REGISTRATION FORM

NAME OF UNDERTAKING: Supersonic Flight Training in the 5 Wing Goose Bay Air Range CYA 732

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GLOSSARY AND LIST OF ABBREVIATIONS

AGL	Above Ground Level (flight altitude)
ASL	Above Sea Level (flight altitude)
CDNL	C-weighted day and night averages
CEAA	Canadian Environmental Assessment Agency
CWS	Canadian Wildlife Service (Environment Canada)
CYA	Canadian Advisory Area (Air Range – for military training)
CYR	Canadian Restricted Area (Air Range – for military training)
dBA	A-weighted Sound Exposure Level (in decibels)
DND	Department of National Defence
D Air CFG	Directorate of Air Contracted Force Generation
EA	Environmental Assessment
FMTGB	Foreign Military Training – Goose Bay
IEMR	Institute for Environmental Monitoring and Research
LLTA	Low Level Training Area
MCC	Military Coordination Centre
MOU	Memorandum of Understanding
MSL	Mean Sea Level (flight altitude)
NM	Nautical Miles
PTA	Practice Target Area
SRC	Scientific Review Committee (of IEMR)
USAF	United States Air Force
VEC	Valued Ecosystem Component

1.0 INTRODUCTION

1.1 Identification of the Proponent

The Department of National Defence (DND) is the Responsible Authority for Foreign Military Training (FMT) 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 flight training in Canada. An implementation arrangement, known as a Memorandum of Understanding (MOU), identified specific requirements and other terms and conditions related 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.

Prior to the expiration of MOU in March 2006, the participating nations and the prospective participants indicated a need to achieve cost savings and training enhancements for their future involvement in Goose Bay. DND considers this undertaking an important element for 5 Wing Goose Bay to remain viable as a training venue; it is initiating this undertaking to satisfy a longstanding air combat training requirement.

1.2 Nature of the Undertaking

1.2.1 Background

Military training at Goose Bay averaged 5,000 - 6,000 low-level flights per year, during the April to October flying season, far below the 15,000 low level sorties permitted in the EIS. These low-level flights took place in the Low Level Training Area (LLTA), which is a defined air training area, capped at 5,000 ft ASL (CYA 731), and lies over the interior of the Quebec-Labrador peninsula. Figure 1.1 illustrates the training area, the entirety of which measures 130,000 square kilometres (the size of England). Until recently, most training comprised of low-level flights involving activity below 1,000 feet (and as low as 100 feet above all obstacles) within the LLTA. Due to lack of new training initiatives available at 5 Wing Goose Bay, during the last few years of the MOU the activity levels declined substantially; and with the expiration of the MOU, military jet flight activity ceased. However, the DND still maintains seventy "camera targets", which are dispersed below the LLTA; these are mock-up structures simulating enemy positions. During low-level training, the crews navigated between selected targets at subsonic speeds, often flying in river valleys and below natural ridge lines (terrain-masking) to avoid radar detection. They conduct simulated attacks using onboard cameras to verify their accuracy - no weapons or stores were launched against the camera targets.

Aircrew were allowed to conduct weapons training through the release of non-explosive practice weapons onto defined targets, but only within the four nautical mile radius Practice Target Area (PTA) shown at Figure 1.1 and 1.2.

The training area straddles the border of Labrador and the province of Quebec. There is only one permanent community (Churchill Falls, population 800) within the training area and it is protected from disturbance by a 22 nautical mile (NM) 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.

In 2003, DND successfully completed the regulatory processes, including an environmental assessment, to introduce the use of practice Precision Guided Munitions at the PTA. This entailed the transfer of administration and control of a larger parcel of land from the Province of Newfoundland and Labrador to DND to establish a Safety Template Zone around the PTA for limited times during the year. A 16 nautical mile radius perimeter was marked on the ground by a 3-metre clear-cut vegetation slash, with signs posted in three languages. During 2004 DND completed the regulatory process, including the environmental assessments, for the use of defensive countermeasures (chaff and flares) by the allies in the Labrador portion of the 5 Wing Goose Bay Air Ranges. DND received approval in principle to allow the use of these defensive countermeasures; and in early 2005 the province of Newfoundland and Labrador also approved monitoring and mitigation program for this activity.

In order to further enhance the allied training opportunities in Goose Bay area, Department of National Defence intends to authorize "Supersonic Flight Training" in the Labrador portion of Goose Bay Air Range CYA 732 down to an altitude of 5,000 ft AGL. To achieve "realistic" training, aircrew must be given the opportunity to briefly accelerate into the supersonic regime during parts of their sortie. This training will be conducted exclusively within the 5 Wing Goose Bay Air Range CYA 732, which lies above the CYA 731 (referred to as the Low-Level Training Area, LLTA). Furthermore, to integrate this new initiative into its current training activities, DND will use the Adaptive Management Strategy so that the environmental impacts can be minimized and mitigated.

The altitude of 5,000 ft AGL is an important discriminator for Air-to-air fighter training: this is the lowest altitude above ground level that is used to simulate the earth's surface. As a safety precaution in Air Combat Training (i.e. "dog fighting"), 5,000 ft AGL is referred to as the "Hard Deck". Once an aircraft comes in contact with the Hard Deck (i.e. dips below 5,000 ft AGL), the air-to-air fight stops, and fighters must reset to a higher altitude for reengagement. Fighters are not precluded from flying below the Hard Deck, but they are not to become engaged in turning and/or vertical fights. It is important that fighters be permitted to operate in the supersonic region down to the Hard Deck. Although a supersonic event below 15,000 ft is rare (see Annex E), such an event is usually because of a significant tactical error; thus, important lessons will be drawn from the event during post-flight debriefing. In the case of 5 Wing Goose Bay, Air-to-air fighters that are likely to engage in supersonic events will train above the Hard Deck (5,000 ft AGL) and Air-to-ground fighters will continue to operate below the Hard Deck at subsonic speeds.

Flight training activity is the main economic engine in the Goose Bay area; and it ceased in 2006 with the expiration of MOU. The Department of National Defence is aggressively trying to market the Goose Bay area as a possible venue for this new type of training. However, due to uncertainty of allies coming back to Goose Bay for on a long-term basis, DND envisages two separate scenarios for the "Supersonic Flight Training" that may be conducted in the Goose Bay Air Range CYA 732, namely: (a) Conventional Night Strike, a short-term, intensive training exercise; and (b) Ongoing Training, a long-term training activity, similar to that was under the MOU. Consequently, in this Environmental Assessment document, it is assumed that all of the Supersonic Flight Training would be conducted in the Labrador portion of the Goose Bay Air Range CYA 732, and the likelihood of sonic booms being heard the ground and the associated noise levels have been predicted.

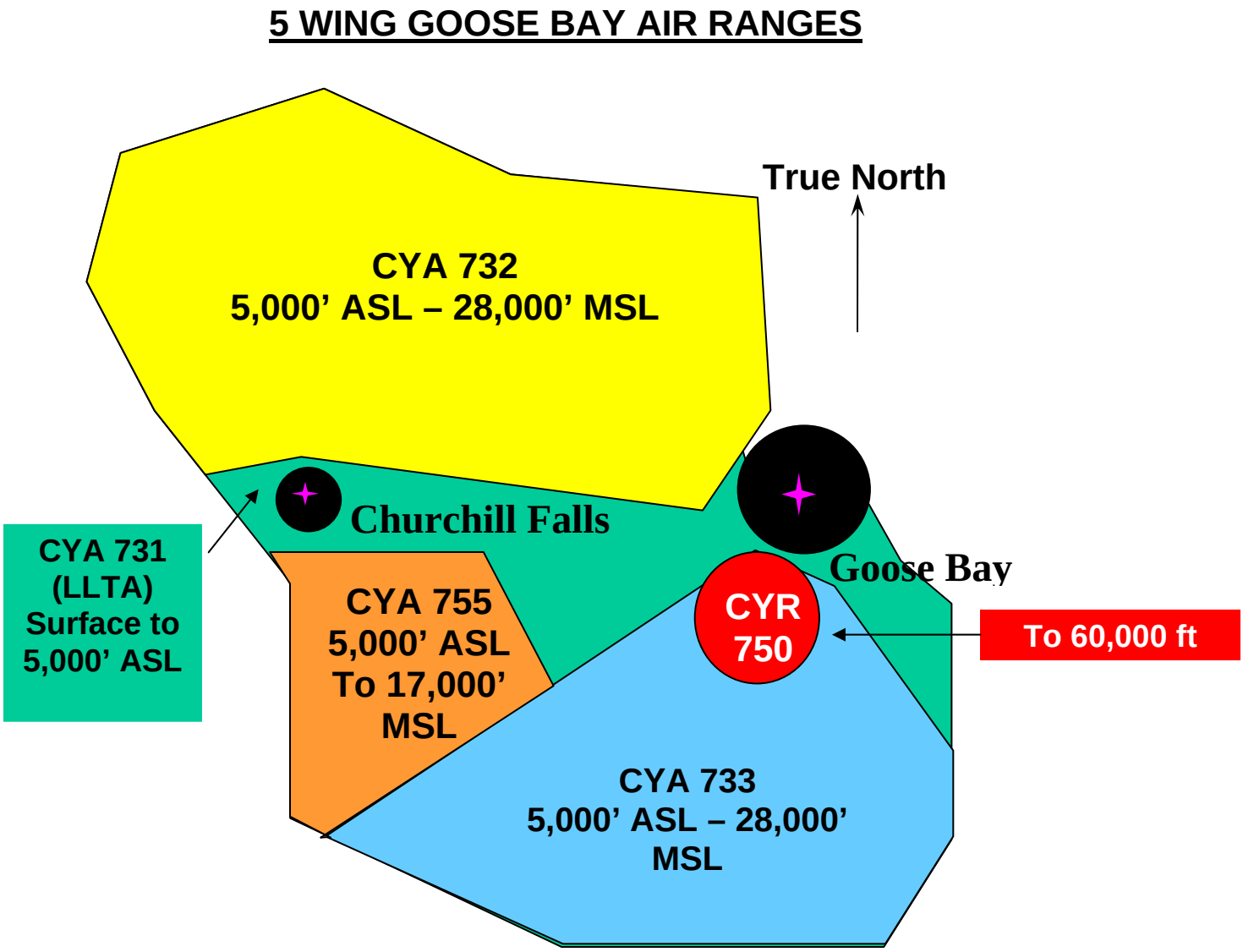

Figure 1.1. Map of the 5 Wing Goose Bay Air Ranges. The Air Range CYA 731 is the Low-Level Training Area (LLTA), and no supersonic flight will be conducted in this range. The Air Ranges CYA 732, 733, 755 and CYR 750 are all located above the LLTA. The DND would authorize supersonic flight training above 5,000 ft AGL in the Labrador portion of the CYA 732 (refer to Fig 1.2 for provincial boundaries).

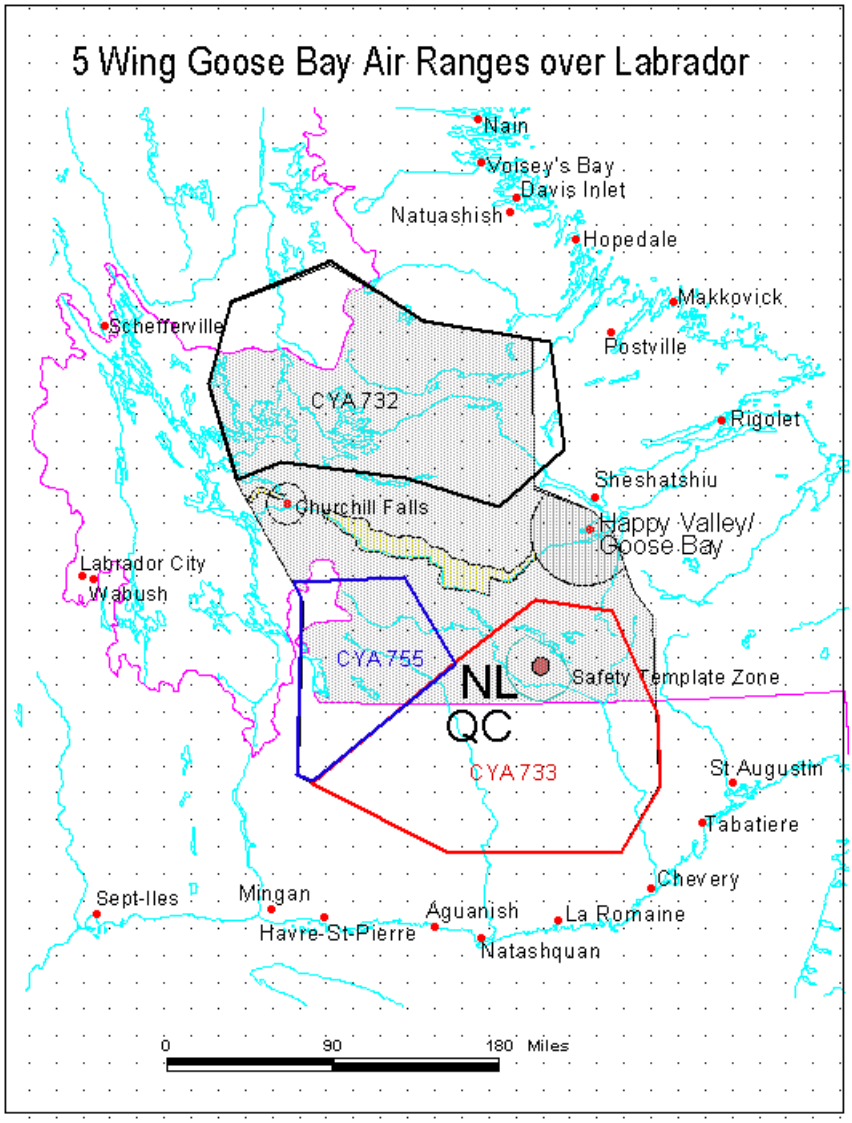

Figure 1.2. The shaded area represents the Labrador portion of the 5 Wing Goose Bay Air Ranges. Supersonic flight activity will take place above 5,000 ft AGL in the Labrador portion of CYA 732. A 25 NM transition zone around the Goose Bay airport and 22 NM zone around Churchill Falls are the exclusion zones and no flight training activity is permitted in these zones.

1.2.2 Previous Environmental and Administrative Processes

Subsonic low-level flight training in the CYA 731 (Low-Level Training Area – LLTA) 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.

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 arrangement was modified in 2003 to accommodate the use of enhanced longer-range practice 'precision guided munitions', and the establishment of a Safety Template Zone.

As part of the comprehensive environmental management system, the federal government established the Institute for Environmental Monitoring and Research (IEMR) in 1996. The IEMR is a third party, independent body that is responsible for conducting monitoring and effects research on the domains below the Goose Bay Air Ranges. The data and results collected by the IEMR are conveyed to DND, which then feeds into the adaptive management models to strengthen the Mitigation Program, for which the Department is responsible. DND retains the responsibility and accountability for conducting environmental assessments prior to the introduction of new training activities within the 5 Goose Bay Air Ranges and mitigating potential environmental effects.

DND publishes an Environmental Report and Mitigation Program relating to Foreign Military Training in Goose Bay on an annual basis. This report indicates the results of the environmental work conducted by FMTGB over the last period, outstanding issues to be addressed, consultations and collaborations with external groups, goals and objectives including the following year's work-plan. The latest report can be obtained online at **www.airtraining.forces.gc.ca/GooseBay**. In 2003, FMTGB also achieved ISO 14001 certification, attesting to DND's comprehensive approach in addressing environmental issues related to the training activity at 5 Wing Goose Bay. Since November 2006, the responsibility for the Environmental Management System (EMS) and Environmental Mitigation has been transferred to 5 Wing Goose Bay.

The work conducted by the IEMR to date confirms that the environmental impact is at or below the impact levels predicted in the 1994 EIS[1]. For the introduction of new training elements, such as supersonic flight, DND has provided the IEMR with all its documentation to facilitate a review by stakeholders and the IEMR Scientific Review Committee.

1.3 The Undertaking

The subject of this Registration is the potential impact on land below Air Range CYA 732 due to "Supersonic Flight Training". An aircraft is said to be supersonic whenever it exceeds Mach 1.0, which is the speed of sound. During a typical training mission with multiple aircraft, the individual aircraft may be at supersonic speeds several times; however, each of these events typically last a few seconds and generally takes place at very high altitudes. All supersonic events produce a sonic boom, but the resulting booms may not necessarily be heard or felt on the ground.

[1] As a result of IEMR and DND monitoring studies, the environmental closures for some of the sensitive species have been removed, whereas for others, the closure size has been reduced.

At any time during a combat mission, aircrew may be exposed to numerous types of threats from either air-based systems (opposing aircraft with missiles and guns) or ground-based systems (various surface-to-air missiles or anti-aircraft artillery). To counter these threats, fighter aircraft require the use of supersonic speed to either engage the threat or to evade the threat. An exposé on the use of supersonic flight, as it pertains to fighter tactics, is included at Annex E.

Because at present, there is no regular ongoing flight training activity at the Goose Bay (flight training activity ceased in 2006); however, the DND is trying to market the Goose Bay as a likely venue for supersonic training. In a typical training sortie there may be several supersonic events, each lasting a few seconds; and the DND will restrict them to above 5,000 ft AGL. The two possible scenarios envisaged are as follows:

Conventional Night Strike exercise, whereby large scale, intensive training is conducted for a short time, generally no more than two weeks involving up to 16 sorties a night. In this case, the aircrew takes advantage of the weather and available daylight. This type of exercise requires large amount of ground resources and are logistically difficult; consequently they can be conducted only ones or twice in the training season. However, because of the location of Goose Bay Air Ranges, and commitment of shorter duration, the allies may be more interested in this type of exercise. If this undertaking is approved, it appears to be the likely scenario.

Ongoing Training, this assumes the worst-case (highest use) scenario, Goose Bay would fly about 5,000 sorties (the historical average under the now expired MOU) during the training season; and a quarter of these, approximately 1,250 sorties would be supersonic. Given the current commitment of the allies in operational missions and reduced funds for training deployment, this number of sorties is unlikely

This document describes the mitigation procedures that DND will employ when it initiates Supersonic Flight Training activity for aircrew in the 5 Wing Goose Bay. Supersonic Flight Training represents an individual element within an overall training activity, which has already been approved under a previous federal environmental panel review process (DND 1994).

1.4 Need for the Undertaking

Almost all air-to-air combat aircraft make use of supersonic speeds either to engage opposing aircraft in air-to-air combat or to escape from enemy threats. It is important to realize that only 25% of an average mission is comprised of air-to-air fighters: the majority of fighters sent on a mission are air-to-surface attack fighters. The air-to-air fighters are usually the only fighters that transit into the supersonic flight envelope.

The supersonic speed of an aircraft provides a tactical edge during the initial setting of intercept geometry. To do so effectively, aircrew need to incorporate training at supersonic speeds into their flight training activities. DND recognizes that, should a supersonic event occur, it could potentially have an impact on the flora, fauna, humans, and buildings located below the 5 Wing Goose Bay Air Ranges. This activity was not incorporated among the activities in the EIS, nor will this activity occur in the low-level environment covered by the EIS (low-level flight is at less than 1,000 ft AGL). However, the

participating air forces indicated that supersonic flight training is vital for aircrew proficiency; and not having this capability at Goose Bay is a significant detriment to their continued training at 5 Wing. Once this new training initiative is approved, DND has plans take on an aggressive marketing campaign to attract allied air forces to Goose Bay.

With the growing sophistication of anti-aircraft systems, the need to regularly conduct realistic training continues to grow. Survival in air combat demands that aircrew develop correct intuitive and instantaneous defensive response to various threats. Combat aircrew are constantly conducting in-flight analysis of enemy weapon systems, surveying on-board warning and defensive counter-measure sensors, employing tactics for timely defensive countermeasures, and employing the use of supersonic speed to make a safe escape if necessary. The success of the chosen tactic is assessed both in-flight and during mission debrief.

In Canada, supersonic flight training activity is permitted at all altitudes in the designated areas of the Cold Lake Air Weapons Range (CLAWR) in Alberta (CYR 204). Further, supersonic flying is permitted above 30,000 ft MSL north of the "Boom Line" as defined by 1 Canadian Air Division Orders. D Air CFG 6 will begin the process to have the Labrador portion of 5 Wing Air Range CYA 732 recognized as "Supersonic Flight Training Area" by the Canadian Forces from altitudes of 5,000 ft AGL and above. This environmental assessment is being submitted in recognition of the fact that supersonic flight below 30,000 ft MSL does create a noise and pressure wave that can be felt by fauna and humans on the ground. The Department of National Defence predicts that the proposed flight training activity would not have significant environmental impacts, and is registering its proposed mitigation program to deal with these effects.

1.5 Alternatives to the Undertaking

The viability of the foreign military training program 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 in a cost-effective and comprehensive manner. The inability to train in a crucial aspect of their operation (i.e. supersonic regime) could compromise the overall training value of their program in Goose Bay, and lead to the selection of alternative training venues elsewhere in the world. The employment and socio-economic benefits accruing from allied training in Goose Bay have been well documented in the 1994 EIS and 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 main stay for the region.

1.6 Environmental Monitoring and Mitigation Program

The Department of National Defence is concerned about the environmental impacts that may result due to the supersonic flight training activity in the region. Further, it is committed to environmentally sustainable defence activities through its Sustainable Development Strategy, and is responsible for mitigating adverse impacts that may occur due to its actions. As a result, IEMR monitoring and effects data will be provided to DND so as to allow for the effective use of a comprehensive Adaptive Management Strategy as part of the DND's Mitigation Program.

1.6.1 Adaptive Management Strategy

The adaptive management strategy is a formal, systematic, and rigorous approach to learning from the outcomes of management actions, accommodating change and improving management. It involves synthesizing existing knowledge, exploring alternative actions and making explicit forecasts about their outcomes. Management actions and monitoring programs are carefully designed to generate reliable feedback, and clarify the reasons for underlying outcomes. Actions and objectives are then adjusted based on this feedback and improved understanding. In addition, decisions, actions and outcomes are carefully documented and communicated to others, so that knowledge gained through experience is passed on, rather than being lost when individuals move or leave the organization.

A rigorous, deliberate approach to learning is appropriate whenever there is significant uncertainty about possible outcomes of alternative actions and where delaying action is either unnecessary or would have unacceptable ecological, economic or social impact. To be effective, adaptive management requires a commitment to learn, to access necessary expertise, and to adjust adequate resources (e.g. for monitoring and data analysis). Quite often, complex and contentious issues will require more skill and expertise than simple problems and may take longer to resolve.

In order to mitigate the environmental impacts due to supersonic flight training activity, the DND intends to use the step-wise approach. A list of completed and planned activities is given below in Table 1.6a-c. Because the process of adaptive management is one of learning from experience and requires periodic adjustments, this list of activities is by no means complete. For the sake of convenience, it is divided in three separate tables. Further, these activities represent a continuum and some of these steps may run concurrently.

Table 1.6a. List of DND's completed and planned activities.

Step no.	Action/ Activity	Description of DND's Activity
1	Collect and Review Literature	The DND has: • collected and reviewed the available literature with regard to the supersonic flight training activity, its impact on the environmental components (wildlife, human, and structures etc.); • obtained necessary predictive tools (i.e. computer software to predict the environmental impacts such as peak overpressure and noise levels). A list of documents that are available from DND is given in Annex A.
2a	Consultation with IEMR, Provincial governments, and other Stake Holders	The DND: • provided copies of the literature to IEMR, Provincial governments, and other interested parties; • invited stakeholders; and the representatives from aboriginal groups, CWS, IEMR, NL government and Churchill Falls (Labrador) Corporation attended its field measurements program in July 2004.
2b	Conduct Field Measurement Studies and Data Analysis	DND provided resources including two dedicated CF-18 aircraft to conduct the field measurement studies in Goose Bay area in April and July 2004, to assess: (a) the efficacy of PCBoom computer model as a predictive tool; (b) response of wildlife (waterfowl and osprey); and (c) seismic effects on the ground. DND analyzed the field data, and presented the results of the filed measurement studies to SRC (IEMR) in November 2004.

Table 1.6b. A list of DND's current and planned activities.

Step no.	Action/ Activity	Description of DND's Activity
3a	Consultation with Aboriginal Groups	DND would: • consult with Aboriginal Groups; and • provide draft version of the EA for their comments.
3b	Prepare an Environmental Assessment on Supersonic Flight Training for the NL Government	DND, as part of its implementation process for supersonic flight training activity at 5 Wing Goose Bay Air Range CYA 732, has prepared an Environmental Assessment (this document) for the government of Newfoundland and Labrador. The DND assumes: • a minimum altitude of 5,000 ft AGL for supersonic training; • majority of the sonic booms to be generated from aircraft above 15,000 ft AGL; • type of training: - Conventional Night Strike, if successful in attracting participants, there could be a maximum of 160 supersonic sorties in two week period; - Ongoing training, a maximum of 1,250 supersonic sorties per year (unlikely scenario); The DND predicts: • sonic booms tend to fall in an elliptical pattern, and the frequency of booms is higher in the centre of the ellipse and lower towards the edges; • CDNL in the centre of the airspace will be slightly over 45 dB - with the conventional night strike, ~2.5 booms may be heard in the centre of the airspace for the duration of exercise; - with ongoing training, if all of the 1,250 sorties materialize, then booms may be felt about 4 times a month in the centre of the training ellipse; • on average, peak overpressure would be less than 1 psf; whereas booms exceeding 1 psf would be rare; • sonic booms may cause some startle reaction in people and wildlife; and • noise level from these booms would not be enough to cause significant environmental damage.

Table 1.6c. A list of DND's planned activities.

Step no.	Action/ Activity	Description of DND's Activity
4	Model/ Predict Environmental Impacts and Validate Predictions	Once the Province agrees with the proposed mitigation plan, and training has started, based on the activity level, IEMR will: • model environmental impacts (noise levels and peak overpressures) using the available computer programs; and • validate the predictions that have been made in this EA document.
5	Work closely and fully cooperate with the IEMR	DND will work closely with the IEMR environmental monitoring plans/ studies, as appropriate: • osprey monitoring – in side/ outside Air Ranges, • harlequin ducks/ waterfowl – surveys of selected river valleys/ water bodies, • peregrine falcons – surveys, • caribou – satellite telemetry, • any other wildlife species that may be of concern (such as, passerines), etc.
6	Monitor VECs (IEMR is responsible for all monitoring activities)	The IEMR will monitor VECs in the areas of interest for adverse reactions (particularly population level disturbances) and provide information for use by DND in its mitigation program. DND will provide IEMR with its best knowledge of changing activities (and training scenarios).
7	Mitigate Environmental Impacts	Mitigate environmental impacts – DND, in consultation with IEMR, would recommend changes to the training activity if adverse population level reactions are observed. This may include implementation of spatial and/ or temporal restrictions.
8	Improve Modelling/ Predictive Capability	To determine environmental impacts, IEMR would improve modelling/ predictive capability by using detailed information obtained from: • Supersonic training flight profiles, and • Global Environmental Multiscale (GEM) weather data.
9	Establish patterns in Supersonic Flight Training Activity	After a year or two, DND/IEMR would undertake to establish patterns in the supersonic flight training activity (i.e. determine the areas of high/ low use, and their relationship with noise receptors on the ground), so as to focus on dedicated wildlife species.
10	Use of ACMI Pods	Should DND acquire Air Combat Manoeuvre Instrumentation (ACMI) pods; the resultant accurate flight profile information and GEM weather data would be used to calculate expected noise levels and peak overpressures in the high use areas.
11	Explore New Modelling/ Predictive Tools	The current modelling/ predictive tool available to DND/IEMR is also being used by USAF; however, DND/IEMR would explore new modelling/ predictive tools that may become available.
12	Recommend Suspension of Supersonic Training Activity	If adverse environmental impacts are severe enough and cannot be mitigated, then in consultation with the stakeholders, the DND would recommend suspension and further investigation of supersonic flight activity in the 5 Wing Goose

		Bay Air Range.

1.6.2 Environmental Monitoring

The Department of National Defence, along with its partners (the IEMR, Provincial Governments, Canadian Wildlife Service, and Consultants), have gathered a vast amount of information on the impact of low-level subsonic flight on the various species. DND has traditionally practiced "avoidance" as a mitigation strategy with regards to the impact of low-level training. To date, no significant impact on wildlife population levels has been observed since the commencement of low-level military flying training in the Goose Bay area.

The DND has gradually turned over the responsibility of wildlife monitoring to the Institute for the Environmental Monitoring and Research (IEMR). The IEMR, with the help its of various Technical Committees and the Scientific Review Committee (SRC), sets the priorities to focus on various environmental issues. With subsonic aircraft activities, these efforts have been mainly directed towards the monitoring of osprey, waterfowl, and harlequin ducks. In the past the allies, through DND, have contributed funds towards the monitoring of caribou; however, with the shift in focus, the responsibility for monitoring of caribou would fall on the IEMR. It should be noted that based on the recommendations from the EIS panel, DND had no specific monitoring program for the passerine birds while low-level training was conducted in the Goose Bay area (see Table C1 and C2, in Annex C); however, recently concerns have been raised about these birds, and if necessary the IEMR (in consultation with the stakeholders) would implement a suitable monitoring program.

It is expected that the IEMR would continue to monitor the impacts due to military training activity (both subsonic and supersonic) in the 5 Wing Goose Bay Air Ranges. Whenever necessary, the Department of National Defence (DND) would provide its input to these studies so that its mandate and objectives are properly met.

1.6.3 Environmental Mitigation

The Department of National Defence as a Responsible Authority for this undertaking would be accountable for overall Mitigation Program. For the Low-Level Training program, it uses spatial and temporal separation criteria to protect sensitive species from subsonic noise disturbance. The avoidance criteria are periodically reviewed and revised in consultation with stakeholders (i.e. IEMR and provincial resource managers). Based on the current criteria, the species (or environmental closures) are protected from subsonic noise disturbance by 1,000 ft of vertical separation, whereas the spatial extent of the closure is dependent on the nature of the wildlife and their sensitivities. For example, the bird nest with fledgling has different size spatial closure than caribou; and spatial closure may be lifted after the chicks have left the nest.

The DND has computer software (PCBoom) to predict the intensity of sonic booms on the ground. PCBoom has been used extensively by United States Air Force (USAF) to predict and mitigate environmental impact due to sonic booms. A number of parameters (e.g. noise level, peak overpressure, and the impacted area, etc.) can be calculated for a variety of aircraft, flying different types of flight profiles (i.e. straight and level flights to aircraft manoeuvres), under different atmospheric conditions.

The DND would restrict the proposed supersonic activity to be above 5,000 ft AGL[2] and most of the supersonic events will be above 15,000 ft AGL. Further, with the deployment of modern fighter aircraft, there has been a gradual shift towards the higher altitudes for supersonic training. When the aircraft are supersonic at higher altitudes, many sonic booms do not reach the ground because of atmospheric refraction. The entire sonic boom event for a typical fighter jet is ~100 milliseconds; and because of the sharp rise time, this type of noise event is expected to elicit a startle reaction from the wildlife.

The US Air Force has done long-term studies of Air Combat Training (ACT) in some of their Military Operating Areas, and has developed a computer model (BooMap) to predict the frequency and magnitude of the sonic booms reaching the ground. The results of these studies indicate that supersonic activity tends to fall in an elliptical pattern, and the frequency of sonic booms is greater in the centre of the manoeuvre ellipse, whereas it is lower towards the edges of the ellipse. Further, the area exposed to sonic booms remains the same (i.e. independent of number of sorties), but the number of sonic booms reaching the ground is proportional to the number of supersonic sorties (i.e. the frequency of booms increases with an increase in the number of sorties).

The DND contracted Wyle Laboratories to conduct BooMap analysis under various training scenarios for the Labrador portion of the CYA 732 Air Range. For the complete Wyle Laboratories report, see Appendix 1 in Annex B.

Based on the BooMap analysis, the DND predicts that under the Conventional Night Strike scenario, a sonic boom may be heard in the centre of the airspace every 4 days if the area is used as a single manoeuvre ellipse, or approximately 2.5 times for the duration of the exercise that last only two weeks, and it would be lower towards the edges of the area. It should be noted that due to the logistics and resources involved, there may be one to two Night Strike events in a year. On the other hand, with the ongoing training, if all the supersonic flights (~1,250 flights[3], maximum number anticipated during a season) are confined to the Labrador portion of the CYA 732 Air Range, then species on the ground are likely to be subjected to sonic booms approximately four times a month (see Annex B, Section 6.3). This predicted number of four booms per month is for the central part of the manoeuvre area (i.e. if the entire Air Range is used as one manoeuvre ellipse), and the frequency of sonic booms is lower towards the edges of the range. In a more likely training scenario, CYA 732 will be split into a number of manoeuvre areas, thereby equally dividing the total number of sorties among these ellipses. Consequently, the frequency of booms in the central part of individual manoeuvre area (ellipse) will be correspondingly lower.

The BooMap analysis indicates that for the proposed supersonic flight activity, the peak overpressure for an average sonic boom would be less than 1 psf, and the resulting cumulative noise CDNL level (C-weighted day and night average) would be around 45 dB. This level of noise would not cause significant impact on wildlife species (see Annex B, Section 4.3).

[2] See Annex E, Table 1, less than 2% of all supersonic events were below 10,000 ft AGL; most of the events are above 15,000 ft AGL.

[3] With the current situation of allied military training, this is highly unlikely scenario. However, If it does happens, DND expects that during a season the initial number of supersonic flights to be far less than 1,250.

It should be emphasized that, if the environmental monitoring activities of the IEMR are to discover any detrimental effects on the population levels of any wildlife species due to supersonic training activity, then the DND would consult with IEMR and provincial resource managers to introduce an immediate and suitable mitigation strategy. Moreover, if adverse environmental impacts are severe and cannot be mitigated then, in consultation with the stakeholders, the DND would recommend the suspension and further investigation of supersonic activity in the associated 5 Wing Goose Bay Air Range.

1.7 Schedule for the Undertaking

The Canadian Forces intends to authorize supersonic flight training as soon as the environmental process is completed. The implementation of this undertaking does not require any new construction and/or modification within the 5 Wing Goose Bay Air Range CYA 732, nor other licenses or approvals.

2.0 DESCRIPTION OF THE UNDERTAKING

2.1 Introduction

Since the 1980s, much of the training conducted at Goose Bay has focused on low-level flying at subsonic speeds. Such tactical employment of aircraft provided a degree of security to the crews, minimizing detection by flying in the valleys. This practice, known as terrain masking, is not always an operational option – crews may have to fly at higher altitudes and higher speeds in order to engage enemy aircraft and employ ordnance. Whenever the speed of an aircraft is greater than the speed of sound, it is said to be supersonic. Supersonic speeds of an aircraft are generally expressed in Mach number, which is the ratio of speed of the aircraft to the speed of sound.

As explained at Annex E, aircrew usually have to use afterburners to attain supersonic speed. Because of the high fuel consumption associated with afterburner use, supersonic events are of very short duration (generally lasting a few seconds and rarely more than a minute). During an air-to-air fighter sortie, the time in the supersonic regime will typically be less than 5 minutes, which represents less than 8% of the total flying time. Furthermore, these events rarely occur in the low level environment because of the physical limitations of fighter design.

As described in Annex B, when an aircraft is flying at supersonic speed it disturbs air in the atmosphere, thus continually generating shock waves due to compression and rarefaction. The sound that is heard on the ground is referred to as a “sonic boom”; it is due to the sudden onset and release of pressure after the build-up by the shock wave (or “peak overpressure”). A sonic boom is an impulsive noise similar to thunder, and its duration is less than a second (~100 milliseconds or so for most fighter sized aircraft). Most of the energy is concentrated in the 0.1-100 Hertz frequency range, which is considerably below that of subsonic aircraft. Peak overpressure is generally measured in pounds per square foot (psf) and this measurement defines the magnitude of the sonic boom.

Although every supersonic event generates a sonic shock wave (sonic boom), some of these shock waves are refracted by atmosphere to the extent that they never reach the ground. The speed of sound at any altitude is a function of air temperature; and as the shock wave descends through progressively warmer atmosphere, it is refracted away from the earth’s surface. If a shock wave does reach the ground, the associated boom is heard 2 to 60 seconds after the flyover.

When a sonic boom reaches the ground, the impacted area is referred to as a “footprint” or, for sustained supersonic flight, a “carpet” (see Annex B, Figure 1). The atmospheric refraction limits the width of the sonic boom carpet, and consequently the areas beyond the carpet are referred as “cut-off”. Sonic booms are loudest near the centre of the footprint and have a sharp sound; near the edges, they are weak and have a rumbling sound like a distant thunder. When the aircraft is performing manoeuvres such as accelerating, turning, and diving, a “focused boom” is generated, which is of greater magnitude than that described above. Unlike the carpet boom, the focused boom does not trail the aircraft; and is confined to a much smaller area (Annex B, Section 2.1).

More detailed information about the characteristics of the sonic boom and its impacts on the ground are provided at Annex B.

2.2 Current and Future Usage

In accordance with 1 Canadian Air Division Orders, supersonic training activity in the 5 Wing Goose Bay Air Ranges (CYA 732, CYA 733, and CYA 755) is currently authorized above 30,000 ft MSL; and no supersonic activity is permitted below this altitude.

In a typical mission, three-quarters of all sorties will continue to be air-to-ground training sorties where supersonic events are very rare. It is important to understand that the fighter maintains these supersonic speeds for brief periods of time: typical supersonic events last less than 30 seconds (see Annex E). For an individual sortie lasting about 1 hour, the total time spent in the supersonic regime may be around 5 minutes or less.

However, if this undertaking is approved, DND would limit the supersonic training activity to altitudes above 5,000 ft. AGL in the Labrador portion of the Goose Bay Air Range CYA 732. This is because of safety concerns for the aircrew, and to minimize the impact of sonic booms. Nevertheless, in order to optimize fuel consumption and reduce the atmospheric drag on the aircraft, most supersonic activity is conducted above 15,000 ft AGL. Moreover, with the use of modern aircraft, and evolving fighter tactics, there is a gradual shift towards the higher altitudes for this type of training activity. As the supersonic training activity shifts to higher altitude bands, there is a corresponding decrease in the number of sonic booms that reach the ground; accordingly, the impact on the ground is lower.

2.3 Current Environmental Protection Procedures

As part of its extensive mitigation efforts, DND participates in a comprehensive monitoring program to identify sensitive areas below the 5 Wing Goose Bay Air Ranges arising from human or wildlife activity on the ground. This information is obtained from various ongoing surveys, tracking of wildlife based on satellite and radio collars, and the data collected through the community liaison program. The Mitigation Program is largely based on “avoidance” of sensitive species by providing spatial and/ or temporal separation. The Military Control Centre (MCC) notifies the Allied crews about the locations of sensitive species, and protective buffer areas are established; these locations are prohibited for low-level subsonic flight activity. A similar avoidance program will be initiated to prevent environmental impacts due to supersonic training directly over sensitive areas (see Section 4).

The DND environmental program is conducted in cooperation with federal and provincial wildlife officials and the Institute for Environmental Monitoring and Research (IEMR), in consultation with interested aboriginal groups. This arrangement provides an effective mechanism to address issues that may arise with this undertaking in the future. DND expects that the IEMR, in accordance with its mandate, will undertake a program to monitor the actual impact of supersonic training on the environment. DND intends to cooperate with IEMR in their active monitoring programs, and will be responsible for maintaining an active Mitigation Program.

2.4 Timeframe for Operational Activity

The international Memorandum of Understanding governing foreign training at 5 Wing provided 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, while active and intense training periods were generally confined to the period April to October of every year, there is an increasing amount of short-term flying training during the winter months.

2.5 Communicating with Civil Aviation and Other Local Authorities

Military Control Centre (MCC) coordinates all military flights into the 5 Wing Goose Bay Air Ranges in accordance with visual and instrument flight rules, and it acts as a liaison with locally based civilian air carriers.

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

This undertaking will utilize the same airspace envelope currently authorized for foreign training. All of the restrictions on non-military airspace use that are currently in effect will remain, and no new airspace restrictions will be imposed.

Supersonic flight in the Goose Bay Air Ranges will not affect the command, control and communications capabilities of MCC or the civilian air carriers, nor will it obstruct commercial air traffic radar systems.

2.6 Amendment to Military Flight Procedure

The proposed undertaking will not require significant changes to existing communications, coordination or mitigation procedures.

3.0 ENVIRONMENTAL ASSESSMENT

3.1 Introduction

This section examines the potential interaction between the undertaking and the environment. Four resource categories were analysed to identify potential impacts:

- Physical resources (soils and water);
- Biological resources (vegetation and wildlife);
- Air quality issues; and
- Land use activity (Land use and management, and recreational resources).

Information from various sources has been used to assess environmental impacts. The reference maps are: The Military Low Level Training Area Map MCE 820, 1:250K NTS sheets, and 1:50K NTS sheets for selected areas. The geomorphic and geological information has been derived from the topographic maps. This information has been supplemented with the Labrador Forest Inventory maps corresponding to each 1:50K NTS sheet produced by the Environment Canada. These 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), continued DND environmental monitoring/ mitigation surveys and programs, and various IEMR studies.

A great deal of material used in the literature review is based on United States Air Force (USAF) reports, primarily because the preponderance of available data originates from that source. That documentation was helpful in identifying the issues and reviewing the various environmental impacts resulting from the supersonic flight training. Annex A provides a complete list of literature available from DND.

3.2 Issues and Concerns

Every supersonic event generates a shock wave, but based on the atmospheric conditions and aircraft's altitude, several of these shock waves will not reach the ground. Nonetheless, when the shock waves (or sonic booms) reach the ground, the main concern is their magnitude, or peak overpressure, which is measured in pounds per square foot.

From the environmental assessment perspective, there are two separate issues related with the magnitude of the peak overpressure when they reach the ground:

(a) Whenever a shock wave impinges on the surface of an object, it may create vibrations in the object resulting in structural damage; and

(b) The loud noise that is associated with a shock wave (because of the sudden rise and fall of the peak overpressure) may cause a disturbance to wildlife and human activity. This disturbance generally takes the form of a startle reaction.

3.3 Physical Resources

3.3.1 Geomorphology

The topography of the area underneath the 5 Wing Goose Bay Air Ranges varies from undulating to hilly, interspersed with relatively large flat areas covered by various types of bogs. The area is punctuated by a number of small lakes, and associated streams flowing between these lakes. In general, geomorphic features are oriented in NW-SE direction, and most of these streams also flow to the southeast. A large water body, known as Churchill Reservoir, is located in the north western part of the training area. There are quite a few broad U-shaped river valleys with fairly flat valley floors. The valley floors may consist of areas covered with barren soil, trees, and/ or areas that have recently experienced forest fires. Some of the areas of recent burn have been re-vegetated. Most of the region is covered with a thin layer of glacial soils, with few outcrops (barren rocks). Small water bodies tend to occupy relatively flat areas, and are generally surrounded by bogs of various types (these have been classified in the Labrador Forest Inventory maps as open bog, string bog, tree bog, and wet sites).

3.3.2 Impacts on Soils and Water

With supersonic flight activity, the main concern is the magnitude of the sonic boom when it reaches the ground. In general, when the shock waves impinge on the surface of objects they could create vibrations in the object, and this can result in structural damage, particularly to vertical structures such as buildings. With the proposed supersonic flight training, the peak overpressures that would impinge on the ground and/ or water surfaces would be of the order of a few pounds per square foot (psf). The additional pressure caused by the sonic boom is much less than that of an average person walking over the same ground. Given the contrast in the acoustic impedance of the atmosphere versus soil and water, an interface exits between the atmosphere and ground/water bodies; consequently, the expected peak overpressures are not likely to propagate to any great lengths (or distances) along the ground surface, or through the water column. These overpressures are not large enough to cause significant injury or harassment to aquatic life (more details are given in the section on biological resources). However, the noise that accompanies supersonic shock waves may cause disturbance to the wildlife (terrestrial animals) and human activity. Since nothing is going to be dropped and/ or released from the aircraft due this particular activity, the soils and water (soil erosion, soil and water chemistry) would not be impacted.

The Department of National Defence commissioned a special study to determine the seismic effects of supersonic flight tests in the Naskaupi River valley in Labrador (Annex B, Section 4.3; and Annex D). For this study, the supersonic program was designed to cause maximum impact on the ground. The study showed that at shallow depths there is measurable movement of the ground. But, the peak particle velocity (which is measured to determine the damage caused by vibrations) was limited to less than few millimetres per second. This peak particle velocity is not sufficient to cause slope instability or slope failures; nor is it sufficient to damage structures (such as dikes) that are present along the Churchill Falls reservoir.

The addition of supersonic training activity to the venue currently offered at 5 Wing Goose Bay would not require construction of any type of specialized facility; consequently, no alteration of infrastructure at 5 Wing or on the land below the 5 Wing Goose Bay Air Ranges would be needed (such as additional drop zones or targets). Therefore, this activity will not impact soils and water.

3.4 Biological Resources

3.4.1 Vegetation Resources

The Labrador Forest inventory maps provide information about the vegetation cover types. 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. 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 Successional; 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); and
- Water: (Water Bodies).

The predominant land cover type is spruce forest, with varying degrees of density. There is a greater diversity of land cover types in the river valleys, particularly where the valley floors are covered with thick soil: this includes patches of mixed-wood and deciduous forest, along with large areas of recent burn and barren soil. Moreover, depending upon the amount of precipitation received in the area, various parts of the streambed are likely to be exposed and/ or covered with sand. Based on the amount of precipitation, these sand bodies (including sand bars) contain varying degrees of moisture and are likely to be shifting, thus providing a variety of land cover types. Around small water bodies, there may be bogs present as well.

Based on a minimum altitude of 5000 ft AGL for the proposed supersonic activity in the Labrador portion of CYA 732 Air Range, and the spatial extent over which it will be deployed, there is no predicted impact on the vegetation (see Annex B and Annex D). Based on the field observations (e.g. during the supersonic trials in the Naskaupi Valley where many sonic booms reached the ground), it is believed that with the proposed activity, the peak overpressures would not be sufficient to knock off dead branches from trees, or nest sites on top of trees.

3.4.2 Wildlife Resources

A number of wildlife species are present within the boundaries of the proposed undertaking. The known wildlife species below the 5 Wing Goose Bay Air Ranges (EIS, 1994) that are of concern include the following:

a. Ungulates
    1. Caribou
        - Migratory Caribou– George River Caribou Herd
        - Woodland Caribou -- Red Wine Mountain Caribou Herd; Lac Joseph Caribou Herd; and other woodland caribou (Mealy Mountain and Joir River)
    2. Moose

b. Fur-bearers

c. Birds
    1. Raptorial Birds
        - Peregrine Falcons (Tundrius and Anatum subspecies)
        - Golden Eagle
        - Bald Eagle
        - Osprey
    2. Waterfowl
        - Harlequin Ducks
        - Barrows Goldeneye
    3. Passerine Birds

d. Fish and Amphibians

3.4.2.1 Species at Risk Considerations

The aim of the Species at Risk Act (Bill C-5) passed into law in 2002 is “to prevent Canadian indigenous species, subspecies and distinct populations of wildlife from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species, to encourage the management of other species to prevent them from becoming at risk.” The Province of Newfoundland and Labrador also announced the provincial Endangered Species Act, identifying species at risk. The land below the 5 Wing Goose Bay Air Ranges is known to contain some of these species and these include:

- Woodland Caribou – The Provincial Designation of Woodland Caribou is Threatened; and these include:

    - Red Wine Herd: found in the Red Wine Mountains and immediately south of the Churchill River. The number of animals has been estimated to be less than 100.
    - Lac Joseph Herd: found in the Lac Joseph area of western Labrador, and their number has been estimated to be approximately 1025 animals.

- Mealy Mountain Herd: found in the eastern Labrador has about 2500 animals; whereas Joir River Caribou in south eastern Labrador and Quebec has about 150 animals.

- Peregrine Falcon/ Tundra Peregrine Falcons – The Provincial Designation of these two peregrine falcon sub-species is Threatened. Peregrine falcons nest along the coast of Labrador and along a large number of major rivers, which offer suitable habitat. There has been an overall upward trend in the populations of these two sub-species.

- Harlequin Duck – The Provincial Designation of the Harlequin Duck is Species of Special Concern. The eastern population of Harlequin ducks breeds mostly in Quebec and Newfoundland and Labrador. It is estimated about 500-1000 Harlequin Ducks winter off the coast of Newfoundland and Labrador

- Barrow's Goldeneye – The Provincial Designation of Barrow's Goldeneye is Species of Special Concern. While Quebec is the main locale for this duck, it is likely that some birds breed in southern Labrador and that some adults moult along the Labrador coast.

- Passerine Birds – Some species of passerine birds have been designated as the Species of Special Concern. The suitable habitats for passerines are generally located in southern Labrador (EIS, 1994); and the northern latitudes (e.g., Air Range CYA 732) may be unsuitable for passerines habitat.

The Department of National Defence has established focused mitigation programs in consultation with the resource manager. These programs have served well to gather significant wildlife population information below the Goose Bay Air Ranges as well as the local region. DND will continue to work with the resource management agencies to prevent unacceptable impacts on particular wildlife species.

3.4.2.2 Wildlife Monitoring Activities

The Department of National Defence, on behalf of the allies, participated in an active wildlife-monitoring program, designed to mitigate disturbance from aircraft noise over sensitive locations in the training area. This program was conducted in collaboration with the Institute for Environmental Monitoring and Research (IEMR), the federal government (Canadian Wildlife Service), provincial government wildlife management agencies (Quebec, and Newfoundland and Labrador), as well as environmental consultants. Temporal and spatial data are collected through a series of real-time, or near real-time data-gathering programs specific to individual species. Extensive use was made of remote monitoring technology such as radio, satellite telemetry and aerial surveys.

The concept for wildlife mitigation pertaining to subsonic low-level aircraft training is based on avoidance (i.e. temporal and/ or spatial separation) between flying activity and sensitive areas to ensure that the acoustic threshold effects (where significant effects may be expected to occur) are not exceeded. Each sensitive species is protected using pre-established criteria for avoidance; these are updated as additional information becomes available through consultation with the resource management agencies and the IEMR. To

date, wildlife-monitoring activities have not detected any population-level adverse impact on the sensitive species due to low-level subsonic training.

There have been suggestions made to conduct extensive field studies prior to the approval of this undertaking. The objective of these studies would be to determine threshold noise disturbance levels for several wildlife species present in the Goose Bay Air Ranges using pre-selected aircraft altitudes and offset distances; and to determine the effects of various weighting functions that are used to quantify the noise. DND has reviewed the published literature to determine these effects, and have taken it into account (see Annex A) It should be emphasized that, such a testing would be counter-productive, subjecting species to more sonic boom disturbances during the trials than they would be subjected to during an entire year of supersonic training activity. For example, during the July 2004 study, osprey and waterfowl were subjected to about 6-8 sonic booms in less than 2 hours. Such a high dosage of disturbance in such a short time could be detrimental to the species of concern.

As of April 2006, there are no permanent allied force detachments present at the 5 Wing Goose Bay, consequently all of the allied forces funding made available to DND for the environmental monitoring programs has been withdrawn. The "*responsibility for environmental monitoring*" will fall onto the Institute for Environmental Monitoring and Research. The Department of National Defence, being the Responsible Authority for new training initiatives in the Goose Bay Air Ranges, continues to be "*responsible for environmental mitigation*". Since the DND's mitigation program is largely based on the avoidance of sensitive species, it relies heavily on environmental monitoring information. DND will continue to provide input in the design of the monitoring studies so that its mitigation mandate is fulfilled. It should be emphasized that during these monitoring studies, if supersonic activity is determined to have a detrimental effect on wildlife population levels, then some sort of spatial and/ or temporal separation approach may be needed in order to mitigate the impacts (based on the Adaptive Management Strategy discussed in Section 1.6).

3.4.3 Potential Impact on Wildlife, Fish and Amphibians

In general, animal responses to aircraft are influenced by many variables including: size of the aircraft, type of aircraft (e.g. fixed wing or rotary), its proximity (both height above the ground and lateral distance), speed, engine noise, colour, flight profile, and the radiated noise. Also, different types of training missions may produce different levels of disturbance and animal responses. Thus, the potential sources of impact on animals (i.e. both the wildlife and livestock) from jet aircraft can be categorized as: (a) the visual effect of the aircraft, and (b) the associated noise.

With the proposed supersonic activity, there would be very little or no visual stimuli to the animals. This is because supersonic training generally takes place at much higher altitudes (15,000 ft and above, ref Annex B, Table 5.) There is almost no direct engine noise heard on the ground, as is the case with subsonic low-level flights (see Annex B, Figure 11). In the case of subsonic jet aircraft at low-level, the noise is persistent, and lasts about 15 seconds (Annex B, Figure 5) with a gradual rise time. The noise level is at its maximum when the aircraft is directly overhead, and a slow drop off follows this. On the

other hand, the noise from a sonic boom is like a loud bang and lasts ~100 milliseconds, thus the rise time for the noise is much shorter. Further, depending on the altitude of the supersonic aircraft, the sonic boom may reach the ground 2-60 seconds after the aircraft flies overhead, consequently it is likely to elicit startle reaction.

The magnitude of the sonic boom (peak overpressure), to some extent depends on the height of the aircraft above ground. The peak pressure on the ground decreases with increase in the height of the aircraft; and this change in peak overpressure is more pronounced at lower altitudes (see Annex B, Table 1 and Figure 2). Due to the higher altitudes involved for supersonic flight activity, the noise from a sonic boom event is expected to be lower than the noise that would result from a subsonic jet aircraft flying low-level (i.e. less than 1,000 ft AGL)[4]. Nonetheless, the sharp noise that results from a sonic boom is expected to elicit some startle reaction from the wildlife.

Sudden and unfamiliar sounds usually act as an alarm for wildlife and can trigger a "fight or flight" startle reaction. Since sonic booms tend to be infrequent and random as compared to multiple-aircraft in a subsonic mission where jets follow pre-planned routes (e.g. "terrain masking" routes where fighters fly in specific valleys to avoid radar systems), they are expected to cause no more than a temporary startle-response. This is because the "pursuit" phase of animals would not be present. Not withstanding, startle effect associated with either a sonic boom or subsonic engine noise can be stressful to an animal. Because many booms do not reach the ground, the Department of National Defence expects that the impact on wildlife in their natural habitat would be less severe than reported in some studies where supersonic flight envelopes were specifically designed for maximum impact on animals.

A review of literature collected from the USAF (see Annex A, sections 8-10) suggests that individual animals, whether wild, domestic or pet, exhibit different reactions to sonic booms according to the species involved. The reaction is also modified if there has been previous exposure. Further, animal reactions tend to vary from boom to boom; but are similar to the reactions associated with low-level subsonic flights, helicopters noise, and any other sudden noises. Common reactions are moving, raising the head, stampeding, jumping and running. Avian species may run, fly or crowd. Similar responses have been observed in the field studies commissioned by the Department of National Defence for the osprey and waterfowl in the Naskaupi River valley during the July 2004 supersonic trials (see Annex B, Section 4.3). In other cases, the responses are either unrecognizable or consist of an apparent alerting accompanied by trotting off a short distance.

It has been suggested that wild animals exposed to intense noise with sudden onset can panic and injure themselves or their young; however, this is usually the result of active pursuit (such as the perceived pursuit of a low flying aircraft). In general, animals control their movements to minimize risk. In the USAF field studies (see Annex A, section 8-10), loss rates have varied greatly in the few documented cases of injury or loss. Quite often, the panic responses became less with each recurrence, usually disappearing completely with fewer than five exposures. It is worth noting that in the study conducted by DND,

[4] The BooMap analysis indicates that the average overpressure would be <1 psf; this is equivalent to a 101.6 CSEL (dB) noise level. Using the expression $L_{NE} = 2(L_{CE}) - 103$ (ANSI S12.9-1996-Part 4), this overpressure corresponds to 100.2 ASEL (dB). This is lower than the noise from a low-level subsonic aircraft.

particularly the osprey in the Naskaupi River valley did not show any overt reaction after about 3-4 sonic booms.

The Department of National Defence has computer software (PCBoom) available to model sonic boom impact on the ground from all types of supersonic training activities. The USAF has been using the PCBoom to model sonic boom impact on the environment for some time. In order to validate the effectiveness in predicting the environmental impact on the ground, DND conducted a supersonic field measurement during the April and July 2004 in Labrador. The data obtained from the field measurement program was compared with modelled values for the individual flight profiles flown, and results were presented to the Scientific Review Committee (IEMR) during a meeting in November 2004. The members of the SRC are of the opinion that computer software (PCBoom) can be effectively used to calculate expected sonic boom characteristics (including carpet widths, peak overpressure and noise level values at different locations) on the ground.

In general, most of the studies related to the effects of supersonic activity have been geared towards assessing population level environmental impacts on the species, rather than to determine threshold levels[5] that can cause potential damage to various wildlife species. For this reason, knowledge concerning the effects of sonic boom peak overpressures on wildlife is limited (i.e. threshold levels that can cause damage to individual animals are unavailable); however, all evidence to date indicates that animals, under most circumstances, are unaffected (see Annex A for the list of available literature). Similarly, studies documenting the long-term physiological impacts of the sonic booms on individual wildlife species are also limited. This is because just to collect this type of information would cause severe damage to the individual animals, than if the same were to be subjected to few sonic boom events during a routine training exercise. Nevertheless, the DND, in conjunction with IEMR, had an active wildlife-monitoring program below the 5 Wing Goose Bay Air Ranges. It is expected that the IEMR will continue to run this monitoring program, and if these monitoring programs reveal population level impacts; then the DND would use this information to develop any mitigation measures that may be necessary. These mitigation measures include, applying suitable avoidance criteria (i.e. by maintaining both temporal and spatial separation between supersonic activity and the sensitive species on the ground), such that the impacts on the wildlife species can be minimized.

The seismic effects supersonic testing study, as explained in Annex B and D, and a study of the literature in Annex A indicate that supersonic overpressure wave transmission through water is negligible. Thus, fish and amphibian species are thought to be unaffected by the supersonic overpressure wave that will result from a supersonic event above 5,000 ft AGL. The IEMR will monitor this VEC for adverse reactions (with attention to population level disturbances) and provide the results for use by DND in its mitigation program.

3.5 Air Quality Issues

[5] In order to determine threshold levels, dedicated flights at pre-determined altitudes and varying offset distances are required. This activity is more detrimental to the species concerned than to observe the effects of normal flight operations by conducting periodic surveys to determine population level variance.

Military aircraft operations commonly contribute little to the total anthropogenic emissions in a region, because they are mobile and cover very long distances. In order to achieve supersonic speed with the current generation of aircraft, the aircrews have to use their afterburners. This consumes an additional amount of fuel, thus supersonic operations generally last only a few seconds per event. The added fuel consumption due to supersonic flight activity, and the consequent aircraft emissions, would add nothing in terms of the total emissions in the 5 Wing Goose Bay Air Ranges. Since nothing would be released/ dropped from the aircraft[6] that could affect the air quality, this activity would not result in effects on human health or visibility.

The residual material from this undertaking is not likely to cause any significant health risk to humans and the wildlife present in the area.

3.6 Assessment of Valued Ecosystem Components (VEC) Vulnerability

At present, the main source of disturbance to wildlife within the training area consists of noise and visual stimuli associated with low-level sub-sonic aircraft. This is particularly true for military training activity that takes place at altitudes lower than 1,000 ft AGL. Since the proposed supersonic training activity would be at altitudes above 5,000 ft AGL, DND expects there would be almost no visual stimuli to the wildlife. (See Annex E: less than 2% of supersonic activity was recorded at altitudes below 10,000 ft; most of the events were above 15,000 ft AGL). With the deployment of modern fighter aircraft, the minimum floor level for supersonic flight training activity is likely to shift to higher altitudes. During supersonic training, fighters do not follow specific patterns and/ or ground features, unlike subsonic low-level training (lower than 1,000 ft AGL). During a 1 hour sortie, there may be several supersonic events, each lasting less than 30 seconds. Unlike subsonic noise, the noise due to sonic booms generated during the supersonic events does not follow the aircraft for the entire sortie. The duration of noise that reaches the ground due to these sonic booms is approximately 0.1 seconds. Consequently, the DND predicts that total noise levels at individual receptor sites would not increase significantly over the current levels accepted for the low-level training.

Besides the aircraft emissions associated with the proposed supersonic activity, nothing is going to be released in the atmosphere (with the exception of chaff and flares, see the footnote); consequently, there is no risk of fire and the effects on vegetation, wildlife, and special-status species would be negligible. Sensitive species closures that are currently applied will not be affected with this undertaking. Thus, impact to wildlife from startle effect would be minimized. Due to the size of the training area, wetlands would not be impacted by residual components of aircraft emissions, and there is an extremely low potential for accumulation of any of these components. Consequently, no (significant) impact to these resources is expected under the proposed action.

Based on the information reviewed (for a complete list, see Annex A), with appropriate mitigation measures in place, if necessary, it is predicted that the new undertaking will have either no negative effect, or minimal effect, on the following valued ecosystem components (VECs):

[6] Chaff and flares may be dropped from the aircraft during supersonic training; these have been treated as separate activities, and the Province has approved the mitigation procedures for their use.

- the health of biota including plants, animals, fish, and amphibians;
- the threat to rare or endangered species;
- damage to bird eggs and young fledglings;
- the reduction in species diversity or disruption of food webs;
- the loss of or damage to habitats, including habitat fragmentation;
- significant discharges or release of persistent and/ or toxic chemicals, microbiological agents, and nutrients into the environment;
- population declines;
- the loss of or damage to commercial species;
- the removal of resource materials (e.g. peat, or coal) from the environment;
- appreciable transformation of natural landscapes;
- the obstruction of migration or passage of wildlife; and
- the significant effects on the quality and/or quantity of the biophysical environment (e.g. surface water, groundwater, soil, land, and air).

3.7 Land Use and Visual Resources

The resource users in the area are the Innu, Inuit, Métis, Settlers and other Labrador residents, visitors/ tourists and clients to outfitting operations. Much of the activity is for subsistence or recreational purposes, with some commercial/ business interests (e.g. caribou harvest, trappers, and adventure and nature tourism operators). Industrial operations include hydropower generation/ transmission and development, some forest harvesting and the construction of the Trans-Labrador Highway.

The literature reviewed summarizes some of the issues regarding the effects of supersonic flight on land use and visual resources. These impacts can be easily mitigated:

- For the proposed activity, the aircraft will be supersonic only for a brief portion of the sortie; and the supersonic activity would be carried out above 5,000 ft AGL. It should be noted that this is the lowest altitude permitted for supersonic sorties; however, most of the activity would take place above 15,000 ft. Because of higher altitudes of aircraft, there would be no associated visual impact.

- The area impacted by the sonic booms is same irrespective of the number of sorties; however, the frequency of booms reaching the ground is proportional to the number of sorties flown. The Department of National Defence estimates that under a given training scenario, that is Conventional Night Strike or Ongoing Training, the number of booms reaching the ground would be either ~2.5 booms for the 2 week exercise period, or about ~4 booms per month. These numbers of booms are likely to be heard in the central part of the manoeuvre ellipses, but their frequency would be lower towards the edges (see Appendix “BooMap Analysis” in Annex B). Further, with a lower number of sorties, the boom frequency would drop accordingly.

- With the proposed level of supersonic activity, the cumulative noise level in the central part of CYA 732 is not expected to increase significantly. Based on the BooMap analysis, DND predicts that even in the worst-case scenario, that is if the entire range is used as one manoeuvre ellipse, then CDNL to be slightly above 45

dB in the centre, and lower values towards the edge. Consequently, environmental damage is not expected to occur.

- With the proposed supersonic flight training, some startle reaction can be expected in humans and wildlife. If need be, impact on human activity will be minimized by maintaining spatial and/ or temporal separation.
- Based on the BooMap analysis, the Department of National Defence predicts that, on average, booms would be less than 1 psf, and sonic booms of greater than 1 psf would be rare. Only 2% of the booms are likely to exceed peak overpressure of 4 psf.
- The predicted peak overpressures with supersonic events at 5,000 ft AGL (the worst case scenario) would be less than 10 psf. A review of the literature suggests that, at these pressure levels, negligible impact on human or wildlife activity is expected (see Annex A and Annex B).
- The predicted peak overpressures from this proposal are not expected to cause any damage to the dikes that are present along the Churchill Falls Reservoir (see Annex D).

Since nothing will be released in the atmosphere with this proposed supersonic flight activity, there is no danger of fire or smoke obscuring the view. The additional aircraft emissions due to the use of afterburners to achieve supersonic speed would not impact the air quality in any way. Thus, this activity is not expected to affect enduring land use or visual attributes. This activity would not obscure views and reduce scenic quality, and would not result in permanent changes to visual resources.

3.8 Protection of Human Occupancy Areas

The greatest impact of sonic booms on people is the annoyance factor resulting from people being startled by the booms. Annoyance can be caused by a variety of factors including house rattling and vibration, interruption of activities, and/ or damage to personal property. Startling is also responsible for creating fear in some individuals. That fear is due to the loud, unexpected noise that surprises the individual. Although some adaptation may be expected with repeated sonic booms, this is a primitive response and, whenever an adequate stimulus occurs, a startle response ordinarily follows.

Department of National Defence maintains an active mitigation program below the 5 Wing Goose Bay Air Ranges. The Department remains aware of the human occupancy areas through its community liaison program and consultations with interested groups. Human occupancy areas are currently protected from subsonic aircraft over flight by environmental closures that are based on the noise threshold values. As an additional precaution in the context of supersonic training activity, DND intends to expand the current lateral separation specified in the environmental closure criteria (generally 2.5 nm, unless special provisions are arranged), while increasing the vertical separation up to 5,000 feet AGL.

Based on BooMap analysis (see Appendix “BooMap Analysis” in Annex B), the predicted number of sonic booms (i.e. the frequency of booms per month) that would reach

the ground, and the associated peak pressures, are not likely to have a significant impact on human occupancy areas. This is because the cumulative noise levels resulting from ambient noise and sonic booms is not sufficient to cause significant impact on the human way of life. At this stage, DND predicts that no special protection areas (i.e. environmental closures) are needed to conduct supersonic flight training activity. If there are ill effects, they should be discovered through the Adaptive Environmental Monitoring and Mitigation Options proposed in Section 1.6 of this EA. At that time, an appropriate action will be taken.

3.9 Aboriginal Land Issues

The Department of National Defence has publicly committed to respecting aboriginal land title regarding the use of land associated with allied training activity in Goose Bay. Most of the land over which the proposed activity will take place is the subject of comprehensive land claims negotiations affecting two aboriginal groups. DND is engaging in technical discussions with the Innu Nation on supersonic training activity and other training requirements.

4.0. ENVIRONMENTAL MANAGEMENT

4.1 General

The Department of National Defence maintains a high standard of environmental management associated with the training activities in Goose Bay. A fully functioning and certified (ISO 14001) Environmental Management System (EMS) governs the conduct of the activity to safeguard the environment. The FMTGB mitigation program benefits from its association with the provincial wildlife agencies (Quebec, and Newfoundland and Labrador), federal agencies (Canadian Wildlife Service), the Institute for Environmental Monitoring and Research and other partnerships that have been developed over the years.

National Defence will continue its mitigation program of the entire area below the 5 Wing Goose Bay Air Ranges for as long as air forces train at 5 Wing Goose Bay. The public can access copies of the annual Environmental Report and Mitigation Program, the EMS, Mitigation Orders, study reports and other material directly from the FMTGB website (www.airtraining.forces.gc.ca/GooseBay).

4.2 Avoidance Criteria

Avoidance criteria are the standards applied to establish protection areas for sensitive locations that are excluded from low-level subsonic flight training activity. The criteria were initially developed in the early phase of the mitigation program, during the preparation of the EIS (DND, 1994). At the time, the potential for impacts that could have resulted from jet over flights at low-level was poorly understood. Therefore, initially the avoidance criteria were based largely on perception and the adaptation of existing aeronautical restrictions.

However, over the years, scientific knowledge base has improved considerably, resulting in changes to the avoidance criteria. Some of these were based on work by the IEMR, which has conducted research focused specifically on the effects of military flight activity. To date, results of these studies clearly indicate that the actual impact of the training activity on the environment is negligible[7]. Avoidance criteria for low-level subsonic flight training are outlined in the FMTGB Mitigation Orders, available online.

The current avoidance practice is designed to minimize noise disturbance on sensitive wildlife species from low-level subsonic flight training; and, it is based on providing spatial separation and/ or temporal separation.

Spatial separation involves separating the sensitive species from low-level aircraft activity either by horizontal or vertical distances (i.e. environmental closures). Currently, the species are protected from subsonic aircraft activity by vertical separation of 1,000 ft AGL, or by horizontal separation (closure areas) that varies depending on the dispersal/ aggregation pattern and nature of the affected species. (This implies that a subsonic aircraft can fly over an environmental closure as long as it is above 1,000 ft AGL. The horizontal separation is

[7] As result of IEMR and DND monitoring studies, some of the environmental closures for sensitive species have been removed, whereas for others, the size of the closure has been reduced.

provided so that the aircrew can fly below 1,000 ft AGL to meet their training objectives and still avoid the sensitive species.) Temporal separation (i.e. completely avoiding the species for a short period) is provided during high sensitivity periods only, such as during calving and nesting periods.

The DND plans to restrict supersonic events to altitudes above 5,000 ft AGL; further, with the deployment of modern aircraft, there is a gradual shift to higher altitudes for this type of training. During a typical one-hour sortie, there may be as many as five supersonic events; however, an average supersonic event lasts less than 30 seconds. The aircraft goes supersonic to engage or evade a specific threat system; but most of the sortie is conducted at subsonic speeds. As indicated earlier, sonic booms reach the ground 2-60 seconds after the aircraft fly overhead. Consequently, there is no associated advance notice of noise build-up with sonic booms; thus, the startle effect would remain. Based on the predicted frequency of sonic booms reaching the ground and their magnitudes (peak pressure levels and associated noise), it is expected that no special avoidance is needed for the wildlife species (see Annex B, Appendix "BooMap Analysis"). The Department of National Defence has a plan in place (see Section 1.6 of this EA) whereby, should detrimental effects on the wildlife species be discovered; appropriate immediate actions will be taken.

As stated earlier, there are no allied forces ready to conduct supersonic training immediately in the Goose Bay area. The DND is aggressively trying to market this area as a possible venue for supersonic flight training, and plans to use only Labrador portion of the CYA 732 Air Range. DND envisages two separate types of training activities: namely, the Conventional Night Strike, and the Ongoing Training activity; and at this stage, probably it may be easier to convince the allies to use the Goose Bay Air Range for the short duration night strike exercise. Since the frequency of sonic booms reaching the ground to a large extent depends on the number of supersonic sorties flown in the airspace, and therefore the proposed undertaking may not require any specific avoidance criteria.

4.3 Environmental Mitigation and Follow-up

Environmental monitoring and follow-up is an essential component of the Environmental Assessment process, thereby providing a means for verifying environmental effects predictions and examining the effectiveness of mitigation measures. It also provides assurances that environmental commitments and legislation standards are being followed. Environmental problems identified through a monitoring or follow-up program can be addressed in an effective and timely manner. As outlined in Section 1.6, the DND intends to use the Adaptive Management Strategy for the integration of Supersonic Flight Training to its current training activities in 5 Wing Goose Bay Air Ranges.

Based on this environmental assessment and various considerations arising from the Supersonic Flight Training over the 5 Wing Goose Bay Air Range, DND proposes to implement the following measures within the mitigation program:

- the supersonic flight training will only be conducted within the Labrador portion of the CYA 732 Air Range;

- 5 Wing Flying Orders will impose minimum height restrictions for supersonic training activity of 5,000 ft AGL: this would preclude visual stimuli, as well as excessive peak overpressure and loud noise;

- the existing FMTGB mitigation program and the associated environmental closures (within which aircraft are not authorized to fly) will also safeguard sensitive areas from supersonic activity;

- the subsonic avoidance criteria currently in effect to safeguard sensitive wildlife locations will be sufficient to mitigate the predicted risk of adverse impact of noise startle. The added noise component due to supersonic flight training is not sufficient to cause significant impact to wildlife species;

- as necessary, the same subsonic avoidance criteria of temporal separation for species during high sensitivity periods (nesting and calving etc.) will be implemented, in consultation with the IEMR and provincial resource mangers, to ensure that the physical and biological effects of this activity are negligible;

- DND will expand its communications activity[8] to include information on the areas where potential supersonic activity would be conducted, and the fact that there is no risk to the environment or to public health and safety; and

- DND will review coordination measures with appropriate provincial officials to mitigate the potential for impacts that may arise at a later date.

If adverse environmental impacts are observed on wildlife during the monitoring program, or supersonic activity becomes too intrusive to human activity below the Air Range, then DND would suspend Supersonic Flight Training at 5 Wing Goose Bay. This decision would be made following consultations with the IEMR and Provincial authorities (see Section 1.6).

4.4 Site Remediation

During the proposed supersonic training activity, nothing will be released or dropped in the training area except for the aircraft emissions and self defence expendables (chaff and flare, in accordance with the approved Environmental Assessments of year 2005). Based upon the annual flight activity, the residual components are not expected to accumulate on soil or water surfaces, or change the chemistry of soil and/ or water properties. Therefore, management and use of the lands would not change from existing conditions and no site remediation would be required.

4.5 Cumulative Environmental Effects

[8] During the training season, DND sends out NOTAMs and/ or advisory notices to the public (e.g. hikers, campers, and prospectors) regarding special training activities in specific areas below the air ranges.

Individual effects can combine and interact, resulting in cumulative environmental effects that may be different in nature or extent from the effects of individual activities. Cumulative environmental effects may result in combination with other projects or activities that have been or will be carried out. Cumulative environmental effects were considered for each of the Valued Ecosystem Components (VECs) within the FMTGB monitoring program, according to:

- spatial and temporal boundaries;
- interactions among the project's environmental effects;
- interactions between the project's environmental effects and those of both existing and planned projects and activities; and
- mitigation measures used towards achieving a no-net-loss or a net-gain outcome.

In the context of the existing flight activity at 5 Wing Goose Bay, the addition of supersonic training activity will produce a net-gain environmentally due to reduced frequency and duration of noise exposure. Generally, the introduction of supersonic flight training will be conducted at higher altitude levels, thereby reducing the intensity of the aircraft noise dosage, which remains the primary concern associated with military training. The noise level associated with sonic booms is likely to be of much shorter duration (about 0.1 seconds long) than the low-level noise that persists for about 15 seconds. Furthermore, because of atmospheric refraction, many of the sonic booms generated by supersonic aircraft will not reach the ground; therefore, startle reaction would be less frequent than that associated with low-level training.

Because of the altitude restrictions that are being imposed on supersonic activity (to minimize the impact on the ground and to maintain aircrew safety), along with sufficient spatial and temporal separation to sensitive species, 'negligible' adverse environmental and health impact is expected. (See Annex A for the literature reviewed.) Further, there is no habitat modification and/ or construction involved in this undertaking.

In addressing cumulative effects, the foremost consideration is that the existing mitigation program operates on a dynamic spatial and temporal basis that precludes the risk of environmental impact by separating the activity from the seasonally changing sensitive locations on the ground. Most of the other projects are based along the Churchill Falls corridor, or other road access, which are areas of relatively minor jet traffic. While the training area may encompass sites where other project activities exist or are planned, those sites will be avoided when occupied. Given the nature of this undertaking, the potential for physical or environmental interaction is minimal.

In the event that an environmental impact, direct or cumulative, were to arise, it would logically be detected through the ongoing monitoring programs (as outlined in Section 1.6), and appropriate measures would be taken to correct the situation, including the possibility of limiting or discontinuing supersonic activity.

Annex C provides the existing (baseline) environment description for the principal VECs identified within the FMTGB Environmental Management System (EMS). It reflects the effects of past and ongoing human activities, including military flying, on the region's natural environment. Where appropriate, the current status of the VEC due to natural and/

or anthropogenic factors is indicated (e.g. a statement is made as to whether a VEC population is declining, stable or increasing).

4.6 Consultations and Communications

The initial DND Supersonic Flight Training proposal was presented in conjunction with other possible future training requirements at a full-day symposium dedicated to this topic, in conjunction with an IEMR Board meeting, at Happy Valley-Goose Bay in September 2001. In November of 2003, DND made another more detailed presentation in St. John's to update invited representatives from interested federal/ provincial departments and the Innu Nation on future training requirements at 5 Wing, including supersonic flight training. Early in 2004, DND provided CD copies of supersonic reference materials to the IEMR and the Province. In November of 2004 DND provided a briefing to the members of the Scientific Review Committee (of the IEMR) about its supersonic flight training activities in Goose Bay. In August 2005, IEMR sponsored a two-day workshop in Happy Valley-Goose Bay on 'Exploring Future Training Options', where all of aboriginal representatives were invited, and this activity was extensively discussed.

DND has since revised its proposed Supersonic Flight Training program to provide a relevant, state-of-the-art program that meets the training needs of countries using supersonic tactics. This EA document has been rewritten to reflect the new proposed Supersonic Flight Training program. Most of the communications relating to this revised undertaking have occurred within the context of the DND's participation in the work of IEMR, which has representation from all of the major stakeholders and aboriginal communities in the region. This interaction has occurred at the Board of Directors level, as well as within the Institute's Scientific Review Committee (SRC) forum, in which FMTGB has ex-officio status. The Draft versions of this EA document were made available to the members of the Scientific Review Committee (IEMR) for their comments in April and November 2005, Nov 2006, Nov 2007, final DRAFT version in Jan 2007 and Jan 2008.

In May 2004, DND concluded a Letter of Understanding with the Innu Nation that, among other provisions, outlines DND support for mechanisms to consult with the Innu Nation on new training activities such as supersonic flight. The Innu Nation was consulted, through the Technical Working Group, prior to the submission of this document to the province.

4.7 Applicable Regulations and Processes

A review of CEAA legislation indicates that supersonic flight training activity does not constitute a project under any of the various provisions of the Act. As well, it does not constitute a "designated undertaking or exception" under Part III of the Province's Environmental Assessment Regulations 2000.

The Department of National Defence is committed to environmental stewardship and, as such, has a policy of conducting "due diligence" screenings to identify and mitigate any potential adverse impacts before a new activity is approved. Foreign Military Training

Goose Bay also received ISO 14001 certification in 2003, which commits all activities to meet rigid environmental standards and commits FMTGB to external audits of its environmental practices.

4.8 Project Related Options

If the proposed Supersonic Flight Training activity is released from the environmental assessment process, and the Commander of 1 Canadian Air Division subsequently approves it, then (based on allied participation) the actual number of flights may vary considerably, and are likely to be lower than predicted here. Consequently, the resulting environmental impacts would be less than what are predicted here. Furthermore, any type of supersonic training (i.e., the Night Strike or Ongoing Training) in the CYA 732 would also provide the DND with an initial opportunity to learn from the experience, so that the mitigation measures can be fine-tuned.

Should it be determined that the undertaking cannot proceed, individual air forces will make their own determination on the value of the training offered at Goose Bay. This proponent will not pursue the undertaking, or some form of it, elsewhere.

4.9 Project Related Documents

Over the past years, FMTGB has conducted an extensive literature search on the subject of supersonic flight training and has compiled a considerable library of reference material. This library of reference material has been made available in CD format to provincial officials, the IEMR and interested aboriginal groups. The list of documents that are on the CD is given in Annex A; and, they may be obtained from the DND contact officer.

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; and
- Mitigation Orders for Foreign Military Training in Goose Bay.

5.0 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 have evolved to meet changing operational demands. The proposed supersonic flight training is a standard training requirement for operational air forces.

Besides occasional startle effect due to sonic booms, this undertaking presents no significant adverse environmental impact. The minor effects that may arise due to the proposed activity would be discovered with the environmental monitoring programs of the IEMR, and these can be mitigated with current avoidance programs and/or mitigation programs.

6.0 APPROVAL OF THE UNDERTAKING

The following permits and approvals may be required to commence training with the Supersonic Flight Training in the 5 Wing Goose Bay Air Ranges, Labrador.

Table 6.1 Permits, Approvals and Authorizations

Provincial, Permit, Approval or Authorization	Agency
Release from Newfoundland Environmental Assessment Act	Department of Environment Province of Newfoundland and Labrador

7.0 FUNDING

There are no incremental funding commitments anticipated for this undertaking. The Department of National Defence would assume any costs that may arise, consistent with arrangements established in a Memorandum of Understanding with participating air forces.

8.0 SIGNATURE

Colonel J.D. Guérin
Director Air Contracted Force Generation
National Defence Headquarters