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Aerospace Requirements for Arctic Sovereignty and Security

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ABSTRACT

With projected increases in activity within the Canadian Arctic region as a result of global warming trends, the continued protection of national sovereignty and the maintenance of security in Canada's North will require rationalization of Canadian Forces (CF) aerospace resources to meet the challenge. This paper examines Canadian sovereignty issues and security aspects resulting from climate change and situates the duties and tasks of the CF within the context of governmental responsibility. In order to create a framework against which aerospace requirements for Arctic sovereignty and security can be examined and determined, Air Force lines of operation (LOO) that support CF force planning scenarios are cross-referenced with JTFN's regional LOOs of Presence, Response, Situational Awareness (SA), and Command and Control (C2). Recommendations are offered for consideration in determining effective current and future Arctic aerospace requirements.

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INTRODUCTION

> *The Arctic is undergoing a period of fundamental change. We may not fully understand the complete nature of the transformation, but there are significant geopolitical developments that portend to the beginnings of a confounding storm about to break upon the entire Arctic region.*
>
> *- Rob Huebert*[1]

The Canadian Arctic has long been a part of our collective identity, a romantic and adventurous frontier with a stark beauty of its own, and yet, at the same time a distant reality for the majority of Canadians who live in a relatively narrow band along the country's southern border with the United States. From time to time, events involving Canada's North have come to prominence, only to quickly fade from daily consciousness into the recesses of the nation's collective mind.

As the last decade of the 20th century unfolded for Canada, the topic of the circumpolar or Arctic region figured more prominently within the political arena and the news media.[2] Whether examining national issues from a sovereignty, security, environmental, or fiscal perspective, there has been emphasis, of late, on specifically mentioning the North.[3] One of the reasons for this distinction is the phenomenon of global warming and its current and projected effects. Although the entire world is, and will continue to be, subject to climate change, the frozen Arctic regions will be impacted

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[1]Rob Huebert, "Controlling the Arctic," *Vanguard*, November/December 2007, 20.

[2]Rob Huebert, "The Rise and Fall (and Rise?) of Canadian Arctic Security," in *Defence Requirements for Canada's Arctic*, Vimy Paper 2, ed. Brian MacDonald, 8-23 (Ottawa: Conference of Defence Associations Institute, 2007), 14.

[3]A cursory glance at news media stories reported online by CTV news during the month of December 2007 concerning the "arctic" reveals reporting on issues such as: sovereignty "Dion suggests ways to assert sovereignty in North - Dec. 8 2007," and "Liberals argue for upgrade of Aurora patrol planes - Dec. 10 2007;" the environment "Melting Arctic ice cap top weather story of 2007 - Dec. 27 2007;" and technology "Old NWT gold mine considered for geothermal heat - Dec. 25 2007." CTV.ca; http://www.ctv.ca/servlet/HTMLTemplate/!ctv/Search/News?query=arctic+&start_row=29&current_row=29&start_row_offset1=0&site_codename=ctv; Internet; accessed 20 March 2008.

more severely.[4] While Canadians living in the south of the country may be welcoming a gradual change to warmer winters and longer summers, Northerners[5] are experiencing stronger warming effects as a result of average temperature increases over the past few decades almost double that of the rest of the world.[6] Higher temperatures are projected to melt a relatively isolated, frozen North making it more accessible to others than it has been in the past. With accessibility comes more interest in what the North may have to offer as well as the potential for development, dispute, and exploitation.

Taking into consideration projected increased activity within the circumpolar region due to global warming trends, the continued protection of Canada's sovereignty and maintenance of national security in its North will require rationalization of Canadian Forces (CF) aerospace resources to meet the challenge. This paper will look at CF aerospace requirements for the maintenance of sovereignty and the enforcement of security within Canada's arctic regions as well as review current assets and projects to determine where gaps may exist. The first section of this paper will define sovereignty and address potential sovereignty issues concerning the Canadian Arctic as a result of global warming. The second section will situate the security and defence responsibilities of the Canadian Forces in supporting the government in its response to sovereignty challenges. The third section will define a framework based on Air Force lines of

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[4]The World Meteorological Organization, *Polar meteorology: Understanding global impacts* (Geneva: World Meteorological Organization, 2007), 3.

[5]"The 'N' in Northerner(s) is capitalized …when referring to a person or persons living in one of the three territories (Nunavut, Northwest Territories or Yukon)." Indian and Northern Affairs, "Terminology Guide," http://www.ainc-inac.gc.ca/pr/pub/wf/trmrslt_e.asp?term=26; Internet; accessed 20 March 2008.

[6]Susan Joy Hassol, *Arctic Climate Impact Assessment: Impacts of a Warming Arctic. AICA Overview Report* (Cambridge: Cambridge University Press, 2004), 8; http://amap.no/acia/; Internet; accessed 13 January 2008.

operation (LOO) upon which to discuss aerospace requirements for Canada's Arctic, taking into account assets, infrastructure and personnel. Finally, a summary will be presented in the form of a conclusion and recommendations will be offered for consideration.

SOVEREIGNTY ASPECTS

DEFINITION OF SOVEREIGNTY

The role of government, according to leaders of the Conservative-led, minority administration currently in power, is to protect Canada and its citizens, ensure security and equal opportunity, foster a favourable environment for prosperity, and provide services that the private sector cannot satisfactorily offer.[7] In order to be able to honour this commitment, one of the fundamental responsibilities that Canada must exercise is its sovereignty. The concept and definition of sovereignty has evolved from the time of the Peace of Westphalia (1648), the birth of modern nationhood,[8] to the present day where the reality of an international, globalized existence continues to influence traditional interpretations. Sovereignty may be defined as "…supreme legitimate authority within a territory…[implying] both undisputed supremacy over the land's inhabitants and independence from unwanted intervention by an outside authority…"[9].

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[7]Conservative Party of Canada – Stephen Harper, "Role of Government," http://www.conservative.ca/EN/2692/41598; Internet; accessed 12 January 2008.

[8]Stephen D. Krasner, "Compromising Westphalia," *International Security* Volume 20, No.3 (Winter 1995-1996): 115-151; http://www.jstor.org; Internet; accessed 9 April 2008.

[9]Daniel Philpott, "Sovereignty: A Brief Introduction and Short History," *Journal of International Affairs* Volume 38, Issue 2 (Winter 1995): 353-368; http://web.ebscohost.com/isc/pdf?vid=8&hid=12&sid=00e80d9d-d2ff-4db2-8cd4-22e85e54c374%40sessionmgr3; Internet; accessed 12 January 2008.

The legitimacy of sovereign authority, however, lies in the state's execution of its obligations of preservation and perfection; namely its duty to safeguard its peoples, territories and interests, and thus, ultimately ensuring that citizens' needs have been fulfilled.[10] In a globalized context, legitimate sovereign authority is being seen, more than ever, as having not only responsibility for one's own people, but also for providing human security for those in other nations who are not accorded protection.[11] An example is the United Nation's Resolution 1674 that Canada championed which reaffirms the responsibility of member nations "to protect populations from genocide, war crimes, ethnic cleansing and crimes against humanity."[12]

In addition, within a sovereign state's duty to preserve and safeguard its territory is an element of stewardship or appropriate management of the environment. This concept was highlighted by the governments of the Yukon, the Northwest Territories, and Nunavut in a paper on Arctic sovereignty and security that stated "The use, occupation, and stewardship of northern land, resources and waters are important to Canada's claims of sovereignty in the Arctic….Aboriginal land claims continue to support this objective."[13] Aboriginal peoples depend on the bounty of the land and sea for much of

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[10]Panu Minkkinen, "The Ethos of Sovereignty: A Critical Appraisal," *Human Rights Review* Volume 8, Issue 2 (January-March 2007): 33-51; http://web.ebscohost.com/isc/pdf?vid=3&hid=12&sid=00e80d9d-d2ff-4db2-8cd4-22e85e54c374%40sessionmgr3; Internet; accessed 12 January 2008.

[11]*Ibid*., 45.

[12]United Nations Security Council Resolutions, "S/RES/1674 (2006) Protection of Civilians in Armed Conflict," http://daccessdds.un.org/doc/UNDOC/GEN/N06/331/99/PDF/N0633199.pdf?OpenElement; Internet; accessed 13 January 2008.

[13]Yukon, Northwest Territories and Nunavut, *Developing a New Framework for Sovereignty and Security in the North: A Discussion Paper* (Whitehorse: Governments of Yukon, Northwest Territories and Nunavut, 2005), 6.

their sustenance and northern sovereignty relies on the continued existence of aboriginal peoples within Arctic communities. Therefore, environmental protection, human security, recognition of Northern culture and the settlement of land claims form part of the Canadian sovereignty definition.

Many mechanisms contribute to a government's capacity to exercise and assure sovereignty. Diplomacy is the primary instrument in establishing and maintaining sovereignty and is vital in representing Canadian values and interest to the international community in order to shape and influence negotiations. Defence provides the government with the capability to project power in asserting sovereignty. It is the iron fist in the velvet glove, and for this reason, it is crucial that defence capabilities be credible in order that citizens know they are protected and other nations believe that action can and will be taken should diplomacy fail.

CANADIAN SOVEREIGNTY ISSUES

Sovereignty over Land

While speaking in Iqaluit, Nunavut in August 2006, Prime Minister Stephen Harper stated "….for far too long, Canadian Governments have failed in their duty to rigorously enforce our sovereignty in the Arctic…we will back our sovereignty over 'Our Land' with all the tools at our disposal, including the men and women of our Armed Forces…"[14] The perception of "sovereignty over 'Our Land'" may have been deliberately emphasized as there is an ongoing international debate as to who has legitimate claim to areas of the Arctic Region.

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[14]Office of the Prime Minister, "Securing Canadian sovereignty in the Arctic," http://pm.gc.ca/eng/media.asp?id=1275; Internet; accessed 12 January 2008.

Historically, Canada's arctic territories were originally ceded to her by the British government in two land transfers, one in 1870 that bestowed the Northwest Territories and Rupert's Land, and a second in 1880 that conferred the remainder of property held by the British on the North American continent, excluding Newfoundland and Labrador.[15] The establishment of districts Mackenzie, Yukon, and Franklin in 1895, and the subsequent amendments to their boundaries in 1897,[16] categorically asserted that the land transfers "included the Arctic archipelago, an area claimed, but not occupied by Britain."[17]

Assertion does not necessarily convince others of the veracity or truth in a statement or claim. A noted Norwegian legal expert on the Arctic, Gustav Smedal, contended that:

> a state's authority and sovereignty was limited to the area over which it exercised control….The state's control had to be 'efficient' meaning that the state had to be able to project its authority without being limited by the polar climate or other physical conditions of the territory…the state must be represented in the territory for the greater part of the year.[18]

Thus, the old adage "possession is nine-tenths of the law"[19] only holds true if one can

In order to exercise sovereignty within territories that it considered belonging to Canada, the government established permanent Royal Canadian Mounted Police (RCMP) posts in the archipelago in 1922.[20] Although the issue of ownership of the Arctic archipelago islands had been largely established by 1933 according to historian V. Kenneth Johnston [21], the government continued the reinforcement of its claim to the Arctic through the use of the Inuit peoples as "human flagpoles"[22] in often forced relocations for the purposes of populating northern areas.[23] Today, Canada's claim to its northern landmass is largely internationally recognized, save the occasional challenge from Denmark for Hans Island or unannounced Russian incursions into Canadian airspace; however, sovereignty disputes regarding jurisdiction over the arctic waterways and the Arctic Ocean remain.

Sovereignty over the Sea

"Freedom of the seas" was a concept conceived in the 1600s that global seas were at the disposal of all nations for any purpose, and states only held jurisdiction over those waters that were internal to their territory or that narrowly banded their coastline.[24] This

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[20]Caldwell, *Arctic Leverage: Canadian Sovereignty and Security*…, 9.

[21]*Ibid*., 16.

[22]Mary Simon, "Sovereignty from the North: An Inuit leader says Canada is asleep at the post in the Arctic," *The Walrus*, Volume 4, Issue 9 November 2007, 34.

[23]Clyde H. Farnsworth, "Iqaluit Journal; The Day the Eskimos Were Cast Into Darkness," *The New York Times*, 10 April 1992; http://query.nytimes.com/gst/fullpage.html?res=9E0CE7DE163CF933A25757C0A964958260&sec=&spon=&pagewanted=all; Internet; accessed 17 January 2008.

[24]United Nations: Oceans and Law of the Sea, "The United Nations Convention on Law of the Sea," http://www.un.org/Depts/los/convention_agreements/convention_historical_perspective.htm#Historical%20Perspective; Internet; accessed 13 January 2008.

gave every country equal access to the sea's resources and navigational routes, creating international tension regarding exploitation and ownership of the sea environment and its riches. In order to legislate issues of pollution, fish stocks, and mineral rights in waters contiguous to their sovereign territory, coastal countries began unilaterally declaring larger limits for territorial waters, as well as adding submerged continental shelves to their jurisdiction.[25] Agreements, such as the United Nations Convention on the Law of the Sea (UNCLOS), were put into place to set out commonly agreed principles for establishing territorial sea limits, as well as sea and seabed use.

There are several contentious issues with respect to Canada's arctic waters. The Canadian government contends that the waters of the Northwest Passage are internal,[26] based on the drawing of "straight baselines" which is allowed by international law to define internal waters in archipelagic areas,[27] while others, such as the United States (US) and the European Union (EU), argue that it is an international strait as per the UNCLOS definition which allows right of transit passage for all ships regardless of nationality.[28] A second area of dispute are the boundaries delineating respective US and Canadian areas

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[25]United Nations: Oceans and Law of the Sea, "The United Nations Convention on Law of the Sea…

[26]Matthew Carnaghan and Allison Goody, *Canadian Arctic Sovereignty*, Report PRB 05-61E (Ottawa: Library of Parliament, Political and Social Affairs Division, 26 January 2006), 3; http://www.parl.gc.ca/information/library/PRBpubs/prb0561-e.htm; Internet; accessed 17 December 2007.

[27]Michael Byers, "Unfrozen Sea: Sailing the Northwest Passage," *Policy Options* Volume 28, Issue 5 (May 2007): 32.

[28]Under UNCLOS Part III Straits Used for International Navigation, Article 37 stipulates "This section applies to straits which are used for international navigation between one part of the high seas or an exclusive economic zone and another part of the high seas or an exclusive economic zone." United Nations: Oceans and Law of the Sea, "The United Nations Convention on Law of the Sea," http://www.un.org/Depts/los/index.htm; Internet; accessed 13 January 2008.

of the Beaufort Sea.[29] A potentially significant area of oil and natural gas resources, both countries have claimed jurisdiction over a wedge-shaped area created as a result of differing boundary interpretations.[30] A third jurisdictional matter to be resolved is the determination of the extent of Canada's continental shelf for economic development and management. According to UNCLOS, a nation has 10 years after treaty ratification to make a claim to waters beyond the already established 200-nautical mile exclusive economic zone for economic jurisdiction. Canada ratified this convention in 2003, and, therefore, has until 2013 to submit its case. Canada has committed $51 million dollars to mapping the seabed.[31]

Therefore, although the issue of Canada's sovereignty regarding Arctic landmass has been largely established and accepted within the international community, the battle for sovereignty over Arctic waters, seabeds, and shelves rages on. Each of the circumpolar nations, Canada included, recognize the potential mineral riches, bio-stocks, and natural resources that exist in these areas, and the meaning of possessing such wealth in a future where their scarcity is foreseen. In the past, the cost of extracting resources from the Arctic was considered prohibitive; however, with the possibility of greater accessibility to the North as a result of global warming and an increasing scarcity of resources, what once was deemed impractical is gaining momentum within the realm of the achievable. The uncertainty of this situation has the impetus to create challenges to Canada's sovereignty.

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[29]Carnaghan and Allison Goody, *Canadian Arctic Sovereignty*…, 3.

[30]*Ibid*., 3.

[31]*Ibid*., 3.

GLOBAL WARMING

The topic of global warming is almost omnipresent in Canadian daily life. If it is not being debated in parliament, championed by interest groups, or reported in the press, then it is more than likely the subject of a documentary film or comedy sketch on television. A reason for so much exposure lies in the potential for significant change to life as we know it. Global warming is a phenomenon that occurs when the atmosphere retains more heat than usual, increasing average temperatures around the world. This retention happens due to a thickening of the atmospheric layer from the emission of carbon dioxide, methane, nitrous oxide, and other gases, commonly referred to as greenhouse gases, generated largely through the burning of fossil fuels and deforestation.[32]

Some results of global warming have been that the amount of naturally occurring ice around the globe is decreasing, the heat content of the seas has increased, and average sea levels have risen.[33] There are differing opinions on the rate at which global warming is occurring and what the resultant impacts may be. Emission scenarios and simulations have been performed in an attempt to predict what may happen as a result of various emission levels;[34] however, what is certain is that global warming is occurring, and although international effort has been made to address the causes,[35] climate change is

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[32]Hassol, *Arctic Climate Impact Assessment: Impacts of a Warming Arctic…,* 2.

[33]Intergovernmental Panel on Climate Change, 2007, *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*; ed. S. Solomon, *et al*, (Cambridge: Cambridge University Press, 2007), 83-84.

[34]*Ibid*., vii.

[35]The United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1992 to address global warming. Members countries of the UNFCCC negotiated the Kyoto Protocol which

expected to continue even if greenhouse gas emissions can be stabilized, largely due to the time that it takes oceanic processes to adjust.[36]

In specifically looking at changes to the Arctic as a result of global warming, "air temperatures are generally warmer, the extent and duration of snow and sea ice are diminishing, and permafrost is thawing."[37] In the western Canadian Arctic, average annual temperatures are expected to increase by three to four degrees Celsius by the end of the century and in an increasingly temperate climate, it is expected that there will be less snow for shorter periods, thawing permafrost, expansion northwards of the boreal forest and the permafrost boundary, and variation in flora and fauna.[38] In the eastern Arctic, winter warming temperatures are predicted to increase between three to nine degrees Celsius with the greatest warming occurring in the area of southern Baffin Island and Hudson Bay, with less warming in the other seasons.[39] Precipitation increases are projected, warm permafrost is expected to thaw, sea ice is estimated to recede from its current range of 150-200 km to 500-800 km, and fast ice thickness in the Northwest Passage is likely to decrease.[40]

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was entered into force on 16 February 2005. The Protocol commits those members who ratify it to a stabilization/reduction of greenhouse gas emissions. United Nations Framework Convention on Climate Change, "Kyoto Protocol," http://unfccc.int/kyoto_protocol/items/2830.php; Internet; accessed 10 March 2008.

[36]Intergovernmental Panel on Climate Change, 2007, *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*…, 89.

[37]Gunter Weller, *et al* "Summary and Synthesis of the ACIA," in *ACIA 2005: Arctic Climate Impact Assessment* (Cambridge: Cambridge University Press, 2005), 991.

[38]Weller, *et al* "Summary and Synthesis of the ACIA," …, 1009-1010.

[39]*Ibid*., 1011.

[40]*Ibid*., 1011-12.

There will be variation in effects of climate change across the vast Canadian north. "The impacts of this climate change in the polar regions over the next 100 years will exceed the impacts forecast for many other regions and will produce feedbacks that will have globally significant consequences."[41] Phytoplankton, which live in the Arctic waters, remove carbon dioxide from the air through the process of photosynthesis. When these plants die, they sink to the bottom of the ocean and do not decompose because of the cold temperatures, thereby retaining the carbon dioxide removed from the atmosphere.[42] There are fears that rising sea temperatures will increase bacteria activity, which will speed decomposition of the phytoplankton and release the carbon dioxide stored in the dead plant back into the atmosphere.[43] Similarly, it is being hypothesized that increased levels of mercury found in Beluga whales may be linked to naturally occurring mercury that is being released into Arctic waters as the permafrost melts, making its way up the food chain.[44]

This warming of the North has also raised the prospect of increased accessibility. More navigable waterways, such as the Northwest Passage, could provide alternate, shorter transportation routes for commercial shipping by 2015, according to some,[45] if the ice continues to thin at its current rate, as well as the possibility for greater fishing and expanded tourism. Less obstructed access to polar seas offers the prospect of oil and gas

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[41]Intergovernmental Panel on Climate Change, 2007, "Polar regions (Arctic and Antarctic)," in *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. M.L. Parry, *et al,* (Cambridge: Cambridge University Press, 2007), 655.

[42]Byers, "Unfrozen Sea: Sailing the Northwest Passage," …, 31.

[43]*Ibid*., 31.

[44]*Ibid*., 31.

[45]*Ibid*., 31.

extraction. It also brings the spectre of pollution, poaching, and border incursions in possible attempts by others to appropriate Canadian resources or to conduct criminal or terrorist attacks against Canada and her infrastructure.

As a nation, Canada is at a crossroads regarding its future. Should the government decide, as it has in the past regarding Arctic sovereignty and security issues, to largely downplay the ramifications that are projected to arise as a result of a warmer, more accessible North, there will be a greater price to be paid at a later date should challenges be made. Russians are planting flagpoles on the seabed of the North Pole[46], claiming the territory as their own. The Danes are testing Canadian resolve with their periodic forays to Hans Island. Canada must be able to monitor activities within her borders and credibly project power into all reaches of her territory in the defence of her sovereignty and the security of her peoples and their way of life. Aerospace capability within the CF can contribute in large part to furthering these goals on behalf of the Government of Canada.

SECURITY AND DEFENCE

CANADIAN FORCES ROLES AND RESPONSIBILITIES

Protecting the whole of Canada and its citizens is one aspect of national security that the Department of Defence (DND) and the Canadian Forces (CF) is charged to perform. The Canadian government issued its inaugural National Security Policy statement in 2004 that "articulates core national security interests and proposes a framework for

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[46]BBC News, "Russia plants flag under N pole," http://news.bbc.co.uk/2/hi/europe/6927395.stm; Internet; accessed 21 March 2008.

addressing threats to Canadians."[47] Within its National Security Policy, the government of Canada identifies three core national security interests:

a. protecting Canada and Canadians at home and abroad;

b. ensuring Canada is not a base for threats to our allies; and

c. contributing to national security.[48]

These security interests are echoed within Canada's International Policy Statement on Defence that identifies three roles for the CF consisting of "protecting Canadians, defending North America in cooperation with the United States [US], and contributing to international peace and security."[49] In light of a heightened security environment, largely stemming from the September 11, 2001 terrorist attacks that occurred in the US, the government has deemed that "a greater emphasis must be placed on the defence of Canada and North America than in the past."[50]

The "greater emphasis" was partly achieved within the CF through transformation efforts to better address the security and safety needs of Canadians. Transformation saw the creation of Canada Command (Canada COM) in February 2006, a "single national command structure…to respond to national contingencies."[51] Canada COM is "responsible for the conduct of all [military] domestic operations – routine and contingency - and will be the national operational authority for the defence of Canada and

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[47]Privy Council Office, *Securing an Open Society: Canada's National Security Policy* (Ottawa: Privy Council Office, 2004), [iii].

[48]*Ibid*., vii.

[49]Government of Canada, *Canada's International Policy Statement: A Role of Pride and Influence in the World – Defence* (Ottawa: Government of Canada, 2005), 2.

[50]*Ibid*., 2.

[51]*Ibid*., 18.

North America."[52] Like its larger American counterpart USNORTHCOM that focuses primarily on homeland security issues and providing support to civilian agencies, Canada COM, too, has a mandate to liaise with other government departments and agencies in order to be able to provide them support, if asked, during consequence management of events such as natural disasters and emergencies.

In order to be able to effectively respond to the security and defence requirements within Canada's vast borders, six regional Joint Task Forces were formed and headquartered as follows: North (Yellowknife), Pacific (Victoria), West (Edmonton), Central (Toronto), East (Montreal) and Atlantic (Halifax). Joint Task Force North (JTFN) is responsible for the area consisting of the Northwest Territories, the Yukon, and Nunavut as well as their maritime waters.[53] The CF permanent physical presence in the North consists of JTFN headquarters and its two detachments located in Iqaluit and Whitehorse; a communications station at Alert which is near the top of Ellesmere Island; 440 (Transport) Squadron, the Canadian Forces Recruiting Centre and the Regional Cadet Support Unit in Yellowknife; and 1 Canadian Ranger Patrol Group (1 CRPG), an organization of approximately 1575 part-time reservists who are organized into 58 patrols across the Arctic.[54]

In formulating an overarching strategy for Arctic sovereignty and security, it must be recognized that the region is not homogeneous in the demographics of its inhabitants,

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[52]Canada Command, "Background," http://www.canadacom.forces.gc.ca/en/background_e.asp; Internet; accessed 22 February 2008.

[53]Lt(N) I.F. Russell, *Impact of Global Warming on JTFN Operations* (Joint Task Force North Headquarters Yellowknife, 24 May 2006), n.p.

[54]The Canadian Army, "Canadian Rangers Patrol Group (CRPG)," http://www.army.forces.gc.ca/lf/English/7_5_1_1.asp; Internet; accessed 21 March 2008.

in the style of government practiced by the territories, nor in the needs of its citizens. If CF activity is to be successful, there must be recognition of the fact that implementation of sovereignty and security measures may have to be individually tailored for the Yukon, the Northwest Territories and Nunavut.

While the Yukon's populace includes a large percentage of southerners, and the government construct reflects the federal system of elected party-affiliated representatives, both the Northwest Territories and Nunavut have significantly larger proportions of Inuit/First Nations people and govern through a method of consensus that derives from their traditional culture. This creates three distinctive geographical and cultural areas comprised of citizens with differing needs and priorities.[55]

Any CF security strategy must take these factors into consideration in planning at the operational and tactical levels. This will require extensive interaction with communities in order to work together to accomplish goals that are mutually beneficial. CF members of JTFN must understand the cultural and traditional history of the peoples as well as their aspirations for the future. This will ensure the identification of achievable objectives that meet defence requirements, as well as promote Northern and circumpolar human security issues.

Commander JTFN created the Arctic Security Working Group in 1999[56] "to enhance the security and sovereignty of Canada's North through information sharing and

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[55]Brigadier-General C.T. Whitecross, "Protecting Canadian Arctic Security – the View from the Top" (presentation, Joint Command Staff Program 34, Iqaluit, Nunavut, 5 March 2008), with permission.

[56]Director General Strategic Planning, *Arctic Capabilities Study,* (National Defence Headquarters Ottawa: file *1948-3-CC4C (DGSP)*, June 2000), 4; http://www.natice.noaa.gov/icefree/Arctic%20Study%20Final%20-%20Canada1.pdf; Internet; accessed 17 December 2007.

cooperation among federal and territorial government departments, Aboriginal governments and organizations, NGOs and other stakeholders operating in the North."[57] The group meets twice a year and provides a forum in which participants can come together, network, and plan collective approaches to security issues. The synergy and cooperation established is essential in order for JTFN to conduct all of its responsibilities, one of which is to be able to provide aid to civil power in an environment where resources are limited and the conditions can often be difficult and inhospitable.

SECURITY ENVIRONMENT

"To fully appreciate the capability requirements of the Canadian Forces (CF) needed to meet the nation's security interests, even in the broadest of terms, it is critical to first understand the potential future security environment."[58] In recognition of this fact, Chief Force Development (CFD) developed a document to explore the security environment from 2007 to 2030 in which the CF will operating and to provide a background against which decisions affecting force structure and capabilities for the future can be made.[59] The paper makes the assumption that the CF will need to continue its provision of a "…three-ocean navy, a robust army and air force, and responsive

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[57]Arctic Security Working Group (ASWG), *Aim and Terms of Reference* (Yellowknife: Joint Task Force North Headquarters, 2006), n.p.

[58]Colonel Mike Cessford, "Some Thoughts on Future CF Capability Requirements," in *Towards the Brave New World: Canada's Army in the 21st Century*, ed. LCol Bernd Horn and Peter Gizewski, 121-122 (Kingston: Directorate of Land Strategic Concepts, 2003), 121.

[59]General R.Hillier, "Foreward," in *The Future Security Environment 2007-2030: Part One (DRAFT)* (Ottawa: Chief of Force Development, 2007), [i].

special forces…"[60] and highlights trends in the areas of politics, society and economics, resources and the environment, science and technology, and the military.

Some of the deductions presented in the report predict that from a political perspective, there will be continued growth in multilateral cooperation to provide peace and stability in the face of an expected increased engagement of non-state actors and criminal elements.[61] In terms of resource trends, the study indicates that oil will remain a crucial resource and that resource inequality, with the possible inclusion of water in that category, will lead to tension between nations.[62] The report also specifically addresses climate change, acknowledging that global warming effects may lead to natural disasters and population migration as well as the fact that it "…will bring about more activity in Canada's Arctic and more traffic in the Northwest Passage – both [of which] will necessitate diligent monitoring and action on Canada's part."[63]

Although much of the current security and defence policies are a product of the previous Liberal government, the current Prime Minister, as part of his Conservative election platform, stated that a "Canada First" defence strategy focusing on sovereignty was required "to fulfill national responsibilities, to provide effective emergency response and to protect our vast territory."[64] With increasing concerns regarding Canadian

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[60]Department of National Defence, *The Future Security Environment 2007-2030: Part One (DRAFT)* (Ottawa: Chief of Force Development, 2007), 1.

[61]*Ibid*., 53-54.

[62]*Ibid*., 55-56.

[63]*Ibid*., 34.

[64]Canadian Association of Defence and Security Industries (CADSI), "Conservative Election Platform for Canada's Defence and Security," http://www.defenceandsecurity.ca/public/docs/2006/march/conservative%20defence%20platform.pdf; Internet; accessed 12 January 2008.

sovereignty due to climate change and the resultant greater accessibility to the North's untapped resource potential and fragile ecosystem, the government announced greater presence initiatives for the Arctic.

In his August 2006 speech in Iqaluit, Nunavut on Canadian Forces Day, the Prime Minister (PM) reaffirmed his election promise "to ensure that Canada's Jurisdiction over the islands, waterways and resources in the High Arctic is respected by all nations."[65] He announced his government's intention to proceed with the establishment of a deep-water port, a new Army training centre, a "revitalized" Ranger program, new long-range unmanned aerial vehicle for surveillance and a program to create an underwater surveillance capability.[66]

The Prime Minister further reinforced the importance of sovereignty and security early in the government's October 2007 Speech from the Throne, again drawing specific attention to the Arctic:

> …the North needs new attention. New opportunities are emerging across the Arctic, and new challenges from other shores….Defending our sovereignty in the North also demands that we maintain the capacity to act. New arctic patrol ships and expanded aerial surveillance will guard Canada's Far North and the Northwest Passage. As well, the size and capabilities of the Arctic Rangers will be expanded to better patrol our vast Arctic territory.[67]

In order to align themselves with the government's declared "Canada First" defence strategy which encompasses these announced Arctic initiatives, DND and the CF have

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[65]Office of the Prime Minister, "Securing Canadian sovereignty in the Arctic,"…

[66]*Ibid*.

[67]Government of Canada, "Speech from the Throne: Strong Leadership. A Better Canada," http://www.sft-ddt.gc.ca/eng/media.asp?id=1364; Internet; accessed 3 December 2007.

been creating updated strategy, policies, and processes in order to ensure that their declared vision and direction is aligned with that of the government.

ACQUISITION OF DEFENCE CAPABILITIES

With a better understanding of the security environment, planning for the acquisition of capabilities can start well in advance of when equipment or services will need to be fielded - capabilities such as those that will be required in dealing with a more active Arctic region. Currently, it may take as long as 30 years to see a weapons system from design to full operating capability.[68] For example, the F-35 Joint Strike Fighter (JSF) program, which had its roots in technology development programs initiated in the late 1980's and early 1990's, contracted with industry in 1996 for the concept demonstration phase of development and saw its first test flight evaluations undertaken in 2000.[69] System design and development commenced in Fall 2001[70] and the US Airforce began in-flight evaluations at the end of January 2008.[71] With Initial Operating

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[68]Kurt M. Campbell, *et al, The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate* Change (Washington, DC: Center for Strategic and International Studies and the Center for a New American Security, 2007), 6; http://www.csis.org/media/csis/pubs/071105_ageofconsequences.pdf; Internet; accessed 13 January 2008.

[69]F-35 Lightning II Program, "History," http://www.jsf.mil/index.htm; Internet; accessed 17 January 2008.

[70]F-35 Lightning II Program, "Program," http://www.jsf.mil/index.htm; Internet; accessed 17 January 2008.

[71]Lockheed Martin, "First Military Pilot Flies Lockheed Martin F-35," http://www.lockheedmartin.com/news/press_releases/2008/0131ae_f35flipper.html; Internet; accessed 17 January 2008.

Capability (IOC) for the US Air Force scheduled for 2013,[72] the estimate of 30 years from concept to capability is not far off.

Of course, buying equipment military-off-the-shelf or a technology already in production shortens the lead times in fielding capabilities. For example, the project office to procure a replacement for the CC-130 Hercules aircraft was initiated in November 2005, and after a short hiatus caused by a change in government, the Solicitation of Interest and Qualification was issued in June 2006. The contract for the aircraft was awarded in December 2007 with an initial operating capability of seven aircraft expected in 2011 and full operating capability by 2012.[73] Although this particular procurement process is only projected to take a maximum of seven years, it is still seven years and cannot be done overnight in response to a new or unforeseen event.

Therefore, as illustrated by the examples stated above, timely decision-making must be taken if the CF is to acquire the capabilities needed to respond to the projected challenges to Arctic sovereignty and security which may result from the current global warming trends. There will also be the requirement to ensure that CF systems are immune from climactic disruption or can adapt to a changing situation or environment.[74] If adequate action is not taken to prepare now, then an appropriate and satisfactory response may not be possible when required in the future.

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[72]Ron Sherman, "F-35 Electronic Warfare Suite: More Than Self-Protection," *Avionics Magazine*, 1 April 2006; http://aviationtoday.com/av/categories/military/845.html; Internet; accessed 17 April 2008.

[73]LCol J. MacCaull, Integrated Logistics Support Manager (ILSM) Airlift Capability Project – Tactical (ACP-T), telephone conversation, 2 February 2008.

[74]Campbell, *et al, The Age of Consequences*…, 20.

ARCTIC CAPABILITIES FRAMEWORK

Between 1960 and 1990, military planning was predominantly threat-based.[75] Specific threats to a given nation would be identified and then used to establish the force options required to defend and/or defeat them.[76] During the Cold War years, the predominant threat to Canada and her allies was a Russian superpower. With a shift in the international security environment from predominantly large conventional conflicts to lower-intensity asymmetric combat, it has been assessed that "At present, there is no identified major direct military threat to Canada, and none is foreseen in the near future. Instead, there are a wide variety of threats and challenges to global and regional stability…."[77] Therefore, to adjust to this "wider variety" of threats where uncertainty, risk and economic restraints are realities, capability-based planning was adopted because it focuses on the achievement of goals identified through analysis of collectively what needs to be done.[78]

Strategic Capability Planning (SCP) is the capabilities-based process that the CF

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[75]CapDEM [Capability Demonstration], "Threat –Based Planning," http://www.capdem.forces.gc.ca/html/tbs_e.html; Internet; accessed 11 March 2008.

[76]Beth Asch and James R. Hosek, *Looking to the Future: What Does Transformation Mean for Military Manpower and Personnel Policy?,* Report prepared for the Office of the Secretary of Defense (Santa Monica: The RAND Corporation, 2004), 4.

[77]Department of National Defence, *Strategic Capability Planning for the Canadian Forces* (Ottawa: Vice Chief of the Defence Staff, DND, 2000), 6.

[78]The Technical Cooperation Program, *TTCP Technical Report: Guide to Capability Based Planning* (Alexandria, VA: Military Operations Research Society (MORS) Workshop, 2004), 2; http://www.mors.org/meetings/cbp/read/TP-3_CBP.pdf; Internet; accessed 7 March 2008.

employs in its force development and structure planning.[79] It links military strategy with political direction, taking into account both international and domestic factors as well as developments in technology and military art.[80] SCP uses the Canadian Joint Task List (CJTL) as a basis from which to derive capabilities required by the CF at the strategic, operational, and tactical levels and to what degree they must be performed. The CJTL has eight major capability areas: Command; Information and Intelligence; Conduct Operations; Mobility; Protect Own Forces, Sustain; Generate Forces and Coordinate with Other Government Initiatives.[81]

Within each of these capabilities areas are functional components that will vary in number and importance depending on the environment in which the capability will be employed.[82] These functional components can assist in better identifying what is required to achieve the best possible capability within different operational environments and are often referred to as "PRICIE" elements: Personnel; Research & Development/Operational Research; Infrastructure & Organization; Concepts, Doctrine & Collective Training; Information Technology Infrastructure and Equipment, Supplies & Services.[83] Assessment of capability requires the formulation of force planning

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[79]Force Development is the "planning and conceptualization associated with the creation, maintenance and adaptation of military capabilities in the face of changing security and resource circumstances. Ideally, force development should be holistic, that is, encompass the entire range of considerations associated with creating, maintaining and adapting military capability." Department of National Defence, *Strategic Capability Planning for the Canadian Forces*…, 28.

[80]*Ibid*., 6.

[81]Defence Planning and Management, "Canadian Joint Task List v1.4," http://vcds.mil.ca/dgsp/pubs/rep-pub/dda/cjtl/cjtl14/intro_e.asp; DWAN; accessed 11 March 2008.

[82]Chief of the Maritime Staff, "PRICIE Elements," http://navy.dwan.dnd.ca/english/dgmfd/dmarstrat/pricie.asp; DWAN; accessed 10 March 2008.

scenarios that take into account the political and strategic direction of the day and reflect the tasks that will need to be conducted in support of that direction.[84]

With the election of the Harper government in January 2006, a new "Canada First" defence strategy was promulgated. The CF is in the process of developing a revised defence policy that reflects the government's tenets and is also revamping the force planning scenarios to identify resultant capabilities that need to be developed, changed or procured to facilitate "Canada First" objectives. Due to the lack of availability of the new planning scenarios at the time of writing, the eleven scenarios outlined in Defence Plan 2001 will be used as representative of the types of situations to which the CF will be expected to respond. The scenarios, which cover the full spectrum of conflict, from peace to war, are listed in Table 3.1.

Table 3.1 Major Force Planning Scenarios

No.	Scenario
1	Search and Rescue in Canada
2	Disaster Relief in Canada
3	International Humanitarian Assistance
4	Surveillance / Control of Canadian Territory and Approaches
5	Protection and Evacuation of Canadians Overseas
6	Peace Support Operations (UN Chapter VI)
7	Aid of the Civil Power
8	National Sovereignty / Interests Enforcement
9	Peace Support Operations (UN Chapter VII)
10	Defence of Canada / US Territory
11	Collective Defence

Source: Department of National Defence, "Defence Plan 2001: The Department of National Defence and Canadian Forces Internal Annual Business Plan for Fiscal Year 2001/2002," 4-22.

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[83]Chief of the Maritime Staff, "PRICIE Elements,"…

[84]The Technical Cooperation Program, *TTCP Technical Report: Guide to Capability Based Planning*…, 2.

In determining what the Air Force must provide to joint CF capabilities in order to effectively respond to these scenarios, nine Air Force lines of operation (LOO) which group and categorize "platforms, infrastructure and personnel into functional capabilities"[85] will be employed. The LOOs, shown in Table 3.2, were derived from the five doctrinal aerospace functions of Sense, Shape, Move, Sustain, and Command, and serve to support capability based planning.[86] These LOOs describe air force capabilities that can be applied in support of all CF missions and operations; but, for the purposes of this paper, it is only those lines of operation applicable to support of Arctic sovereignty and security that are of interest. It should be noted that some aerospace assets can contribute to more than one LOO, due to their versatility.

Table 3.2. Air Force Lines of Operation (LOO)

No	Line of Operation (LOO)	Primary Function(s)
1	1st Stage Training	Sustain
2	Aerospace Force Application	Shape
3	Aerospace Management and Control	Command/Sense/Shape/Sustain
4	Air Demonstration	Sustain
5	Air Expeditionary Support	Sustain
6	Air Mobility	Move
7	Domestic Search and Rescue (SAR)	Shape/Sustain
8	Intelligence, Surveillance, Reconnaissance and Control (ISR&C)	Sense/Shape
9	Tactical Helicopter	Sense/Shape/Move/Sustain

Source: Lewis, "Canada 2017," 2.

Commander JTFN has defined the JTFN end state or desired situation to be achieved as "Successful execution of joint and integrated operations and support to civil

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[85]William J. Lewis, *Canada 2017*, Report prepared for Chief of the Air Staff (Trenton: Canadian Forces Aerospace Warfare Centre, 2007), 2.

[86]*Ibid*., 1.

authorities to maintain the sovereignty of the North and the safety and security of Canadians in the Arctic."[87] In order to combat potential threats to the North such as

Table 3.3. Mapping of AF and JTFN LOOs

AF LOO	Supported JTFN LOO
First Stage Training	Presence, Response
Aerospace Force Application	SA, Presence, Response
Aerospace Mgmt and Control	C2, SA
Air Demonstration	Presence
Air Expeditionary Support	Presence, Response
Air Mobility	C2, SA, Presence, Response
Domestic SAR	SA, Presence, Response
ISR&C	C2, SA, Presence, Response
Tactical Helicopter	C2, SA, Presence, Response

Sources: Lewis, "Canada 2017," 2, and Whitecross, "JTFN Campaign Plan Diagram."

JTFN mission and end state. Similarly, Air Demonstration, although a valuable recruiting tool that contributes to force sustainment as well as community development and integration, does not figure prominently in directly contributing to Arctic sovereignty and security.

Although Aerospace Management and Control is fundamental in exerting sovereignty through surveillance and control of Canadian airspace, this LOO will be examined as part of two other LOOs, namely: Intelligence, Surveillance, Reconnaissance and Control (ISR&C) where an examination of how best to exploit the aerospace environment to achieve situational awareness will be conducted, and Aerospace Force Application where response and control of undesirable activity will covered.[90] Each of the remaining six AF LOOs will be examined in order to determine what is needed to fulfil the Arctic mandate.

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[90]Department of National Defence, A-GA-007-000/AF-002 *The Aerospace Capability Framework: A guide to transform and develop Canada's Air Force* (Ottawa: DND Canada, 2003), 9.

ARCTIC CAPABILITIES STUDY

An Arctic capabilities study was carried out by the CF's strategic planning staff in June 2000 to determine "the need for and the feasibility of an increased CF presence in and surveillance of the Arctic region."[91] Commander Canadian Forces Northern Area[92] had expressed concern that the need for environmental protection, the potential for increased sea and air traffic in the North as a result of climate change, and transnational criminal activity may lay the Arctic open to asymmetric challenges at a time when the CF was reducing its presence.[93] The study made recommendations on options for increased CF presence and capability in the North based on objectives set out in the Defence Planning Guidance for 2001, mindful of the fact that defence funding was not limitless.

The study was conducted prior to the 9/11 terrorist attacks that took place in New York City and therefore, the results and recommendations do not take into account the new security environment in which North America finds itself. Some of the report's analysis is still valid, however, given the potential sovereignty and security challenges that have arisen as a result of not only climate change, but also due to terrorist activity and a shifting balance of power, it must be re-evaluated with these factors in mind. The results of this study will be referred to when analyzing current and future aerospace requirements, for comparative purposes. The government can no longer afford to postpone or ignore capability requirements for the Arctic if it wishes to be able to act

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[91]Director General Strategic Planning, *Arctic Capabilities Study…,* 3/26.

[92]Canadian Forces Northern Area is now known as Joint Task Force North or JTFN.

[93]Director General Strategic Planning, *Arctic Capabilities Study…,* 2/26.

decisively in the face of a crisis, both on the behalf of Canada and in support of others with whom it has entered into agreement.

AEROSPACE REQUIREMENTS TO SUPPORT JTFN LINES OF OPERATION

AEROSPACE FORCE APPLICATION

Aerospace force application is defined as "the primary means of applying force against an adversary's centre of gravity to achieve desired strategic effects."[94] The primary platform currently used within the CF to project aerospace force is the CF-18 Hornet fighter aircraft, and it is well-suited to conduct the following operations in support of sovereignty and security in Canada's North because of its speed, reach, and responsiveness:

a. strategic defensive operations to detect, identify, intercept, and if necessary, destroy enemy forces that are attacking Canada;

b. joint operations with other elements (navy, land forces) of the CF; and

c. surveillance and reconnaissance operations.[95]

Within the context of Canada's North, the greatest military threat since WWII had been perceived to be the potential for an "over-the-Pole" Soviet nuclear attack on North America. In order to decrease their vulnerability to such an action, the governments of Canada and the US entered into a bilateral agreement called North American Aerospace Defence Command (NORAD) in 1958 for the collective defence of the North American continent. As part of its air defence commitment, the CF contributes to Operation

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[94]Department of National Defence, A-GA-007-000/AF-002 *The Aerospace Capability Framework…,* 10.

[95]Department of National Defence, B-GA-430-000/FP-000 *Tactical Fighter Operational Doctrine* (Ottawa: Department of National Defence, 1994), 2-1 – 2-2.

NOBLE EAGLE[96] which requires that aircraft be maintained in a high readiness posture, able to respond to incursions into, and emergencies within Canadian airspace.

With the dissolution of the Soviet Union in 1991, the Post-Cold War era was ushered in and many thought that the threat of a Russian attack had become negligible, given the poor state of the Russian economy and the country's subsequent decline from the position of "superpower" within the international community. Although Russian military flights and incursion of Russian aircraft into North American airspace had slowed over the years, on 17 August 2007, Russian President Vladimir Putin announced that the "Russian Air Force would resume regular, long-range patrols by nuclear-capable bombers over the oceans."[97] This announcement was made during combined military exercises with the Chinese and other central Asian countries.

The Russian military has indicated that since this announcement "Russian strategic bombers have conducted over 70 patrol flights and more than 217 practice launches of unarmed missiles... [and that] …bomber crews had practiced early detection and identification of potential targets and counter-intercept measures."[98] Monitoring of Russian activity has indicated near weekly flights that coincide with geo-political events

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[96]Operation NOBLE EAGLE came into being after the 9/11 terrorist attacks to provide an immediate response capability against internal aerial threats, in addition to the originally envisaged external threats. "CANR [Canadian NORAD Region] CF-18 aircraft are on continuous alert to respond to any potential aerial threat to the safety of Canada and Canadians." Canada's Air Force, "Post September 11, 2001," http://www.airforce.forces.gc.ca/site/athomedocs/athome_1_5_e.asp; Internet; accessed 28 March 2008.

[97]Andrew E. Kramer, "Putin orders long-range bomber flights," *International Herald Tribune,* 17 August 2007; http://www.iht.com/articles/2007/08/17/europe/russia.php; Internet; accessed 21 February 2008.

[98] Novosti - Russian News& Information Agency, "Russian strategic bombers conducted over 70 patrols since August," RAI *Novosti*, 4 December 2007; http://en.rian.ru/russia/20071204/90864261.html; Internet; accessed 21 February 2008.

and as of the end of February 2008, this has materialized into five intercepts of Russian aircraft within the Canadian Air Defence Identification Zone (CADIZ) by Canadian fighter aircraft.[99]

This "step-up" in air activity within the Arctic region, coupled with Russia's efforts to stake a larger claim to Arctic gas and oil resources and her close association with a resource-hungry China, could be interpreted as potentially challenging to Canadian sovereignty and security. There are opinions, such as that of Douglas Bland, Chairman of the Defence Management Studies Program at Queen's University expressing that "Issues in the North aren't going to be dealt with by the Canadian Forces….[t]hey'll be handled by diplomacy and other similar means."[100] Hopefully, this will be the case; however, the military needs to possess a credible capability at an appropriate readiness posture to conduct both routine and contingency operations, as required, should diplomacy need bolstering.

The CF recently came to the assistance of the US within the context of their NORAD commitment when in November 2007, CF-18 aircraft were stationed for an approximate two-week period at Elmendorf Air Force Base near Anchorage, Alaska, to conduct US sovereignty patrols due to a temporary grounding of the American F-15 Eagle fighter fleet.[101] Given the context of a more active Russian neighbour, it was important that Canada was able to step into the breach and contribute with concrete

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[99]Major-General J.M. Duval, "Canadian NORAD Region (CANR) Northern (Air) Sovereignty Ops," (presentation, Chief of Defence Staff Seminar, Canadian Forces College Toronto, 27-28 February 2008), Slide 5.

[100]Doug Saunders "Treading on Thin Ice," *Globe and Mail*, 20 October 2007.

[101]CBCnews.ca, "Canadian fighter jets temporarily fill in for U.S. air defences," http://www.cbc.ca/canada/north/story/2007/11/27/fighter-jets.html; Internet; accessed 8 February 2008.

capacity. The patrolling supported Canada's NORAD partner while at the same time contributed to the exercising and training necessary for Canadian combat air assets to effectively operate within an Arctic environment.

The results of an Arctic Capabilities Study (ACS) that was conducted in 2000 indicated that the deployment of CF-18 Hornet aircraft to Forward Operating Locations (FOL) in the North had decreased in recent years and although an increase would contribute to presence, it "would not add to either the compilation of an operational picture or of CF ability to respond to suspected activities in a meaningful way."[102] The platform was dismissed, at the time, as a cost-efficient, viable asset to confirm suspected activity based on the range limitations of the aircraft, its support requirements and the lack of aircrew training to perform the tasks.[103]

The security environment has changed significantly in the past eight years as evidenced by the increased Russian bomber activity, the changing political spectrum, as well as the terrorist attacks that took place on 11 September 2001 that brought violence and extremism from "over there" to the North American continent. The recommendations of the ACS concerning the efficacy of employing the CF-18 aircraft in the Arctic was largely founded on the fact that the aircraft was not based in strategic, supported locations nor operated by mission-trained personnel familiar with operating in a northern environment. This is the issue that must be addressed at this time to meet the sovereignty and security challenges of the future.

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[102]Director General Strategic Planning, *Arctic Capabilities Study…,* 23/26.

[103]*Ibid.,* 21/26.

In 1992, at the end of the Cold War, the deployment of strategic air assets to remote locations was suspended, however, in 1999, there started a gradual increase in the scale of training for northern sovereignty patrols as well as the number of out-of-cycle and out-of-area missions.[104] In order to carry out missions in Northern regions, aircrew and maintainers alike must exercise regularly in order to refine requirements and procedures as well as acclimatize CF members to the particulars of the arctic working environment. In other words, a force must train in the same way it intends to fight. In March 2006, prior to the start of familiarization training in Canada's North, the Commander of 1 Canadian Air Division and the Canadian NORAD Region reinforced this assertion stating "Our pilots and ground crews must be familiar with these Forward Operation Locations [FOL] should we need to deploy aircraft to them in support of our NORAD mission."[105]

Working in the Arctic brings with it several challenges that stem from the unique weather patterns that exist. One Air Force publication on Arctic operations warns "…unless you want to become an icecube for the big martini shaker in the sky, try to expand your understanding of the Arctic conditions you will encounter."[106] The climate is characterized by a persistent cold that results in "long cold winters and short cool summers;"[107] however, global warming is affecting this trend, as discussed previously.

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[104]Duval, "Canadian NORAD Region (CANR) Northern (Air) Sovereignty Ops," …, Slide 4.

[105]Department of National Defence, "CF-18's [sic] to Conduct Forward Operation Location Familiarization Training in Canada's North," http://www.mdn.ca/site/Newsroom/view_news_e.asp?id=1881; Internet; accessed 23 February 2008.

[106]Department of National Defence, FG/CANR HQ FOL Handbook, (Ottawa: Department of National Defence, 1989), I-1.

[107]*Ibid*., II-4.

There is seasonal variation in the amount of daylight that is experience throughout the region and on average, the year can be divided into four blocks of three months each where one block experiences no daylight, one experiences continuous daylight and two blocks are transitional periods between the extremes.[108] Working conditions on the ground can be complicated by high winds, blowing snow, fog, white-out, and snow reflectivity causing glare.[109] Although flying conditions in the Arctic are for the most part good, in-flight phenomenon such as damp and ice-crystal haze causing reduction in the slant visual range, icing and turbulence over open water must be understood.[110]

With the advances being made in space-based intelligence, surveillance and reconnaissance (ISR) capabilities that will be discussed later in this paper, the CF-18 is an asset well-suited to respond to an unfolding incident if properly cued to its location. There are no indications of personnel number issues with respect to operation and support of this asset in the near term;[111] however, the outstanding issue rests in its appropriate deployment and basing within the Canadian North. Aircraft can be scrambled from a main operating base (MOB) such as 4 Wing Cold Lake to intercept unauthorized intruders into northern Canadian airspace; however, it may take anywhere from 3.5 to 8 hours after launch to make contact, depending on the availability of American air-to-air

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[108]Department of National Defence, FG/CANR HQ FOL Handbook .., II-4.

[109]*Ibid*., II-9-12.

[110]*Ibid*., II-7-8.

[111]Lewis, *Canada 2017*…, 4.

refuelling assets to support the mission.[112] And then, there is the requirement for continued support of these aircraft over the course of the operation.

Currently, there are FOLs established across the North that are "designated airfield[s] at which austere facilities are maintained to support periodic tactical fighter operations."[113] The issue is that it takes 24-48 hours to activate an FOL with the personnel and equipment required to support the CF-18 aircraft, and while in the summer months it may be possible for CF-18 aircraft to deploy and operate without support for the first 48 hours, during the winter months it is not feasible,[114] largely due to not have the requisite personnel on-site to install the arrestor cable system that must be used to assist aircraft in landing. An increase in the number of FOLs located within the Canadian Arctic for aircraft operation in response to sovereignty incursions and security crises could be made, but, if not manned any better than in the past, they will not contribute significantly to Air Force and JTFN LOOs. In order to augment capability, existing FOLs must be upgraded to Deployed Operating Bases (DOB) which will enable greater support to operations while increasing presence. A DOB is a:

> …military airfield to which continuous or regular deployments are conducted…for which dedicated facilities are required. Full first line aircraft maintenance is provided…. Deployment of personnel and equipment may be required to sustain operations.[115]

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[112]Major C. Hamilton, "Northern Sovereignty Operations," (presentation, Chief of Defence Staff Seminar, Canadian Forces College, Toronto, ON, 27-28 February 2008), Slide 7.

[113]Department of National Defence, B-GA-430-000/FP-000 *Tactical Fighter Operational Doctrine*…, 3-2.

[114]Hamilton, "Northern Sovereignty Operations,"…, Slide 7.

[115]Department of National Defence, B-GA-430-000/FP-000 *Tactical Fighter Operational Doctrine*…, 3-1/3-2.

Activities have been initiated recently to address some of the shortcomings associated with CF-18 operations in the Arctic. At the FOL in Inuvik, there has been a skeleton crew of 16 personnel deployed from 4 Wing Cold Lake since July 2007 charged with the duties of snow and ice control (SNIC), fuelling, arrestor gear operations, fire fighting and rescue, and personnel support.[116] This increased presence provides a higher level of readiness as well as the capability to sustain operations within winter weather conditions, but will be reduced during the spring and summer months due to SNIC not being required.[117]

With an increased operations tempo in the North as a result of Russian bomber exercises, civilian contractors in Inuvik were not able to meet the military's demand for fuel; therefore, three fuel storage bladders were positioned at FOL Inuvik and are replenished by CC-177 Globemaster aircraft to ensure an adequate fuel supply.[118] Another infrastructure initiative being contemplated for this location is an extended runway.[119] Extension of the runway would negate the need for CF-18 aircraft to use arrestor cables in the winter months and would allow the deployment of Canadian CC-150T strategic tanking assets to support operations, effectively increasing CF-18 endurance and range.

Initiatives such as those being taken and contemplated for FOL Inuvik, should be extended to more FOLs across the north to increase CF and NORAD readiness and

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[116] Duval, "Canadian NORAD Region (CANR) Northern (Air) Sovereignty Ops,"…, Slide 6.

[117] *Ibid*., Slide 6.

[118] Major-General J.M. Duval, " The Aerospace Component in Joint and Combined Operations," (lecture, Canadian Forces College, Toronto, ON, 19 February 2008), with permission.

[119] Duval, "Canadian NORAD Region (CANR) Northern (Air) Sovereignty Ops,"…, Slide 8.

presence while at the same time contributing to a collective enhancement of Arctic capability with governmental and agency partners. An increased familiarity of CF members in conducting Arctic operations and exercises is crucial and will assist in identifying deficiencies in training and support that contribute to effective operation in an area that is becoming increasingly prominent within Canada's economic, security, sovereignty and environmental arenas.

AIR EXPEDITIONARY SUPPORT

Expeditionary Aerospace Support, the latest incarnation of Air Expeditionary Support, is defined as "the ability of Canada's Air Force to conduct operations effectively at home and abroad, and to project aerospace power globally."[120] As a result of CF Air Force experience gained largely during the 1991 Gulf War, the concept of what was to become expeditionary aerospace support was created in order to provide operations and logistic support to expeditionary missions via units organized on something other than an *ad hoc* basis.[121] In the past, personnel were pulled from units and locations across the country to be deployed without having had adequate opportunity for standardized training and equipping. The idea of expeditionary aerospace support was to create flexible, scalable and modular deployment teams that could be "task tailored" to a specific mission.[122]

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In creating an Air Force capability that can provide effective and timely deployment support, 2 Aerospace Expeditionary Support Squadron (2 AESS) was established as part of 2 Wing, a lodger unit of 3 Wing Bagotville.[123] 2 AESS is a "permanent, rapid-reaction, initial rotation 250-person standing unit [that] generates trained, equipped and ready-to-deploy air expeditionary components including command, combat support, and combat service support personnel.[124] These components can be used to form or activate an Air Expeditionary Wing (AEW) that can be deployed in support of aerospace operations at home or abroad. Although aircraft may be tasked into high threat areas to conduct operations, an AEW will only be based in a maximum medium threat environment. An environment of medium threat level is defined as one where "An individual/organization/nation has been identified as *possessing* both the capability and intention of effecting the defined threat, but *may not do so* for various reasons. It is *probable*; however, they may attempt to do so at some other time."[125]

The composition of an AEW depends on the number and type of aircraft that require support. Typically, the AEW is comprised of a command element, an air detachment, an operations support flight (OSF), and a mission support flight (MSF).[126] The command element consists of a Commander, his Chief Warrant Officer and his headquarters staff. The air detachment provides "a fleet-specific force package to

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[123]Department of National Defence, B-GA-410-000/FP-001 *Aerospace Power Doctrine*…, 3-1.

[124]*Ibid*., 3-1.

[125]*Ibid*., 7-3.

[126]*Ibid*., 3-1.

generate aerospace power as part of the AEW"[127] which will vary in size and composition depending on the platform being employed. The OSF provides "combat support to the air detachments and coordinates battle staff ops"[128] and can include force protection, intelligence, explosives disposal and chemical, biological, radiological and nuclear (CBRN) support.[129] MSFs are located at six Wings across the country that support unique aerospace platforms, are typically comprised of 99 personnel and provide combat service support to the AEW in the form of administrative, logistic, transport, construction engineering, food services, fire fighting and information services support.[130] Although the MSFs are a proven concept and have been deployed on a rotating basis to support air mobility operations in Camp Mirage, there remains a shortage in personnel to fully implement the concept. According to a study conducted by CFAWC, by 2017, there will be a deficit of 801 personnel required to maintain an AEW.[131]

This aerospace expeditionary capability that projects "military power over extended lines of communications into a distant operational area to accomplish a specific objective[132] is an excellent vehicle that could be deployed domestically within the Arctic region in support of protecting Canadians as well as in the conduct of NORAD continental defence commitments.[133] Whether assisting territorial governments respond

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[127]Department of National Defence, B-GA-410-000/FP-001 *Aerospace Power Doctrine*…, 3-2.

[128]*Ibid*., 3-3.

[129]*Ibid*., 3-4.

[130]*Ibid*., 3-5.

[131] Lewis, *Canada 2017*…, 6.

[132]English and Colonel John Westrop (Retired),

to natural disasters that could feasibly necessitate evacuation of citizens from areas of danger, transporting CF personnel and equipment to address an unfolding situation, or projecting force against external threats, an AEW could be deployed to the Arctic and integrated into the command and control structure as follows:

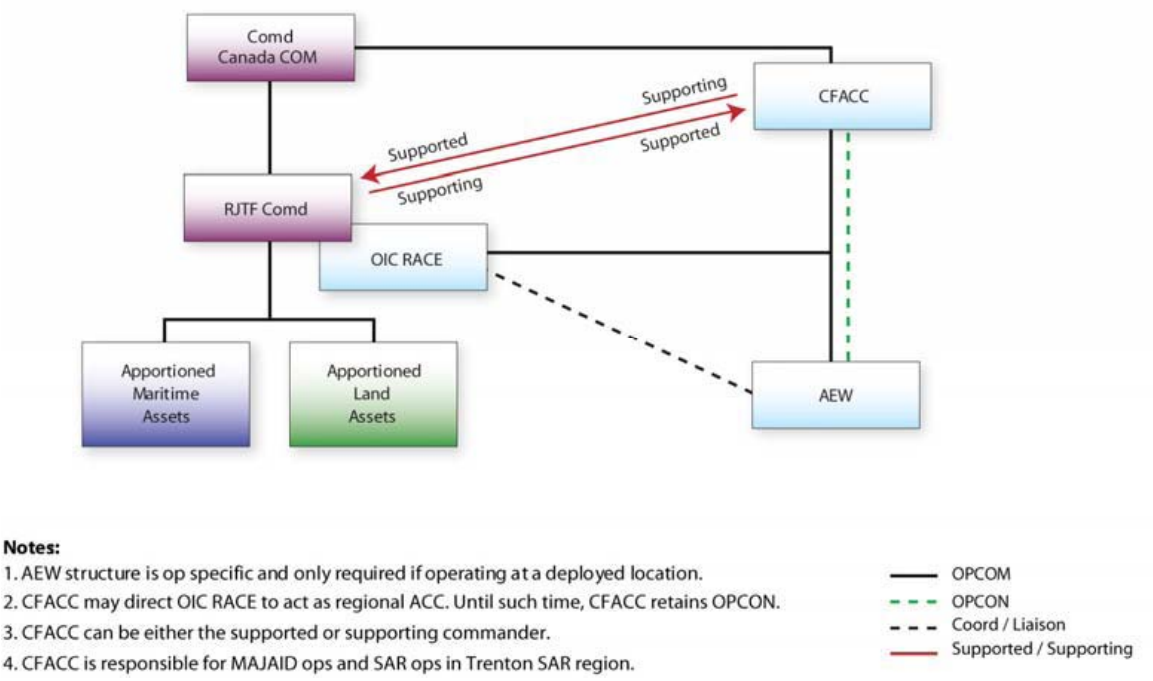

Figure 4.1 – C2 for an AEW Employed in Canada COM Operations

Source: Department of National Defence, B-GA-410-000/FP-001 *Aerospace Power Doctrine: Aerospace Expeditionary Support Operations Doctrine – Study Draft 1*, 4-1

Commander JTFN would be the Regional Joint Task Force Commander within this construct. In most cases where the AEW was deployed domestically, Commander JTFN would be supported by the Combined Force Air Component Commander (CFACC), who would exercise operational command (OPCOM) and operational control

(OPCON) of aerospace assets being employed.[134] If the crisis called for a largely aerospace response versus a joint effort, such as in the case of a major air disaster (MAJAID), the CFACC may be designated as the supported commander by Commander Canada COM with the Commander JTFN in the supporting role.[135] The Officer in Charge (OIC) of Regional Air Control Elements (RACE) provides Commander JTFN with aerospace situational awareness and heads the organization through which Commander JTFN will input or request aerospace requirements from the CFACC.[136]

The AEW is an important capability in that it gives Commander JTFN a flexible and timely surge response, as well as increased presence, in the event of an emergency. It also contributes to a "Team North" partnering ability with all levels of government and non-governmental organizations.[137] Use of DOBs and FOLs across the North will provide the infrastructure necessary to conduct and sustain operations, aircraft, and personnel until a given crisis is under control.

AIR MOBILITY

Air Mobility is the capability of deploying personnel and cargo from one point to another in support of operations. It is absolutely essential in order to carry out operations within a country the size Canada, as well as being able to project forces abroad in support of Canadian interests. Air Mobility supports all four JTFN LOOs. Effective command and control demands that the Commander or JTFN staff have the ability to move

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[134]Department of National Defence, B-GA-410-000/FP-001 *Aerospace Power Doctrine*…, 4-1.

[135]*Ibid*., 4-1.

[136]*Ibid*., 4-1.

[137]Whitecross, *Draft Joint Task Force (North) Campaign Plan*…, 7/14.

throughout the Northern Area of Responsibility (AOR) in a timely manner, if need be, to respond to unfolding situations involving national sovereignty and security. The ability to move also provides situational awareness and presence in the region which acts as a credible counter- threat to external forces and a measure of assurance internally to its citizens. Because of a relative scarcity of resources in the North, all government departments pool resources in order to effect plans. Air mobility contributes to these efforts.

Currently, within JTFN's AOR, there is one air mobility unit, 440(T) Squadron that consists of four CC-138 Twin Otter Aircraft. These CF assets are used to provide short takeoff and landing (STOL) utility transport throughout the region in support of training, exercises, operations and opportunity surveillance.[138] In its mobility role, the CC-138 Twin Otter aircraft is well-suited for Northern employment as it is manoeuvrable, responsive, and can land on almost any given surface due to authorized configurations using wheels, skis, or floats.[139] The aircraft has conducted directed surveillance when other support has been unavailable, however, this is not a primary role for the platform as it has no marine radio, limited camera resources, must operate in daylight, and is limited in range, hours and by weather.[140] For larger exercises and operations, additional airlift in the form of CC-130 Hercules and CC-177 Globemaster aircraft is requested through 1 Canadian Air Division and worked into fleet scheduling.

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[138]Whitecross, *Draft Joint Task Force (North) Campaign Plan*…, 12/14.

[139]Canada's Air Force, "CC-138 Twin Otter," http://www.airforce.forces.gc.ca/site/equip/cc138/default_e.asp; Internet; accessed 18 February 2008.

[140]Lt(N) I.F. Russell, *Surveillance Resources* (presentation, Persistent Arctic Surveillance and Communications Conference, Joint Task Force North Headquarters, Yellowknife, NT, 7 February 2006), Slide 3.

The CC-138 Twin Otter is an aging aircraft that requires replacement in the near term. The estimated life expectancy (ELE) for aircraft operation is until the year 2010, however, a request to extend that limitation until 2015 has been made.[141] There are advocates for a follow-on utility transport aircraft (UTA) with greater range and speed than the CC-138 Twin Otter as well as a larger payload in order to better support JTFN tasks. Currently, 440(T) Squadron can only provide support for 50% of their taskings, and 40% of the payload required.[142] Commercial airlift is often chartered to accommodate the difference.

At the time of writing, the specific operational requirements for the UTA were unavailable, however, in broad terms the UTA will have an ability to launch and recover on 3500 foot-long runways[143] or at approximately 60%[144] of the aerodromes within the AOR. The Twin Otter currently has a payload of approximately 2000 lbs[145]; the capacity of the UTA is being specified at 6000 lbs,[146] giving it three times the payload to meet current taskings and the possibility of decreasing dependence on commercially chartered flights. The UTA will have the speed and range to fly from Yellowknife to Iqaluit,

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[141]Captain K. Pinke, CC-138 Twin Otter Aircraft Engineering Officer, telephone conversation, 11 February 2008.

[142]Lieutenant-Colonel D.R. Williams, Director Air Requirements 2, telephone conversation, 5 February 2008.

[143]*Ibid*.

[144]This figure is based solely on the length of the landing strip without taking into consideration other factors such as airstrip surface and whether there are instrument approach procedures published to accommodate air traffic in darkness or bad weather conditions. NAV CANADA, *Canada Flight Supplement: Canada and North Atlantic Terminal and Enroute Data, Part 3 – Aerodromes (AD), Effective 0901Z 14 February 2008 to 0901Z 10 April 2008* (Ottawa: NAV CANADA, 2008).

[145]Captain D.M. Dea, Adjutant 440(T) Squadron, e-mail correspondence, 28 March 2008.

[146]Lieutenant-Colonel D.R. Williams, Director Air Requirements 2, e-mail correspondence, 27 March 2008.

return, in a single crew day, as well as having the capacity to travel the distance necessary between Northern airports.[147]

At one time, the UTA was being sourced as part of the Fixed Wing Search and Rescue (FWSAR) program. Four of the airframes being procured were to have replaced the CC-138 Twin Otter. Although the requirements for the FWSAR would provide the capability required for a utility role in the North, the requirements for Search and Rescue (SAR) are much more stringent than those required for transport aircraft operating in a relatively low-traffic area. SAR aircraft system requirements, including the specification for the aircraft to have a ramp, would have been nice-to-have capabilities, but not explicitly essential to fulfil a utility transport role. Therefore, the four aircraft for UTA were removed from the contracting process in favour of finding a less expensive alternative.

In examining options for service delivery, consideration must be given to whether or not it would make more sense to purchase or lease. Cost-effective business cases for the leasing of aircraft and support services have been made in the past for other CF fleets; however, unless contracts are well-conceived and specific, a loss in usage flexibility may be experienced. Contracts may incorporate limitations such as the number of flying hours that can be incurred within a given period without penalty or how the aircraft is to be employed and where. To build flexibility into a contract costs money which drives up overall costs, making it less attractive than having the resident capacity within the CF, in some cases.

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[147]Lieutenant-Colonel D.R. Williams, Director Air Requirements 2, telephone conversation, 5 February 2008.

In the case of CF aircraft being based in Canada's North, one of the main operations that this aircraft has to perform is that of presence in support of Canadian sovereignty. Presence means being seen, and it is for this reason that aircraft conducting CF operations must be painted in a recognizable CF colour scheme with a Canadian flag on its tail, and operated by military pilots and aircrew. The aircraft are not just transporting equipment and personnel from one location to another; they are "footprinting the North"[148]. There are some that would argue that support services are, perhaps, less visible and, therefore, more easily contracted out. This approach has been adopted for non-deployed, CF-owned and flown CC-144 Challenger aircraft based out of Ottawa and CH-149 Cormorant SAR helicopters on Wings across the country.

In a point paper endorsed by Commander 1 Canadian Air Division to the Chief of the Air Staff,[149] however, an argument is made to not to contract UTA maintenance support to civilian agencies:

> [the] UTA, for example, should be retained as an opportunity for CF aircraft technicians to depressurize, and help create a more realistic sustainment ratio for a high tempo, expeditionary focused force.…Further, should a domestic crisis occur, this ready pool of personnel would be able to respond in all eventualities.[150]

In addition, the opportunity to have CF members live and work within Northern communities, building ties and representing the CF, may be lost if contractors were to do the job of uniformed technicians:

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[148]Lieutenant-Colonel D.R. Williams, Director Air Requirements 2, telephone conversation, 5 February 2008.

[149]Major-General Bouchard, *Maintenance Support to Non-Deployed Aircraft Fleets* (1 Canadian Air Division, 17 Wing Winnipeg: file 1003-2 (A4 Maint), 2 March 2007), 1/2.

[150] Colonel J. C. Madower, *Point Paper on Aircraft Maintenance Support to Non-Deployed Aircraft Fleets* (1 Canadian Air Division Winnipeg, 19 January 2007), 3/4.

> In deference to the Canada first [sic] defence policy, UTA provides opportunities for regular and reserve personnel to connect with the local population and to more deeply, positively, influence the northern region of this country….the CF would more directly influence the neighbourhoods and citizens of the north than would be the case if contractors were engaged.[151]

With respect to Air Mobility within the North, the Arctic Capability Study that was conducted in 2000 indicated that "The addition of more capable aircraft to 440 Squadron should be investigated…."[152] Commander JTFN also requested at the time that consideration be made to provide a CC-142 Dash 8 aircraft for enhanced transport capability in the North.[153] The Dash 8 aircraft has approximately three times the payload and speed of the Twin Otter. It fulfils the basic UTA requirements for range, speed, payloads, and ability to use most Arctic airports. The Dash 8 aircraft is already a part of the CF inventory. A modified version of the aircraft is being flown by the CF to train aircraft navigators. Thus, the requisite training infrastructure for pilots and maintenance technicians is already in place, as are publications, logistics, and engineering support. This negates the cost of creating new, unique, support structures. Of course, there are other aircraft that will be able meet the operational requirements for the UTA and ultimately, will objectively be assessed as part of a bid evaluation process to assure best value for money.

Acquiring a platform for the North ultimately comes down to the overall CF capability required, the money available, and priority. Of late, the Canadian government has repeatedly reiterated its commitment to the North, despite other, on-going,

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[151]Madower, *Point Paper on Aircraft Maintenance*…,3-4/4

[152]Director General Strategic Planning, *Arctic Capabilities Study…,* 12/26.

[153]*Ibid.,* 19/26.

obligations that might draw the spotlight away. With announcements by the government for an increased Ranger complement in the North, the establishment of an Arctic training centre and development of a deep water port,[154] the requirement for a robust air mobility component is evident, given the current lack of roads and rail linking Northern communities. Although CC-177 Globemaster and CC-130 Hercules aircraft support Arctic operations and exercises, they are not based in the Arctic, conducting day-to-day missions in support of JTFN.

The UTA project will provide an air mobility capability to handle today's tasking with room to grow for the future. There is a case to be made, however, for continued service of the CC-138 Twin Otter, given the fact that there are no CF helicopter resources based within the Arctic to conduct operations. If infrastructure is going to be challenged by global warming, an aircraft that can land on almost any surface should be preserved within the stable of assets to be employed in support of JTFN taskings and responsibilities.

Viking Air, located in Victoria, British Columbia, and owner of the commercial DHC-6 Twin Otter type certificate and production rights, announced in April 2007 that it would begin production of the 400 Series Twin Otter.[155] Currently, there are four aircraft in production[156] and at least 16 more aircraft on order.[157] Newer, upgraded Twin Otters

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[154]Office of the Prime Minister, "Securing Canadian sovereignty in the Arctic,"…

[155]Viking Air, "Viking Launches Twin Otter Series 400 Aircraft Production Program," http://www.vikingair.com/content.aspx?id=392; Internet; accessed 18 February 2008.

[156]Captain K. Pinke, CC-138 Twin Otter Aircraft Engineering Officer, telephone conversation, 11 February 2008.

[157]Viking Air, "Viking Launches Twin Otter Series 400 Aircraft Production Program," http://www.vikingair.com/content.aspx?id=392; Internet; accessed 18 February 2008.

could be procured should the current models reach their ELE before there are other assets in place with its unique capabilities. The continued operation of the CC-138 Twin Otter in the North would compliment the addition of a UTA, and would provide JTFN with flexible response under its command to respond to sovereignty and security situations in a variable and changing environment.

DOMESTIC SEARCH AND RESCUE (SAR)

In 1947, the Federal Government assigned primary responsibility for the coordination of SAR within Canada's 15.5 million square kilometre territorial lands and waters to the Royal Canadian Air Force.[158] The conduct of SAR within Canada today is an interdepartmental responsibility that spans all levels of government from federal to municipal, including volunteer organizations.[159] The Minister of National Defence remains the lead federal minister and governmental spokesperson on all SAR matters, and DND is specifically responsible for the provision of aeronautical SAR.[160]

Questions have been raised in the recent past as to whether or not SAR should continue to be a military function. There are proponents who argue SAR is not a core military task and that it might be better conducted by Transport Canada[161] or perhaps the Canadian Coast Guard. Contracted SAR might be considered as there has been precedent

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[158]CBCnews.ca, "In Depth: Search and Rescue," http://www.cbc.ca/news/background/search_rescue/index.html; Internet; accessed 18 February 2008.

[159]*Ibid*.

[160]Department of National Defence, B-GA-209-001/FP-001 *National Search and Rescue Manual* (Ottawa: DND Canada, 2000), 4-5.

[161]Canadian American Strategic Review, "A Modest Proposal – SAR Aircraft: Rethinking Search and Rescue," http://www.sfu.ca/casr/mp-sar.htm; Internet; accessed 3 December 2007.

set in this area by others such as the Australia RAAF.[162] It is an argument that merits discussion, but, as DND is currently mandated to carry out the responsibility, an examination of how to best support JTFN LOOs with military SAR assets will be conducted.

As a member of the International Civil Aviation Organization (ICAO), Canada has been assigned an aeronautical SAR AOR and has agreed to adopt SAR standards and procedures as stipulated in the Convention on International Civil Aviation.[163] As shown in Figure 4.2, the Canadian AOR has been divided into three SAR regions with five locations from which SAR missions are launched. Aircraft currently assigned to the primary SAR role are the CH-149 Cormorant helicopter, the CH-146 Griffon helicopter, the CC-130 Hercules aircraft and the CC-115 Buffalo aircraft; however, the fixed-wing assets are old, have an estimated life expectancy (ELE) of 2010, and require replacement.[164] It should be noted that all other aircraft within the CF inventory have SAR as a secondary role in addition to their core functions.

What is immediately noticeable in Figure 4.2 is that Canadian SAR resources are largely located along the southern Canada/US border, save Gander, Newfoundland, leaving the Arctic exposed without any immediate, specialized resources to call upon in the case of a short-fuse emergency.

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[162]*Ibid*.

[163]Department of National Defence, B-GA-209-001/FP-001 *National Search and Rescue Manual...*, 1-3 – 1-4.

[164]Department of National Defence, *Fixed Wing Search and Rescue Project: Statement of Operational Requirement* (Ottawa: Project File No: 3136-6-00000609, Version 1.0 26 March 2004), 13/122.

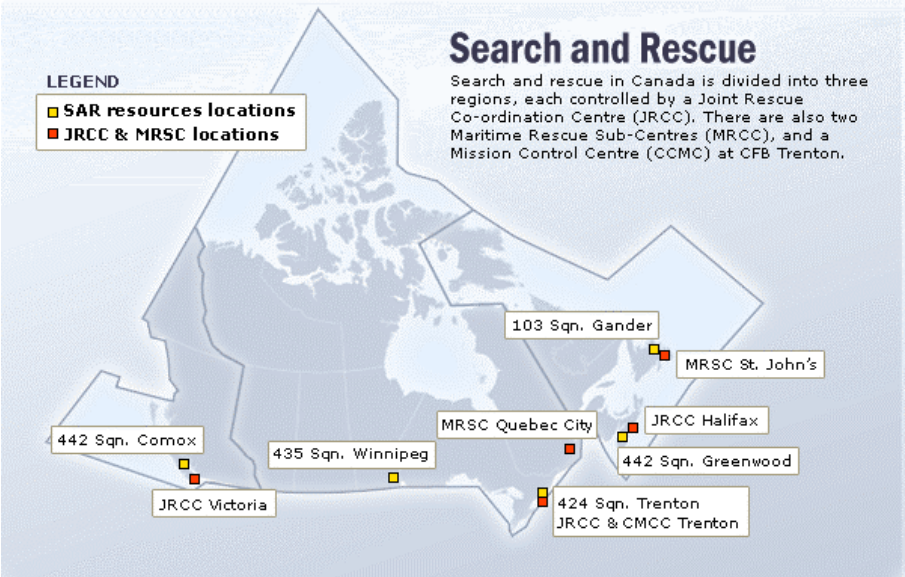

Figure 4.2. Search and Rescue Regions and Resource Locations

Source: Canadian Broadcasting Corporation, *In Depth: Search and Rescue*, http://www.cbc.ca/news/background/search_rescue/index.html

NAV CANADA[165] announced in February 2007 that it was acquiring new surveillance technology for Canada's Arctic region to provide "more cost-effective and comprehensive surveillance systems intended both to enhance safety, and reduce customer fuel costs…."[166] The ability for commercial operators to save on fuel costs by using polar routes will undoubtedly lead to more air traffic over Canada's North. With more than 1,200 commercial flights transiting through Canadian Arctic SAR airspace per month,[167] the potential for an increase to SAR callouts in this region is apparent.

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[165] "NAV CANADA is the private sector, non-share capital corporation that owns and operates Canada's civil air navigation service (ANS)." NAV CANADA, "About Us – Who are We?" http://www.navcanada.ca/NavCanada.asp?Language=EN&Content=ContentDefinitionFiles%5CAboutUs%5CWhoWeAre%5Cdefault.xml; Internet; accessed 28 March 2008.

[166] NAV CANADA, "NAV CANADA announces the acquisition of new surveillance technology to improve air traffic safety and customer efficiency," http://www.navcanada.ca/NavCanada.asp?Language=EN&Content=contentdefinitionfiles\newsroom\newsreleases\2007\nr0212.xml; Internet; accessed 20 February 2008.

An Air Force contingency plan (ACOP 210) exists for SAR response to major air disasters (MAJAID) involving up to 360 persons in remote, uninhabited areas that fall within Canada's SAR response commitment. [168] A new draft of the plan that has not yet been released acknowledges the increased activity within Canada's North in the "growing number of trans-arctic flights…[and] an increasing volume of marine traffic including large capacity cruise ships…"[169] and states that although the probability of an incident occurring may be low, the potential severity of the consequences deem that planned response be ready for activation. In the case of an air disaster, the plan calls for the establishment of on-site medical services for patient triage and stabilization; a forward operating base (FOB) from which to support the crash site and provide more extensive medical treatment options; and, a casualty reception point (CRP) that can accommodate a "large numbers of casualties with varied levels of injury."[170] Of course, this requires SAR response and air mobility support to put the required assets into place.

Upon initial notification of a crash, accident or disappearance, primary SAR assets will be tasked to respond. Depending on the size of the area to be covered and the time that it takes to get primary SAR assets into the region, there are provisions for chartering local aircraft and calling upon other assets such as NORAD fighter aircraft,

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[167]Department of National Defence, *Fixed Wing Search and Rescue Project: Statement of Operational Requirement*…, 2/122.

[168]Department of National Defence, *ACOP 210 - Major Air Disaster* (Ottawa: Chief of the Air Staff, 1998), 1/22; http://winnipeg.mil.ca/a3sar/activities/majaid/majaid_plan_e.htm; DWAN; accessed 11 March 2008.

[169]Department of National Defence, *Major Air Disaster (MAJAID) Plan – Draft Plan V4* (Ottawa: CANADA Command, 2007), 8/31; http://winnipeg.mil.ca/a3sar/activities/majaid/majaid_plan_e.htm; DWAN; accessed 11 March 2008.

[170]Department of National Defence, *ACOP 210 - Major Air Disaster*…, 3/22.

CC-138 Twin Otter aircraft based out of Yellowknife, CP-140 Aurora maritime patrol aircraft or United States Air Force (USAF) platforms for assistance.[171] CC-130 Hercules aircraft and CC-177 Globemaster aircraft are tasked to bring in MAJAID support personnel and equipment, including CH-146 Griffon helicopters, if it will take too long for them to fly under their own steam, as they are a key resource for survivor transit from the incident site to medical treatment.

Primary fixed-wing SAR assets are excellent platforms for conducting searches and inserting SAR technicians and equipment, however, as stated previously these assets are old. Parts availability and supportability are issues for both the CC-130 Hercules and the CC-115 Buffalo aircraft. In the conduct of a role so crucial that lives may be on the line each time the aircraft is called out, a reliable platform is required. A Fixed-Wing Search And Rescue (FWSAR) project has been ongoing to identify a suitable replacement for the CC-115 and CC-130 SAR aircraft.[172] The replacement aircraft will "deliver the same portion of the SAR service currently provided by those fixed-wing SAR aircraft that are being phased out."[173] It is also anticipated that the platform will be able to contribute to other roles such as disaster relief in Canada, surveillance of territory and approaches, air mobility taskings (due to its ramp-enabled, air droppable, capability and STOL characteristics) and aid to civil power.

SAR helicopters are a vital asset as they can get into and out of areas with little or no infrastructure. At some point, rotary-wing SAR with the requisite complement of

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[171]Department of National Defence, *ACOP 210 - Major Air Disaster*…, 4/22.

[172]Department of National Defence, *Fixed Wing Search and Rescue Project: Statement of Operational Requirement*…, 40/122.

[173]*Ibid*., 12/122.

SAR specialists will have to be based further north in order to be able to better respond to emergencies. Until this occurs, the CC-138 Twin Otter should be retained as part of the CF aircraft complement in Yellowknife. Its unique configuration allows the aircraft to land and take-off from almost any surface in the North. There are, of course, commercial assets that can be chartered for SAR, and are in emergencies, however, until policy changes, SAR is a capability that the CF must be able to provide.

Changes or increases to the number of locations at which SAR assets are based are not being contemplated at this time. Even with the procurement of a new FWSAR aircraft "consideration of a change in location to the present fixed-wing Main Operating Bases (MOBs) and a change of SAR standby posture" are not within the scope of the project.[174] It should also be noted that by 2017 it has been calculated that there will be a shortage of 575 personnel within this capability or Domestic Search and Rescue LOO, if nothing is done identify and train more.[175]

INTELLIGENCE, SURVEILLANCE, RECONNAISSANCE AND CONTROL (ISR&C)

Active surveillance of Canada's North, an area the size of continental Europe, is a tremendous challenge.[176] Canada's International Policy Statement makes specific reference to the employment of satellites, UAVs and radar in enhancing surveillance of

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[174]Department of National Defence, *Fixed Wing Search and Rescue Project: Statement of Operational Requirement*…, 14/122.

[175]Lewis, *Canada 2017*…, 7.

[176]Major P.J. Butler, *Project Polar Epsilon: Joint Space-Based Wide Area Surveillance and Support Capability*, Report prepared for the 31st International Symposium on Remote Sensing of Environment in St Petersburg, Russia, 20-24 June 2005 (Ottawa: Directorate of Space Development, n.d.) http://www.isprs.org/publications/related/ISRSE/html/papers/1000.pdf; Internet; accessed 10 February 2008.

the Arctic region with the goal of a "Canadian Forces better able respond to northern contingencies, and the Government…able to more strongly assert Canada's interest in this vital region of the country."[177] In order to obtain situational awareness (SA) of activities occurring within Arctic territory and waters, there are several projects ongoing to augment the current capabilities in producing a recognized, coherent picture more commonly referred to as a common operating picture (COP).

Polar Epsilon

Polar Epsilon, a DND project that saw the launch of the RADARSAT-2 satellite in December 2007,[178] is a joint, space-based, wide area surveillance and support capability that will provide "near real-time ship detection; arctic land surveillance; environmental sensing; and maritime surveillance radar beam optimization."[179] The realization of this capability is a huge step forward in being able to enforce Canada's northern sovereignty and security; targets of interest (TOI) may be detected, classified, identified, tracked, and perhaps even their intent determined.[180] Example targets may consist of large vessels, satellite and aircraft crash sites, as well as environmental concerns such as water pollution; however, the sensor cannot detect ballistic missiles, small craft, or individuals.[181]

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[177]Government of Canada, *Canada's International Policy Statement…,* 18.

[178]Department of National Defence, "Polar epsilon to assert Canada's arctic sovereignty," http://www.forces.gc.ca/site/newsroom/view_news_e.asp?id=2547; Internet; accessed 8 February 2008.

[179]Butler, *Project Polar Epsilon*…, n.p.

[180]*Ibid*.

[181]Department of National Defence, "Polar Epsilon project,"…

The employment of this all-weather, 24-hour surveillance, "polar orbiter" is the first step in being able to respond. Once a TOI has been established, then other sensors and assets such as maritime patrol aircraft, UAVs or strike aircraft can be cued to take action. The full capacity of the project is not yet available. The Arctic surveillance capability is scheduled to be operational in May 2008 with the full complement of capabilities available by March 2011.[182] RADARSAT-2 will provide SA and virtual presence in the North, contributing to all four of JTFN's LOOs and allowing for the judicious and effective employment of other aerospace assets.

Uninhabited Aerial Vehicles (UAV)

Although the CF's association with Uninhabited Aerial Vehicles (UAV) seems to be a fairly new phenomenon, its history dates back to the late 1950s when the Royal Canadian Air Force (RCAF) assisted the United States in the testing of one of their reconnaissance drones and Canadian industry (Canadair) started the development of UAVs as a way of diversifying to compensate for slowing aircraft sales.[183] Modern day interest in UAV capabilities was rekindled following the successful employment of UAVs by other nations in the Bosnian and Kosovar theatres of operations during the 1990s.[184] Since 2000, the CF has conducted more than five UAV trials to examine the potential roles for their use at the strategic, operational and tactical levels.[185]

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[182]*Ibid*.

[183]Stephen Wheatley, *The Time is Right: Developing a UAV Policy for the Canadian Force,* Report for CDAI-CDFAI 7th Annual Graduate Student Symposium (Kingston: Royal Military College of Canada, 2004), 5; http://www.cda-cdai.ca/symposia/2004/Wheatley,%20Stephen.pdf; Internet; accessed 13 February 2008.

[184]*Ibid*., 7.

[185]*Ibid*., 7.

Of specific interest regarding UAV use in Canada's Arctic, were the results of the Atlantic Littoral Information Surveillance and Reconnaissance Experiment (ALIX) held during August 2004. ALIX was an interagency trial with a threefold purpose: to examine network enabled operations, to investigate the use of a beyond line-of-sight (BLOS) Medium Altitude Long Endurance (MALE) UAV as an integrated sensor, and to obtain a better understanding of the requirements for an effective Integrated Intelligence Surveillance Reconnaissance Architecture (IISRA).[186] Of the three scenarios devised for the trial, one was a simulated domestic contingency operation paired with the "real-world" Exercise NARWHAL, a sovereignty operation in the Canadian Arctic. The scenario called for continuous UAV surveillance of a simulated satellite crash site; a scenario that incorporated two DP 2001 force planning scenarios of Surveillance/Control of Canadian Territory and Approaches as well as Aid to Civil Power.[187]

UAV systems can be classed into five categories: High Altitude Long Endurance (HALE), Medium Altitude Long Endurance (MALE), Tactical UAVs (TUAV), Mini-UAVs and Micro-UAVs.[188] The Altair MALE UAV, produced by GA-ASI was chosen for the ALIX trial based on its high dash speed, loiter time,[189] and ability to carry the required payload, given the vast size of Canadian territory that they would have potentially to cover during surveillance and targeting operations. HALE UAVs would

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[186]Lieutenant-Colonel S.J. Newton, Major M.M. Regush, Paul Comeau, Dr. Greg Van Bavel, Richard K. Bowes and Allan M. Shurson, *Experiment Military Report IISRA 2004-01: Atlantic Littoral ISR Experiment (ALIX)*, Report prepared for the Department of National Defence Canada (Ottawa: Canadian Forces Experimentation Centre, 2005), iii.

[187]*Ibid*., 11-12.

[188]Wheatley, *The Time is Right*…, 4.

[189]Newton, *et al*, *Experiment Military Report IISRA 2004-01: Atlantic Littoral ISR Experiment (ALIX)*…, vi.

also have been suitable for this type of mission, but in practical terms, there is only one HALE UAV that is currently available, the Northrup Grumman Global Hawk, "a very large platform with unmatched range and payload capacity…[with an] endurance of 32 hours…."[190], whereas there are several MALE UAVs that are being marketed.

Three Altair MALE UAVs and four remote video terminals (RVT) from which to view the UAV real-time imagery were chartered for the trial and each carried a payload or sensor suite consisting of an Automatic (Vessel) Identification System, an electro-optical, infrared (EO/IR) surveillance and targeting camera, and a multi-mode maritime demonstration radar for surface and air targets.[191] The MALE UAVs were launched and recovered at 5 Wing Goose Bay, Newfoundland, but controlled from Ottawa via satellite while airborne. In the execution of the Arctic scenario, the MALE UAV travelled 900 nautical miles (nm) for a total flight time of 19.5 hours and operated north of 66^{o} latitude.[192] The sensor data collected was to be fused with information from other sources to create a Common Operating Picture (COP) as well as contribute to the Recognized Maritime Picture (RMP).

Several deficiencies were identified as a result of the trial that must be addressed if this platform is to be an effective and viable SA enabler when employed within the Canadian Arctic. With respect to the platform itself, the MALE UAVs must incorporate:

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[190]Joetey Attariwala, "UVS Technology in Canada: Unmanned Systems offer solutions for many CF projects," *Canadian Defence Review*, October 2007, 18; http://www.auvsi-canada.org/CanadianDefenceReview.pdf; Internet; accessed 13 February 2008.

[191]Newton, *et al*, *Experiment Military Report IISRA 2004-01: Atlantic Littoral ISR Experiment (ALIX)*…, 34-36.

[192]*Ibid*., 135.

a. an anti-icing system in order to allow the vehicle freedom of manoeuvre instead of having to change altitude to avoid icing conditions;

b. the capacity for faster cruising speeds to decrease transit times, make altitude transitions more quickly and extend loiter time;

b. an all-weather sensor capability, given the variability not only within the Arctic region, but Canada as a whole; and

c. sensors that perform throughout the entire operating envelope.[193]

The trial also concluded that satellite communication (SATCOM) within the Canadian Arctic region was not sufficient for BLOS UAV command and telemetry when using traditional geosynchronous satellite orbits. There were geometry problems encountered as a result of the location of the MALE UAV antenna and the satellite look angle that cause blanking when the MALE UAV was transiting in a north-easterly direction.[194] In order to alleviate the issue, a solution will have to be devised. One answer may be to install ground-based terminals, at significant cost, to provide adequate SATCOM coverage or another may be to consider the feasibility of launching two Molniya satellites[195] that are characterized by their highly elliptical orbits, giving good polar coverage and thus, sufficient dwell times.

There are vehicle certification issues that must be addressed as well in order to operate the UAV within domestic Canadian airspace in a less restricted manner. Firstly, any UAV that the CF procures to conduct surveillance and targeting will need to incorporate a Traffic Collision Avoidance System (TCAS) to deconflict its route with

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[193]Newton, *et al*, *Experiment Military Report IISRA 2004-01: Atlantic Littoral ISR Experiment (ALIX)*…, 235.

[194]*Ibid*., 139.

[195]Major Derek W. Ebdon, Deputy Project Manager, JUSTAS, telephone conversation, 13 February 2008.

other air vehicles in the area. The UAV must be able to operate in non-segregated airspace without being a risk to other commercial air traffic. This is an important feature in a Northern airspace that is seeing growing numbers of flights, both domestic and international, a trend that is sure to continue given the growing access and subsequent development in the Arctic region. Secondly, the UAV will need to be certified to operate in Reduced Vertical Separation Minimum (RVSM) airspace (between FL 290 and FL 410) which has been in effect north of 57°N latitude since April 2002[196] and the in the rest of Canada since January 2005.[197] Flight within this altitude range will enable better fuel economy and therefore, endurance.[198] Thirdly, the MALE UAV used in the trial was not Minimum Navigation Performance Specification (MNPS) certified due to the fact that the platform did not carry requisite navigational systems, such as a Very High Frequency Omnidirectional Range (VOR), a Distance Measuring Equipment (DME) or an Automatic Direction Finder (ADF) that are standard on other aircraft.[199] The UAV will need this certification in order to improve its routing capability to fly within a greater portion of the domestic airspace envelope.[200]

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[196]Transport Canada, "Southern Domestic Reduced Vertical Separation Minimum and Reduced Vertical Separation Minimum Approval Process," http://www.tc.gc.ca/civilaviation/commerce/circulars/AC0226.htm; Internet; accessed 16 February 2008.

[197]NAV CANADA, "Reduced Vertical Separation Minimum (RVSM)," http://www.navcanada.ca/NavCanada.asp?Language=EN&Content=contentdefinitionfiles\services\ansprograms\rvsm\default.xml; Internet; accessed 16 February 2008.

[198]Newton, *et al*, *Experiment Military Report IISRA 2004-01: Atlantic Littoral ISR Experiment (ALIX)*…, 139.

[199]*Ibid*., 142.

[200]*Ibid*., 142.

Maritime Patrol Aircraft

Currently, the CP-140 Aurora aircraft is the only platform within Canada's inventory that provides a "strategic airborne surface surveillance capability."[201] It is a particularly suitable asset for operation in Canada's North due to its wide-area, surveillance sensors, long 17-hour endurance and 9,266 km range.[202] Over-flying terrain on speculation in an attempt to augment SA is never the best use of manned assets. Cueing via satellite or UAV would make more effective use of this asset. Although scheduling of the aircraft does not dedicate any hours of operation specifically to JTFN, typically four to five patrols are flown annually in support of Northern operations and exercises.[203] A hiatus in CP-140 Aurora sovereignty patrolling of the North was introduced in November 2007 due to "More than half of Canada's fleet…[being] in the repair shop, undergoing long-term maintenance…."[204] Resumption of operations is anticipated for Spring 2008.[205]

The CP140 Aurora aircraft entered into service in 1980 and requires modernization to enable it to survive in future maritime threat environments, as well as to ensure interoperability with allied nations.[206] In light of this fact, and coupled with parts

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[201][Capability Investment Database] CID, "Aurora Incremental Modernization Project (AIMP) (AIMP) (Omnibus)," Project No. 00000140; http://otg-vcd-webs018.ottawa-hull.ca/CID/Project-Home_e.asp; DWAN; accessed 18 February 2008.

[202]Department of National Defence, "Canada's Air Force: CP-140 Aurora," http://www.airforce.forces.gc.ca/site/equip/cp140/default_e.asp; Internet; accessed 10 March 2008.

[203]Russell, *Surveillance Resources…,* Slide 4.

[204]CBCnews.ca, "Canada's air force cancels surveillance flights to the Arctic for winter," http://www.cbc.ca/canada/story/2007/11/13/arctic-surveillance.html; Internet; accessed 10 Mar 2008.

[205]*Ibid*.

obsolescence and supportability issues, the Aurora Incremental Modernization Project (AIMP) was initiated. The project, which consists of a minimum of 23 core increments, was divided into three, phased, capability blocks.[207] Block I/IB addressed the aircraft's cockpit voice recorder, the HF radios and the electro-optical, infrared (EO/IR) turret and has been largely completed on all 18 aircraft. Block II modernization of communication and navigation capabilities is ongoing, however, Block III acoustics, data management system and sensors groups will only be implemented on 10 aircraft that will undergo structural upgrades intended to extend the life expectancy of those assets from 2010 to 2020 until a replacement aircraft can be procured.[208]

The Arctic Capabilities Study that was conducted in June 2000 recommended several initiatives to enhance ISR capabilities in the North. One such initiative was to invest in space-based sensors for effective surveillance of our vast arctic areas. The Polar Epsilon project should be able to provide ISR data to increase arctic SA starting this summer, however, for it to be of maximum value, adequate architecture and connectivity must be in place to ensure appropriate dissemination of the information to key organizations such as JTFN, Canada COM and other government departments (OGD) with whom the military works in support of national sovereignty and security objectives.

Another recommendation of the report was the introduction of HALE UAVs to cue other assets, such as CP-140 Aurora aircraft, to targets of interest (TOI). The ALIX trial was "proof of concept" for employment of UAVs in the Canadian Arctic. The post-

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[206][Capability Investment Database] CID, "Aurora Incremental Modernization Project (AIMP) (AIMP) (Omnibus),"…

[207]*Ibid*.

[208]Lieutenant-Colonel N.D. Bell, Deputy Project Manager and Systems Engineering Manager Project Management Office Aurora, telephone conversation, 20 February 2008.

exercise report identified areas that require attention to develop a product that is optimized for Northern employment as well as in the many other regions of Canada. The Joint Unmanned Surveillance and Target Acquisition System (JUSTAS) project was established to "produce a national surveillance capability"[209] to support both domestic and international operations.

The program, which intends to procure High or Medium Altitude Long Endurance (HALE/MALE) UAVs, is guided by the principle of "evolutionary acquisition" meaning that the intention is to have a two-phase procurement.[210] The first phase will see the acquisition of an affordable, common airframe to implement "an overland domestic and international UAV capability"[211] as well as the definition of the capability required for maritime and Arctic surveillance. The second phase will focus on specialized sensor and payload requirements to implement maritime and Arctic ISR. The JUSTAS program is working toward reaching the project definition phase between June and December 2008. Initial Operating Capability (IOC) for the basic, first phase system is anticipated for the first quarter of 2012, with an IOC of 2015 for a UAV with an arctic and maritime payload.[212]

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[209]Chris Thatcher, "The Move to Unmanned Aerial Systems," http://www.vanguardcanada.com/TheMovetoUnmannedAerialSystems; Internet; accessed 13 February 2008.

[210]Major Derek W. Ebdon, Deputy Project Manager, JUSTAS, telephone conversation, 13 February 2008.

[211][Capability Investment Database] CID, "Joint Unmanned Aerial Vehicle Surveillance Target Acquisition System (JUSTAS)," Project No. 00001035; http://otg-vcd-webs018.ottawa-hull.ca/CID/Project-Home_e.asp; DWAN; accessed 18 February 2008.

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[212]Major Derek W. Ebdon, Deputy Project Manager, JUSTAS, telephone conversation, 13 February 2008.

TACTICAL HELICOPTER

The CF has several helicopter assets within its inventory: the CH-149 Cormorant for SAR, the CH-146 Griffon Utility Transport Tactical Helicopter, and the CH-124 Sea King Shipborne Maritime aircraft. The employment of helicopters provides versatility and flexibility within many environments due to their ability to land and lift-off from unprepared locations, and when considering the North, these assets contribute to all four JTFN LOOs of Presence, Response, SA, and Command and Control.

As mentioned earlier, SAR helicopter assets based closer to the North, with appropriately positioned fuel caches, would assist in meeting the need for increased SAR in the Arctic as the number people transiting the area increases. Another helicopter that often conducts secondary SAR and is suited for employment in Canada's Arctic is the CH-124 Sea King shipborne helicopter, since it does not require any additional infrastructure; it brings its own base of operation with it in the form of a ship.

Currently, the fleet of CH-124 Sea King aircraft numbers 28 and are split between three Squadrons located on the east and west coasts.[213] They deploy with Canadian frigates and destroyers to provide surface and subsurface surveillance as well as maritime power projection from the sea to the land.[214] The fleet has been in service for over 40 years[215] and will begin removal from service in 2010. A new platform, the CH-148 Cyclone helicopter, is in the process of being procured to replace the Sea King and will

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[213]Lewis, *Canada 2017…*, 17.

[214]Department of National Defence, *Leadmark: The Navy's Strategy for 2020* (Ottawa: Directorate of Maritime Strategy, 2001), 36.

[215]Department of National Defence, "Canada's Air Force: CC124 Sea King," http://www.airforce.forces.gc.ca/site/equip/ch124/default_e.asp; Internet; accessed 9 March 2008.

start delivery in 2009 and achieve IOC in 2011 with the establishment of two fully functioning helicopter air detachments (HELAIRDET).[216]

The CH-148 Cyclone helicopter will conduct surface surveillance and control, subsurface surveillance and control, and utility operations that may include SAR/medevac operations as well as transport and passenger transfer functions.[217] Since sovereignty patrols, SAR and support to OGDs are the main responsibilities of Canadian ships in internal and territorial waters,[218] the CH-148 Cyclone will be employed in the tracking and control of vessels within Canadian waters to ensure that

a. illegal or unauthorized action is not taken with respect to Canadian natural resources,

b. pollution regulations are followed, and

c. criminal activity and illegal immigration are not permitted.[219]

It should be noted that the draft technical requirements for the six to eight Arctic/Offshore Patrol Ships (AOPS) that the government announced that they were funding "to help reassert Canada's sovereignty over the North…"[220] stipulate that the ship be able to accommodate helicopter assets. It is envisaged that the ship will be able to provide facilities for the support of day and night helicopter operations under IMC and

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[216]Lewis, *Canada 2017*…, 17.

[217]Department of National Defence, *Maritime Helicopter: Statement of Operational Requirement* (Ottawa: Project File No. 32680-304 DSP No 00002680, Copy #1, Original 1999), 11-12/47.

[218]*Ibid*., 13/47.

[219]Department of National Defence, *Maritime Helicopter: Statement of Operational Requirement…,* 13/47.

[220]CBCnews.ca, "Ottawa buying up to 8 Arctic patrol ships," http://www.cbc.ca/canada/story/2007/07/09/arctic-cda.html; Internet; accessed 14 March 2008.

VCM for the CH-148 Cyclone helicopter, as well as facilities for the day operation of a "designated" helicopter under visual meteorological conditions (VMC).[221] This "designated" helicopter will most likely be a commercially available model in the five tonnes class flown by the Canadian Coast Guard such the BO-105, Bell 212, or Bell 206L. The ship shall be designed to be capable of operating the helicopter assets in up to sea state three conditions[222] and supporting a complement of one pilot and one maintenance technician.[223]

CONCLUSION

Sovereignty is fundamental to a government's ability to provide for and protect its citizens and territories. It forms the basis upon which other pillars of Canadian society such as peace, order, prosperity, and rights and freedoms rest. There are several instruments and mechanisms involved in maintaining national sovereignty of which diplomacy is first and foremost. DND and its armed military, the CF, contribute to sovereignty through the provision of credible force that can be employed in the preservation of national sovereignty and security when negotiation and reason fail.

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[221]PMO AOPS Documents and Presentations, "Technical Statement of Requirements (TSOR) – Draft 7 December 2007," 8/98; http://www.forces.gc.ca/admmat/dgmpd/aops/docs_e.asp; Internet; accessed 14 March 2008.

[222]Sea state three conditions are winds of 7-10 knots and a wave height of 0.6 to 1.0 m. World Meteorological Organization, *Manual on Codes – International Codes, Volume I.1, Part A – Alphanumeric Codes, WMO-No. 306* (Geneva: Secretariat of the World Meteorological Organization, 1995), 439/503; http://www.wmo.int/pages/prog/www/WMOCodes/Manual/WMO306_Vol-I-1-PartA.pdf; Internet; accessed 15 March 2008.

[223]PMO AOPS Organization, "Proposed Ship Capabilities," http://www.forces.gc.ca/admmat/dgmpd/aops/capability_e.asp; Internet; accessed 15 March 2008.

The level of the interest and commitment expressed by the Canadian government regarding the sovereignty of its Northern Arctic regions, in the face perceived external challenges from other nations to Canada's territory and waters, has fluctuated throughout much of the twentieth century. Once disputes had been resolved or were superseded by other, more pressing issues, a seeming indifference to the North was re-established until the next crisis. Interest in the Canadian Arctic, however, has been raised once again due to the prospect of increased, easier, access to a resource-rich North as a result of the effects of global warming.

The potential effects of climate change and their ramifications on the Canadian Arctic cannot be trivialized. The result of increasing average sea and air temperatures, as a result of greenhouse gas emissions, is being manifest in a changed Northern landscape. There is the appearance of open water that previously was frozen, and therefore, unnavigable by maritime vessels. This increased ability to transit and access areas of the North is giving rise to sovereignty and security concerns regarding the Northwest Passage as well as the natural resource wealth within the region. The permafrost is thawing and the familiar Arctic landscape is receding northwards, leaving an increasingly warmed surface layer that may not support existing infrastructure without modification. The warmer environment will, and is, having an impact on the area's ecosystem, affecting both land and sea-based flora and fauna. The rate of climate change and its impact must be monitored in order to be able to react and adapt appropriately.

Like the RCMP detachments that were sent up North in the 1920s to strengthen national sovereignty, the CF must also establish itself more firmly in the Canada's Arctic, in light of the changing environmental conditions, in order to be able to more effectively

contribute to national sovereignty objectives, protect Canadian citizens at home and abroad, as well as support collective security agreements and arrangements that the nation has ratified. The PM, consistent with his "Canada First" defence strategy, has recently made announcements regarding defence initiatives to enhance Northern sovereignty that include land, naval and aerospace aspects. The government's current interest and commitment to Northern sovereignty issues seem more substantive than in the past, based on declarations being made and action being taken.

In order to comply with defence objectives, the CF employs capability-based planning to determine force options and appropriate structure required to meet governmental direction with respect to sovereignty and security issues. The planning process employs the Canadian Joint Task List (CJTL) as the basis from which to derive military capabilities at the strategic, operational and tactical levels. The CJTL consists of eight major capability areas and within each of the capability areas are functional components that assist in determining how to achieve the best possible capability that can be used in different operational environments. Capabilities are assessed through the employment of force planning scenarios that are developed to take into account political and military strategic direction as well as the tasks that will need to be performed by the CF.

In determining aerospace requirements for Arctic sovereignty and security, Air Force LOOs that support the CF force planning scenarios were cross-referenced with JTFN's regional LOOs of Presence, Response, Situational Awareness (SA), and Command and Control (C2). Six of the nine Air Force LOOs were determined to directly support Northern operations, namely, Aerospace Force Application; Air Expeditionary

Support; Air Mobility; Domestic Search and Rescue (SAR); Intelligence, Surveillance, Reconnaissance and Control (ISR&C); and Tactical Helicopter, and each was examined in light of current and future capability.

Aerospace Force Application within the Canadian Arctic is carried out largely by the CF-18 Hornet fighter aircraft in conjunction with Canada's NORAD ally, the United States. After the end of the Cold War and the demise of the Soviet Union's superpower status, an aerospace threat to the North was considered to be negligible and CF Air Force activity within the region decreased. With the resumption of regular, Russian bomber flights that commenced in August 2007, Canadian aircraft have made five interceptions of Soviet aircraft in Canadian airspace. Initiatives have been undertaken to increase CF presence in the North with respect to this LOO through the deployment of personnel to man FOLs throughout the winter months and through infrastructure upgrades. The establishment of a military fuel storage capability has addressed commercial shortage issues, and there are plans to extend runways which, if realized, would resolve the issue of having to use arrestor cable systems during winter months to land CF-18 Hornet aircraft and would allow CC-150T Polaris air-to-air refuelling assets to operate from these locations. Increased preparation, training and exposure of CF personnel within an Arctic working environment are key in being able to effectively respond in a crisis, whether it be use of force or support to SA.

Air Expeditionary Support could contribute to JTFN Response and Presence LOOs during deployments to the Arctic. 2 AESS comprised of 250 personnel positions has been established at 3 Wing Bagotville to force-generate scalable and modular deployment teams consisting of command, combat support and combat service support

elements in the support air operations. In the event of a crisis such as a MAJAID or some other incident that would necessitate the temporary establishment of an air operations location, expeditionary support elements could provide timely surge response to sustain operations until the crisis has been resolved.

Air Mobility is absolutely essential within the Arctic, given its immense size. It contributes to presence activities while providing rapid response, surveillance capabilities that contribute to SA as well as support to command and control. Currently, there are only four CC-138 Twin Otter aircraft stationed in Yellowknife on a permanent basis to support JTFN operations. Additional CF airlift support can be coordinated through 1 Canadian Air Division or commercial assets can be chartered when military aircraft are unavailable or when it is the more effective option. Although the CC-138 Twin Otter is ideally suited to the Arctic because of its ability to launch and recover on almost any surface, it is coming to the end of its operational life and does not provide enough range, speed and payload capacity for current and future tasks and missions. The Utility Transport Project (UTA) was initiated to address this issue, however, it is still working towards contract award and remains in the queue with other projects vying for limited defence dollars. Given the projected increase in Arctic activity as a result of global warming, it is essential that aerospace mobility assets are available to support Canadian sovereignty and security operations.

The CF is mandated to provide aeronautical SAR within Canada, as assigned by ICAO and as directed by the government. Currently, the role of primary SAR is carried out by fixed-wing aircraft, the CC-115 Buffalo and CC-130 Hercules, and rotary wing aircraft, the CH-149 Cormorant and CH-146 Griffon. The majority of SAR assets are

based along the southern Canada-U.S. border except for one unit in Gander, Newfoundland. This leaves a growingly active Arctic without ready access to CF primary SAR assets. Although all other CF aircraft perform a secondary SAR role, as required, and commercial aircraft can be chartered, the expertise resident in SAR technicians and aircrew do not reside in Canada's North. There are contingency plans in place to respond to major air disasters, however, the ability to act in a timely manner is predicated on weather conditions, the location of the crash, and the resources at hand. Helicopters are especially useful for Northern SAR as they do not require prepared landing strips to access areas. The currently employed FWSAR assets are coming to the end of their operational life and require replacement. A project is on-going for the procurement of new FWSAR platforms.

In order to respond to sovereignty and security threats in the Canadian Arctic, one has to be aware that there is suspicious or abnormal activity taking place. In an area as vast as Canada's North, it is often difficult to obtain comprehensive SA. A variety of aerospace assets are being employed or considered for use in the Arctic for the purpose of ISR&C. RADARSAT-2 was launched in December 2007 and will provide an arctic land surveillance capability by May 2008 as well as near real-time ship detection, environmental sensing and radar beam optimization in maritime surveillance. This will aid in the effective cueing of other aircraft assets to respond to situations of interest. Currently, the CP-140 Aurora aircraft is the most capable asset within the CF inventory to conduct ISR&C activities because of it sensor and communications systems as well as its long-range endurance. The aircraft, like many others in the CF inventory, is aging and has provided over twenty years of service to date. In order to address obsolescence and

supportability issues, the fleet is currently undergoing a systems modernization (AIMP), of which 10 will also undergo structural upgrades in order to extend the ELE of the aircraft from 2010 until 2020 when a replacement platform will be procured.

Another asset that may be used for ISR&C in the future is the UAV. The ALIX interagency trial that was carried out in August of 2004 demonstrated the potential for Arctic employment of MALE UAVs; however, several deficiencies were identified during the experiment that must be addressed prior to service in Canada's North. The issues to be resolved include development of an all-weather UAV capability and sensors that perform throughout the entire operating envelope, installation of systems to allow safe operation of the UAV within commercial airspace and a solution to the current satellite communications difficulties that do not enable BLOS UAV command and telemetry. UAVs may not be ready for employment in the North tomorrow, but with ongoing technical and regulatory developments, it may be feasible in the future.

Tactical Helicopter employment within the Arctic regions provides versatility and flexibility in support of all four JTFN LOOs. Consideration should be given to permanently basing helicopters within the Arctic region for increased CF response and presence. Until this is realized, the operational life of the CC-138 Twin Otter should be extended or new variants, which are currently in production, should be procured. Helicopters deployed on CF maritime vessels do not require additional infrastructure to operate in an Arctic environment, only sufficient caches of fuel in strategic locations to permit continued operation. The CH-148 Cyclone is being procured to replace the stalwart CH-124 Sea King and will be employed in the tracking and control of vessels in Canadian waters. The Arctic/Offshore Patrol Ships (AOPS) that the government

announced were to be procured in support of Arctic sovereignty will have the on-board facilities to accommodate the CH-148 Cyclone as well as Canadian Coast Guard helicopters.

Overall, the CF footprint must be expanded to take in more of the North in order to conduct its defence tasks, as well as work with other government departments in a collective effort to maintain sovereignty and security of the country. The development and employment of CF aerospace resources and capabilities are key in supporting Arctic objectives. Doubtless, there will be significant cost and considerable infrastructure challenges to overcome, but there is no avoiding it. Unhampered access to the North may not be a reality today or tomorrow, but in twenty-five years from now when eco-tourism is well-established, when waterways are more navigable and when resource development opportunities are well underway, it may not be sufficient to have to wait for SAR resources to arrive from the south, or have mobility and ISR assets unable to respond in the timeframes required.

Just as the Canadian Pacific Railway pushed west in the 1880s in support of uniting Canada and opening that frontier, terminals in the new Northern frontier will be also have to be established. The CF, with its responsibilities for sovereignty, security of the nation, and collective defence of the continent, must establish a greater Northern presence, consisting of boots on the ground, aerospace platforms in the skies and ships on the seas. If Canada continues to define itself as an Arctic nation, then the CF will find its attention refocused to include a greater emphasis on the North and its requirements in the coming years.

RECOMMENDATIONS

The results of this examination of the aerospace requirements for Canadian Arctic sovereignty and security lead to the following recommendations for future consideration:

a. CF188 Hornet aircraft are well-suited to a force application role in support of Arctic sovereignty, however, the infrastructure to support operation of these aircraft in the North must be fortified in order to enhance response capabilities. Initiatives in Inuvik which include the installation of fuel storage bladders, the establishment of a "skeleton crew" to continuously man the FOL, and plans to extend the runway, negating the requirement for arrestor cable use and creating the capability for launch and recovery of air-to-air refuelling assets, should be contemplated for other FOLs across the North. These improvements would facilitate Northern operations in terms of CF and NORAD readiness and presence, as well as contribute to an overall enhanced Arctic capability in collaboration with other federal departments, the territorial governments, and municipal agencies;

b. Aerospace expeditionary support provides a cohesive, modular and scalable surge capability that can be deployed domestically as well as internationally to support aerospace operations. This capability should be considered for Arctic employment in the event of a major air disaster (MAJAID) or some other event that would necessitate extended operation in a deployed location;

c. Utility Transport Aircraft (UTA) must be procured to replace the current CC-138 Twin Otter aircraft, the only CF aerospace asset physically based within the Arctic region. With growing activity across the North, these aircraft will provide Commander JTFN with faster response and greater payload capability in support of training, operations and Northern patrols;

d. Procurement of new Twin Otter aircraft should be considered if helicopter assets are not relocated to the North because of the aircraft's ability to launch and recover on water, snow, ice, unpaved airstrips as well as conventional runways. Twin Otter capabilities would compliment and augment those of the UTA;

e. Specialized and dedicated SAR assets must be considered for location in Canada's Arctic as air and sea vessel traffic increase. In particular, helicopters would provide the capability to operate with relatively few restrictions across the North, as long as there was adequate access to fuel. Analysis that takes into account probability of an incident as well as associated risks in being able to effectively respond must continue in order to determine the critical point at which this must occur;

f. Appropriate policy and procedures for setting RADARSAT-2 information collection and analysis priorities must be implemented in order to obtain the intelligence required to monitor Arctic activity. Connectivity is also required for SA at the appropriate levels and to cue response as needed;

g. The employment of UAVs for Northern surveillance has great potential, as evidenced in the 2004 ALIX trials, however, the resolution of SATCOM

and certification issues is required before it can be employed as a viable asset. Investigation into putting Molniya satellites into orbit should be followed up to enable UAV SATCOM; and

h. Helicopter assets, with their versatility and manoeuvrability, should be stationed in the Arctic region in support of SAR operations and the four JTFN LOOs of Presence, Response, SA, and Command and Control.

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