semi-active laser, the detector assembly and laser energy receiver being mounted in the front end behind the glass dome. After the bomb is released the laser error sensor measures the angle between the bomb's velocity vector and the line between the bomb's axis and target. Steering corrections are made by moving the nose-mounted canard control fins to adjust the bomb's trajectory to line up with the target. The tailfins/wings are for stabilisation purposes only. Target illumination for both the UK Paveway systems may be either by an aircraft-mounted laser designator (not necessarily on the parent aircraft) or a ground-based laser designator.

### **Operational Status**

Paveway II (UK) entered service in the UK in the late 1970s and it was used on a limited scale in both the 1982 Falklands conflict and the 1991 Gulf War. In the latter, the weapon was delivered by Tornado aircraft against targets illuminated by Buccaneer aircraft fitted with Pave Spike designator pods. Paveway III (UK) entered service in the UK in 1998, and has been certified for use on Tornado GR1 and 4, Jaguar, Harrier GR7 and the Eurofighter. The weapon was used extensively from RAF Tornado aircraft during the four day operation Desert Fox in December 1998. There are unconfirmed reports that some of the weapons were fitted with BROACH warheads and Hard Target Bomb Fuzes (HTBF).

### **Specifications**

	<b>Paveway II</b>	<b>Paveway III (BLU-109 warhead)</b>
Length	3.55 m	4.39 m
Body diameter	420 mm	370 mm
Tailspan	0.72 m closed 1.68 m extended	n/k
Lug spacing	356 mm	762 mm
Weight	450 kg	1,065 kg
Filling	184 kg Torpex	240 kg Tritonal

## Appendix B

### The Evolving Military Threats, Technology and Training Requirements

During the Cold War years, most allied air forces generally depended on free-fall “dumb” or General Purpose (GP) bombs to deal with military targets. The highest probability for success when employing such bombs came as result of attacking targets, at close range, low altitude, high speed and with as many bombs as could be carried. “Dumb” GP bombs also came with the negative side effect of often creating collateral damage on non-military targets and potentially injuring civilian non-combatants due to the inherent inaccuracies of the weapons or through operator miscalculations. Today, most, if not all NATO nations have or will acquire precision-guided munitions (PGM) to better deal with the military challenges, but also for economic and political reasons.

Modern Warfare and the Laws of Armed Conflict dictate that only military targets or those supporting the endeavours of combatants can be attacked. Recent years have demonstrated that hostilities are less likely to involve open warfare with massed troops, but instead the selective use of force in a confined theatre of operations. In essence, small pinpoint military targets often located near civilian facilities must be surgically removed without inflicting “unacceptable” damage or harm. From an Air Force perspective, laser-guided munitions offer an ideal solution for these circumstances.

Lessons learned during hostilities in the Gulf War and again in the Kosovo conflict point to the net advantage of conducting sorties from the medium to high altitude environment, during the day or night, in combination with laser-guided munitions. The results, even with the earlier (Paveway II) technology, were very convincing. Initially, the Royal Air Force (RAF) and the Italian Air Force (ITAF) attempted to penetrate the Iraqi Air Defense network from low altitude. The ITAF ceased this practice relatively early in the conflict as a result of suffering losses. Since the RAF aircraft and weapons systems were designed for low altitude penetration and their crews tasked with airfield denial to the enemy forces, they continued in this role. RAF losses per sortie were considerably higher than their American counterparts who conducted almost all their missions from medium or high altitude.

Precision laser-guided munitions, and particularly the newer (Paveway III) system, offer a number of advantages. One is termed the “Force Multiplier” - weapon guidance accuracy dramatically reduces the number of aircraft required to effect the desired target results. This frees other available aircraft to attack other targets. Secondly, the safety and accuracy of allied aircrew increases - higher release altitudes improve navigation and target identification accuracy, while reducing their vulnerability to small arms fire and providing more defensive reaction time to deal with ground-to-air missiles threats. Finally, weapon guidance accuracy ensures that damage is confined to the actual target and minimizes any collateral, or unintended, damage.

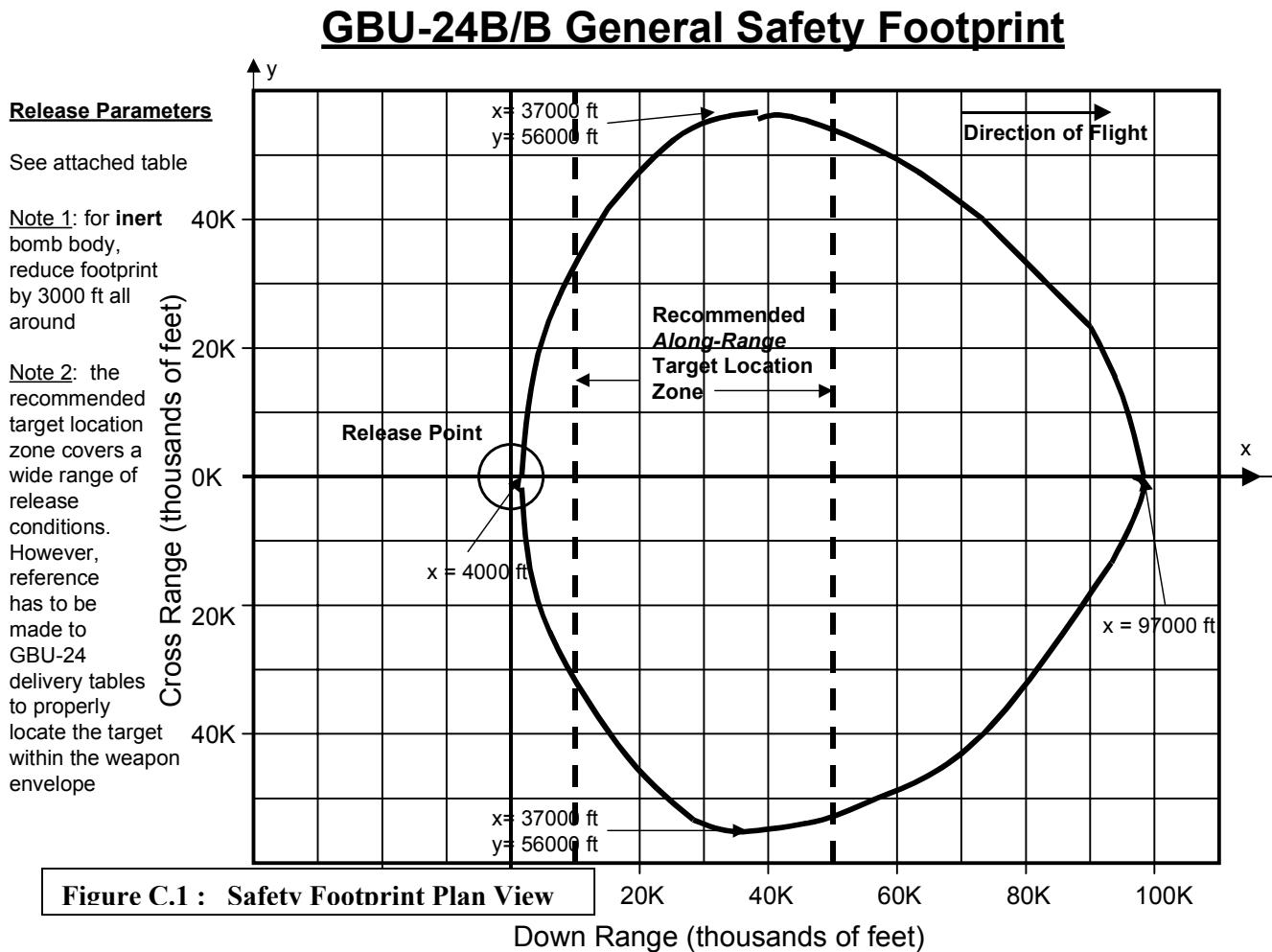
## Appendix C

## Defining the Safety Exclusion Zone

The size and configuration of the Exclusion Zone that will extend beyond the PTA is a function of several parameters. "General safety footprints" have been calculated for various types of weapons, and under specified operating conditions that are set out in weapons' technical publications. A review of the safety footprints associated with each of the systems planned for use at the PTA indicates that the one for the GBU-24 (ie 2000 lb bomb with the Paveway III kit) is the largest and that the resulting template can accommodate all other practice bomb release envelopes in the foreseeable future. The template is based on the Safety Footprint and delivery envelope shown at Figures C-1 and C-2 below, and subject to the release envelopes indicated at Figure C-3. The following maximum envelope release conditions will apply:

- release of LGB at or below 20000 feet Above Ground Level (AGL);
- speed not to exceed .95 mach at time of release;
- aircraft attitude at time of release will be level or diving;
- aircraft heading at time of release must be between 140 degrees true and 300 degrees true.

Applying the template results to the selected aircraft approach headings produces the Exclusion Zone depicted in Figure 2.3. The recommended maximum and minimum weapon release points from the target on the range are seen on Figure C-1 to be approximately 8.5 nautical miles (50,000ft) and 1.6 nautical



miles (10,000ft) respectively. Accordingly, the aircraft will already be inside the existing 10 nautical mile airspace restriction area at the time of weapon release. The maximum forward glide distance for the bomb from an altitude of 30,000 feet is approximately 97,000 feet, or 16 nautical miles.

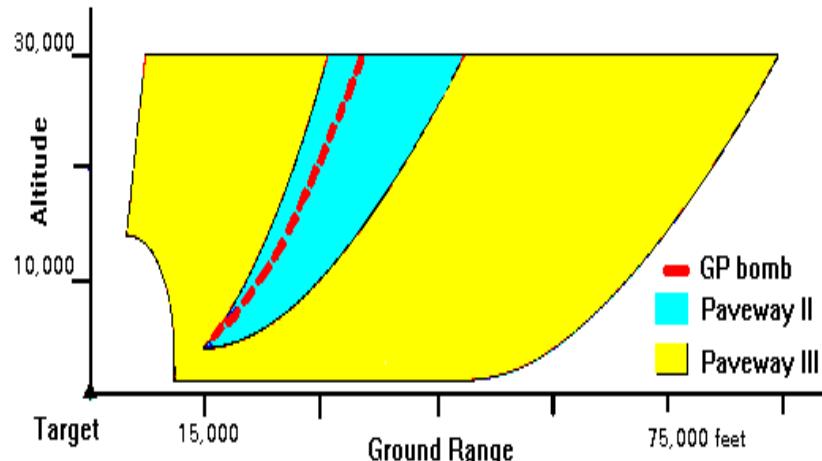


Figure C.2: GBU 24 Delivery Envelope (Vertical View )

### GBU-24B/B General Safety Footprint Release Envelopes

GBU-24 Delivery Mode	Level Flight Envelope	Miniloft Envelope	Loft Envelope	Dive Envelope	Point + Shoot Dive Envelope
1	5K to 20K ft 480KIAS to 0.95M	10 deg 200 ft 500 to (600KIAS/ 0.95M **)	10 to 30 deg 200 ft 480KIAS to 0.95M	N/A	-10 to -15 deg: 5K to 8.2K ft 450 to (600KIAS/ 0.95M **) -15 to -40 deg: 10K to 20K ft 480 to (600KIAS/ 0.95M **)
2	5K to 20K ft 480KIAS to 0.95M	0 to 10 deg 200 ft 480KIAS to 0.95M	10 to 30 deg 200 ft 480KIAS to 0.95M	0 to -20 deg 10K ft 550KIAS to 0.95M	-15 to -20 deg 12K to 19.5K ft 480 to (600KIAS/ 0.95M **)
3	5K to 20K ft 480 KIAS to 0.95M	N/A	N/A	N/A	N/A
4	5K to 20K ft 480KIAS to 0.95M	5 deg 15K to 20K ft 540KIAS to 0.95M	N/A	N/A	N/A

\*\*: whichever limit is lower

Note: refer to the CF188 WSOI, C-12-188-NFM/MB-002, for appropriate CF188/GBU-24B/B carriage/release configurations limitations

Figure C.3