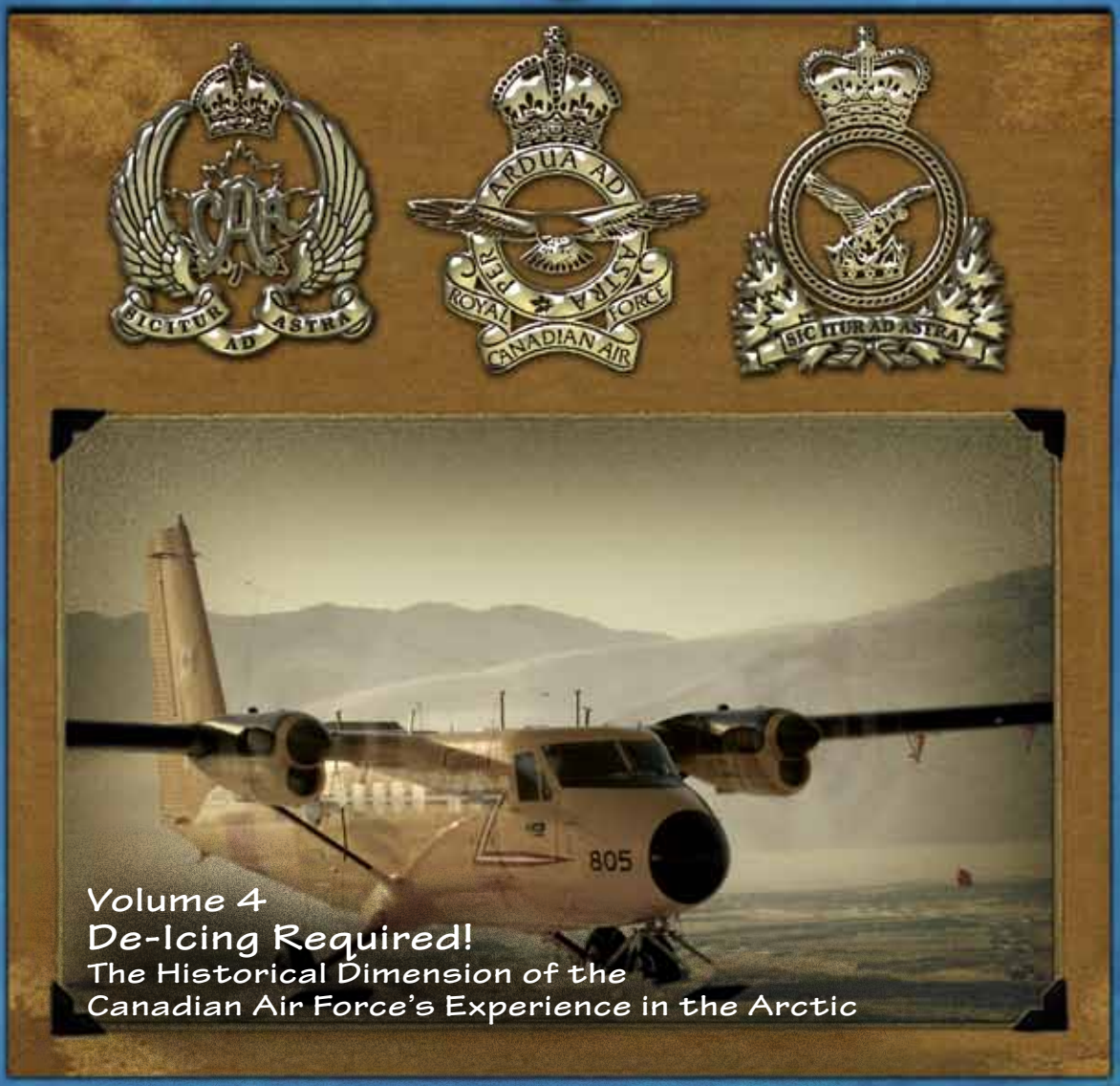
Sic Itur Ad Astra
Canadian Aerospace Power Studies



Volume 4
De-Icing Required!
The Historical Dimension of the Canadian Air Force's Experience in the Arctic

National Defence Défense nationale

Canada

Sic Itur Ad Astra:
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De-Icing Required! The Historical Dimension of the Canadian Air Force's Experience in the Arctic

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Preface

The *Sic Itur Ad Astra* series of publications has as its primary focus the history of air power in Canada. Yet, as we explore our military aviation history, we should be struck by how often what we have done in the past resonates with the present. Never has this linkage been more evident than in the theme of this volume—the historical dimension of the Canadian Air Force's experience in the Arctic.

With the passage of time, the Royal Canadian Air Force (RCAF) and the Arctic have become "old friends." It was a friendship that started out tentatively, with a few exploratory flights during the interwar period, strengthening as the decades rolled by. With the advent of the cold war, the Arctic became very much an RCAF operational theatre. The creation of the North American Air Defence Command (NORAD) spurred the growth of radar sites, forward operating locations for fighter aircraft and the need for permanent establishments such as Alert. These activities were augmented by regular resupply flights, sovereignty patrols and the permanent stationing of 440 Squadron at Yellowknife, Northwest Territories, in 1994. For the RCAF, it is not a matter of returning to the Arctic—we never left.

The emphasis on the North found in the *Canada First* Defence Strategy and *Canada's Northern Strategy: Our North, Our History, Our Future* serves to remind us that we cannot rest on past accomplishments; instead, we must build upon them to meet future challenges. The Commander of the Air Force has taken steps to ensure that the RCAF continues to be at the forefront of government activity in the Arctic. One of these steps is to encourage the study of our past, gleaning knowledge and recognizing lessons that can be applied to current and future operations. Hence, the need for publications such as *De-Icing Required*.

Enjoy the read.

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Commanding Officer
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Introduction

P. Whitney Lackenbauer and W. A. March

Canada's Arctic is back in the headlines. Although most commentators agree that there is no short-term military threat to the Canadian Arctic, climate change has created an environment of instability and uncertainty. The retreat of multi-year sea ice raises the prospect of increasing accessibility to and through the Arctic region, increasing the viability of maritime transit routes (to complement the commercial polar overflights that have increased steadily since the end of the cold war) and of commercial exploitation of Arctic oil, gas and minerals to fuel a resource-hungry world. Security challenges are intertwined with a myriad of political, social, economic, environmental, cultural and sovereignty issues that create a significant degree of complexity.[1] If this region has been overlooked historically, most commentators now agree that the time has come for concerted actions. As the government's Northern Strategy released in 2009 emphasizes, the Arctic is "part of our heritage, our future and our identity as a country."[2]

The Canadian Forces (CF), in general, and the Royal Canadian Air Force (RCAF), in particular, have played, and continue to play, a high-profile role in exercising sovereign control over Canada's Arctic. Although the environmental challenges facing the CF when operating in this theatre remain daunting (from climate, to vast distances and isolation, to a lack of infrastructure), rising interest in the region may, in the future, require enhanced CF responses to defend Canadian territory, respond to emergencies and crises, support civilian organizations, and assist our allies. The *Canada First* Defence Strategy directs the CF to "have the capacity to exercise control over and defend Canada's sovereignty in the Arctic."[3] As the chapters in this volume reveal, the RCAF has historically played a significant role in shaping the Arctic: from mapping activities, to search and rescue, to surveillance and control, to community development. These military contributions fit within the government's broader, integrated Northern Strategy built around four priority areas:

a. exercising our Arctic sovereignty;
b. protecting our environmental heritage;
c. promoting social and economic development; and
d. improving and devolving Northern governance.

Accordingly, the RCAF will contribute to other government priorities where feasible, through a coordinated effort.

Royal Canadian Air Force involvement in the Arctic fits within the longer and broader history of Canadian activities in the region. The only non-Aboriginal people active in the Arctic prior to the 1870s were explorers, fur traders, whalers and missionaries, while the Hudson's Bay Company represented the only formal administration. Two great land transfers in 1870 and 1880 changed this situation and made Canada responsible for half a continent. The territories of the Hudson's Bay Company, comprising Rupert's Land and the North Western Territory, were surrendered to Great Britain in 1869, and Canada accepted them from Great Britain in 1870. All other British territories or territorial rights in the Arctic, involving approximately or ostensibly the archipelago, were handed over in 1880. Canada proceeded to ignore the Arctic for the following quarter century, until the Klondike Gold Rush encouraged it to look north for a short time. In the early 20th century, the government sent official missions to the Arctic to explore and to collect customs duties and licensing fees from whalers—a modest assertion of Canadian legal authority. In the interwar years, Royal Canadian Mounted Police posts dotted the northern landscape, providing the "effective occupation" prescribed by international law. There was little cause for worry about lands and islands once Canadian negotiators reached agreements with Denmark and Norway to settle terrestrial sovereignty claims. After a debacle in 1925, American explorers complied with Canadian regulations.[4]

The prospects for Air Force activities in the region were first identified in the interwar years. After having served with distinction within the Royal Flying Corps and Royal Air Force,

Canadian airmen returned home to find a government that, while supportive of aviation, was not willing to spend the necessary funds required to establish a separate service. The short-lived Canadian Air Force (1919–1923) found itself desperately trying to make do with a handful of "gift" aircraft from Great Britain and a small number of veteran aviators determined to keep military aviation alive in Canada. To remain viable, the Air Force had to be useful to the government of the day. Thus, the Canadian Air Force and, after the addition of the "Royal" prefix in 1942, the RCAF became adept at providing services such as mapping, forest fire spotting and supporting other government agencies. These activities would eventually lead the RCAF to the North and create a unique period in Canadian military aviation described as "bush pilots in uniform."[5]

In Chapter 1, Colonel Ernest Cable, OMM, CD (Retired) of the Shearwater Aviation Museum provides an overview of RCAF activities in the Arctic during the interwar years, revisiting the important expedition led by Squadron Leader R. A. Logan in 1922, the Hudson Strait expedition of 1927, and solutions to polar navigation problems devised in the late Second World War and early post-war period. There was no pressure, however, for sustained military engagement. Geography seemed to preclude any military threat; the common interwar consensus insisted that Canada was a "fireproof house" insulated from European and Asian conflagrations by distance and isolation.

The Second World War brought the Canadian North into new strategic focus. The Americans were worried about overland and air routes to Alaska, and they entered into agreements with Canada to build airfields, a highway and an oil pipeline in the northwest. When American personnel swept into the region to complete these tasks, "Northern nationalists" in Canada worried that these developments, taken in the name of North American military security, would undermine Canadian sovereignty.[6] In the end, the Americans pulled out of Canada as the war wound to a close and, at Ottawa's request, the ownership of permanent facilities in the North passed into Canadian hands.

With the onset of the cold war, Canada faced renewed pressures to balance sovereignty concerns with continental security imperatives. Polar projection maps revealed how Canada's strategic situation had changed when the United States and the Soviet Union became rivals. Arctic defences were inextricably linked to American security, and the United States pushed for access to Canada's Far North to build airfields and weather stations. Canadian officials grew apprehensive and cautious in authorizing new installations, whereas the Americans were anxious to proceed. Journalists began to talk about a looming sovereignty crisis, and some scholars cite the era as further evidence that the Americans were willing to encroach on Canadian sovereignty to achieve their ends.[7]

In Chapter 2, Peter Kikkert, a PhD candidate at the University of Western Ontario, argues that this negative portrayal is distorted. Drawing upon a solid array of archival material, Kikkert reassesses the RCAF's role in the Arctic from 1945–53. As the world split into opposing spheres and the Canadian North became a potential front line in any future conflict, the RCAF struggled to embrace new roles and responsibilities in the area, hampered by its almost total lack of experience past the Arctic coastline. The first flights into the uncharted region were journeys into the proverbial "unknown"—only slowly did the RCAF develop a real northern capability. By the early 1950s, however, the force was in charge of an ever-growing portion of the air transport to the region and a large-scale photographic operation. Furthermore, it regularly cooperated with other government departments in additional surveys and scientific studies. The RCAF learned to deal with the unique and challenging operating conditions in the Arctic and developed a strong relationship with its key partner in the area: the American military. At the same time, the functional and symbolic roles the service performed made the RCAF the lynchpin of the government's sovereignty strategy. While the government loved that RCAF aircrews were showing the flag throughout the North, they also performed the special and vital jobs for which their training made them ideal. As the RCAF develops new roles in the Arctic today, it can look to the early cold war for examples of functional contributions to Canada's broad array of responsibilities to the region—as well as successful international cooperation and collaboration.

In Chapter 3, Sandy Babcock, PhD, revisits the famous case of Operation CANON—the attempt to rescue missionary John Turner in the remote region of Moffet Inlet in 1947—as an example of early RCAF Arctic search and rescue (SAR) capabilities. This case study reaffirms the importance of the initiative and ingenuity of individuals and the acute challenges facing SAR crews, such as poor maps, equipment and navigation aids as well as the need for specialized medical training. Although the aircraft were different, the fundamental aspects of this SAR mission were virtually unchanged from what had transpired during the interwar period. Yet from these humble beginnings, SAR has evolved into a mature Air Force capability that includes regular Arctic exercises involving not only Canadian assets but those of other Arctic nations as well.

In the late 1940s, the Canadian government made a deliberate decision not to establish permanent garrisons of soldiers in the Arctic. The geography was too expansive, and threat assessments downplayed the danger of a land force invasion.[8] Accordingly, the creation of an airborne or air transportable brigade group—the Mobile Striking Force (MSF)—in 1948 fit the strategic assessment and the modest military budget at the time. In Chapter 4, Major Raymond Stouffer examines how the air power demands of the MSF placed operational and cultural pressures on the post-war RCAF. Carefully situating the MSF concept in early cold war defence policy, he explains that the flexibility and mobility of air power was considered essential to meeting the MSF's objective of reducing enemy lodgements in northern Canada. By the early 1950s, the RCAF had four Auxiliary squadrons organized to provide close combat and reconnaissance support. The decline of the MSF concept in the late 1950s, coupled with more general questions about the utility of the concept of Reserves in the nuclear age, meant that the RCAF Auxiliary squadrons found their cherished air defence and tactical air support roles substituted with that of an emergency and rescue role in support of civil defence. In the end, Stouffer concludes that the visible, public value of the MSF offset its questionable military value. Service cultures and politics undermined this inexpensive approach to asserting sovereignty. Nevertheless, during the early cold war, the MSF sustained knowledge of airborne and joint air support operations (mostly through joint training at the Canadian Joint Air Training Centre), when such concepts were not popular in the Canadian Army and the RCAF, providing experience for operations in difficult climatic conditions and contributing to defence of and offensive capability of United States (US) strategic nuclear forces. Today, with the Land Force developing its Arctic Response Company Group concept, the RCAF is anticipating what support needs it will provide and how best to increase its capacity and flexibility to respond to partner needs.

In Chapter 5, Richard Goette, PhD, a Department of National Defence Security and Defence Forum postdoctoral fellow at the University of Waterloo, demonstrates how articles in the RCAF service magazine, *The Roundel*, contributed to a sense of *Arctic* "air mindedness" (a concept introduced by historian Jonathan Vance) during the early cold war. With Canadian strategic thinking during the early cold war geographically reoriented from a focus on east-west to a north-south perspective, the RCAF found itself much more involved in Arctic pursuits. These included more "kinetic" roles of defending North America in conjunction with the US but also other roles such as aerial mapping, aid to the civil power and, especially, sustainment and search and rescue missions carried out by air mobility resources. Goette's chapter reveals a concerted effort by the RCAF leadership to ensure that Air Force personnel thought about operational requirements in the Arctic. Greater awareness of the strategic importance of the Arctic to Canada was an important objective, as was making personnel familiar with the challenges and opportunities experienced by personnel manning RCAF bases in the North. Air mobility assets proved to be—and still are—an important lifeline for RCAF personnel as well as other military, civilian and indigenous communities in the region. Furthermore, in analyzing coverage of Arctic and northern aviation-related issues of interest to Canadian aviators, Goette touches on the unique social life and working conditions that evolved at remote bases.

Relationships between RCAF personnel, technology and the environment also had dramatic impacts on local populations in the Arctic. In Chapter 6, Whitney Lackenbauer, an associate professor at the University of Waterloo, and Ryan Shackleton, a historical consultant in Ottawa, explore Inuit-Air Force relations in the Qikiqtani (Baffin Island and High Arctic) region

from the Second World War to the mid-1960s. Drawing upon oral histories, archival documents and newspapers, they re-examine the impacts of "military modernization" on the Inuit communities of Frobisher Bay (Iqaluit) and Resolute. Listening to a myriad of voices, their study demonstrates that relationships were neither uniformly positive nor negative. At Frobisher Bay, the military hub of the eastern Arctic, defence activities drew Inuit people into the web of modern urban life. The expansion of the military's footprint in the decade after the Second World War reshaped boundaries, expectations and tastes of Frobisher's inhabitants. It also changed the socio-economic and cultural geographies of southern Baffin Island more generally. In Resolute, the establishment of the Inuit community immediately adjacent to an RCAF base had unexpected consequences. Inuit mixed both tradition and modernity when incorporating the wage economy into their daily lives. In some respects, Resolute served as a model for the transitioning Inuit society. Although CF planners now respect the cultural needs of local inhabitants and take into account the environmental impacts of all Arctic activities, the authors' basic message about the need to consider local impacts when conceiving military projects remains acutely relevant today.

As the cold war heated up in the 1950s, the Americans sought extensive air-defence systems extending to the northernmost reaches of the continent. The Distant Early Warning (DEW) Line, built across the 70th parallel to detect Soviet bombers, was the boldest megaproject in Arctic history, dramatically altering the military, logistic and demographic characteristics of the Canadian Arctic. The United States designed and paid for it. The Canadian military was already stretched thin by the North Atlantic Treaty Organization's commitments in Europe, and Canada could not afford the kind of installations that the Americans wanted. Once again, Canadian officials negotiated a very favourable agreement that protected Canada's sovereignty and secured economic benefits for Canadian companies in meeting the logistical demands associated with constructing and sustaining a system of this magnitude in the Far North.

In Chapter 7, historians Daniel Heidt, a PhD candidate at the University of Western Ontario, and Whitney Lackenbauer examine the important (and contentious) role of civilian airlift contractors in the construction and early operational phases of the DEW Line. The airlift requirements of the 2500-mile (4023-kilometre) long radar network required a herculean effort. The Canadian government, conscious of nation-building possibilities, secured guarantees from the US that Canadian carriers would be utilized "to the fullest extent practicable." Canada's power to control specific tenders was sometimes compromised by America's power of the purse. Yet, investments in new aircraft and the need for continued work ensured that Canadian companies jealously guarded and policed American airlift competition independently of Ottawa. American DEW Line contract dollars, therefore, afforded Canadian commercial carriers the opportunity to expand while concurrently buttressing Canadian Arctic sovereignty. Although contexts have changed, important lessons learned during the DEW Line civil airlift remain noteworthy—particularly the prospect of leveraging civilian assets in the North. This point is clear in the "handshake deal" between military officials and the Civil Air Search and Rescue Association (CASARA), a national agency that promotes aviation safety and provides air search support, so that part-time CASARA volunteers can assist with first-response services using civilian planes.[9]

Although the construction of installations like the Joint Arctic Weather Stations, the DEW Line, Churchill and Alert have generated scholarly attention, there is less historical reflection on the ongoing operation of these facilities. This is especially true of the "human" element of serving in these remote locations. In Chapter 8, Rachel Lea Heide, a defence scientist at National Defence Headquarters in Ottawa, provides an introduction to the history of Canadian Forces Station (CFS) Alert. Using a collection of photographs from her father, Master Warrant Officer M. D. Heide, who served as a teletype technician at CFS Alert from February to August 1971, Dr Heide provides a unique perspective on the day-to-day life of airmen and airwomen required to live at such a remote location. Her narrative, woven around the practical requirements of establishing, supplying and maintaining an Arctic station, provides a glimpse into the absolute necessity to the people living there of such mundane items as food choice, entertainment and hobbies. In very many ways, the mental well-being of individuals in remote locations is as important as their physical security.

With the requirement to exercise Canadian sovereignty over our Arctic territory comes the responsibility to deal with non-military threats. Canada, in concert with other Arctic nations, has enacted a wide range of regulations that govern things such as pollution, mining and wildlife management. Still, there are times when legislation cannot address a real-life situation; in other words, the government has to be ready to deal with the unexpected. In Chapter 9, Master Seaman William Sparling, CD, MA, writes about such an event, providing an overview of Operation MORNING LIGHT—the CF's response to the uncontrolled re-entry and crash of the Soviet Union's Kosmos 954 satellite in the Northwest Territories in 1978. At that time, no one anticipated that a man-made spacecraft would scatter radioactive debris across a broad swath of Canadian territory. Yet it did, and for the CF and Air Command, which commanded all Canadian air assets at that time, it became one of its largest peacetime operations. MORNING LIGHT re-emphasized the need to be prepared to provide not just a "token" presence in the northern regions of the country but the absolute requirement to be able to mount a major operation, with all of the associated logistic and interagency coordination, to deal with the unexpected.

Political responses to perceived sovereignty challenges, from the *Manhattan* voyages of 1969–70 to the *Polar Sea* incident in 1985, drew renewed attention to the CF and its role in asserting sovereignty and defending security. Debates about the legal status of the Northwest Passage, which Canada firmly clarified to be internal waters when it declared straight baselines around the Arctic archipelago in 1986, and the military's role in evolving custodial responsibilities in a broader government framework have been discussed by various authors elsewhere.[10] With the end of the cold war, budget pressures, promises of a "peace dividend" and few direct military threats on the northern horizon, the Canadian Forces' capabilities in the North were allowed to atrophy in the 1990s. The all-party House of Commons Standing Committee on Foreign Affairs and International Trade approved a 1997 document that recommended Canada's relations focus on international Arctic cooperation through multilateral governance (particularly the Arctic Council) to address pressing "human security" and environmental challenges in the region. The report, *Canada and the Circumpolar World*, accepted that the concept of security had broadened from military issues to encompass an array of social and environmental issues. "This new agenda for security cooperation is inextricably linked to the aims of environmentally sustainable human development," the report noted. "Meeting these challenges is essential to the long-term foundation for assuring circumpolar security, with priority being given to the well-being of Arctic peoples and to safeguarding northern habitants from intrusions which have impinged aggressively on them."[11]

The Liberal Government under Jean Chrétien embraced this emphasis on international cooperation and reconfigured Canada's approach to Arctic sovereignty accordingly. Although the Government rejected the committee's recommendation that the Arctic should become a nuclear-free zone, it did not perceive any security crisis that warranted an increased military presence beyond a modest expansion in the number of northerners serving with the Canadian Rangers.[12] In 2000, the Department of Foreign Affairs and International Trade issued *The Northern Dimension of Canada's Foreign Policy*, which revealed how environmental and social challenges were predominant. "Whereas the politics of the Cold War dictated that the Arctic region be treated as part of a broader strategy of exclusion and confrontation," the document noted, "now the politics of globalization and power diffusion highlight the importance of the circumpolar world as an area for inclusion and co-operation."[13] Framed by principles of Canadian leadership, partnership and ongoing dialogue with northerners, this new northern foreign policy was rooted in four overarching objectives:

a. to enhance the security and prosperity of Canadians, especially northerners and Aboriginal peoples;
b. to assert and ensure the preservation of Canada's sovereignty in the north;
c. to establish the circumpolar region as a vibrant geopolitical entity integrated into a rules-based international system; and
d. to promote the human security of northerners and the sustainable development of the Arctic.[14]

The focus on diplomacy and circumpolar cooperation relegated defence considerations to the proverbial back-burner.

Growing concerns about climate change, the opening of the Northwest Passage, global demands for Arctic resources and security in the post-9/11 world have since coalesced to put the Arctic back on the national and international agendas. The 2000 Canadian Forces' *Arctic Capabilities Study* recognized that northern security had evolved to include environmental, social and economic aspects, but it argued that the coming decades would make the Canadian North even more vulnerable to "asymmetric" security and sovereignty threats. The CF had to be prepared to respond to challenges related to environmental protection, increased shipping as Arctic sea lanes opened as a result of climate change, heightened commercial airline activity, and "trans-national criminal activity" that would accompany resource development such as diamond mining.[15] Concerns in the early 21st century were amplified by lingering disputes or ambiguity about: Hans Island, the legal status of the Northwest Passage, the Beaufort Sea, and limits to extended continental shelves in the Arctic basin. Although the Liberals modestly increased the tempo of military operations in the Arctic and promised to augment capabilities in their 2005 Defence Policy Statement, Stephen Harper swept into office in 2006 with a much stronger resolve to make the Arctic a top priority, and he has not wavered in his commitment.

The Conservatives have made the CF the centerpiece of their Arctic sovereignty strategy. "We believe that Canadians are excited about the government asserting Canada's control and sovereignty in the Arctic," Prime Minister Harper told a *Toronto Sun* reporter on 23 February 2007:

> We believe that's one of the big reasons why Canadians are excited and support our plan to rebuild the Canadian Forces. I think it's practically and symbolically hugely important, much more important than the dollars spent. And I'm hoping that years from now, Canada's Arctic sovereignty, military and otherwise, will be, frankly, a major legacy of this government.[16]

His government's main military announcements, all announced as sovereignty initiatives, include: expanding and enhancing the Canadian Rangers, ordering new Arctic / offshore patrol ships, building a deepwater Arctic docking and refuelling facility in Nanisivik, launching RadarSat-2 to provide enhanced surveillance and data-gathering capabilities, conducting major military exercises, building a Canadian Forces Arctic Training Centre in Resolute, establishing a new CF Reserve unit in Yellowknife, and creating the Arctic Response Company Group.

The government's commitments to invest in more military capabilities for the North are reasonable and proportionate to probable short- and medium-term threats. They also fit within a whole-of-government strategy. The Northern Strategy, released in July 2009, reinforced a message of partnership: between the federal government and northern Canadians, and between Canada and its circumpolar neighbours. Although the document emphasized that Canada's disagreements with its neighbours are "well-managed and pose no sovereignty or defense challenges for Canada,"[17] it reaffirmed the government's commitment to "putting more boots on the Arctic tundra, more ships in the icy water and a better eye-in-the-sky."[18] Although the CF is not the lead agency in most domestic incidents and does not have a standing mandate to enforce Canadian laws, the RCAF and its partner services play an invaluable supporting role to other departments and agencies with functional responsibilities for security and emergency preparedness in the Arctic.

What about tomorrow? The future is always difficult to predict, yet that is precisely what military organizations seek to do in order to determine what is required in the way of resources and capabilities. Such is the focus of Chapter 10, in which Lieutenant-Colonel (LCol) Daniel Lachance, CD, BA, explores "Arctic alternative futures." Rather than define "a" future, LCol Lachance highlights, from an Air Force perspective, the gap between a best-case scenario (the Arctic remains a frozen hinterland) and a worst-case where the region is thrown open to a resource gold rush as nations seek to further their own interests. The future will likely fall somewhere between these two extremes, which means that the RCAF will need to make hard

choices concerning capability development and resource allocation. The one constant, given our history and present government direction, is that the RCAF can expect an increase in its Arctic operations.

As with many books of this nature, this one only scratches the surface of its topic; much more research needs to be done to obtain a better understanding of how the RCAF has impacted on the Far North and vice versa. Yet, this research should not be done in isolation, as the Air Force is but one element in a complex social, political, cultural and defence mosaic. As well, Canada's Northern Strategy recognizes that constructive international engagement will play an important role in ensuring stability and security in the region. Balancing an Arctic security agenda with domestic imperatives to improve the quality of life of northerners grappling with the challenges and opportunities accompanying climate change remains difficult. As the following papers show, the RCAF has been, is, and will continue to be engaged in the Arctic. Harkening back to our "bush-pilot in uniform" heritage, Arctic operations were (and are)

> the means by which a generation of officers and airmen learned their craft as commanders, staff officers, pilots, mechanics, storemen, and photographers. Advancing technology rapidly made their aircraft and equipment obsolete, but their experience taught them to handle adversity and improvise in unfamiliar circumstances which could not be foreseen in any training manual. The indispensable military virtues—endurance, flexibility, determination, self-discipline, technical proficiency, professionalism—were nurtured in Canada's remote regions.[19]

Notes

1. For a sampling of scholarship on these issues, see Ken Coates and others, *Arctic Front: Defending Canada's Interests in the Far North* (Toronto: Thomas Allen, 2008); Frances Abele and others, eds., *Northern Exposure: Peoples, Powers and Prospects for Canada's North* (Ottawa: Institute for Research on Public Policy, 2009); Michael Byers, *Who Owns the Arctic?* (Vancouver: Douglas and McIntyre, 2009); Shelagh Grant, *Polar Imperative* (Vancouver: Douglas and McIntyre, 2010); and Franklyn Griffiths, Rob Huebert, and P. Whitney Lackenbauer, *Canada and the Changing Arctic: Sovereignty, Security and Stewardship* (Waterloo: Wilfrid Laurier University Press, 2011). For international perspectives, see Alun Anderson, *After the Ice: Life, Death and Geopolitics in the New Arctic* (New York: Harper-Collins, 2009); Charles Emmerson, *The Future History of the Arctic* (New York: Public Affairs, 2010); and James Kraska, ed., *Arctic Security in an Age of Climate Change* (Cambridge: Cambridge University Press, 2011).

2. Canada, "Canada's Northern Strategy," Canada, http://www.northernstrategy.gc.ca/index-eng.asp (accessed August 24, 2012).

3. Canada, *Canada First* Defence Strategy (Ottawa: Government of Canada, n.d.), 8, http://www.forces.gc.ca/site/pri/first-premier/index-eng.asp (accessed August 24, 2012).

4. See, for example, Donat Pharand, *Canada's Arctic Waters in International Law* (Cambridge: Cambridge University Press, 1988); and Janice Cavell and Jeff Noakes, *Acts of Occupation: Canada and Arctic Sovereignty, 1918–25* (Vancouver: University of British Columbia Press, 2010).

5. For a good overview of this period see Chapters 4 and 5 of W. A. B. Douglas, *The Creation of a National Air Force*, vol. 2, *The Official History of the Royal Canadian Air Force* (Toronto: University of Toronto Press, 1986).

6. Shelagh Grant, *Sovereignty or Security? Government Policy in the Canadian North, 1936–1950* (Vancouver: University of British Columbia Press, 1988).

7. See, for example, Grant, *Sovereignty or Security?*; and Adam Lajeunesse, "Lock, Stock, and Icebergs? Defining Canadian Sovereignty from Mackenzie King to Stephen Harper," CMSS Occasional Paper No. 1 (Calgary: Centre for Military and Strategic Studies, 2007), 6–7.

8. See, for example, Bernd Horn, "Gateway to Invasion or the Curse of Geography? The Canadian Arctic and the Question of Security, 1939–1999," in *Forging a Nation: Perspectives on the Canadian Military Experience*, ed. B. Horn (St. Catharines: Vanwell, 2002), 307–32.

9. "Military turns to volunteers for Arctic rescues," CBC News, December 1, 2011, http://www.cbc.ca/news/canada/story/2011/12/01/pol-search-rescue-curmore.html (accessed August 24, 2012).

10. See, for example, P. Whitney Lackenbauer and Peter Kikkert, eds., *The Canadian Forces and Arctic Sovereignty: Debating Roles, Interests and Requirements, 1968–1974* (Waterloo: Laurier Centre for Military Strategic and Disarmament Studies / Wilfrid Laurier University Press, 2009); Elizabeth Elliot-Meisel, *Arctic Diplomacy: Canada and the United States in the Northwest Passage* (New York: Peter Lang, 1998); Ron Purver, "The Arctic in Canadian Security Policy, 1945 to the Present," in *Canada's International Security Policy*, eds. David B. Dewitt and David Leyton-Brown (Scarborough, ON: Prentice-Hall, 1995), 81–110; Edgar Dosman, ed., *The Arctic in Question* (Toronto: Oxford University Press, 1976); John Kirton and Don Munton, "The *Manhattan* Voyages and Their Aftermath," in *Politics of the Northwest Passage*, ed. Franklyn Griffiths (Kingston: McGill-Queen's University Press, 1987), 67–97; Nathaniel Caldwell, *Arctic Leverage: Canadian Sovereignty and Security* (New York: Praeger, 1990); Franklyn Griffiths, ed., *Arctic Alternatives: Civility or Militarism in the Circumpolar North?* (Toronto: Science for Peace / Samuel Stevens, 1992); and Rob Huebert, "A Northern Foreign Policy: The Politics of Ad Hocery," in *Diplomatic Departures: The Conservative Era in Canadian Foreign Policy, 1984–93*, ed. N. Michaud and K. R. Nossal (Vancouver: University of British Columbia Press, 2001), 84–112.

11. House of Commons Standing Committee on Foreign Affairs and International Trade (HCSCFAIT), *Canada and the Circumpolar World: Meeting the Challenges of Cooperation into the Twenty-First Century* (Ottawa: House of Commons, 1997): ix, 100.

12. Department of Foreign Affairs and International Trade, *Government Response to Standing Committee on Foreign Affairs and International Trade Report Canada and the Circumpolar World: Meeting the Challenges of Cooperation into the Twenty-First Century* (Ottawa: Department of Foreign Affairs and International Trade, 1998).

13. Department of Foreign Affairs and International Trade, *The Northern Dimension of Canada's Foreign Policy* (Ottawa: Department of Foreign Affairs and International Trade, 2000), http://www.international.gc.ca/polar-polaire/ndfp-vnpe2.aspx?view=d (accessed August 24, 2012).

14. *The Northern Dimension of Canada's Foreign Policy*.

15. Canadian Forces Northern Area (CFNA), *Arctic Capabilities Study* (Yellowknife: Canadian Forces Northern Area, 2000).

16. Kathleen Harris, "Laying Claim to Canada's Internal Waters," *Toronto Sun*, February 23, 2007.

17. Canada, *Canada's Northern Strategy*: *Our North, Our Heritage, Our Future* (Ottawa: Government of Canada, 2009), 13, http://www.northernstrategy.gc.ca/cns/cns-eng.asp (accessed August 24, 2012).

18. Ibid., 9.

19. Douglas, 118.

Chapter 1

Air Force: Leader in the Arctic

Ernest Cable

Canada's Arctic Archipelago is the largest group of islands in the world. Yet, its geography is unfamiliar to most Canadians, and despite its strategic importance it remains an enigma to most of the world. The area stretches across 70° (degrees) of longitude from Cape Chidley, Labrador's most northern point, to the Yukon-Alaska border—a great circle distance of just over 2,000 miles (3,218 kilometres [km]).[1] The southern coastal island group, including Baffin, Somerset, Prince of Wales, King William, Victoria, Banks, and some smaller islands, is divided from the northern Queen Elizabeth Islands by Lancaster Sound, Barrow Strait, Viscount Melville Sound, and McClure Strait. These waterways form the main axis of the long-sought-after Northwest Passage, which is the principal east-west route through the Arctic Archipelago.[2]

Beginning in the sixteenth century, explorers took nearly four centuries to find the Northwest Passage in their search for a shorter trade route from Europe to China and India. However, after the existence of the Northwest Passage was confirmed early in the twentieth century, Canada showed little interest in the northern waterway traversing its Arctic frontier until the advent of the airplane provided Canadians greater access to their Arctic. In the early 1920s, the Canadian Air Force (CAF) sent an officer to assess the feasibility of operating aircraft in the Arctic. However, it wasn't until 1927 that the Royal Canadian Air Force (RCAF) gained its first experience operating aircraft in the polar region. This expedition identified unique problems in Arctic flying which were not solved until RCAF navigators developed innovative navigation procedures for polar latitudes. Successful demonstration of the navigation procedures instilled new confidence in aviators venturing into the northern latitudes and opened Canada's Arctic to unprecedented exploration and development. The surge in interest in the Arctic gave rise to Terrence Armstrong, from Cambridge University's Scott Polar Research Institute, to observe, "The twentieth century advance into the Arctic owes more to the aeroplane than any other factor."[3]

Canadian Air Force, 1922 Arctic Survey

As in previous events in Canadian history, fear of American action triggered an interest in sovereignty over the Arctic islands. Canada countered an increasing American presence in the Arctic with regular expeditions and patrols. Between 1904 and 1911, the Canadian Coast Guard Ship (CGS) ARCTIC, commanded by Captain Bernier, made several voyages and brought back a wealth of information, including valuable surveys of the Arctic islands. Bernier was a prodigious surveyor and built up a wealth of Arctic navigation. On Dominion Day (1 July) 1909, he planted a plaque on Melville Island asserting Canadian sovereignty over "the whole of the Arctic Archipelago lying north of America from longitude 60° West to longitude 141° West [the Yukon-Alaska border]."[4]

After the First World War, Bernier returned to command his old ship, the CGS ARCTIC, and in 1922 embarked on an Arctic expedition to establish Royal Canadian Mounted Police (RCMP) posts in the Far North. The Canadian government, alert to the growing success of air operations in southern Canada, was keen to take advantage of the CGS ARCTIC's voyage to explore the potential of aircraft in the Arctic. Consequently, the Canadian government tasked the Canadian Air Board to investigate the use of aircraft in the Arctic for preliminary exploration and mapping and for communications between RCMP posts. The Air Board deemed it prudent to conduct a thorough investigation of the Arctic climate and topography before sending aircraft and equipment or attempting any flying. The Air Board selected Squadron Leader (S/L) Robert Archibald Logan of the CAF, an experienced pilot well qualified in meteorology and navigation, to join Bernier as an observer on the CGS ARCTIC to examine the feasibility of air operations in the Arctic. Logan was born in Middle Musquodoboit, Nova Scotia, in 1892, and was commissioned as a Dominion Land Surveyor with experience in northern Canada before joining the Royal Flying Corps (RFC) in 1915. After pilot training at the Curtiss Aviation School in Toronto, he

served with the RFC in France until shot down and taken prisoner in the spring of 1917. After the war, Logan made a study of meteorology, aerial navigation, and wireless communications, and from 1920 was in charge of the CAF's Ground Instruction School at Camp Borden, where he earned acclaim for his work.[5]

The CGS ARCTIC sailed from Quebec City on 18 July 1922, and visited the north end of Baffin Island as well as Bylot, Ellesmere, and North Devon Islands. At each location, Logan made careful notes of the weather and terrain and earmarked possible landing sites at Craig Harbour on Ellesmere Island and Pond Inlet on Baffin Island.[6] On 29 August 1922, while at Craig Harbour, Logan raised the CAF Ensign at latitude 76°12′, only 828 nautical miles (1,533.5 km) from the geographic North Pole. Logan was the first Air Force officer to conduct a land survey of the Arctic to evaluate areas for further aerial exploitation and assess the problems aircrews would encounter;[7] it was the farthest north reached by the Air Force for many years.

The CGS ARCTIC returned to Quebec City on 2 October 1922, and upon his return to Ottawa, Logan prepared a comprehensive report on his investigation in the eastern Arctic. It contained many valuable suggestions and comments that are as pertinent today as they were 88 years ago. One section of his report illustrates Logan's profound vision:

> [T]he development of the Arctic and sub-Arctic flying is of the greatest importance, not to Canada alone, but the British Empire as a whole…. Aircraft operated from Arctic or sub-Arctic bases [could] swoop down and leave trails of destruction throughout the rest of the world, but from the very nature of their bases of operation they would be almost inaccessible to aircraft of countries to which "cold-weather" flying was unfamiliar. It is generally agreed that the best method of defence from aircraft is to destroy the enemy's aircraft before it leaves its own borders. Whether war with such a country as Russia would ever come or not, should not affect the determination to develop flying in the Canadian Arctic and sub-Arctic regions because Canada, if it considers itself worthy to be called a nation, should have enough pride and spirit to take at least ordinary precautions and be prepared to defend itself in any emergency.[8]

Logan's comprehensive report provided a detailed picture of the conditions in Canada's Arctic Archipelago. He described the terrain, its inhabitants, climactic and weather conditions, suggested uses of aircraft in the Far North, and the types most suitable to meet the severe conditions. He thought aircraft could play a large part in developing the region by mapping the inaccessible interior, assisting the RCMP, transporting surveyors and geologists, developing a reindeer and caribou industry, and conducting ice patrols to assist marine navigation. Logan recommended that an Arctic expedition be undertaken, consisting of a small detachment of four men and two aircraft and operate from the north end of Baffin Island. He judged that ski-equipped aircraft could be used for more than half the year, and that air patrols could be conducted in pairs, each carrying adequate ground survival gear. Also, a local native should always accompany a patrol because an Inuit could find food and direction where a white man would be lost, starved, or frozen to death.[9] He suggested the detachment spend an entire year and fly every day that weather permitted, compiling meteorological and other data, observing flying conditions, exploring for new landing areas, and studying the possibility of aerial photography throughout the year. He outlined the ground equipment necessary to overcome the difficulties and examined the needs for transportation, fuel, food, clothing, and other logistic requirements. Although he spent only two summer months observing the Arctic, Logan was confident that conditions would be favourable for aircraft operations throughout a fair portion of the year.[10]

The Air Board accepted Logan's report and recognized that aircraft could play an important role in developing the Arctic, and that although cold weather presented unique challenges, none appeared to be insurmountable. However, there was no imperative to pursue Arctic air operations in view of the fact that the CAF was fully committed to mapping southern Canada. Despite Logan's prognostications, defence of Canada's northern frontier was not as important in 1922 as it would become a generation later. Logan's report was filed away until 20 years later[11]

when the building of aircraft staging routes through the Yukon and Labrador focused attention on the Arctic.

Royal Canadian Air Force, 1927 Hudson Strait Expedition

Although Logan was the first Air Force officer to survey the Arctic for air operations, it was not until 1927 that the RCAF sent its first aircraft into the northern latitudes. In 1926, the Canadian government decided to complete the Hudson Bay Railway from The Pas to Churchill, Manitoba (MB), as the first stage of a route to ship western grain to Europe. To confirm the feasibility of Churchill as a port, the government decided to send an air expedition into Hudson Strait to determine the viability of marine navigation through the Strait to the Atlantic Ocean. To provide direction to the expedition, the Cabinet created an advisory board headed by Dr. N. B. McLean of the Department of Marine and Fisheries, and included Group Captain (G/C) J. S. Scott, the Director of the RCAF. The expedition had three objectives:

a. obtain accurate information about weather and ice conditions using aerial photography and visual reconnaissance so that the length of the season for safe marine navigation through the Strait could be determined;
b. examine the feasibility of aircraft aiding marine navigation; and
c. assess possible landing sites and the suitability of aircraft and equipment with the aim of establishing air bases in the Strait area.[12]

The RCAF's role was to provide a detachment of six officers and twelve airmen under the command of Flight Lieutenant (F/L) Thomas A. Lawrence, who had been promoted to temporary S/L to command the expedition's flying operations. The RCAF officers were not entirely happy with the expedition as they had been told that regardless of the outcome of their dangerous task, the port at Churchill would be built to placate Western grain farmers.[13]

The RCAF had experience in winter flying, but not in severe Arctic conditions. The pilots required a versatile, rugged aircraft with a spacious cabin and an absolutely reliable engine. Recognizing that none of the aircraft types in the Air Force's inventory would survive the severe Arctic conditions, the RCAF's chief engineer, Wing Commander (W Comd) Stedman, and Lawrence, evaluated several British and American aircraft; none of which was deemed suitable. The original plan called for the modified British Avro 504N Lynx,[14] but when Lawrence strongly objected, Scott sent him to New Jersey where the Dutch designer, Anthony Fokker, had recently set up shop, for Lawrence to test-fly one of the Fokker designs. Lawrence liked the Fokker Universal, and with the cooperation of R. B. C. Noorduyn, later designer of the Canadian Norseman bush plane, Fokker produced six Universals for the expedition on relatively short notice. The Universals were purchased by the Department of Marine and Fisheries for $16,000 each and given civil registrations G-CAHE to G-CAHJ.

The Universals were flight tested at Camp Borden, then packed into crates and shipped to Halifax by rail. Most of the aircraft spares, safety equipment, and other supplies were shipped directly from the factory to Halifax. These five-place, high-wing monoplanes had steel tube fuselage frames covered with fabric, with wood covering on the wings, an open cockpit and enclosed cabin; the Universals were powered by a Wright Whirlwind engine, capable of cruising at 98 miles per hour (mph) [163 kilometres per hour (km/h)] for four hours. Including crew, fuel, emergency supplies, and cameras, the Universal had an operational payload of 1,700 pounds (772 kilograms [kg]). The Universals would prove to be excellent aircraft for the expedition, with the exceptions that the floats and fittings were structurally weak, and all photography had to be taken through a window in the side door. The RCAF acquired a seventh aircraft for the expedition, a float-equipped de Havilland 60 X Moth, registration G-CAHK, for preliminary reconnaissance flights to search for potential base sites.[15]

The advisory board planned to construct three bases, one at each end of the Strait and the third halfway in between. The bases were to consist of seven prefabricated buildings: dwellings for the officers and men, a radio house, a store house, a blubber-house, and two hangars. Two Universals, equipped with floats, skis, and wheels, were to be assigned to each base along

with spare engines and all accessories. Each base would also be supplied with a 30-foot (9-metre [m]) motor launch, a Fordson tractor, radio equipment powered by two gasoline generators, two 150-foot (46-m) steel radio masts, and a 16-month stock of provisions, including gasoline, oil, coal, stoves, bedding, firearms, and ammunition. The 18 RCAF personnel were augmented by 4 personnel from the Royal Canadian Corps of Signals, 3 RCMP constables, and 19 civilians, making a total party of 44. Each base was to be manned by 2 RCAF officers and 4 airmen, a medical officer, a radio engineer, a Signal Corps signaller, an RCMP constable, a storekeeper, and a cook.[16] The RCAF personnel received special air and ground refresher training at Camp Borden in early 1927. The six aircraft riggers were sent to the Atlantic Aircraft Corporation factory for training on the Universal.

On 17 July 1927, the icebreaker CGS STANLEY, carrying all expedition personnel, and the Steam Ship (SS) *Larch*, a freighter loaded with 2,585 tons (2,345 metric tonnes [MT]) of general cargo, including the six crated Universal aircraft, 2,700 tons (2,449 MT) of coal, and a 57-man construction crew departed from Halifax. Ten days later, the ships arrived at Port Burwell (60°25′N, 64°49′W), 12 miles (20 km) south of the Chidley Islands, where the Moth seaplane, which had been stowed on STANLEY's deck, was lowered over the side. Lawrence and F/L A. A. Leitch made several reconnaissance flights to search for a site for Base "A." Because the ice first formed at the western end of the Strait, it was decided to establish the remaining two bases in sequence from west to east. The expedition left a detachment of four men with a motorboat and two months' supplies at Port Burwell to finalize the base location.

On 3 August, the expedition reached Nottingham Island (63°17′N, 77°54′W) at the western end of the Strait and repeated the procedure, launching the Moth to find a suitable site on the very rugged island. The permanent party, construction crew, and equipment were subsequently landed to establish Base "B" with Leitch in charge.

The ships left Nottingham Island on 18 August and turned eastward to find a third base in mid-Strait. After extensive reconnaissance along the south coast of Baffin Island failed to locate a suitable beach, the search turned to the southern side of the Strait where the Moth reconnaissance flight discovered a good site at Wakeham Bay (61°36′N 71°57′W), now Kangiqsujuaq, Québec, on 24 August. Food and supplies were unloaded and the construction crew and permanent party established Base "C" with Lawrence in charge. Two days later, the Moth was wrecked and capsized in an unexpected heavy gale, despite Herculean attempts to save it. During its brief life, the little seaplane had provided invaluable service for reconnaissance as it would have taken the ships months of hazardous work to survey the coastlines for suitable base sites.[17] On 11 September, the ships returned to Port Burwell.

After collecting the construction crews from the three bases, the CGS STANLEY sailed southward on 11 November, leaving the permanent party to complete the final construction to house personnel, equipment, and supplies before the severe cold weather set in at the end of November. Unfortunately, McLean, who was in overall command of the expedition, became quite ill and had to accompany the ships on their return trip south. Lawrence was left in charge of the expedition without having received any written instructions. Fortunately, he had drafted his own air operation order on the way north.[18] Leaving Lawrence in command without written authority caused a little friction, as not all of the civilians approved of having a military officer in command. [19]

During the first few weeks, while the permanent crews were completing their bases, low ceilings and fog prohibited any reconnaissance flights. Consequently, air operations did not begin until 30 September when Wakeham Bay made its first reconnaissance flight, followed by Nottingham Island on 11 October, and Port Burwell eight days later. From October to December 1927, only 42 patrols were flown for a total of 45.8 hours. Since the first ice did not appear until 16 November near Nottingham Island, the limited amount of flying during September and October did not prevent the expedition from documenting the freeze-over of the Strait.

Lawrence organized a schedule of routine and special patrols for each of the three bases to provide regular and systematic coverage of the Strait as well as to ensure the safety of the flight

crews. Weather permitting, daily patrols collected data on meteorological and weather conditions, and when it was necessary to collect overlapping data, aircraft would rendezvous at a point midway between adjacent bases to ensure a continuous picture of the ice movements. Pilots filed detailed flight reports after each patrol, supplemented by photographs for a permanent record. Oblique photographs were taken with a hand-held camera, and the photographic exposures were plotted as accurately as possible on a grid overlaid on hydrographic survey charts.[20] The aircraft had to fly at a constant altitude and the photographs taken with the same angle of deflection with a 60 per cent overlap so that the nature of the ice could be determined by stereoscopic photo interpretation. Since surveillance required visual reference to the ground, navigation was by simple map reading using Admiralty charts dated 1837. The Universals were equipped with two types of magnetic compasses; however, they were not reliable because of the large iron ore deposits in the area.[21] The sun compass, although the most accurate, was of little value because of the almost continuous overcast. The Aperiodic compass when used in conjunction with the "turn and bank indicator" proved to be the only compass that could be safely relied upon. [22]

The expedition established three communications systems. Radio technicians from the Department of Marine and Fisheries operated a short-wave link from Wakeham Bay to Ottawa, as well as long-wave links between the three bases.[23] The Universal pilots reported to the ground stations using a new CT 21 transmitter (no receiver) and a trailing wire antenna which provided a 100-mile (165-km) range by voice and 500 miles (830 km) by telegraphy. A remote radio-controlled device in the cockpit allowed the pilot to meet the requirement to communicate with base every five minutes. Although wearing a face mask and heavy mitts made handling a microphone inconvenient, messages were always duplicated; transmissions were sent first by Morse key, then voice. The CT 21 transmitter proved to be very reliable, with only three failures during the 175 flights on which wireless communications were attempted.[24] However, the pilot had no way of knowing if the ground base received the transmissions until the aircraft returned to base. The Royal Canadian Corps of Signals received the one-way, air-to-ground, wireless transmissions from the aircraft on a SITD2 wireless receiver at each of the three bases. Nottingham Island, the western base, was often able to receive signals from aircraft operating out of the eastern base at Port Burwell.

Although there is no evidence that Lawrence consulted Logan's reports on recommended aircraft survival equipment, Lawrence similarly concluded that each aircraft should carry an Inuit passenger to provide survival expertise if an aircraft was forced down. In the same vein, emergency rations carried on each of the flights consisted of bully beef, hardtack, bacon, pork and beans, chocolate, and tea, in sufficient quantities to sustain the three-man crew for at least ten days. Each aircraft also carried a primus stove and coal oil, engine tool kit, lubricating oil, rubber raft, distress signals, rifle and ammunition, Arctic sleeping bags, rope, axe, and knife. Depending on the season, other equipment carried included an anchor, bilge pump, and silk tent during the short summer season, or ice picks, snow knife, engine cover, and blowtorches during the winter.

Pilots and crew soon perfected the procedure for starting the Universals in the frigid Arctic cold. After each flight the engine was completely drained of oil, which was then stored in a warm place. To start up, the engine was draped with an asbestos cover and heated with two or three blowtorches. After 30–45 minutes the torches were removed and the engine oil, having been heated on a stove, was poured into the engine, which had to be started quickly before it cooled. The technique worked well, even when the aircraft was forced down away from base.

The Universals' first patrols were flown with pontoons until the end of November when the three-week freeze-up period made conditions unsuitable for either pontoons or skis. While waiting for the ice to form on the Strait, the crews replaced the pontoons with skis. Once the Strait was frozen, one of the most challenging tasks was building an ice ramp from the hangars over the rough shore ice to the runway on the level bay ice. Tons of ice and snow were chopped down, filled in, leveled off, and packed into a ramp, using the tractor as a roller. At each change of the tide, the ice ramp, which extended about 220 yards (200 m) across the beach, heaved and cracked until eventually, after many repairs, it formed a solid bridge of ice, rising and falling with

the tide.[25] After the changeover to skis, patrols continued on a daily basis until the end of January 1928, when they were replaced with bimonthly patrols because the static ice conditions eliminated the need for daily surveillance. The bimonthly patrols continued until late May when the ice break-up caused a suspension of operations for periods ranging from 11 days at Wakeham Bay to 40 days at Port Burwell. During the pause in operations, the pontoons were re-installed and the daily surveillance flights were resumed to more closely monitor the dynamics of the spring break-up. Patrols continued until 18 August when the Strait was clear of ice and surveillance was no longer required.

From the start of operations on 30 September 1927, to the last flight on 18 August 1928, the three bases flew 227 patrols for a total of 369.7 hours and took 2,285 photographs. This tempo of operations was a commendable achievement considering that fog, snow, high winds, and heavy shore ice formations limited flying to only 10 of the 53 days from the start of operations until freeze-up in November.

Base "C" at Wakeham Bay was the most active of the three bases, logging 151.8 hours on 98 patrols.[26] Base "B" at Nottingham Island flew 82 patrols for 134.2 flying hours. It was the coldest of the three bases and had the shortest water to ice transition period, lasting only 7 days. Base "A" at Port Burwell suffered the worst weather and was only able to fly 47 patrols for 83.8 hours. After flying its first patrol on 23 October, continuous high winds, snow, and low visibility precluded flying for 31 days, after which ice started to form in the cove, making it necessary to change from pontoons to skis. Ice conditions presented endless problems. Tides continually ruined efforts to build an ice ramp from the hangar over the rough shore ice to the level ice in the cove. As a result, 19 more days elapsed before it was possible to resume operations on skis on 13 December. There was an even longer 40-day interruption during the spring break-up; operations on skis ceased on 22 May, and patrols on pontoons could not resume until 2 July.[27]

Despite the difficulty of maintaining the aircraft in the severe Arctic climate, no scheduled patrols were cancelled because of mechanical failure; however, abominable weather in the form of blinding snowstorms created navigation problems which resulted in three forced landings, one at each base. Returning to Nottingham Island from Erik Cove at Cape Wolstenholme on 15 December, Leitch encountered a heavy snowstorm halfway across the Strait. After flying for some time, he concluded that he had overshot the base in poor visibility and landed on the pack ice to wait for clearer weather. The next morning, Leitch determined that he had been way off course and took off and headed northeastward until he made landfall at the northwest corner of Nottingham Island; he then followed the coastline back to base, landing with only a quart of fuel and his crew suffering from frostbite.

The second incident occurred on 8 January 1928, on a patrol from Wakeham Bay to Nottingham Island, when a severe snowstorm forced Lawrence to land at Sugluk Inlet to await better weather. The next day, when the weather showed no improvement, the crew attempted to return to base only to be forced down again by a snowstorm at Deception Bay. After being marooned on the ice for eight days, Lawrence and his crew were found by a search aircraft from Wakeham Bay, piloted by Flying Officer (F/O) Carr-Harris, and the two Universals returned to base the next day.

In March, the third incident came much closer to disaster. Flying Officer Lewis was on patrol northward from Port Burwell to Resolution Island, and then to the Grinnell Glacier on Baffin Island. On the return flight home, the crew became lost in a heavy snowstorm and reported to base that they were out of fuel and "Landing on ice in middle of Ungava [Bay]." Lewis' reported position was grossly in error as he was actually on a rough ice floe in the Labrador Sea well east of Ungava Bay. After a full day of marching eastward and not sighting land, the crew realized their navigation error, reversed their direction and headed west. After seven days of travelling over very rough ice conditions and crossing open lanes of water in their inflatable rubber raft, they reached the stark coast of Labrador, starving and exhausted. The three crew members, having consumed all the food in their emergency kit, had to live off raw meat from a walrus shot by their Inuit companion. After four days of trudging northward up the barren coast, suffering

badly from hunger and exposure, they came across an Inuit family who helped them to a village and gave them food. The next day, a native escort provided a dog team to carry them back to Port Burwell after an absence of 13 days.[28]

The original plan was to return the aircraft to Ottawa by air, flying down the east coast of Hudson Bay using fuel caches established by the Hudson's Bay Company and Northern Aerial Minerals Exploration Limited. On 29 July, the five remaining Universals assembled at Erik Cove near Cape Wolstenholme on the western limit of Hudson Strait for the trip south. Three aircraft took off successfully, but a pontoon support on Flying Officer Coghill's aircraft, weakened by saltwater corrosion, collapsed in the rough sea; the nose of the pontoon was turned inward and sliced off by the propeller. The fifth aircraft was unable to take off because of engine trouble. Lawrence recalled the SS *Larch* and CGS MONTCALM which had embarked with other expedition members and equipment from the three bases for the return voyage south. Inspections indicated that the pontoon fittings on the other aircraft were in poor condition and return by air was considered too risky. *Larch* took aboard three aircraft, and the two in best condition flew to Wakeham Bay with reduced loads, were dismantled, and shipped south on the CGS CANADIAN VOYAGER. The ships arrived in Halifax in October 1928.[29]

In his final report, Lawrence stated that magnetic compasses were very erratic and at times unsafe for navigation. However, his primary recommendation was the need to produce accurate maps and charts because the existing ones were grossly inaccurate and would dangerously impede the development of the Strait as a navigable waterway. [30] He reported the need for a detailed aerial survey with vertical photographs followed by a hydrographic survey. Lawrence thought stationing at least one aircraft and crew in the Strait region at all times would be invaluable to ships by reporting ice conditions by radio to help them navigate through ice-free channels. Lawrence suggested that the ideal aircraft would be a twin-engine amphibious flying boat with air-cooled engines and ski attachments. The aircraft should have an endurance of seven to nine hours at about 100 mph (166 km/h) and be capable of carrying a crew of three or four, radio equipment, and full emergency kit with rations for 16 days.[31]

Lawrence's report was recognized as an important contribution to the development of the Hudson Bay transportation route. As a result, radio stations were established as aids to navigation, and in 1930, the government icebreaker N. B. MCLEAN began regular patrols. However, the route's potential remained unrealized. The Hudson Strait Expedition was the RCAF's first flying experience in the Canadian Arctic. Under Lawrence's leadership, ground crews learned by trial and error to maintain the aircraft in abominable weather conditions, with not a single mission being missed because of serviceability problems. The expedition was even more remarkable in that in addition to the weather, the pilots had to cope with unreliable maps and erratic compasses, yet experienced no loss of life or catastrophic aircraft accidents. Belatedly, Lawrence and his colleagues received public acknowledgement for their achievements only in 1970.

Navigating in the Arctic

The success of the Hudson Strait Expedition is all the more remarkable when it is considered that there were few Arctic navigation precedents for guidance. The first recorded flight in the Arctic was in August 1914, when Lieutenant Y. L. Nagasaki of the Russian Imperial Navy conducted a search along the shores of Novaya Zemlya, the island separating the Barents and Kara Seas. In the intervening period between 1914 and the Hudson Strait expedition in 1927, there were no practical advances in Arctic navigation, and visual reference to the ground remained the principal form of navigation. The first use of an aircraft for Arctic exploration occurred in 1924 when the Oxford University Expedition used an Avro 504Q Lynx to reach a record latitude of 80°15′ North while conducting an aerial survey of Spitsbergen; again, map reading was the prime means of navigation. In May 1926, Roald Amundsen and his navigator Ruser-Larsen took off in the airship *Norge* from Kings Bay, Spitsbergen, on a record-seeking flight to be the first to reach the North Pole. Since there is no land mass or islands en route to the Pole for map reading, Amundsen's sole means of navigating was using the sun to fly up a selected meridian of longitude to the North Pole, then south down the anti-meridian to Alaska. The flight was anticlimactic as United States (US) Navy Lieutenant Richard E. Byrd, also taking off from Spitsbergen on his record-seeking flight, claimed to be the first to reach the Pole two days earlier on

10 May. Byrd was the navigator of the Fokker Tri-Motor *Josephine Ford*, piloted by the well-known Alaskan aviator, Floyd Bennett. Like Amundsen, Byrd employed the only known polar navigation technique of using sightings of the sun with a sun compass to fly due north up one meridian to the Pole, then retraced his flight due south down the meridian to arrive at his destination. Since meridians of longitude converge on the North Pole like radii converge on the centre of a circle, and since direction is measured relative to the meridians, any direction not parallel to the meridian of the starting position will progressively change as one departs the starting meridian in an easterly or westerly direction. The Arctic navigators of the 1920s had yet to discover how to cope with the continuous change in easterly or westerly directions as they traversed the meridians of longitude. So, they were limited to flying due north or due south when no land features were available for navigation. Consequently, Amundsen's and Byrd's record-seeking flights achieved their aim of being the first to reach the North Pole, but they did little to advance polar navigation. The more difficult challenge was to fly between two points *not* on the same meridian.

Greenwich Grid

Navigating in the Arctic poses several challenges that are not experienced at mid- and equatorial latitudes. First, the rapid convergence of the meridians of longitude in the polar region complicates the measurement of direction and ultimately leads to the dilemma at the North Pole where all directions point south. Secondly, the magnetic North Pole, located in the Canadian Arctic archipelago, creates a large area of magnetic compass unreliability where it is virtually impossible to steer by magnetic compass.[32] The problem of finding direction in the Arctic was finally resolved when RCAF navigator F/L Kenneth C. Maclure devised the Greenwich Grid. Ironically, Maclure was related to Robert McClure, the Arctic explorer credited with discovering McClure Strait in 1853, the last waterway link that led to the founding of the Northwest Passage.[33]

Kenneth Maclure, a 1939 navigator graduate of the British Commonwealth Air Training Plan, was the senior navigation instructor at the RCAF's No. 1 Air Navigation School (ANS) in Rivers, MB. In the summer of 1941, he was temporarily attached to the Royal Air Force's (RAF) No. 31 ANS at Port Albert, Ontario, on Lake Huron north of Goderich, to evaluate a prototype Celestial Navigation Trainer (CNT). Link Aviation Devices of Binghamton, New York, developed the CNT specifically for the RAF to train student navigators in celestial navigation for long flights at night or over water. Although not designed as such, the CNT was capable of simulating flights at all latitudes, including the polar region, and provided an ideal vehicle for Maclure to test the high-latitude accuracy of astrograph curves,[34] which navigators compared with sextant observations to determine aircraft position. From experimentation with the CNT, Maclure gained an in-depth understanding of the problems of measuring direction at polar latitudes, which prompted him to author a paper titled "Polar Navigation." Maclure's paper proposed an innovative means for overcoming the two fundamental problems of Arctic navigation: measuring direction and steering a desired heading. The October 1941 treatise was the most authoritative document on polar navigation that had been written to that date.[35]

Maclure's paper postulated that on a polar stereographic chart,[36] preferred for polar navigation, a system of straight lines, or grid, could be drawn on the chart parallel to the Greenwich meridian. The direction from the North Pole to Greenwich, England, along the Greenwich meridian would be the grid's north direction, or 000° Grid (G). The grid of parallel lines would similarly have a north direction of 000° G. The opposite direction would naturally be Grid South, 180° G, and all directions from any one of the parallel lines could be measured in a clockwise manner from 0° to 360° G. Maclure realized that frequent celestial sightings with an astro compass would be required to monitor aircraft heading. Since Greenwich (zero degrees longitude) was the reference meridian world over for celestial calculations using True (T) direction, Maclure selected Greenwich as the Grid reference meridian to keep calculations as simple as possible when using an astro compass; hence, the Grid became known as the Greenwich Grid.

A simple formula converted True direction to Grid direction: Direction in degrees Grid = Direction in degrees T + 180° plus longitude West or minus longitude East; for example, for a 50°T direction from Iqaluit at Longitude 68° W, the Grid direction is:

$$50°T + 180° + 68°W = 298° G.$$

By late 1941, Maclure's paper had been distributed among Allied air and naval forces, but remained classified until the end of the Second World War (WWII). The paper was discussed extensively at the RCAF's Central Navigation School (CNS) at Rivers, MB, and the RAF's Central Navigation School at Cranage, Cheshire, in the United Kingdom (UK). While Maclure was attending the Specialist Navigation Course at the RAF's CNS, which had moved from Port Albert to Cranage, the CNS issued a technical memorandum titled "A Report on a Discussion on Polar Navigation." The report concluded, in part, that "the [Maclure] Grid based on the Greenwich or 180 degrees offers the clearest solution to the difficulty of indicating direction in high latitudes."[37]

Aries Test Flights

In November 1944, at the request of the RAF, Maclure returned to the UK, where he was appointed Director, Test and Development at the Empire Air Navigation School (EANS) at Shawbury, Shropshire. Early 1945 was the earliest opportunity for the EANS to acquire a four-engine Lancaster bomber, subsequently named *Aries*, as a navigation test and development aircraft. *Aries* was extensively modified, all paint, armour, and armament was removed, and accommodation made to evaluate a wide range of navigation instruments and techniques. *Aries*' nose was lengthened to carry additional fuel, which extended its range to 5,000 miles (8,300 km) for flights into the polar regions.[38]

On 10 May, *Aries* embarked on a series of polar flights with a crew of 11, including now W Comd Maclure and two RAF navigators, for the long awaited trials of Maclure's Grid. Four flights were made from Iceland, one of which took them to the Geographic North Pole and return to Iceland. The next flight was planned from Iceland via Disko Island (on the west coast of Greenland) to the Boothia Peninsula (west of Baffin Island) to determine the position of the Magnetic North Pole, but an unserviceable generator forced a diversion to Goose Bay, Labrador. The next day, the *Aries* crew flew to Boothia Peninsula again in search of the Magnetic North Pole. Within 200 miles (322 km) of the Magnetic Pole, compasses became more erratic; they were stable in periods of steady flight, but should the aircraft accelerate or slow down, the needles wandered aimlessly. On reaching their prudent limit of endurance (PLE), the crew had still not located the Magnetic North Pole, but the evidence indicated it lay north-north-west of the Boothia Peninsula. They turned south, running down the east coast of Hudson Bay, finally landing at Dorval in Montreal. The next stop was at RCAF Station Rivers, MB, to brief the CNS on their preliminary trial findings before continuing to Edmonton. The last stop was at Whitehorse, Yukon, from where they took off on their return flight to Shawbury via 78°N,90°W, a point between the Geographic and Magnetic North Poles. At this most northerly point of their route it was obvious that the Magnetic North Pole lay south of their track, which was 250 miles north of their most northerly point in their earlier search around Boothia Peninsula, proving that it was much further north than previously thought.[39] *Aries* landed at Shawbury at 12:45 p.m. on May 26, having been airborne for 18 hours. Over a period of 16 days the crew had flown 110 hours, covering 22,400 miles (33,300 km), roughly half of which lay within the Arctic Circle. In addition to successfully proving the Greenwich Grid technique for determining direction, the crew had collected a massive quantity of information, including 30,000 observations on magnetic phenomena alone. The flights were acclaimed to be the most scientific polar flights to that date. Every member of the *Aries* crew received formal recognition for their historic polar flights, with Maclure being awarded the Air Force Cross.[40]

Low Frequency LORAN and the Polar Grid

In 1946, the cold war and the threat of transpolar aggression, as postulated by Logan in 1922, concerned the United States Army Air Force (USAAF) because, except celestially, there was no long-range navigation aid in the Arctic. The RCAF shared the USAAF's concerns, but more for sovereignty than strategic reasons, as it was committed to the aerial mapping of northern Canada. Consequently, the RCAF embarked on a combined Canada-US classified program to investigate the performance of low frequency (LF) long-range aid to navigation (LORAN)[41] in the Arctic. By mid-1948, three high-latitude LF LORAN stations were located at Skull Cliff, Alaska, Kittigazuit, Northwest Territories (NT), and Cambridge Bay, Nunavut. The test area included northern Alaska, northern Canada, and the Arctic Ocean out to a distance of about 500 miles (830 km). To investigate LF LORAN reception, the USAAF deployed three modified B-29 bombers to Edmonton,

Alberta, from the 4149 Air Materiel Command Unit at Watson Laboratory in Red Bank, New Jersey. Detachment personnel consisted of a detachment commander, four pilots, three navigators, four LORAN operators/navigators, two flight engineers, and several technicians. The RCAF provided the facilities and services for the three stations and ground monitoring sites. The Defence Research Board (DRB) provided the RCAF with scientific and technical assessments.[42]

The USAAF detachment commander began flying from Edmonton almost immediately. Unfortunately, the Air Officer Commanding Northwest Air Command, Air Vice-Marshal T. A. Lawrence (leader of the Hudson Strait Expedition) had not been informed of the program and immediately grounded the detachment. After Lawrence was briefed, flight testing quickly resumed. However, a Canadian presence was added to the detachment with the addition of F/L Keith Greenway, an RCAF navigator, to mitigate sovereignty concerns about foreign overflights of Canadian territory and to provide a singular Canadian presence on the joint Canadian-American team. The detachment dropped its USAAF designation and was renamed the LF LORAN Flight Test Section. Greenway was more than the token Canadian on the Flight Test Section; he took full part in planning flights, navigating the B-29s, recording and analysing LF LORAN data, and preparing reports. Recognizing the original USAAF staff was far too small for the workload, Greenway organized additional Canadian representation with the welcome addition of RCAF aircrew and technicians. He realized that Canada would benefit from the LF LORAN project, as it provided the RCAF an excellent opportunity to be on the leading edge of low-frequency technology as an aid to long-range navigation and the development of high-latitude navigation so essential to Canada.

None of the USAAF navigators had experience in Arctic flying nor had heard of the Greenwich Grid until they conferred with Commander J. Catlett of the US Navy just before departing for Edmonton. Catlett had studied Maclure's paper as part of his investigation of various polar charts and grids using one of the Navy's CNTs. He favoured Grid North in the opposite direction to that proposed by Maclure, although Maclure had considered this as an option. Greenway also had no experience in Arctic flying but was very familiar with the Greenwich Grid, having studied it while on staff at the CNS at Rivers.

The B-29 Flight Test Section trialed Catlett's Grid orientation towards the Geographic North Pole, and starting in April 1946, Flight Test Section adopted the Polar Grid as the standard procedure. The North Pole oriented grid eliminated the 180-degree term in the Grid equation, which more simply became:

Degrees Grid = Degrees True plus West longitude or minus East longitude.

More importantly, the astro-compass would be used in the conventional manner, and therefore, would be less prone to navigator errors. To avoid confusion with the Greenwich Grid, the true-north oriented grid was referred to as the Polar Grid. On 9 May 1946, Greenway was the navigator of B-29 44-84021 on a 22-hour flight to the Geographic North Pole to establish the maximum reception ranges from the LF LORAN stations. This was the first US military aircraft to reach the North Pole and the first aircraft to terminate a Pole flight in Canada.[43] Greenway played an important role in proving the Polar Grid, and as a result of the Flight Test Section's unqualified success, the USAAF formally adopted the Polar Grid in June 1946. By the end of 1946, the Polar Grid had replaced the Greenwich Grid throughout the RCAF.

Low Frequency LORAN - Gyro Steering

During the latter part of WWII, aircraft magnetic compasses were stabilized by the use of gyroscopes, which dampened compass needle oscillation during turns. As a result of the *Aries* flights through areas of magnetic compass unreliability, the EANS recommended that the gyroscope be decoupled from the magnetic compass and the free-running gyro used as a steering reference.[44] A gyro has the unique property of "rigidity in space," which means that once the spin axis of a gyro is aligned to a point in space it maintains its orientation if not influenced by any external forces. In practice, this required the navigator to use an astro compass to align the free-running gyro to True or Grid North to establish the gyro as a stable

reference to steer the aircraft. This Astro Compass-Gyro (Asco-Gyro) procedure was first discussed in Maclure's 1941 paper; however, for navigators with an inbred reliance on the magnetic compass, the switch to gyro steering was too radical without further investigation.[45]

Buoyed by the EANS recommendations from the *Aries* flights, the LF LORAN Test Flight Section felt confident in using the Asco-Gyro steering technique in the area of magnetic compass unreliability. Consequently, the B-29 navigators took the bold first step of adopting the technique for flights north of a line through Kittigazuit, NT, Great Bear Lake, Great Slave Lake, Eskimo Point (north of Churchill), Mansell Island in Hudson Bay, and Cumberland Sound southeast of Baffin Island.[46] Gyro technology at the time was in its infancy; however, two phenomena, "precession" and "apparent wander," were known to cause the gyro spin axis to drift or appear to wander, thereby creating insidious steering errors. Manufacturing imperfections such as spin axis pivot friction or unbalance in the gyro's gimbals provide external forces which cause the gyro axis to drift or wander; this type of drift is known as precession or real wander. Apparent wander is caused by the earth's rotation and makes the spin axis of the gyro appear to change direction in relation to the earth. Since the earth rotates from west to east and the gyro axis remains fixed in relation to a point in space, there will appear to an observer on the earth an apparent movement of the gyro's axis from east to west.[47] The combined effects of precession and apparent wander caused the early gyros to drift at rates of up to 20 degrees per hour. Consequently, the LF LORAN flights, which lasted more than 20 hours, required three navigators when using the Asco-Gyro steering technique: one to plot the aircraft's course, a second to take astro-compass sightings every 20 minutes and maintain a Gyro Log to calculate and compensate for gyro drift, and the third located in the transparent nose to keep a complete log of what was observed below. Later, as gyro manufacturing techniques were refined and drift rates decreased to 6 degrees per hour or less, the workload required only a single navigator.

After the Asco-Gyro procedures had proved so successful, the LF LORAN Flight Test Section became the training agency for the USAAF and the RCAF. The USAAF Ptarmigan B-29 reconnaissance aircraft, in their almost daily flights from Alaska over the Geographic North Pole, were the first Americans to be trained on the Asco-Gyro technique. Lieutenant Willie Gray, USAAF, and F/O Norrie Burnett, RCAF, briefed the first RCAF units, 435 Transport Squadron and the Winter Experimental Flight in Edmonton. Prompted by a visit from W Comd Langstaff from the Directorate of Navigation at Air Force Headquarters, the Flight Test Section provided a comprehensive précis on Asco-Gyro navigation to the newly opened RCAF Air Navigation School in Summerside, Prince Edward Island. Shortly thereafter, the RCAF abandoned the magnetic compass in polar regions in favour of the Asco-Gyro technique and introduced full Grid-Gyro training into its basic navigator training. Asco-Gyro steering using the Polar Grid was the most effective navigation technique for over 40 per cent of Canada's land mass.[48]

Following Langstaff's visit to the LF LORAN Flight Test Section at Edmonton, the RCAF specially modified three Mark (Mk) X Lancasters which were used to introduce Arctic flying into the prestigious Specialist Navigation (Spec N) Course. On 2 May 1949, four RCAF navigators on No. 1 Spec N Course reached the Geographic North Pole in Lancaster FM 211, named *Zenith*. Flying off an ice strip at Kittigazuit, *Zenith* was the first Canadian aircraft to reach the North Pole and established the precedence for following Spec N courses where navigation training flights to the North Pole became a regular part of the curriculum.[49]

The LF LORAN Program failed because of severe attenuation of the low frequencies over the polar icecap. However, the Flight Test Section's navigators were remarkably successful in developing procedures for safe, reliable navigation in the Arctic that were adopted by most nations in the northern hemisphere. Combining the *Aries* proven grid technique with their internally developed Asco-Gyro steering technique, the Flight Test Section developed practical procedures that were within the capability of the average navigator. Other lasting benefits from the LF LORAN Program were the development of the Twilight Computer, the Skylight Compass, and a revitalized interest in radar-scope interpretation for Arctic navigation.

Polar Twilight

During the Arctic twilight, light conditions obscure the celestial bodies that navigators require for critical astro-compass heading checks to steer by gyro. Twilight in the Arctic lasts much longer than at lower latitudes and could be further extended by several hours on east to west flights when the B-29 could keep pace with the apparent movement of the sun. With gyros requiring a check every 20 minutes, the inability to take astro sightings could result in an aircraft wandering many kilometres off course. In fact, gyro wander was attributed to two weather reconnaissance B-29s becoming lost and crashing with disastrous results, one in Alaska and the other in Greenland.[50] To ameliorate the lengthy twilight problem, Greenway and Mr. Cox from the DRB developed the "Twilight Computer" to enable aircrews to determine if their flight profile would require an unacceptable length of time in the twilight zone and adjust their flight plan accordingly. The Twilight Computer proved to be popular with both the RCAF and the USAAF Strategic Air Command (SAC).[51]

The problem of taking heading checks during twilight was finally resolved in 1947, when Dr. Pfund from John Hopkins University developed the Sky Compass, which determined the Sun's azimuth using polarized light. The Sky Compass enabled navigators to determine aircraft heading during twilight conditions when the sun was at a very low altitude or as much as seven degrees below the horizon. After conducting trials on the engineering model of the Sky Compass during the LF LORAN test flights, Greenway recommended that the RCAF adopt the production version, the Kollsman Skylight Compass, for heading checks during twilight in the Arctic regions.[52] The Skylight Compass was soon adopted by the RCAF, USAAF, and numerous airlines, enabling them to use Asco-Gyro steering during Arctic and transpolar flights without regard for extended periods of twilight.

Radar in the Arctic

Since its inception during WWII, radar has played an important role in determining an aircraft's geographic position. Radar navigation in the Arctic is especially important because there are few other navigation aids. Like most other activities in the Arctic, radar navigation is much more difficult as ice formations distort land masses and shorelines and there are no geographic features on the Arctic icecap. Seeking as much information as possible from the few available features in the barren Arctic, Greenway wrote a book about radar scope interpretation in the region. He was also instrumental in developing a new radar technique of using sequential range and bearing returns from unmapped topographical features such as rock outcroppings and ice ridges. Although, the aircraft's geographic position could not be determined, the information enabled the navigator to calculate aircraft drift and groundspeed, which greatly aided in keeping the aircraft on track and reducing the very time-consuming celestial-fixing cycle.[53] This radar technique became a standard procedure in the RCAF until the appearance of Doppler radar, which was specifically designed to provide a continuous indication of aircraft drift and ground speed.

Strategic Air Command's Gyro Problem

Despite the corporate gyro-steering knowledge gained from the joint Canada-US B-29 team in Edmonton, the United States Air Force (USAF)[54] SAC experienced navigation difficulties on their polar routes well into the 1950s, primarily because they were still using a magnetic steering reference. In 1954, Greenway, now an internationally acknowledged authority on Arctic navigation, was sent on exchange duties with SAC to help solve their steering difficulties. In 1955, SAC implemented Greenway's recommendation to use the Asco-Gyro steering procedures, developed by the B-29 Flight Test Section, for all northern flying. Collaterally, SAC gained a more stable steering reference for their bomb runs.[55] However, SAC B-47 navigators still experienced steering problems because their new low-drift gyros frequently exceeded the specified one-degree-per-hour drift rate, but when the gyro was checked by the manufacturer, no defects were found. Greenway's analysis of the problem found that the gyros were in fact performing to specification. From his exceptional understanding of gyros and navigation chart construction, Greenway determined that the excessive gyro drift observed by the SAC navigators was caused by the difference between convergence of the meridians of longitude on the spherical earth and the convergence of the meridians as printed on a flat map. This phenomenon, called residual transport wander (RTW) always existed but was not apparent in earlier gyros because, as Greenway

discovered, their higher drift rate masked the smaller RTW.[56] The RTW problem caused by the difference between earth and map convergency was most apparent on east-west flights where the change of longitude was a maximum. SAC navigators readily corrected the RTW phenomenon by procedurally applying a compensating torque to the gyro.

Conclusion

Logan's insightful report was the first to urge a permanent Canadian Air Force presence in the Arctic, not only to foster development but also to fulfill a national obligation to defend its northern approaches.

After a year-long expedition to the Hudson Strait, the small cadre of air crews and ground crews overcame the difficulties of operating in the severe Arctic climate by trial and error and left a legacy of Arctic operating procedures which remain pertinent today. Lawrence's report that maps of the area were dangerously in error, and that magnetic disturbances made compasses grossly unreliable was not acted upon until 1945, when 408, 413, and 414 Squadrons embarked on a multi-year project to photograph the Arctic to make accurate maps. By 1946, the *Aries* and the LF LORAN test flights gathered data that provided a better understanding of the area of magnetic compass unreliability. As a result of improved maps and a better appreciation of the limitations of magnetic compasses, Arctic flying expanded beyond the realm of pioneering bush pilots. Growing commercial air services provided greater access to the farthest reaches of the Arctic and expedited its economic development.

Maclure's Greenwich Grid provided the first practical solution to the problem of measuring direction in the Arctic—a problem that had long plagued early polar explorers and the record seekers attempting to reach the North Pole. Maclure's proposal to replace the magnetic compass with the gyro took about 10 years to gain favour. However, with advances in gyro technology, gyro steering was adopted by air forces and airlines flying in the polar regions.

The joint RCAF-USAAF LF LORAN program failed to provide electronic fixing in the Arctic Basin, but provided five significant benefits to polar navigation. As a result of the B-29 Test Flight Section trials, the direction of the Greenwich Grid was reversed to bring about the Polar Grid. Most importantly, the Asco-Gyro steering technique evolved through the necessity to fly through the region of magnetic compass uncertainty. The resultant "Asco-Gyro-Grid" procedures provided the world's first safe and effective navigation technique throughout the polar region. These procedures were adopted by major North Atlantic Treaty Organization (NATO) air forces and airlines on their transpolar flights and North Atlantic routes.

Although Logan and his profoundly perceptive report were unheralded, the role of his successors in advancing aviation in the Arctic was recognized by both RCAF and civilian authorities. Lawrence was appointed a Companion of the Order of the Bath and retired as an air vice-marshal. Maclure was awarded the Air Force Cross and rose to rank of group captain. Greenway was awarded the President's Prize of the Royal Meteorological Society and the Order of Canada and retired as a brigadier-general. For their superlative contribution to Arctic navigation, Maclure and Greenway were awarded the coveted Thurlow Award from the United States Institute of Navigation. As national recognition of their outstanding contribution to advancing aviation in Canada's polar regions, Lawrence, Maclure, and Greenway were inducted into the prestigious Canadian Aviation Hall of Fame.

Notes

1. Tony German, *The Sea is at Our Gates* (Toronto: McClelland & Stewart Inc, 1990), 250.

2. Ibid., 251.

3. K. R. Greenway and M. D. Gates, *Polar Air Navigation–A Record* (Canada: Cambridge University Press, 2009), iii.

4. Ibid., 253.

5. Robert A. Logan, "Air Board, CAF, RCAF," Canadian War Museum Paper No. 2, Ottawa: August 1972, 79.

6. Air strips were eventually built at Grise Fiord, 55 km northwest of Craig Harbour, and at Pond Inlet.

7. Hugh A. Halliday, "Bernier of the North," *Legion Magazine*, 1 January 2006.

8. Logan, 80.

9. W. A. B. Douglas, *Creation of a National Air Force, The Official History of the Royal Canadian Air Force*, vol. 2 (Ottawa: University of Toronto Press and Supply and Services Canada, 1986), 106.

10. Logan, 80.

11. Ibid.

12. Ibid., 198.

13. Bernard Shaw, *Photographing Canada From Flying Canoes* (Burnstown, ON: General Store Publishing House, 2001), 97.

14. Canada received a national gift from the UK in 1919 which included 62 Avro 504K's. A modified Avro 504Q had been prepared for the Oxford University Arctic expedition in 1924.

15. Douglas, 106.

16. Logan, 198.

17. Ibid., 199.

18. Douglas, 108.

19. Shaw, 97.

20. Logan, 200.

21. Shaw, 98.

22. Logan, 203.

23. Douglas, 108.

24. Logan, 201.

25. Ibid.

26. Ibid.

27. Ibid.

28. Ibid., 202.

29. Shaw, 102.

30. Logan, 203.

31. Douglas, 112.

32. Greenway & Gates, 33.

33. Hugh A. Halliday, "Aries Flights of 1945, Air Force Part 1," *Legion Magazine*, 1 January 2004.

34. Greenway & Gates, 34. Pre-computed celestial sight reduction tables were not yet in use.

35. Ibid., 34.

36. Ibid., 87. A chart that portrays the Polar Region viewed from above the North Pole down to a latitude of 60° North. The North Pole is located at the centre of the Polar Stereographic chart.

37. Ibid., 38.

38. Ibid.

39. Ibid., 53. It was later established that the North Magnetic Pole was about 250 kilometres north-northwest of its charted position, further emphasizing the failure of the magnetic compass as a steering reference.

40. Halliday, "Aries Flights of 1945, Air Force Part 1."

41. The Long Range Navigation was a hyperbolic navigation aid developed during the Second World War.

42. Greenway & Gates, A5-2.

43. Ibid., A5-3.

44. Ibid., 67.

45. Ibid.

46. Ibid.

47. Ibid., A8-2.

48. Ibid., 76.

49. Ibid.

50. Ibid., A5-10.

51. Ibid.

52. Ibid., A4-11.

53. Ibid., 78.

54. The USAAF transformed into the USAF as a separate military branch on 18 September 1947.

55. Greenway & Gates, 82.

56. Ibid., 100.

Ernest S. C. Cable

Colonel Ernest Cable (Retired) was born in Saskatoon, Saskatchewan. Upon completion of four years at Royal Roads Military College in Victoria, British Columbia, and the Royal Military College in Kingston, Ontario, he graduated with a Bachelor of Science degree in 1965. Colonel Cable received his navigator wings a year later at the Canadian Forces Air Navigation School in Winnipeg, Manitoba. Upon completion of his operational training at the 2 (Maritime) Operational Training Unit in Summerside, Prince Edward Island, Colonel Cable flew as an Argus navigator on 404 Maritime Patrol Squadron at 14 Wing Greenwood, Nova Scotia, for four years and became the squadron's first Oceanography Officer. In 1970, he was transferred to 449 Maritime Patrol and Training Squadron where he was employed as a maritime patrol tactics and oceanography instructor.

In 1972, Colonel Cable graduated from the Aerospace Systems Course at the Canadian Forces School of Aerospace Studies in Winnipeg and was posted on exchange duties with the US Navy at the Naval Air Development Center (NADC) in Warminster, Pennsylvania. During his three-year tenure at NADC, Colonel Cable was the P-3C (Orion) Update Aircraft Project Officer where he was responsible for the software design, the flight testing, and the training of the first US Navy squadron to convert to the P-3C Update aircraft. For his work at NADC, Colonel Cable was awarded the Secretary of the Navy Commendation.

Upon returning to Canada in 1975, Colonel Cable attended the Canadian Forces Staff College in Toronto, after which he was posted to the CP140 Aurora Program Office in Ottawa as the Operational Requirements Manager. Upon promotion to lieutenant-colonel, Colonel Cable became the Aurora Program Office Director of Requirements.

In July 1980, Colonel Cable assumed command of 405 Maritime Patrol Squadron based at 14 Wing Greenwood. While under his command, 405 Squadron transitioned from the Argus aircraft to the new CP140 Aurora. During the first year of Aurora operations, the Squadron won the coveted Fincastle Trophy, emblematic of anti-submarine warfare supremacy among Commonwealth air forces.

Following his tour as Commanding Officer 405 Squadron, Colonel Cable became the 14 Wing Operations Officer at Greenwood where he was responsible for planning and coordinating all Aurora missions and conducting the post-flight analyses.

Upon promotion to colonel, he was posted to Canadian Forces Base (CFB) Trenton, Ontario, where he assumed the duties of Deputy Chief of Staff Personnel and Administration at Canadian Forces Training System Headquarters. Colonel Cable was next posted to Maritime Command Headquarters, Halifax, as the Deputy Chief of Staff Operations. In August 1990, Colonel Cable became the Deputy Commander, Maritime Air Group. For his contributions throughout his career to the advancement of maritime air warfare, Colonel Cable was inducted into the Order of Military Merit (OMM) in 1994.

Colonel Cable retired from the Canadian Forces in September 1995. He and his wife, Carol, reside in Dartmouth, Nova Scotia. Colonel Cable is on the Board of Directors for the Shearwater Aviation Museum, and has served as the museum's historian. He has a particular interest in the history of maritime aviation in Canada and serves as an Associate Air Force Historian for 1 Canadian Air Division Headquarters in Winnipeg. In addition to advising the Centre for Foreign Policy Studies at Dalhousie University on maritime security issues, Colonel Cable has had numerous articles on maritime affairs published by the Defence Association News Network, Defence Quarterly, *the* Dalhousie University Maritime Affairs Bulletin, *and by Air Force, wings, and Canadian helicopter magazines.*

Chapter 2

Constructing a Role: The Royal Canadian Air Force in the Arctic, 1945–1953

Peter Kikkert

In the year following the Second World War (WWII), the Royal Canadian Air Force (RCAF) finally fixed its attention on the Arctic. As the world split into opposing spheres, the two rival superpowers, the United States (US) and the Soviet Union (USSR), sat on either side of the Arctic Ocean; sandwiched between them was Canada. The Canadian North represented a potential front line in any future global conflict and immediately became one of the most strategically important regions in the world. In response, the Canadian military's interest and activity in the North increased dramatically. The Army, Navy, and Air Force struggled to define roles and responsibilities in the area, which proved an incredibly difficult task given each service's respective lack of experience in the Arctic. For the Air Force, the first flights into the region were journeys into the unknown, and only slowly did a real Arctic capability develop.

Constantly looming in the minds of defence planners was the need to balance Canadian activities with the increased American military presence in the area, as US personnel flooded into the North in the name of continental security. The presence of the Americans in the thinly populated region caused grave sovereignty concerns in Ottawa, and ensured that the RCAF role in the Arctic was largely defined in terms of how it could bolster Canada's control. The American presence also placed added stress on the RCAF as it developed an extremely close working relationship with the United States Air Force (USAF) in the region and tried to maintain an independent operating identity. These formative years proved especially challenging for the RCAF as different priorities and roles pulled it in multiple directions, and it had to learn to work and cooperate with other government departments operating in the region. Despite some serious growing pains and a rather slow start, by the early 1950s, the service was heavily engaged in the Arctic and had become the lynchpin of the government's sovereignty strategy.

The Air Force Enters the Unknown

Prior to 1946, Canada's Air Force had very little experience flying in the North, and practically none in the Arctic Archipelago. In the mid-1920s, General Andrew McNaughton promoted a northern training programme for the RCAF, hoping that it would provide the new service with a valuable role, and as a result, more funding. Soon, pilots were flying over the North in the Canadian-built Vickers Vedette, designed specifically for northern flying, and the RCAF initiated an aerial photography programme in cooperation with the Topographical Service and the Geological Survey.[1] The small northern training programme would continue into the 1930s, and pilots would frequent places like Aklavik, the mouth of the Coppermine, and other points on the Arctic coast, though they did not fly into the confusing maze of channels and islands beyond. While these flights represented only the first small step in building a northern capability for the RCAF, McNaughton's initiative at least acknowledged the country's northern boundaries.

The first representative of the Canadian Air Force to visit the Arctic islands did not travel there by plane. In 1922, Squadron Leader R. A. Logan joined a sea-borne expedition to Ellesmere Island to report on the conditions that might affect the operation of aircraft in the Arctic. Logan's report contains a picture of the Air Force ensign flying from a point on Ellesmere Island, 825 miles (1,327 kilometres [km]) from the North Pole; many years would pass before the RCAF once again made it that far north.[2] In 1927 and 1928, pilots again participated in missions north of the mainland as they scouted Hudson Bay and the Hudson Strait to determine how long into the season marine shipping was possible, and to examine the possibility of establishing operational airbases in the area. The expedition actually established three temporary bases, one located at Port Burwell off the Labrador Coast, another on Nottingham Island, and the third at Wakeham Bay in the Hudson Strait.[3] The aircrews established no permanent bases, however, and the RCAF ventured no further into the Arctic Archipelago in the 1930s.

Throughout WWII, the RCAF worked in the northern regions of the country on a more regular basis as it assisted in the operation of the Northwest and Northeast Staging Routes. In 1943, the service finally flew past the Arctic coast when it carried out a geodetic survey of southern Baffin Island. After they completed the survey, however, the aircrews withdrew from the Archipelago. They gained little knowledge of Arctic flying conditions and completed no new charts during the brief foray, and the region remained something of a mystery for the RCAF. In the summer of 1945, the Royal Air Force carried out a series of long-range experimental navigation flights in the northern polar regions, using a plane called *Aries*. Members of the RCAF joined these flights and afterwards helped analyse the data collected. Although the trips collected valuable information, they did not represent a complete study of the problems of polar navigation, nor did they inspire the RCAF to embrace a greater role in the Arctic.[4] The flights, nonetheless, set a precedent for RCAF airmen serving as observers on allied missions to the Arctic.

The Exposed Roof to the Continent

Post-war events forced the RCAF to finally consider the Arctic approaches to the continent. Led by American A. D. de Seversky, military thinkers unrolled polar projection maps in place of their old Mercator projections, and the proximity of the US to the Soviet Union became strikingly obvious.[5] With the Soviet Union waiting ominously across the North Pole and the technological advances of the war slowly strengthening the USSR's military arsenal, many strategists came to see the Arctic as North America's Achilles heel. Although at war's end the Soviet Union possessed only a small strategic bomber force and no aircraft capable of making a round-trip bombing mission to the United States, American military strategists and the press still obsessed over the idea of enemy planes coming over the Pole to launch raids on the continent's industrial heartland. The Americans knew that as early as 1936, the Soviet air fleet for the Glavsevmorput, the Arctic region, comprised 125 planes and 90 pilots well trained in polar operations, and speculated that those numbers only grew during the war.[6] Furthermore, while the large-scale strategic bombing operations carried out during the war proved far less effective than Western strategists anticipated, the dropping of the atomic bombs on Hiroshima and Nagasaki changed the strategic picture entirely.[7] The prospect of one devastating blow effectively ending any future war suddenly became all too real.

On 5 December 1945, General H. H. Arnold, Commander in Chief of the United States Army Air Force (USAAF), the service most worried about the Soviet aerial threat, declared to the public that the Arctic would be the heart of any new conflict.[8] Defence planners envisioned chains of interceptor bases and radar sites for the region, along with the necessary infrastructure.[9] In response to these rather grand ideas, the Canadian military, especially the RCAF, spent 1946 trying to determine what would be expected of it in this new strategic environment.

Between the 20th and 23rd of May 1946, Canadian and American military delegations met to hammer out a revised version of *ABC-22*, the basic defence plan for the continent laid out during WWII. After a marathon session of planning and discussion, the Military Cooperation Committee (MCC) released an *Appreciation of the Requirements for Canadian-United States Security* and a *Joint Canadian-United States Basic Security Plan*.[10] The documents emphasized that the military potential of North America would be a major target in any outbreak of hostilities, and that an air offensive was a distinct possibility. Any incoming aerial attack would likely come over the North Pole, making use of Spitsbergen, Greenland, and Canada's Arctic islands as stepping-stones to the continent. To protect the continent, the MCC argued, the Canadians and Americans should keep ahead of enemy capabilities by building an integrated air defence system, along with air warning, weather forecasting, communications networks, surveillance, anti-submarine capabilities, and mobile strike forces to counter any possible enemy lodgement in the north.[11] The defence scheme of the MCC would force Canada to invest ten-fold more resources into continental defence and brace itself for a veritable Maginot Line in the Arctic. The RCAF would have to reorient its priorities to the Canadian North and assume a major and extremely costly role in the region.

The establishment of massive American air defences in the North American Arctic, which could challenge Canada's territorial sovereignty in the thinly settled region, worried Ottawa.

The MCC report also caused disagreement amongst the upper echelon of the RCAF. Air Marshal Robert Leckie vehemently disagreed with Air Vice-Marshal (A/V/M) Wilfred Curtis, the Canadian chairman of the MCC, who supported more expansive air defences. Leckie could not accept the financial implications of the programme envisioned by the MCC, anticipated any assault on North America to be diversionary, and suggested Canada push for more modest plans for the Arctic.[12] In the end, as historian Joseph Jockel describes so well in *No Boundaries Upstairs*, the grandiose proposals of the MCC did not appeal to either nation's high command. The Joint Chiefs of Staff took little notice of the report, and suggestions for air defence bases and radar stations throughout the Arctic faded away for the short term.[13] What, then, would the role of the RCAF in the Arctic actually be?

In the fall of 1945 and winter of 1946, the service started to work on this question and planned a test programme of polar flights to be run by the Winter Experimental Establishment based in Edmonton, Alberta. The flights were to investigate the effectiveness of weather methods of navigation in the polar regions, especially in the vicinity of the north magnetic and north geographic poles, to determine the performance of navigation instruments and equipment, especially compasses, and to study the use of various plotting charts with the aim of further developing modes of polar navigation. The RCAF also hoped the flights would fix the exact location of the north magnetic pole and provide information on all mechanical problems involved with flying in the unique conditions of the region.[14] From the start, the programme highlighted the type of long-term planning required in the Arctic. For instance, before the planes could use the runway at Norman Wells, the RCAF had to ensure that the airstrip could actually accommodate them and that its storage facilities held enough fuel.[15] Planners could not simply focus on the flights, but also had to address the construction and maintenance of a suitable runway, the transport of enough surplus fuel to the area, and other infrastructure problems. In fact, the time required preparing for the mission and the exorbitant cost of operating in the North proved too much, and the RCAF cancelled the programme in February 1946.[16] The cancellation highlighted the lack of RCAF interest in adopting an expensive but meaningful role in the Arctic in the first months after the war.

Observing the Americans

Instead, throughout much of 1946, the RCAF acted as observer to USAAF operations in the Arctic, as it had on the *Aries* missions. In March, Canadian airmen flew on American B-29 Superfortresses dispatched to the Arctic to search for suitable sites for a proposed system of weather stations. RCAF observers also participated in Operation NANOOK, an American naval cruise around the eastern end of the Northwest Passage.[17] At the end of 1946, Canadian airmen also attached themselves to a more regular and controversial American project, Operation POLARIS.

In April 1946, the Americans requested permission to institute a regular air transport service of three round trips per week over the Canadian Arctic, codenamed POLARIS. The three B-29s assigned to the mission would travel over Canadian territory as they moved between Meeks Field, Iceland, and Ladd Field, Alaska.[18] This rationale reflected the American desire to improve its operational capability in the region, especially in Arctic aviation. If American bombers ever had to cross the polar regions on a mission against the Soviet Union, their crews required advanced training, and their equipment testing in conditions unique to the Arctic.

Despite misgivings about the Americans overflying the Arctic and testing Canada's sovereignty, the Cabinet Defence Committee (CDC) considered the proposal for POLARIS. The CDC felt that since these flights were primarily concerned with gaining experience in the operation of long-range aircraft in the Arctic, the establishment of this air route would actually prove advantageous to the RCAF.[19] The Canadians, like their American counterparts, thought that if war broke out, the type of experience provided by POLARIS would be essential. The Canadian government agreed with the CDC; also, they were far more worried about permanent American facilities being set up in the thinly populated Arctic regions, such as weather stations, than they were of temporary overflights.

The Canadians granted permission for Operation POLARIS on 8 June 1946, contingent upon the inclusion of observers from the RCAF. While these observers would provide important operational data, they were also to serve as the first line of defence for Canada's sovereignty in the region. If the Americans did anything that breached the agreed upon programme or challenged Canada's control in the region, the observers were to report it immediately.

The goal of all these operations was to learn as much about flying conditions in the region as possible, develop strategies to deal with the unique environment, test equipment, and, of course train aircrews. These men were flying into an unfamiliar and dangerous environment, which had not yet been fully mapped or even explored, and their logs reflect this feeling of flying into the unknown. In August 1946, for instance, an American B-29 went on an extremely long journey of the region, during which it covered some 3,467 nautical miles in 20 hours and explored some of the most remote and inaccessible parts of the Arctic. In fact, this sortie was the first time anyone had ever seen some of Canada's Arctic islands in the summer months.[20] The mixed Canadian and American crew noted the inaccurate mapping of the region, that there were more islands than the map showed, and even suggested that Borden Island might actually be two islands. The flight revealed just how little was known about the Canadian Arctic and highlighted the problems caused by inaccurate mapping, unreliable magnetic compasses, and extremely limited meteorological support, all of which created a nightmare for navigators. The environment of the Arctic also frustrated navigators as the weak horizontal magnetic force throughout the region made maintaining a set course difficult.[21] The complexities of operating in the Arctic still required investigation.

In the summer, the RCAF finally launched an independent mission in the region to further study conditions in the Arctic. Called Operation INVESTIGATOR, the mission's objective was to locate, examine, and report on suitable airbases for float and ski operations in the Western Arctic. The force consisted of a Canso Amphibian and two single-engine Norsemen on floats, with 11 personnel. These small planes covered a lot of terrain that summer, including Bank's Island, the North Coast of Victoria Island, King William Island, the Boothia Peninsula, Holman Island, and Cambridge Bay. Although on a much smaller scale than the operations of their American comrades, this was the first sustained effort by the RCAF to gain flying experience in the area, and they did gather a great deal of information.[22] The operation also showed the effectiveness of small planes in the Arctic, as 440 Squadron continues to demonstrate today.

The Americans and their Canadian observers steadily improved knowledge of conditions in the region. The reports from the observers on Operation POLARIS, for instance, are filled with information on navigational difficulties and solutions, the reliability of communications, the polar air masses, and air mass circulation, all essential elements for flying.[23] Throughout the summer of 1946, the Americans operated three B-29 bombers out of Edmonton, in support of the long-range aid to navigation (LORAN) programme. Crewed by a mix of RCAF and USAF personnel, these aircraft made dozens of sorties over the Arctic Archipelago and gathered invaluable information on Arctic flying. These flights led to the creation of an aviators' handbook entitled *An Aerial Reconnaissance of Arctic North America*, which greatly assisted navigators in the years to come.[24] While the RCAF should have adopted a more extensive role during this period, the information collected by the observers was invaluable and likely far more substantial than the Canadian service ever could have collected on its own. Cooperation with the Americans, when carefully regulated, often proved extremely beneficial.

The RCAF and Sovereignty in the Arctic

Despite the gains made by observing the Americans, defence needs and sovereignty concerns continuously demanded an expanded RCAF role in the North. In May 1946, a report from the American Standing Sub-committee on the Arctic called into question Canada's sovereignty over undiscovered lands north of its mainland. This stirred the fears of the Canadian government.[25] The report explained that a gap existed in the network of Arctic aviation facilities from Spitsbergen to Greenland and across the "Canadian islands" to Alaska.[26] To fill this gap, the paper suggested American reconnaissance (RECON) flights look for undiscovered islands in the Arctic upon which to establish weather stations.[27] The committee questioned whether the

US recognized Canadian claims to the region north of Prince Patrick Island and west of Grant's Land, and pondered whether the US could claim the newly discovered islands. In short, the report raised questions about Canada's claims in the region.

Reading too much into this document is erroneous. The sub-committee's report, a low-level planning document, carried little political weight in Washington.[28] Still, to a Canadian government already worried about sovereignty, the report only confirmed its worst fears. The Americans wanted to improve their capabilities in the Arctic, and, so it seemed, they would test Canada's sovereignty to do so. Though Canadian diplomats would effectively safeguard Canada's Arctic sovereignty in defence negotiations, sovereignty fears would still lead to an expanded RCAF role.

In January 1946, Cabinet launched a comprehensive mapping programme in the Arctic and concluded that the planes of the RCAF provided the best platform to complete the programme. Given all the American interest and activity in the region, the programme only intensified in the ensuing years. The USAF was not given permission to conduct aerial photography or RECON in the region; if any undiscovered islands were photographed and mapped, it would be by the RCAF. Using Avro Lancasters and Noorduyn Norsemans, the RCAF conducted dozens of photographic flights over the region and established an air photography school that provided special northern training.[29] By 31 March 1947, Canada's Air Force surveyed 335,000 square kilometres (km^2), and planned to complete 550,000 km^2 in the next fiscal year.[30] To accomplish these feats, the airmen had to overcome many challenges.

Aerial photography in the Arctic during the 1940s was a difficult job. The only viable months for this type of operation were May and June, after the snow departed for the most part, and before the ice started to melt to create additional cloud cover. No matter how experienced the crew, in these first years the myriad of lakes, channels, rivers, and islands, coupled with inaccurate charts, made locating one's position and navigating extremely difficult. Facilities proved to be a near-insurmountable obstacle for the missions. Only Whitehorse, Norman Wells, Yellowknife, Churchill, and Frobisher Bay (now Iqaluit) had landing strips capable of handling the large four-engine Lancaster. The acquisition and caching of fuel remained a difficult process. It had to be pre-positioned well in advance, and emergency situations or additional flights could burn enough fuel to disrupt an entire year's programme.[31] In 1950, the photography programme improved when 408 Area Reconnaissance Squadron became the primary Arctic patrol unit, and three of its Lancasters were modified from Mark 10P to Mark 10 AR (Area Reconnaissance) planes, equipped with extra fuel tanks, ten camera systems, and new search radar.[32] It took until 1967, however, to complete the aerial photography programme in the North, capping off a decades-long process. No other government department could have undertaken such a mission at this point in time, and the RCAF stepped in nicely.

Despite the best efforts of the RCAF, however, aerial photography would become one of the major stumbling blocks of the Canadian-American defence relationship in the Arctic during the 1940s. In the fall of 1947, RCAF observers on Operation POLARIS proved their worth again, this time by reporting that the USAAF was performing aerial RECON and photography in the Arctic, in contravention of the defence agreement for the project.[33] Certain Americans regarded air RECON and photography as important enough aspects of the security plan to risk the fragile harmony of the bilateral defence relationship.[34]

The RCAF started to ask questions in September 1947, when Wilf Curtis requested information from the Americans on the reported breach in protocol.[35] Though the Americans defended their actions, the RCAF and senior diplomats continued to investigate the situation, eventually forcing the Americans to correct their mistakes and making them listen to Canadian concerns about sovereignty and national rights. The Chiefs of Staff reminded the Americans of the need to gain the approval of the Canadian government before they engaged in aerial activities over the Arctic, especially on a "regular basis."[36] Clearly, the RCAF did not simply fall in line with their American partners in the Arctic; from low-level observers to the top brass, its servicemen protected their country's interests and sovereignty.

Manning the LORAN Stations

The RCAF activity on the ground in the Arctic also proved helpful in safeguarding Canada's sovereignty and maintaining its control in the Arctic. By the end of 1946, the RCAF started stationing its personnel at LORAN sites and airbases. The LORAN stations, including one at Cambridge Bay, acted as a series of interdependent "lighthouses" that ships or aircraft could use to pinpoint their position through triangulation.[37] By sending out a message to an aircraft from a tower and measuring the time of the echo from that tower with the time of an echo from two to three other stations, an aircraft could determine its exact position using measurements running into the millionths of seconds.[38] The CDC hoped the stations would significantly improve navigation for ships and aircraft operating in the Arctic.

While the scientific and navigation work accomplished by the RCAF through the LORAN programme was important, from the government's perspective the service had a more important role to play protecting Canadian sovereignty at the stations. Ottawa worried constantly that a prolonged American presence at sites like those set up for the LORAN programme would challenge Canada's control in the region. Thus, the agreements worked out between the Canadians and Americans for the LORAN project contained stringent guidelines to protect Canada's sovereignty.[39] Most importantly, at least half of the personnel serving at the stations had to be members of the RCAF, as did the commanding officer.[40] Though the RCAF had a tough time finding enough trained personnel for the mission, it did the best it could, and always provided the officer in charge to ensure effective Canadian control of the region.[41] At Cambridge Bay, the RCAF officer was the eyes and ears of the Canadian government on the ground in the Arctic.

While the Canadians were in command of the stations, technical control remained in the hands of the senior US technical officer. RCAF officers expressed occasional annoyance at visiting American officers who bypassed them and went straight to the American technical officer. According to historian Kenneth Eyre: "This phenomenon may be partially attributable to the fact that visiting officers were usually on a technical inspection and hence their interest would primarily lie with the LORAN operation itself. On the other hand, the blithe assumption by individual American servicemen in the late 1940s and 1950s that the Canadian Arctic was really the American Arctic was a common occurrence in the North."[42] Despite the occasional American indiscretion, which RCAF officers religiously reported, the working relationship at the LORAN sites was usually cooperative and friendly.

By the time the Canadians actually took over the LORAN stations in October 1948, the programme was being phased out. The LORAN method of obtaining fixes of rotation worked well in places further south, but the difficult ionospheric conditions of the Arctic did not allow the stations to send out signals strong enough to determine the exact position of aircraft.[43] By the end of 1948, the stations were practically abandoned save for skeleton crews that performed housekeeping duties. Critics labeled the project a "white elephant" after reports surfaced that it cost Canadian and American taxpayers over 50 million dollars.[44] Although a brilliant idea and despite the RCAF's best efforts, in the end, the LORAN stations simply could not cope with the northern environment.

Command and Control in the North

Another type of navigation system, shore-based aid to navigation (SHORAN), highlighted the difficulty the RCAF had in effectively coordinating and cooperating with all the government departments in the region. In early summer 1947, the Americans requested permission to establish three SHORAN geodetic control stations on Baffin Island.[45] These stations would allow the USAF to establish effective ground control in Greenland in support of their aerial mapping programme of the area. Obviously, these aids to navigation could also be used to bolster Canada's own photographic operation, and on 4 July Curtis acknowledged that the US proposal actually supported the RCAF's own plans.[46]

Later in the month, however, the Department of Mines and Resources (DMR) learned that the Americans planned to send a party of over 100 men to Baffin Island to establish these temporary SHORAN stations, the first anyone in that department heard of the project. An

internal memorandum on the project explained that "the real point… is that this seems to be another case in which the United States authorities are going ahead with an operation on and over Canadian soil for which no prior clearance has been obtained."[47] In reality, the SHORAN programme did not mark an American transgression, but a lack of coordination between Canadian departments. After the DMR threw up the red flag on the project, the RCAF admitted that the Chief of the Air Staff and the Canadian Joint Staff Mission already knew of the American activities.[48] Although the RCAF apologized for not sharing information, this lack of coordination indicated a deeper problem in Canadian defence activities in the Arctic.

In fact, interdepartmental cooperation proved so difficult in the region that by the spring of 1947, Hugh Keenleyside proposed the establishment of a Geographical Bureau to be attached to the DMR,[49] which would assist in the coordination of all government activities—including defence programs—in the North.[50] Eventually, the Bureau evolved into the Advisory Committee on Northern Development, which addressed the communication problem that existed between the different Canadian departments and resulted in interdepartmental misunderstandings and annoyance at the Americans for breaches of conduct they did not actually commit. The RCAF would benefit from this coordinating body.

In 1947, the RCAF also faced the difficult problem of controlling the Arctic airfields. In November, the Chiefs of Staff Committee highlighted the burgeoning number of American-built airstrips in the Arctic as proof of Canada's lack of control. By late 1947, the USAF still operated wartime airfields at Mingan, Fort Chimo (now Kuujjuaq), and Frobisher Bay, and began building more to support the weather and LORAN stations. The USAF also planned to improve the airstrip at Eureka Sound to make it usable all year round by C-47s and to expand the airstrip at Resolute from 6,400 feet to 10,000 feet (1,950 metres to 3,048 metres) in length, making it usable by the heaviest of aircraft.[51] Canadian officials constantly worried about the size of these airfields and American intentions to develop and enlarge them, perhaps to accommodate bombers.[52] They also disliked the idea of American-run bases in the Arctic operating without Canadian supervision. To many, the new American plans seemed excessive.

Upon hearing of the proposed bases, A/V/M Morfee wrote to a USAF colleague that "plans for the development of extensive facilities at Resolute Bay came to me as a complete surprise…. Any development at this point or elsewhere in Canada of the kind and significance mentioned by General [Dale Vincent] Gaffney would, of course, be one for consideration of the highest government level."[53] In the face of this increase in American activity, the Chiefs of Staff concluded, "Unless control is exercised and provided by Canada, the US will just carry on as they please."[54] Control over the airstrips would obviously fall to either the RCAF or the Department of Transport, though neither department immediately stepped up to take responsibility.

The general opinion of the RCAF was that the best policy was to keep the Arctic undeveloped; if the Americans continued to construct numerous landing strips and airfields, they would only establish stepping stones for a would-be invader. Should a hostile force attack the continent by way of the Arctic, a base at Resolute Bay would provide an operating position within 1,500 miles (2,414 km) of any enemy installations situated in Franz Josef Land or Spitsbergen, thus facilitating offensive action.[55] There was also worry about establishing a negative precedent for the situation in the Arctic.[56] Air force officers recognized that if one northern base had all of this potential, any of them could be similarly developed—at great cost to Canada financially and in terms of its sovereignty. In the end, these concerns were overruled. By 1948, the Chiefs of Staff Committee decided to approach the airstrips as joint Canadian-American projects, and in the ensuing years the RCAF got more involved at all of the airbases in the North. In 1950, both countries agreed that the Canadians should take over all of the airstrips.[57] That year, the RCAF took full responsibility for the largest facilities at Resolute Bay and Frobisher.[58] The air force, thus, played a pivotal role in securing Canada's control on the ground in the Arctic.

Working Together in the Arctic

As command and control improved in the Arctic, cooperation between the RCAF and other government departments also continued to develop. Along with the Magnetic Division of the

DMR, the service also launched Operation POLCO, a particularly ambitious project that set out to obtain magnetic observations and fixes at 14 points in the area of the North Magnetic Pole in the hopes of discovering the position of the Pole.[59] Both the pilot and the navigator of the Canso flying boat were decorated for the skills they displayed in flying about the pole, and the program continued with RCAF support in subsequent years. The service also cooperated with the DMR in a geodetic survey of the northern half of Baffin Island.[60] These expeditions embodied the growing cooperation between the RCAF and other departments in the North. Air Force planners learned the valuable lesson that cooperation with civilian departments already engaged in the Arctic could improve operational success.

The RCAF provided a great deal of direct and indirect assistance to other governments in the region. In January 1947, a less ambitious version of the experimental polar flights program was initiated at the Air Navigation School. This program involved two modified Lancasters, and its objective was to provide long-range navigation training with a special emphasis on polar navigation. At the same time, these long-range flights assisted the Canadian Radio Wave Propagation Committee by conducting radio propagation measurements, basically determining how radio waves traveled in the region.[61] This information would assist in the choosing of frequencies, in radio navigation, and in the operation of radar systems. In the early 1950s, working with the Department of Northern Development and Natural Resources, the RCAF organized the evacuation of a starving band of Inuit from Ennadai Lake.[62] The service also started to provide transportation assistance to many of the scientific studies conducted in the Archipelago. Between 1949 and 1951, for instance, the RCAF provided transport to the National Museum of Canada as it worked out of Resolute, Mould Bay, and Alert conducting archaeological and zoological studies, as well as the Northern Insect Survey of the Department of Agriculture.[63]

While the RCAF continued to work well with their American counterparts in the Arctic, minor problems did arise. On 5 March 1952, for instance, an RCAF Lancaster aircraft was carrying out an aerial photography mission off the coast of Baffin Island when Thule airbase contacted the crew and asked under whose authority the operation was undertaken. When the crew responded that the Canadian government had authorized the operation, Thule passed them instructions to cease their activity immediately and report to Thule until proper authority could be granted. Choosing to ignore their radio for a while, the Lancaster crew continued on with its operation. Other RCAF aircrews were shocked when, on several occasions, the USAF-operated base at Frobisher Bay denied them permission to land.[64] The USAF decision to advise Scandinavian Airlines when the company carried out its pioneer flights on the polar route from Edmonton to Thule to Copenhagen also annoyed Canada's airmen.[65] This flight travelled over a large swath of the Canadian North, and RCAF personnel should have been asked to participate.

More seriously, the USAF still occasionally tried to bypass the Canadian government in an attempt to attain permission for northern projects through service channels. In the spring of 1952, the USAF attempted to use service channels to gain permission to land a party on one of the ice islands around Alert. The RCAF, however, ensured that the Americans understood it could not give approval for such an undertaking and pointed them in the government's direction.[66] The service continued to prove unwilling to engage in these types of negotiations and dutifully alerted Ottawa to these attempts. These problems were, for the most part, caused by low-ranking American airmen, and did not reflect the general attitude of Washington or the USAF. Major infractions rarely occurred, and the two services accomplished a great deal pooling their resources and working together.

An Expanded Role for the RCAF

Many of the minor problems between the RCAF and USAF occurred as the former service expanded its role in the North. The service used Churchill, Manitoba, for northern experimental projects, operational training, and search and rescue (SAR) techniques, which, in turn, facilitated more activities in the North. After 1947, there was an increased number of independent Canadian flights in the Arctic, including Operation CANON and several other searches and rescues.[67] The fact that Canada took on SAR responsibility in the Arctic Archipelago was considered an important example of Canada exercising its sovereignty. The service also

increasingly engaged in joint operations with the other branches of the military. It provided transport to the Mobile Striking Force whenever it deployed to the North. During the Royal Canadian Navy's (RCN) cruise to Churchill in the summer of 1948, Lancasters and Consolidated Cansos from 103 Search and Rescue Squadron conducted exercises with the naval task force. These exercises let the RCAF practice shadowing exercises in northern conditions, and allowed Her Majesty's Canadian Ship (HMCS) MAGNIFICENT's fighters to practice intercepting potential attackers.[68] All three services benefitted from this interaction in the North.

Despite this intensification of activity, the RCAF still did little to participate in the air supply of defence activities in the region. Between 1946 and 1949, the Canadian government pursued a policy of gradual acquisition as it attempted to safeguard Canada's sovereignty in the North. The government secured *de jure*, or legal, control over the Arctic islands, and in every defence agreement the Americans accepted Canada's right to regulate activities in the Arctic Archipelago. While the Canadian government continued to scrutinize minor American indiscretions on the ground, like what occurred in Operation POLARIS, the higher levels of the US government consistently respected Canada's rights and interests. Canadian officials, however, recognized that all of the American concessions meant little if Canada could not effectively operate in the Arctic. The government decided that a functional approach towards sovereignty was required that would support their allies' interests, but not to the detriment of Canada's own.

In 1949, Prime Minister St. Laurent launched a policy of re-Canadianizing the Arctic. To ensure its sovereignty, Canada had to improve its capabilities in the region and assume a larger role in defence projects. Sovereignty required that Canada take on more of the transportation responsibilities, establishing an independent transport capability. In the spring of 1949, the Air Services Branch, Department of Mines and Resources, claimed that "the RCAF with their organization and equipment are the most suited to efficiently operate, maintain and supply these bases. In so doing, the Air Force can show the flag continuously, and, equally important, acquire the Arctic experience and knowledge necessary to defence."[69] In the 1940s, the RCAF did not have the ability to participate meaningfully during the construction phase of the Joint Arctic Weather Stations (JAWS) programme because it lacked large transport aircraft. When the weather station at Isachsen was established, for instance, the USAF flew in 84 tons (76 metric tons) of supplies in ten days, and the RCAF contributed nothing.[70] The service, clearly, would have to do better.

The RCAF's upper echelons understood the importance of developing a strong Canadian transport capability in the Arctic. At a meeting of the Chiefs of Staff, Curtis "pointed out that, in the long run, effective Canadian control could be maintained only if Canada provided the necessary air and sea transportation and other facilities essential to the supply, operation and maintenance of Arctic installations."[71] He realized this would mean an increased commitment from the RCAF and would require time for additional personnel to be trained in Arctic operations.[72] The Air Force immediately started to increase the tempo of its transport missions in the area.

As the RCAF prepared to take on more transport responsibilities in the North, it worked carefully on the problem with the other departments in the region. Along with the Department of Transport and several other civilian departments, the RCAF undertook a careful study of the problem of air supply in the Arctic. Before creating a transport plan, the RCAF wanted an interdepartmental plan that showed the division of responsibility and ensured the efficient use of resources.[73] Though the supply of the military bases in the North was the major concern of the Air Force, they planned to assist the other departments as best they could.

In February 1949, the Air Force assumed full responsibility for supplying the remaining northern LORAN stations, though they were in decline and required few supplies.[74] While the RCAF still struggled to participate in the construction phase of northern projects, after the installations were set up and the supplies required dropped dramatically, the RCAF took on a larger role in the airlifts. Armed with new heavy transport aircraft and polar trained crews, in 1950 the RCAF instituted a regular northern supply service out of Montreal, largely achieving the Canadianization of airlift responsibilities for the weather stations, Arctic airbases, and other

installations. For the first time, Canadian aircraft also contributed to the construction of an installation, this time at Alert. Flying out of the American base at Thule, the RCAF and USAF flew in all of the necessary materials.[75] The RCAF had finally achieved an independent transport capability, and this functional role represented a strong assertion of Canada's sovereignty in the Arctic.

The RCAF had come a long way since 1946 and learned many valuable lessons. In that year, Canadian pilots and aircrew first ventured deep into the unknown and uncharted Arctic Archipelago. By 1953, the force was in charge of an ever-growing portion of the air transport to the region, a large-scale photographic operation, and several other surveys and scientific studies. During the years in between, the RCAF slowly embraced an independent role in the Arctic and developed a strong relationship with its key partner in the area, the American military. It also learned how to deal with the unique and challenging operating conditions in the region. When the government placed the added burden of protecting Canada's sovereignty upon the shoulders of the RCAF, it rose to the challenge admirably. This was a period of accomplishment for the Air Force in the Arctic and should be seen as another bright spot in this service's history.

Lessons Learned

What kind of lessons can be drawn from these experiences that are applicable to the situation today? First, the RCAF came to realize the extreme difficulties of operating in the region and understood the need for long-term planning, which is always necessary when working in the Arctic. Second, these past experiences also highlighted the need for close cooperation between the Air Force and the civilian departments already operating in the North. By pooling resources and capabilities with these organizations, the RCAF increased its operational efficiency and accomplished more with fewer of its own resources. At the same time, this cooperation provided otherwise unavailable services and opportunities to the other government departments. Third, history also points to the benefits of close cooperation between Canada and the United States. Together, the USAF and RCAF accomplished far more than either service could have done by acting unilaterally. As the Air Force again returns to the Arctic, long-term planning should be undertaken with the assistance of the other departments involved in the region and with our American allies.

The formative post-war years also point to the types of roles the Air Force should be undertaking in today's Arctic. From the early days of McNaughton's northern training programme, Air Force crews applied their unique skills to national development in the North. The service performed aerial photography, ice RECON, and support and transport operations—all functional roles. While the government appreciated that RCAF aircrews were showing the flag throughout the North, they were also performing the special and vital jobs for which their training made them ideal. In the 1960s and 1970s, these functional jobs, including the supply of stations and bases in the North, were assumed by commercial companies. In turn, the Air Force was given far more symbolic roles, such as surveillance, which were supposed to establish a Canadian presence in the Arctic and thereby bolster Canada's sovereignty. The idea that any increase in military activity in the region strengthens sovereignty is tenuous, however. More flight hours over the Arctic and an improved capability does not equal more sovereignty. As the Air Force develops a reinvigorated role in the 21st century Arctic, its plans should be evaluated according to the functional contributions they can make to Canada's broad array of responsibilities to the region. The functional roles adopted in the 1940s and early 1950s are excellent examples of jobs that meet these responsibilities. These kinds of roles provide the Air Force with a strong foundation for activity in the North, not roles based on a political message of increased presence and sovereignty protection that may prove to be built on "shifting sands."[76] In forming a role for the Air Force in today's Arctic, a model might be found in the early cold war.

Notes

1. Shelagh Grant, *Sovereignty or Security: Government Policy in the Canadian North, 1936–1950* (Vancouver: University of British Columbia [UBC] Press, 1988), 15.

2. "Royal Canadian Air Force Operations in the Arctic Islands," Directorate of History and Heritage (DHH) 75-50 (hereafter cited as RCAF Arctic Islands Ops).

3. Ibid.

4. W. A. Curtis, memorandum to the Chief of the Air Staff (CAS), 10 January 1946, Record Group (RG) 24, Vol. 5368, file HQ S45-9-78A, pt 1.

5. Kenneth Eyre, "Custos Borealis: The Canadian Military in the North" (submitted to UBC Press in 2007).

6. Canada, "Report on the Arctic, Atlantic Division Air Transport Command," Atlantic-Division Air Transport Command, Report on the Arctic, 1946, National Archives and Records Administration (NARA), RG 319, Entry 82 (A1), Box 2975.

7. Eyre.

8. David Beatty, *The Canadian-United States Permanent Joint Board on Defence*, (Ann Arbor: University Microfilms International, 1969), 117.

9. Canada, Extract from the 20th meeting of the CDC, DHH File 112.3M2 (D125).

10. Memorandum by Joint Canadian-United States Military Cooperation Committee, 23 May 1946, Department of External Affairs, Documents on Canadian External Relations (DCER) Vol. 12, 1946, 1615–23.

11. Ibid.

12. Canada, "Cabinet Conclusions," 15 November 1946, DCER, Vol. 12, 1946, 1686–95.

13. Joseph Jockel, *No Boundaries Upstairs* (Vancouver: UBC Press, 1987).

14. W. R. Macbrien, Memorandum to CAS, 23 October 1945, RG 24, Vol. 5368, file HQ S45-9-78A, pt 1.

15. C. A. Davidson to A. I. Summerville, Department of Transport, 10 January 1946, RG 24, Vol. 5368, file, HQ S45-9-78A, pt 1.

16. C. R. Slomon for CAS, 6 February 1946, RG 24, Vol. 5368, file HQ S45-9-78A, pt 1.

17. Memorandum to Assistant Chief of Naval Staff (ACNS) and Chief of Naval Personnel (CNP), Reference – Permanent Joint Board on Defence (PJBD) American Section Letters of 14 May 1946 and 22 May 1946, Library and Archives Canada (LAC), RG 24, Vol. 8152, file NSS 1660-12, pt 1.

18. Senior United States Army Member, PJBD, to Secretary, Canadian Section, PJBD, April 30, 1946, DCER, Vol. 12, 1946, 1541–42.

19. Canada, Memorandum from Secretary, Chiefs of Staff Committee, CDC, 3 June 1946, DCER, Vol. 12, 1946, 1564–65.

20. Canada, "Report on Reconnaissance of the Canadian Archipelago, Made During Flight No. 16, 16–17 August 1946," K. R. Greenway, Liaison Officer, B29 Detachment, Edmonton, B29 Operations, 29 August 1946, RG 24, Vol. 5368, file HQ S45-9-78A, pt 1; another Canadian operation in June 1946 also travelled throughout the Western Arctic in several small aircraft, see RCAF Ops in the Arctic Islands.

21. The Canadian government also approved the establishment of the Joint Services Experimental Testing Station at Fort Churchill for the winter of 1946–1947.

22. RCAF Arctic Islands Ops.

23. Senior United States Army Member, PJBD, to Secretary, Canadian Section, PJBD, April 30, 1946, DCER, Vol. 12, 1946, 1541–42.

24. RCAF Arctic Islands Ops.

25. Canada, Memorandum from Head, Third Political Division Legal Division, Sovereignty in the Arctic, 6 May 1946, DCER, Vol. 12, 1946, 1545–46. f.

26. Arctic Aviation Development Program for the United States Recommended by the Standing Subcommittee on the Arctic, 6 November 1945, NARA, RG 330, Entry 341A, Box 451, Folder 1, File "Geophysics and Geography."

27. Ibid.

28. David Bercuson, "Review of Sovereignty or Security? Government Policy in the Canadian North, 1936–1950," *The Canadian Historical Review* 70 (December 1989): 587; and P. W. Lackenbauer, "Right and Honourable: Mackenzie King, Canadian-American Bilateral Relations, and Canadian Sovereignty in the Northwest, 1943-1948," in *Mackenzie King: Citizenship and Community* eds. John English, Kenneth McLaughlin, and P. W. Lackenbauer (Toronto: Robin Brass Studio, 2002), 238, fn 51.

29. Sean M. Maloney, "Canada's Arctic Sky Spies: The Director's Cut," *Canadian Military Journal* (2008-08-27), http://www.journal.forces.gc.ca/vo9/no1/11-maloney-eng.asp (accessed April 4, 2011). Three squadrons were involved in photo-mapping, the 408 and 414 Squadrons out of RCAF Station Rockcliffe, flying Lancaster Bombers, and 413 Squadron.

30. Canada, Department of National Defence (DND), "Report of the Department of National Defence for the Fiscal Year Ending March 31, 1947" (Ottawa, Queen's Printer, 1947), 45 (hereafter cited as DND 1947).

31. Maloney. For instance, the search for a lost commercial pilot out of Whitehorse in 1951 used up 75,000 gallons (284,000 litres) of gasoline.

32. Maloney.

33. DND 1947, 45. The reports of these observers clearly indicated all of the US activities, including the fact that the Americans were taking pictures during their flights. It took quite a while for these reports, such as "Operation POLARIS" 46/47, DHH 80-574, to trigger alarm within the Canadian military.

34. Memorandum for Joint Chiefs of Staff from PJBD on Canada-United States Military Cooperation, NARA, RG 218, Entry 943011, Box 018, file CCS 092 (9-10-45), Section 4.

35. Guy Henry, Memorandum for Commanding General Army Air Force, September 16, 1947, NARA, RG 333, PJBD, Entry 17-A, Box 3, file "Top Secret General Correspondence, 1941–1956."

36. Canada, Memorandum from Chiefs of Staff Committee to the Cabinet Defence Committee, 7 February 1947, DCER, Vol. 14, 1948, 1560.

37. The Americans and Canadians decided to establish the master LORAN station at Kittigaziut at the mouth of the Mackenzie River, the slave station at Cambridge Bay, and the monitoring station at Sawmill Bay. Canada, "Report on the Low Frequency LORAN Program," Privy Council Office, 5 August 1947, DHH 112.3m2 (565). Although all stations were initially planned for the Arctic Coast, a suitable site could not be found for the monitoring station.

38. Canada, Secretary of State for External Affairs to Canadian Ambassador, Washington, 28 June 1950, LAC, RG 25, Vol. 3675, file 5138-40, pt. 2; Canada, Memorandum from Cabinet Defence Committee to Cabinet, 17 February 1947, DCER Vol. 13, 1947, 1487–88.

39. The Americans and Canadians decided to establish the master LORAN station at Kittigaziut at the mouth of the Mackenzie River, the slave station at Cambridge Bay, and the monitoring station at Sawmill Bay.

40. Canada, Extract from Minutes of Meeting of CDC, 2 April 1947, DCER Volume 13, 1947, 1490–91. Interestingly, to the Canadian public the LORAN program was showcased as a Department of Transport-led initiative, to avoid complaints about the militarization of the North and the involvements of the USAF. The RCAF did its best to play along.

41. L. B. Pearson, Secretary of State for External Affairs, Letter to Ray Atherton, US Ambassador, 22 December 1947, LAC, RG 25, Vol. 3841, file 9061-A-40, pt. 2.; D. M. Johnson, Memorandum to Mr. Rae, 25 April 1947, LAC, RG 25, vol. 3841, file 9061-A-40, pt. 2.

42. Eyre.

43. L. B. Pearson, Secretary of State for External Affairs, to Canadian Ambassador, Washington, 28 June 1950, LAC, RG 25, Vol. 3675, file 5138-40, pt. 2.

44. Eyre.

45. Lieutenant-Colonel (LCol) Arnold, War Plans Division, Memorandum to LCol J. C. Tison, Air Corp, LAC, RG 24, Vol. 5347, file HQS 34-79-5.

46. Memorandum from A/V/M W. A. Curtis, 4 July 1947, LAC, RG 24, Vol. 5347, file HQS 34-79-5.

47. Canada, Department of Mines and Resources to Pearson, 4 July 1947, LAC, RG 24, Vol. 5347, file HQS 34-79-5.

48. S. W. Coleman to S. F. Rae, Secretary PJBD, 11 July 1947, LAC, RG 24, Vol. 5347, file HQS 34-79-5.

49. Grant, 221.

50. Albert Heeney, a supporter of the Bureau, claimed, "I am fearful lest the old desire to build up within individual services may result in half-hearted cooperation and consequent loss of efficiency in every way…. I am quite sure that there will be a good deal more support from the government for the development of a geographic bureau in Mines and Resources than in any comparable development in National Defence." Heeney to Gill, 6 May 1947, LAC, RG 2/18, Vol. 70, file D-17-3.

51. Colonel (Col) Deerwester to Morfee, 22 October 1947, LAC, RG 24, Vol. 6169, file S-15-24-56, pt. 1.

52. W. A. Curtis to Chiefs of Staff Committee, 10 December 1947, LAC, RG 24, Vol. 6169, file S-15-24-56, pt. 1.

53. Morfee to Deerwester, 30 October 1947, LAC, RG 24, Vol. 6169, file S-15-24-56, pt. 1; Gaffney was Deputy Assistant Chief of Air Staff, Operations, Arctic Affairs, HQ USAFF, at this time. See U.S. Air Force Fact Sheet, Gaffney, Dale Vincent Papers, Air Force Historical Research Agency. Available online at http://www.afhra.af.mil/factsheets/factsheet.asp?id=11141 (accessed December 20, 2011).

54. Canada, Memorandum from Secretary, Chiefs of Staff Committee to Secretary to the Cabinet, 13 November 1947, DCER, Volume 13, 1947, 1516–19.

55. Canada, Extracts from Minutes of 410th Meeting Chiefs of Staff, 7 January 1948, DHH 112-009, File D44 (hereafter cited as Minutes of 410th Meeting).

56. Canada, Chiefs of Staff Committee to the CDC, re: Arctic Air Facilities – Resolute Bay, LAC, RG 24, vol. 6169, file S-15-24-56, pt.1.

57. C. C. Eberts, Defence Liaison Division, to Mr. Heeney, 19 December 1949, LAC, RG 25, Vol. 6298, file 9061-A-40, pt. 3.1.

58. David Bercuson, "Continental Defence and Arctic Sovereignty, 1945–1950: Solving the Canadian Dilemma," in *The Cold War and Defence*, eds. Keith Neilson and Ronald Haycock (New York: Praeger Press, 1990), 166.

59. RCAF, Directorate of Public Relations, Release No. 7218.

60. Canada, Note from Privy Office Clerk to Clerk of the Privy Office, 29 December 1952, Extract from Attached Memorandum, 29 December 1952, DCER, Vol. 18, 1951, 1195–96 (hereafter cited as Privy Office Note).

61. W. A. Curtis to CAS, 22 January 1947, RG 24, Vol. 5368 File HQ S45-9-78A pt 2.

62. Eyre.

63. Privy Office Note, 1195–96.

64. Ibid., 1194.

65. Ibid., 1195–96.

66. Ibid.

67. RCAF Arctic Islands Ops.

68. Canada, "Report – RCAF Participation in RCN Task Force Northern Cruise," DHH RCN File ACC 1650-26 (28 October 1948).

69. Canada, Memorandum for the Air Services Branch, Department of Transport to the Advisory Committee on Northern Development (ACND), 24 August 1949, DCER, Vol. 15, 1949, 1480–81.

70. Bercuson, 165. Also, in 1949 the Americans complained for the first time about the lack of Canadian assistance in the transport of supplies to the North. Due to the demands of the Berlin airlift, the USAF was unable to carry supplies to Alert, the proposed site for a new weather station on the northern tip of Ellesmere Island. As the Soviets blockaded Berlin, the US needed to use its resources, including most of its heavy transport aircraft, to keep the city supplied.

71. Minutes of 410th Meeting.

72. Ibid.

73. Canada, Extract from the Fourth Meeting of the Advisory Committee on Northern Development, 9 March 1949, DHH 112-3M2, File D128.

74. Canada, Memorandum to Advisory Committee on Northern Development, March 2, 1949, "Re-Canadianization of Northern Canada," DCER, Vol. 15, 1949, 1474.

75. Eyre.

76. For greater insight into the defence polices in the North during the 1970s, see Whitney Lackenbauer and Peter Kikkert, *The Canadian Forces and Arctic Sovereignty: Debating Roles, Interests, and Requirements, 1968–1974* (Waterloo, ON: Laurier Centre for Military Strategic and Disarmament Studies, 2010); and their chapter "Building on 'Shifting Sands': The Canadian Armed Forces, Sovereignty, and the Arctic, 1968-72" in P. W. Lackenbauer, ed., *Canada and Arctic Sovereignty and Security: Historical Perspectives* (Calgary: Centre for Military and Strategic Studies, 2011), 283–308.

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Chapter 3

Operation CANON: A Case Study of Early RCAF Arctic Search and Rescue Capabilities

Sandy Babcock

Search and rescue (SAR), as a formal military discipline, has its roots in the Britain of the Second World War (WWII), and SAR as such soon spread to Canada. With the geographic mass of this country, the widely dispersed population, and the range of climatic conditions, Canadian SAR activities were always going to prove challenging. This is all the more evident in the Arctic, where the distances involved, scarcity of medical facilities, shortage of landing strips, navigational difficulties caused by the magnetic North Pole, and one of the most austere weather environments in the world combine to make Arctic SAR complex and dangerous. These considerations posed even greater problems before some of the technological advances made over the past 50 years, and at a time when detailed maps of the entire Canadian North did not exist. This article examines an early SAR mission from 1947 that took an extraordinarily long time to finish and required a monumental effort from those involved. Operation CANON provides a compelling case study into the unique challenges of Arctic SAR operations.

Search and Rescue within Canada

Airborne SAR has a rich history in Canada. It can be traced from the first Canadian use of an aircraft to transport an injured person in August 1920 from Camp Borden to Toronto for medical treatment,[1] to the heroic jump in October 1992 to rescue the survivors from the Boxtop 22 crash near Alert,[2] up to today. While the Arctic poses unique problems for SAR, various technological advances have helped facilitate some recent rescue missions. For instance, in January 2010, an Inuk hunting near Resolute, Nunavut, became stranded on an ice floe but was able to use his satellite telephone to report his dilemma. The Air Force was able to drop food and shelter until weather conditions allowed for rescue by a long-range, rotary-wing aircraft capable of landing almost anywhere.[3] Such technological assistance has not always been available.

The formal association of SAR with the Air Force dates back to 1942, when, as part of Canada's war effort, an Air Sea Rescue Organization was established similar to that founded in the United Kingdom during the Battle for Britain. One of the civilian-run schools established by the British Commonwealth Air Training Plan, No. 2 Air Observer School in Edmonton, had been involved in search efforts for downed aircraft. The head of the school, Wilfred (Wop) May had participated in mercy flights on his own and decided to form a team of civilian volunteers to parachute into crash sites to provide medical care. May and those involved soon realized that specialized training and equipment was needed in order to properly do the job, and May forwarded a proposal to Royal Canadian Air Force (RCAF) Headquarters (HQ) to integrate this capability into the Air Force. North West Air Command (NWAC) was established in June 1944, and as part of the creation of this new formation, authority was provided to establish a military para-rescue capability. Subsequently, NWAC developed a training syllabus that emphasized parachute jumping, bush lore, survival skills, and mountain climbing, as well as medical training and maintenance of specialized equipment.[4]

That same year, the federal government created the Interdepartmental Committee on Search and Rescue, chaired by the Royal Canadian Mounted Police (RCMP). Officials soon realized that SAR would be better placed under the military, and in 1946 the RCAF took over leadership of this committee. When Canada committed to the International Civil Aviation Organization in early 1946 to accept the responsibility for SAR in international airspace over Canadian territory and adjacent ocean areas, officials recognized the requirement for permanent rescue coordination centres (RCCs). As part of the RCAF's ongoing reorganization, and with the release of Plan E in February 1947, RCCs were created in Halifax, Rockcliffe, Winnipeg, Edmonton, and Vancouver. SAR has been a part of the Air Force's mandate ever since.[5] This capability has also come to be accepted as an expression of sovereignty, as the government extended support and services across all Canadian territory.

SAR missions have resulted in numerous displays of incredible courage and perseverance. The Boxtop 22 rescue mission was the most decorated peacetime event in Canadian military history, resulting in one Meritorious Service Cross, 18 Meritorious Service Medals and 14 Chief of the Defence Staff Commendations. An earlier rescue showed the difficulties of operating in the Arctic and amply demonstrated the ingenuity and perseverance of those involved in SAR in the Canadian Far North. This article focuses on the story of Operation CANON, one of the longest rescue missions in Canadian history.

Canon John Turner

The SAR mission at the centre of this case study has its roots in the story of missionary work in the Canadian Arctic. The Church Missionary Society, founded in England in 1799, is an evangelical group from the Church of England with missions in Africa, Asia, Europe, and the Middle East. As early as 1820, the Church Missionary Society was active in the Canadian Arctic, ultimately providing services from Fort Chimo, Ungava, Quebec, to several sites along south and southwest Baffin Island. In 1915, the Church Missionary Society withdrew from the Arctic, leaving it to the Canadian Church to provide pastoral services to the Inuit.[6]

In 1922, concern over the introduction of liberal ideas within the Church Missionary Society caused a splinter group to form the Bible Churchmen's Missionary Society, which held more conservative views yet remained faithful to the Church of England.[7] The first missionary from this group was Archdeacon Mackay of Saskatchewan, who ministered to the Inuit population. Meanwhile, the Canadian Churches had not stepped forward, and ministering to the Inuit of Baffin Island region had lapsed. This led to a call in 1925 from Bishop Anderson of Moosonee for the newly-formed Bible Churchmen's Missionary Society to provide services to the area. He also advocated increasing the area covered to include more northerly portions of Baffin Island.[8] In 1926, efforts to recruit additional missionaries in England led to two brothers joining, Arthur and John Turner, both of whom were to lead missions in Canada's North, providing pastoral services to the indigenous people.[9]

John Hudspith Turner, born 14 July 1905, was the youngest of three sons, whose father died before John's birth. Raised in his maternal grandparents' house,[10] John grew up with a love of the outdoors and sports, and in time, had a calling for the ministry.[11] He combined the three before his 1929 departure for Canada, riding 300 miles (483 kilometres [km]) by bicycle, camping under bed sheets along the way, to attend a religious convention.[12] This willingness to travel in support of his religious convictions became a hallmark of John Turner's character.

In 1928, Reverend Arthur Turner departed England to establish a mission at Pangnirtung, Baffin Island, followed a year later by his brother John, who helped set up what was then the most northerly mission in Canada, also on Baffin Island, at Pond Inlet, over 800 km north of the Arctic Circle. A nearby community, Arctic Bay, would also be served by this mission. John Turner was to fully embrace living in the Arctic and working with the Inuit. Over time he acquired Inuit names, first *Mikeneksak*, meaning "the smaller one," referencing his shorter stature in comparison with a second missionary working with him, Harold Duncan.[13] Later, he became known as *Ayogesueye Mikeneksak*, meaning "the smaller teacher" because of his tireless efforts to bring enlightenment to the Inuit people. Over the next 18 years, Turner was devoted to his ministry, learning the native language sufficiently to translate the Old Testament into Inuktitut and to revise earlier translations of the New Testament.[14] He also spent significant time spreading the Gospel throughout his corner of the Arctic, with annual sledge trips from 1934 to 1947 totalling over 35,000 km. During the winter of 1941–42 alone, he covered around 6,100 km by sledge,[15] which easily exceeds the distance between Canada's Atlantic and Pacific coastlines. It is no exaggeration to say that John Turner became adept at living and operating in one of the least hospitable regions of the world. In 1937, Turner established a missionary post in Moffet Inlet, a desolate and deserted location about 150 km south of Pond Inlet, where he provided services to Inuit passing through or hunting in this isolated area. His dedication was recognized in 1938 with the award of the Coronation Medal for his Arctic service, and in 1939 he was promoted to Canon by the Diocese of the Arctic.[16] An indication of Turner's successful ministry can be found in a 1946 statement to a Montreal newspaper by the Catholic bishop responsible

for Baffin Island, who observed that, despite the presence of Catholic missionaries in Arctic Bay since 1929, there had not been a single baptism of an Inuit in good health amongst the 350 residents. As explanation, this bishop indicated that "it is not superfluous to note that a protestant missionary lives here."[17]

During a furlough in England in 1939, Turner met Joan Miriam Hobart, and following a courtship from afar for over five years, Joan travelled in 1944 to Pond Inlet on Baffin Island, where they married. A year later, they moved to Moffet Inlet with a young daughter, and another daughter quickly followed.[18] This inlet was over 100 km from the nearest settlement and the Turners were the sole full-time residents of the area. Inuit travelling through or hunting nearby were always welcomed guests at the small two-room mission house, which measured only 3.35 by 7.3 metres (m). By late September 1947, Joan was entering the third trimester of another pregnancy.

Wednesday, 24 September 1947, began like many other days for the Turners. Two Inuit girls, one of whom was Rebecca Dahneckee, while visiting the mission, mentioned seeing a seal nearby, and John Turner set off with his rifle. Returning later in the morning from his unsuccessful hunt, he noticed one of the Inuit girls struggling towards the mission with a pail of ice, which was used to provide fresh water. He slung his rifle under his left arm, took the pail, and while he was standing at the top step at the mission's door, the rifle accidentally discharged. Since the rifle was pointing upwards, a .22 round hit his upper lip, went through his nasal cavity and lodged near his brain. He also injured his spine while falling from the steps.[19]

Although called the "little teacher," John Turner was still a large man—over 182 centimetres (cm) tall and weighing 105 kilograms (kg).[20] His wife, with assistance, was able to move her unconscious husband by slipping a blanket under him and dragging him into the house, where he was made as comfortable as possible on the floor. Joan was a registered nurse, but this head injury was beyond her experience, and the nearest doctor was hundreds of kilometres away. Especially in view of their extreme isolation, help was obviously needed. A visiting adult Inuit hunter, David Tongalok, volunteered to use the mission's powerboat to travel to Arctic Bay, where the nearest radio was located, at the Hudson's Bay Trading Post. Tongalok was unfamiliar with this boat and had to wait until the weather calmed down, which finally happened around 7:00 p.m. John Cormack, the trading post manager, arrived four days later and indicated that he had called the Department of Health and Welfare in Ottawa, and Offices of the Diocese of the Arctic in Toronto for assistance. He then helped to make a bed for the injured John Turner, who was too heavy to move into the loft bedroom. Cormack and Joan Turner, with the help of the Inuit in the area, set about caring for the injured missionary and waited for help to arrive.[21] Finally, on 30 September, now six days after the accident, the Department of Health and Welfare contacted the Department of National Defence for assistance. It was at this point that the RCAF and Canadian Army became involved in the rescue that became known as Operation CANON.

Operation CANON

Upon receiving notification of the accident, the RCAF and Canadian Army formed an ad hoc rescue team and began planning the operation from Winnipeg. To lead the mission, Royal 22e Régiment Captain (Capt) Lionel Guy D'Artois was selected from the nearby Canadian Joint Air Training Centre in Rivers, Manitoba. Hailing from Richmond, Quebec, D'Artois was described as tough and resourceful, attributes that soon would be called upon. His wartime service included parachuting into occupied France to work with the resistance, for which he was awarded the Distinguished Service Order. A doctor, Captain Ross Warrington Willougby, also from Rivers, was attached to the rescue team, as were two communicators, Sergeant (Sgt) William Wallace Judd and Sgt Clifford Cook.[22] From Ottawa, Colonel Graham Rowley, who had travelled across the Arctic in 1936 and had met John Turner, helped with the planning.

An immediate problem for the rescue team was that Moffet Inlet was not identified on any of the available maps. Rowley knew that Reverend Maurice Flint, then living in Toronto, had previously been a missionary in the area. After Flint was located, he travelled to Ottawa to provide assistance and was soon despatched to Winnipeg to provide hand-drawn maps, a briefing on the environment, and some photographs of the area.[23] From Flint's knowledge and the photographs,

it was soon evident that the Moffet Inlet mission was near the base of a steep, 180-m cliff, and that the rough terrain made landing an aircraft nearby impossible. The rescue team would have to parachute in.[24]

On October 2, now eight days after the accident, an RCAF Dakota 270, piloted by Flight Officer Robert Race, took off with the team and supplies from Winnipeg. As a testament to the lack of readiness for the military to conduct such SAR missions in the Far North at this time, during an overnight stop at Fort Churchill, the team drew additional winter clothing from the supply section.[25] The aircraft was also switched for a Dakota 969, nicknamed the *Snowbird*, which was fitted with long-range aid to navigation (LORAN) equipment. The communicators made good use of this time to liaise with a local Department of Transport representative and a Fort Churchill Signals Officer, to coordinate a communications plan (i.e., call signs, frequencies).[26] On October 3, the next leg of the flight took them to Coral Harbour on Southampton Island, before the final approach was made to Moffet Inlet on October 4.

Navigational aids for flying in the Arctic were in their infancy at this time, since the magnetic North Pole made magnetic compasses worthless. LORAN helped with this, but its operations were affected by a range of factors, including the existence and location of transmitting stations, time of day, and weather. Operating from hand-drawn maps that were not to scale, over a snow-swept landscape that made geographic features look alike, the challenge of finding the small mission house in foggy, overcast weather conditions was no easy matter. After circling for almost an hour over what was thought to be Moffet Inlet, conditions cleared enough for the target to be sighted. But, since it was now 11 days since Canon Turner had been shot in the head, and over a week since the last communication with the Hudson Bay Trading Post, the rescuers had no way of knowing whether they were in time to be of any help. A note was dropped along with two panels, asking that one panel be laid out if Turner was still alive and two panels if not. They soon got their answer: a single panel was stretched out for them to see.[27] Reverend Flint later noted that the *Daily Light on the Daily Path*, a publication that provides daily devotional quotations, happened to reference I Chronicles 12:21 for October 4: "*And they helped David… for they were all mighty men of valour.*"[28] D'Artois, Willoughby, Judd, and Cook prepared to parachute into the Arctic.

The drop zone had to be carefully selected. The mission was on a small, 65-metre-wide spit of land, surrounded by freezing salt water. The steep cliff behind the mission and the rocky terrain made it hazardous for the team to try landing close by. The selected area for the landing was several kilometres (km) away, on the plateau above the mission, and the drop of the men and over a metric ton of supplies was carried out successfully. Although the team had a large radio weighing several hundred kg with them to communicate with the outside world, a small No. 58 radio carried by Sgt Judd allowed them to contact the aircraft immediately to provide feedback that the landing had gone well. Leaving most of their supplies behind until a situational assessment could be made, the team began the two-and-a-half-hour journey over rough terrain to the mission.[29] Meanwhile, the aircraft left the scene to embark on its return flight. The combination of the distance to and from Moffet Inlet, the weight of the passengers and supplies, the difficulty in finding the mission house, and the length of time spent over the drop zone meant that the *Snowbird* had used most of its fuel by the time it returned to Coral Harbour eight hours and fifty minutes after departure. With insufficient fuel to reach an alternative landing site, Capt Race was compelled to land in poor weather conditions, with high gusting winds, and a ceiling of less than 60 m.[30] Over the next several days, attempts to return to Moffet Inlet by the *Snowbird* were frustrated by poor weather, including winds that gusted up to 125 km per hour.

Upon arrival at the mission, Capt Willoughby performed a medical examination of Canon Turner. He found that the missionary's left side was paralysed and his back covered with a large, gangrenous bed sore. A treatment regime of penicillin every three hours was set up, and care was provided for the bed sores. The routine set up for the remainder of the rescue was for Capt Willoughby, assisted by Mrs. Turner, to provide the medical care during the day, and the doctor taking on the responsibility for the treatment during the night. In addition to providing help with the care of her husband, the pregnant Joan Turner also had to be a mother for her two

daughters, and to help feed the rescue team and the various Inuit who provided assistance. The young Inuit girl Rebecca helped out where she could.[31]

On October 5, the day after arriving, the team returned to the landing site to gather their scattered equipment and begin moving it to the mission. The large No. 52 radio set, weighing more than 200 kg, had been damaged in the drop and was found to be inoperable. A tent was set up at the landing site and the two communicators worked on the set for the next couple of days, without success.[32] Concurrently, and on the recommendation of John Cormack, the decision was made to move the injured man by boat approximately 150 km to Arctic Bay, where better medical facilities and accommodations were available. On October 7 and 8, rough weather conditions prevented the attempted boat trip. Also on the 8th, the RCAF Dakota returned to circle the area and contact was made through the small No. 58 radio set. An update on the situation was provided and the requirement for a replacement radio was identified.

On October 9, two boats were prepared and Canon Turner was readied for the trip. Finally, the next day, the weather improved and the patient was loaded onto a boat. The presence of thin ice prevented the boats from reaching the shoreline, thereby requiring the rescue team to wade into freezing water while carrying the injured missionary. As they set off, the weather again turned for the worse. The thin layer of ice on the water abated after about 3 km, but other problems began to mount. The boats began taking on water and the engine of the boat carrying Turner failed, which caused it to drift close to an iceberg. Sgt Judd was able to re-start the engine temporarily, but the continued bad weather and poor progress led to a decision to anchor overnight in a small inlet for protection. Calm weather conditions during the night allowed the ice on top of the water to thicken, resulting in concerns that Turner's boat would be trapped and eventually crushed. It was only through careful manoeuvring of the second boat by Capt D'Artois and Mr. Cormack that the Turner boat was towed to safety. The long exposure to the elements was hard on the injured man, and there was no indication that weather conditions were going to improve sufficiently to allow the journey to Arctic Bay to be completed. In disappointment, the team made the decision to return to the mission on October 11.[33] Cormack later struck out on his own for Arctic Bay.

John Turner's condition had continued to deteriorate, and on October 12, Capt Willoughby determined that some gangrenous flesh had to be removed. He operated on the missionary, taking away a 5 by 12-cm chunk of flesh. Although anaesthetic could not be used, Turner "displayed remarkable courage and stood up well under the ordeal."[34]

On October 14, Capt D'Artois decided to have the damaged radio moved to the mission site. Given its significant weight and the height of the cliff, this proved to be a difficult task, especially since the last portion of the descent was made in the dark during a blizzard. But D'Artois and Sgts Judd and Cook proved up to the task. Further unsuccessful attempts were made on October 15 to repair the radio, which led to a request for a replacement during a re-supply drop from the returning aircraft, which took place the next day.[35] Given the difficulty in moving the supplies from the initial site, Race and the *Snowbird* were asked to use a new drop zone next to the mission. This site proved less than ideal for the aircrew. Because of the steep cliff and the narrowness of the shoreline, the Dakota had to fly parallel to the cliff at a low altitude and then bank to starboard to avoid another cliff. The aircrew had only a small window of opportunity over the target site, necessitating Race to make a number of passes for multiple drops. More than another metric ton was dropped by parachute, although one large box with radio parts jammed in the door and could not be delivered on this mission. All other supplies were delivered on target and undamaged except the first drop, which landed about 25 m offshore and broke through the ice. This contained the replacement radio, which was damaged by the freezing water.[36] Judd and Cook retrieved it and proceeded to make improvised repairs, using parts from the damaged radios and the small No. 58 set. They were finally able to establish contact with the outside world on October 18, two full weeks after their arrival.[37]

It was now three weeks since John Turner had been injured. Since word had first been released about the accident, people across Canada had been following the story with interest. For

instance, the *Winnipeg Free Press* ran seven front-page articles over a ten-day period.[38] Radio operators across the North had been awaiting news from Moffet Inlet, making the establishment of radio communications much anticipated.[39]

Canon Turner remained aware and lucid throughout his rescue, normally remaining positive although in great pain. His will to live proved strong, as he battled to recover. He provided assistance to the rescuers by serving as translator with the Inuit and passing on details about the geography of the area. He also continued his ministry, praying with visitors and well-wishers.[40]

After the failed boat trip, the evacuation of Canon Turner had to be completed by aircraft. On October 18, Capt D'Artois set off on a long, arduous search for an appropriate place to land a Dakota. In an ever-expanding search pattern radiating out from the mission, he travelled hundreds of kilometres by foot, as well as some additional distance by dog sled, in an attempt to find a good location. At times, he was stranded outdoors overnight by weather conditions. One time, in the hope that the sea water was freezing hard enough to take the weight of an aircraft, he ventured out onto the inlet and ended up breaking through the ice, from which he was rescued by an Inuit boy accompanying him. Eventually, as the weather got colder and the smaller lakes in the area started to freeze, D'Artois focused his search to the south of the mission. On November 3, he found a lake suitable for a landing strip, located almost 40 km away. He camped on the site for 11 days, preparing it and collecting weather data to help the aircraft landing. During this period, a storm wrecked his tent and he had to spend two days curled up in his sleeping bag without light or heat, as the weather prevented the Inuit from providing him with supplies. Upon returning to the mission on November 13, Capt D'Artois radioed the information about the landing site and prepared to move the wounded missionary and the others in the party.[41] During this period, a third supply drop had taken place without incident. Amongst the supplies was a stretcher to help with the evacuation of Canon Turner.

Flight Officer Race attempted to fly the *Snowbird* from Coral Harbour between November 13–16, but blizzard conditions kept him on the ground. On November 17, he was able to take off, but poor weather caused him to turn back before reaching Moffet Inlet. Deterioration of the Coral Harbour runway would not allow its usage on the 18th, and bad weather conditions returned again on the 19th and 20th. It was not until the 21st that he was able to try again, and successfully made the landing on the improvised landing strip.[42] Turner was bundled onto a sledge and transported to the landing strip, along with his family and Rebecca Dahneckee, who continued to provide care for the children and to help Joan Turner. Between the landing of the aircraft at 12:22 p.m. and the arrival of Canon Turner at 6:00 p.m., concern about the changing weather caused some delay in the return voyage. Finally, at 22:39 p.m., the now renamed *Blizzard Belle* was able to take-off and proceeded to Coral Harbour, where it landed more than four hours later. After spending the night there, the Turners and the rescue party departed at 11:30 a.m., November 22, for Winnipeg, landing at 6:15 p.m., where all received a large welcome.[43] From the time of Turner's injury until his arrival in Manitoba, 60 days had passed, making this one of the longest rescue missions in Canadian history.

John Turner was transferred immediately by ambulance to a Winnipeg hospital, where he received the best care possible. But the damage done by the bullet and his weakened condition proved impossible to overcome. In addition to the development of meningitis, an attending doctor suggested that a case of the hiccoughs acquired during Turner's hospital stay aggravated his already weakened condition. Still the subject of cross-Canada headlines, Canon Turner's health continued to deteriorate, and he passed away on 8 December 1947.[44]

Postscript

Following Turner's death, the Canadian public continued to have an interest in Operation CANON and the welfare of the family. According to Sgt Judd, "There aren't many men up to the calibre of Canon Turner, and I don't think I'd be wrong in saying that he left his heart behind him."[45] There was a successful fund-raising campaign across Canada, which led to some financial support being provided for the family and for missionary work in the Arctic.[46] Soon after her husband's death and burial, Joan Turner went back to England to stay with her parents.[47] On

December 21, she gave birth to another daughter, whom she named Faith. Joan later returned to Canada, where her work included a stint at a students' residence in Iqaluit. She did not return to the Arctic Bay area and the nearby Pond Inlet for any length of time until September 1989, when she was involved in unveiling a plaque commemorating her husband. In a remarkable coincidence, her daughter Faith was then head nurse in Pond Inlet.[48]

Rebecca Dahneckee had accompanied Joan to England to continue to help with the children.[49] She became homesick, and the Canadian government ensured that she was returned home.[50] In June 1948, she went back to the Arctic in the company of John Turner's brother, Arthur, who was returning to his mission in Pangnirtung following a sabbatical at home in England.[51] Arthur remained a missionary on Baffin Island until his own death in 1953.[52] Arthur's daughter, Jeanie, also became a nurse and worked in Pangnirtung in the 1960s before returning to England. She is currently writing a book about the experiences of her family on missionary service in the Arctic, which will be published by Crosslinks,[53] the name assumed by the Bible Churchmen's Missionary Society in 1992. Crosslinks continues to support missionary work, mainly in Africa. After Arthur Turner's death, this Society did not send any more missionaries to the Canadian Arctic. Canadian churches now provide spiritual guidance to the Inuit people, with religious training being provided for many at the Arthur Turner Training School in Pangnirtung, which opened in 1970.[54]

Brooke Claxton, the Minister of National Defence of the time, initially recommended every participant in the mission for gallantry, including four Air Force Crosses and three British Empire Medals. The Canadian Army resisted this, and by December 1947, expressed support for George Medals for Capt D'Artois and Flight Officer Race, and commendations for the remaining participants. Claxton persisted and the recommendations for 11 awards were forwarded through a sceptical Governor General, Field Marshal Alexander, to King George VI. The King decided against endorsing all of these awards and indicated a preference for the two George Medals to be reduced to an Air Force Cross and a Member, Order of the British Empire (MBE). In early March 1948, Claxton agreed to this, but soon thereafter changed his mind and decided to make another attempt to have the originally recommended 11 awards bestowed. In May, while visiting London, the Governor General discussed the case with King George VI, who pointed out his role in maintaining a balance and standard in awarding decorations across the Commonwealth. The King expressed concern that in the event of granting all the awards being sought, he would later be subjected to demands from the other Dominions for similar recognition. Moreover, it was thought that the widespread distribution of awards would lower their value. As a compromise, he advocated the award of six decorations, including two George Medals, and five Commendations. How these were to be distributed would be left to the discretion of Canadian authorities. On 29 June 1948, Claxton accepted this proposal to avoid further embarrassment to the King.[55]

Capt D'Artois' inspirational leadership was appropriately recognized with the George Medal. The pilot of the *Blizzard Belle*, Flight Officer Robert Race, also received the George Medal, for his four return trips to the Moffet Inlet area in the face of foul weather and with minimal navigational aids. Capt Willoughby was inducted as a member of the Order of the British Empire. Flying Officer Clifford McMillan, the navigator on the Dakota, received the Air Force Cross. Sgt Cook was presented with the British Empire Medal. Corporal James Paterson, the flight engineer on the *Blizzard Belle*, was given the Air Force Medal. Sgt Judd got the King's Commendation for Brave Conduct, and four other aircraft crew received King's Commendation for Valuable Services in the Air.

Reverend Maurice Flint, who provided the hand-drawn maps of Moffet Inlet, wrote a short book commemorating John Turner's life for The Bible Churchmen's Missionary Society.[56] He went on to become an Anglican minister in Toronto, but continued to provide support for the Inuit people. He translated various works into Inuktitut, including a 1956 translation of John Bunyan's *Pilgrim's Progress*.[57] Later in life, he became the director of the Ontario correctional services ministry.[58]

For those interested in aircraft history, the *Blizzard Belle*, which began service in the United States Army Air Force before being transferred to the Royal Canadian Air Force (RCAF) in 1944, remained in service with the RCAF and the Canadian Forces until 1975, when it was struck off strength. Its post-service roles included stints with Ilford-Riverton Airways, Northland Outdoors Canada, Air-Dale Limited (Ltd.), Northland Air Manitoba, Austin Airways Ltd., Air Ontario, and finally, Central Mountain Air Service in British Columbia. Its registration was cancelled in 1989.[59]

Post-Operation Assessment

It is not possible to conduct an assessment of Operation CANON without acknowledging the hard work, perseverance, and ingenuity of those involved, especially the team that parachuted into Moffet Inlet. Yet, even at the time, there were grounds for recommendations for improvements for future operations. An obvious requirement was for the completion of detailed maps across Canada, including the Arctic, and this work continued for many years. The absence of such maps contributed to the selection of Coral Harbour on Southampton Island as the staging base. Subsequent consideration showed that other airstrips, including at Resolute Bay, were closer to Moffet Inlet and better suited to support the mission. A contributing factor to Resolute Bay not being considered was that it was under the control of the United States Air Force at the time, which gave it an air of secrecy.[60]

Flight Officer Race made a number of specific recommendations on behalf of the RCAF after this operation. Since Arctic rescue operations could involve landing on and departing from unprepared and deep fields of snow, jet-fuel assisted take off (JATO) modules were recommended as standard equipment for similar missions.[61] JATO is a system for providing aircraft with additional thrust by attaching small rockets.[62] While ski attachments were available for the Dakota's wheels, the development of a simpler version was advocated by Race. Recommended standard equipment for Arctic missions included gasoline stoves, snow knives and handsaws, along with directions on how to build an igloo. The requirement to wear gloves or mittens in the Arctic meant that fastening devices for the existing wing and engine covers needed to be simplified and covers for windshields and propeller blades developed. The fibre material used for cabin fuel tanks was unsuitable for continuous use and the complexity of the installation was criticized. The variety of fuel drums used across the North meant that SAR aircraft should have a complete set of tools so that the fuel could be accessed. Although there was no problem with the Dakota during this mission, as a matter of practice, Race recommended that aircraft used in the Arctic have their cabins fully lined and insulated. He also suggested the addition of a 24-volt electric blanket (in order to be compatible with the aircraft's electrical system) and a securable stretcher outfitted with safety straps as standard equipment for evacuation operations.[63]

Additional recommendations derived from the experience of the team that parachuted into Moffet Inlet. The rescue team should have had adequate winter clothing available, without having to obtain additional stores at Fort Churchill.[64] A more portable communications capability was desirable, since a 200-kg radio set is too large and heavy to use easily.[65] Shelter suitable for operations in Arctic conditions was required, as the failure of Capt D'Artois' tent amply demonstrated. Navigational aids for use in the Far North had to be developed. This need would eventually be satisfied by helicopters with long range, although an initial step towards meeting SAR support requirements was made in 1949 with the allocation of 34 specially equipped aircraft.[66]

Whereas the rescue team provided no specific recommendations about the type of personnel required for SAR missions or about desirable skill sets in the immediate post-operation period, military planners obviously learned from the various missions that took place. Specialized medical training was required for SAR teams operating in isolated locations, and in 1950, the first doctor was trained to be a permanent member of a para-rescue team.[67] The creation of full-time rescue teams had been ongoing at the time of Operation CANON, and by 1953, 53 personnel were posted against 62 positions, including 5 medical officers, 7 nurses, 17 medical assistants, and 24 para rescue safety equipment technicians.[68] In the future, ad hoc teams would no longer be required to perform rescue operations.

Conclusion

Operation CANON occurred soon after the SAR mandate was given to the RCAF, and it quickly demonstrated the need for this capability. SAR is called upon when people are at their most vulnerable, and if in the Arctic, in a demanding, unforgiving environment. In this instance, the RCAF responded to the challenge, and despite many obstacles and difficulties, was able to successfully extract Canon Turner and his family from an isolated Arctic location. Sadly, the time it took to accomplish this contributed to Turner's inability to recover from his injuries. The RCAF and Canadian Forces were to learn from operations such as this, allowing for an increasingly dedicated and sophisticated rescue capability to be developed over time. The rescue mission for BOXTOP 22 amply demonstrated the dedication, courage, and resourcefulness of those working in this field, as well as the ability to operate in a hostile environment. The acquisition of the Cormorant helicopter allows operations to be mounted anywhere in Canada. Without question, SAR may now be considered a mature, fully developed Air Force capability that brings credit and recognition to the Canadian Forces.

Notes

1. J. A. Macauley, *That Others May Live: FiftyYears of Para Rescue in Canada, 1944–1994*, (The Para Rescue Association of Canada, n.d.), 9.

2. Ibid., 205–08.

3. See "Hunter rescued from ice floe," *CBCNEWS*, January 25, 2010, http://www.cbc.ca/canada/story/2010/01/25/hunter-stranded.html, (accessed April 6, 2011).

4. Macauley, 12–17.

5. Ibid., 31–33.

6. Maurice S. Flint, *Operation CANON*, (London: The Bible Churchmen's Missionary Society, 1949), 16–18.

7. Ibid., 11.

8. Ibid., 18.

9. Ibid., 13.

10. Ibid., 4–5.

11. Ibid., 6.

12. Ibid., 15.

13. Ibid., 26.

14. Ibid., 29.

15. Ibid., 83.

16. Ibid., 38.

17. Ibid., 53.

18. Ibid., 60–62.

19. John Melady, *Heartbreak and Heroism: Canadian Search and Rescue Stories* (Toronto: Dundurn Press, 1997), 19–20; Flint, 70–71.

20. The original source documents on Operation CANON used the Imperial system for weights, heights and distances. These have been converted to the Metric system for the purposes of this article.

21. Flint, 70–72.

22. Hugh A. Halliday, "Rescue Mission," *The Beaver* 75, no. 2 (April/May 1995): 14–15.

23. Flint, 72–73.

24. Canada, Department of National Defence (DND), "Preliminary Report on the Army Aspect," Directorate of History and Heritage (DHH), file DHH 181.003 D2261, RCAF HQ file 4-2-2, 3–4 (hereafter cited as Preliminary Report on the Army Aspect).

25. Ibid., 6.

26. Canada, DND, "Report – Operation Canon, Appendix B," RCAF file 4-2-2, 3 December 1947, 1 (hereafter cited as Report – Operation Canon).

27. Preliminary Report on the Army Aspect, 7–8.

28. Flint, 75.

29. Preliminary Report on the Army Aspect, 10.

30. Directorate of Air, Army Headquarters, "Operation Canon," *Canadian Army Journal* 2, no. 2 (May 1948): 15.

31. Preliminary Report on the Army Aspect, 11–12.

32. Ibid., 12–13.

33. Ibid., 14.

34. Ibid., 15.

35. Ibid., 16.

36. Report – Operation Canon, Appendix A, 5.

37. Preliminary Report on the Army Aspect, 16.

38. Front page articles appeared in the *Winnipeg Free Press* on 1–4, 6, 7 and 9 October 1948. Headlines included "Mercy Flight Planned to Rescue Missionary"; "Mercy Plane Flight Delayed by Darkness"; and "Supplies to be Flown to Turner Rescuers," on 1, 3 and 9 October respectively.

39. "Arctic Shrouded in Silence as Radio Operators Await Word on Missionary," *Winnipeg Free Press*, 7 October 1947, 1.

40. Flint, 18.

41. Ibid., 16–18.

42. Report – Operation Canon, Appendix A, 9–11.

43. Ibid., 12–13.

44. *Winnipeg Free Press*, "Heroic Fight for Life Futile – Canon Turner Loses Long Battle as Arctic Injury Proves Fatal," December 9, 1947, 1 & 8.

45. *Winnipeg Free Press,* "Sgt. Cook Pays Tribute to Canon Turner," December 10, 1947, 25.

46. *Montreal Gazette,* "Turner of Moffet Inlet Fund has Branch Opened in Montreal," February 9, 1948, 3.

47. *Winnipeg Free Press*, "Grateful to Canadian People – Mrs. Turner En Route to England by Plane," December 16, 1947, 12.

48. Richard Matthews, "Pond Inlet Revisited," *Arctic News*, 1990, http://www.arcticnet.org/Pond%20Inlet (accessed April 6, 2011).

49. *Winnipeg Free Press*, "Grateful to Canadian People," 12.

50. *Winnipeg Free Press*, "Homesick – Rebecca Will Return in June," February 14, 1948, 1.

51. *Winnipeg Free Press*, Untitled picture with text, June 15, 1948, 1.

52. Anglican Church of Canada, The Diocese of the Arctic, "Information about and History of the Diocese of The Arctic," http://www.arcticnet.org/story (accessed April 6, 2011).

53. Crosslinks, "Arctic Research Grant," *The Means of Mission: Projects and Project Partners*, (April 2009), 13, http://www.crosslinks.org/publications/mags/0904/0904complete.pdf (accessed April 6, 2011).

54. Anglican Church of Canada.

55. "Claxton vs. The King – An Afterthought to 'Operation Canon'," *The Beaver* 76, no. 3 (June/July 1996): 48–57.

56. Flint.

57. Sylvia Brown, "Pilgrim's Progress: Takkorngartaub Arvertarninga: Pilgrim's Progress translated into Inuktitut," *Sunsite* (University of Alberta), http://sunsite.ualberta.ca/Projects/Pilgrim_Progress/htdocs/ (accessed April 6, 2001).

58. George Summer et al, *Insight*, December 2000, http://www.wycliffecollege.ca/documents/insightdec00.html (accessed April 6, 2011).

59. See "Canadian Military Aircraft," http://www.ody.ca/~bwalker/RCAF_951_1000_detailed.htm and http://www.ody.ca/~bwalker/CAF_Dakota_detailed_list.htm (accessed April 6, 2011).

60. Halliday.

61. Report – Operation CANON, 3 December 1947, 6.

62. See http://en.wikipedia.org/wiki/JATO for additional details.

63. Report – Operation Canon, 3 December 1947, 6-7.

64. This observation is made by the author. No evidence was found of this specific recommendation being made by the rescue team or army or air force staff.

65. Report – Operation Canon, 3 December 1947, 6-7. Notwithstanding the difficulty experienced moving the 200 kilogram No. 52 radio set, Captain D'Artois and his team did not make any post-operation recommendations about the capability or weight of the radio equipment used.

66. Macauley, 39–40.

67. Ibid., 44.

68. Ibid., 56.

Sandy Babcock

Since completing a 29-year career with the Canadian Forces in 2002, Dr. Sandy Babcock has worked with Defence Research and Development Canada as an operational analyst. In this role, he has researched and written on the areas of concept development and experimentation, analytical support to operations, and network enabled operations. His work as a historian has largely focused on RCAF related topics, including the RCAF Auxiliary, civilian participation in air defence, the British Commonwealth Air Training Plan (BCATP), and air force leadership. His doctoral thesis was entitled "The Making of a Cold War Air Force: Planning and Professionalism in the Postwar Royal Canadian Air Force, 1944–1950," which is being further developed with a view towards publishing it. He has also published on the efficacy of peacekeeping, civil-military relations, and improving governmental responses to crises. He currently resides in Mons, Belgium, but will soon be returning to Canada to take up a position at the Canadian Forces Warfare Centre.

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Chapter 4

Military Culture and the Mobile Striking Force

Raymond Stouffer

Introduction

Less than a year following the conclusion of the Second World War (WWII), and in the midst of post-war demobilization, the Canadian government authorized the creation of an airborne or air transportable brigade group. Initially referred to as the Mobile Reserve, by 1948 this formation was renamed the Mobile Striking Force, or MSF. The MSF represented a continuation of the traditional Canadian approach to a peacetime military force structure. With a much reduced defence budget, the professional, full-time land element was cut to the bone. In contrast, allowances were made to retain a large (and less expensive) reserve, or part-time component. The main task of the cadre regular force was to train the reserve element. It was also to have plans in place to generate the latter's mobilization during times of tension or war. The original post-war plan called for the creation of four infantry and two armoured divisions following a two-year mobilization period.[1] By 1947, the Army Active or Regular Force had a paltry authorized strength of 15,563 all ranks. As the operational land element of this component, the MSF had but three infantry battalions with combat support and combat service support units.[2]

At the same time, though, the MSF represented a departure from previous Canadian peacetime defence policy. From its very inception, the MSF was assigned a wartime mission. By the late 1940s, a great wartime ally, the Soviet Union, became the new enemy. Equipped with long-range strategic bombers, and predicted to have an eventual atomic capability, the Soviets threatened North America as well as Western Europe. The shortest route to Canadian and American targets was over the North Pole. However, unless the Soviets entertained suicidal one-way bomber missions, they needed forward operating bases in Canada's north for return flights. The principal military role of the MSF was, therefore, to prevent Soviet forces from establishing such bases.[3] This commitment had two important implications. On a strategic level, the MSF was to be part of a growing bilateral United States-Canadian (US-CDN) approach to the defence of North America. Canadian defence policy was consequently as much a question of limiting American encroachment on national sovereignty as it was an exercise in preventing a Soviet attack on Canadian soil. The second implication in creating the MSF was the need for mobile land and air forces. This was why cooperation with the Americans also came at the operational level. Finally, and equally significant, the air power demands of the MSF placed both operational and cultural pressures upon a much reduced post-war Royal Canadian Air Force (RCAF).

In their respective articles, David Charters and Sean Maloney agree that the MSF satisfied Canada's defence needs in light of the perceived threat of the late 1940s, early 1950s. These authors quite correctly conclude that the MSF was not a waste of time or resources. Whatever the military value of this formation, it was a visible and inexpensive solution to an existing threat. Maloney even suggests that Canadian sovereignty was preserved, not jeopardized, by cooperation with the Americans. At the same time, these authors also conclude that the military utility of the MSF was in decline by the mid-1950s. By that time the Soviet Union was capable of attacking North America directly. The Soviets possessed a new generation of longer-range bombers armed with thermonuclear bombs. There was no longer a need, if ever seriously considered by the Soviets, of sending small airborne forces to Canada's north.[4] One author who would challenge these views is Bernd Horn. In his work on the history of the Canadian Airborne Regiment, Horn sees the creation of the MSF as nothing more than a cynical ploy on the part of the Canadian government to simultaneously appease the national defence demands of the Americans and the Canadian public.[5]

If this paper covers much the same ground as that of previous works on the MSF, its approach is a narrower one. More effort is spent looking at the operational level of the MSF. Emphasis will be on the approaches taken by the Canadian Army and RCAF with respect to the need for joint planning, training, and operations in support of this formation. Particular attention will be

placed on the creation of the Canadian Joint Air Training Centre (CJATC) in Rivers, Manitoba. The CJATC became a true joint (in fact, tri-service with the participation of the Royal Canadian Navy [RCN]) training establishment that wrote tactical air support doctrine and provided resources for the MSF. This analysis will be done in the context of existing inter- and intra-service rivalry over the priorities of air power.

Whatever the objectives of their military and political masters, air-land cooperation was an unpopular pastime for participating soldiers and airmen. While a priority to soldiers, the creation of tactical air forces was complete anathema to the post-war RCAF. Even though they understood that strategic bombers were no longer affordable, senior airmen stubbornly clung to the dogma that this air power role remained the most important. Strategic air power was supplanted by the air superiority role in the RCAF during the early cold war. Still, any attempt to get Canadian airmen to support ground forces was resisted. The creation of a tactical air force gave life, however short it turned out to be, to the post-war RCAF Auxiliary. But it was also the case that the creation of airborne forces was immensely unpopular in the post-war Canadian Army. It was, therefore, no small irony that the two major components of the MSF, tactical air and airborne forces, were eschewed by their respective supporting services.

An analysis of the MSF at the operational level therefore brings to light additional reasons for the rise and fall of this formation. It will be argued that the eventual demise of the MSF was an outcome attributable to internal service culture in addition to the changing strategic environment. While training in support of the MSF sustained knowledge of airborne and joint air-support operations, such initiatives occurred at a time when these concepts were not popular in the Canadian Army nor in the RCAF.

Canada's Post-war Strategic Challenges

Looking back at the period from 1945 to 1951, one has to wonder how the Canadian government came up with any sort of coherent defence strategy. Post-war plans for peace and stability were overtaken by rapidly deteriorating relations between the West and the Soviet Union. Early on, leaders in the Western world, including Canada's Prime Minister Mackenzie King, were optimistic that the newly created United Nations (UN) could create an environment for world peace and global economic stability. Such faith was dashed by the failure of this world body to prevent the onset of the cold war.[6] Consequently, just when the Canadian government was relieved that the anticipated economic and social instability created by the demobilization of a million servicemen and service women never materialized, it had to increase the numbers of a peacetime Canadian military.

Mackenzie King was known for his equivocation. This was especially so when his country was confronted by defence commitments during the late interwar period and WWII. But the post-war years were different. King's views would harden. He recognized the need for a military and economic response in light of the growing Soviet threat to Western Europe.[7] His initial enthusiasm for the UN turned to disillusionment. King compared post-war Soviet actions in Eastern Europe to those of the Nazis. He, therefore, became a proponent for the creation of the North Atlantic alliance. To the surprise of many, including those in the Liberal Party, King and his successor, Louis St. Laurent, unequivocally committed standing military forces and economic aid to the North Atlantic Treaty Organization (NATO)—a peacetime alliance, no less.[8]

However, before his retirement, King was not yet prepared to abandon his plans for a much reduced military. Nor was he going to allow the US military unrestricted access to the Canadian North. If the 1946 US-CDN Basic Security Plan (BSP) was a concession on the part of the Canadian prime minister for the need of a bilateral strategy for the defence of North America, it was initially a limited one.[9] Even so, given the possible threat of Soviet lodgements of company size or smaller in the Canadian North, a mobile battalion-size force to counter this threat was at once appropriate and affordable. So, while it was true that the MSF as Canada's military commitment to continental defence was defined by "uncertainty, purpose and cost,"[10] it did for a short period satisfy the country's political agenda and military responsibilities.

The key phrase here is "for a short period." Serious planning for the MSF by the Canadian military was limited to a few years. This timeline needs to be recognized if one wants to understand the ephemeral interests of the Canadian Army and RCAF in supporting this formation. At the opening of this period, the West was just beginning to react to a growing Soviet threat. At the closing, member countries of NATO, under American leadership, were building forces in earnest to meet an expected Soviet attack in Western Europe. In fact, interest in the MSF by Canada's military and political leaders arguably ended sooner. Canadian defence priorities changed dramatically in response to the invasion of South Korea by its northern neighbour in June 1950. Within a year of that event, Canada simultaneously raised an army brigade for Korea and for NATO's integrated forces in Germany. The latter also became the RCAF's priority as it became busy building up an air division with two wings each in eastern France and southwest Germany.

The important consideration here is that the extent of Canada's unprecedented international military commitments could not have been anticipated by its armed forces prior to the Korean conflict. It is in the context of this small historical window that this paper examines the efforts of the Canadian Army and RCAF in bringing the MSF to an operational posture.

Canada's Post-war Military

People and equipment are two essential components of military forces. There was little of each in the post-war Canadian military. The government's initial blueprint for its military did not leave senior officers overly optimistic about their future. In the same month that WWII came to a conclusion, the King government announced its plans for the RCN, the Canadian Army, and the RCAF. On September 28, 1945, Cabinet approved a post-war military strength of less than 50,000.[11] How were airmen, soldiers, and sailors going to create operational and sustainable peacetime forces within this manpower ceiling?

By April of 1946, the RCAF was undergoing rapid demobilization towards an anticipated establishment of 27,462 personnel. The latter figure was close to the expected manpower ceiling of just over 30,000 for a three-component air force: Regular (16,100), Auxiliary (4,500) and Reserve (10,500). Then in July, it was learned that Cabinet lowered the authorized ceiling of the RCAF to 16,100, including all components. More bad news was to come. The government decided that for the fiscal year 1947–48, the RCAF was not to exceed 75 per cent of the total personnel required for the establishments drawn up.[12] Consequently, the RCAF reached its post-war establishment nadir on 31 December 1947. The Air Force strength had dwindled to 11,569 all ranks. This figure included a pathetic sum total of 455 all ranks in the Auxiliary against an authorized personnel establishment of 4,500.

Equally disappointing for airmen were RCAF equipment plans for its post-war squadrons. In its defence, the Air Staff was, from the beginning, constrained by reduced funding and uncertainty. Air force planners were not clear as to the threat, apart from the fact that the new enemy was the Soviet Union. They also needed to take into account rapid improvements in weapons and aircraft capabilities. As far as the Chief of the Air Staff was concerned, his initial post-war plan permitted the RCAF to uphold national policies and interests and, in concert with the Army and RCN, to guard Canada from attack. Even so, in 1946 Air Marshal Leckie conceded that he was not entirely sure how the proposed Air Force would fit into future schemes: "It has been necessary to plan initially for an orthodox force, but it has been borne in mind that changes will have to be made as technological advancements in aircraft, weapons, and the utilization of atomic energy, demand … ."[13] To come up with a plan in the midst of uncertainty, the Air Staff did two things. It utilized existing stocks of wartime aircraft, parts and supporting equipment to put together its initial establishment of five Regular and eight Auxiliary squadrons. Second, it took action to acquire more modern aircraft.

These plans led to several interesting and, for Canadian airmen, unpopular results. First of all, it was the Auxiliary and not the Regular Force squadrons that were initially combat capable. Until the end of 1948, the latter were relegated to transport, photographic, and communications duties. By the time the first Regular Force fighter squadron stood up in December of that year, the majority of the de Havilland Vampires arriving from Britain were being delivered to

the Auxiliary air defence squadrons. In addition to the 85 Vampires, Cabinet also purchased 30 North American P-51 Mustangs from US war surplus stocks.[14] With the exception of 417 Squadron, the bulk of the Mustangs were also distributed among Auxiliary squadrons.

The Air Staff understood that these aircraft were at best an interim solution until more modern types were to become available. They anxiously anticipated the arrival of the Canadian-made de Havilland CF100 all-weather air-defence fighter. The problem was that these jets were not expected to be introduced to squadron level until the early 1950s. This delay forced the government to obtain from the Americans the right to build under licence the North American F-86 Sabre. If these jet fighters were also an interim solution, they proved to be the best daytime fighter in the West at the time. As such, all RCAF squadrons in the Air Division in Europe between 1951 and 1955 were equipped with the Sabre. But all of this was years away from the perspective of the winter of 1948–49. Consequently, until the Sabre and CF100 came into service, the RCAF had to rely upon its Auxiliary squadrons to defend Canadian cities from air attack. Further, before the introduction of the Sabre in the early 1950s, the RCAF had no front-line aircraft for an expeditionary force overseas.

Still, what the RCAF did have were war surplus attack aircraft. In addition to the F-51s (attack version of the Mustang), the RCAF had the B-25 Mitchell light bomber assigned to its Auxiliary squadrons. So when the decision was made in 1948 to support the MSF with tactical support aircraft, the combat portion came from Auxiliary, not Regular Force squadrons. Over the next few years, therefore, with an eventual total of 13 squadrons performing the air defence and tactical air support roles, the RCAF Auxiliary experienced its golden years.

The air power tasking for the MSF would also include Regular Force squadrons. But here was the rub. The latter were, for the most part, transport aircraft. At the time the MSF was being planned, senior airmen were already more focused on building an air force that would be led by Regular Force fighter squadrons performing air defence. As an institution, the RCAF eschewed tactical air support. Such a role meant working for the Army—an outcome that airmen feared would relegate the air force to a supporting service and loss of independence. So, until the air power priorities moved to that of air defence in both Europe and at home and was performed by Regular Force squadrons, the RCAF was placed in an unhappy position of having to provide tactical air support to the MSF with mostly Auxiliary squadrons operating obsolete aircraft.

What about the Canadian Army? Like its air force counterpart, "the strength of the post-war army was to be its mobilization potential."[15] From its wartime strength of almost half a million all ranks, the authorized post-war size of the Canadian Army was less than 16,000. The Active Force was limited to three infantry battalions, two armoured regiments, as well as supporting engineering and service support units. Where did airborne forces fit into the Army's post-war plans? Quite simply, they did not. They were rejected by the Army General Staff as being too expensive and anachronistic as a future military capability.[16]

The 1st Canadian Parachute Battalion was disbanded at the conclusion of WWII. The Canadian Parachute Centre located at Shilo, Manitoba, officially ceased training in May 1945. Its ability to remain in existence and sustain some semblance of parachute training was due in large part to the efforts of its commanding officer. There was certainly no support from higher headquarters.[17] Luckily for those officers who wanted to retain an airborne capability, their wishes were not solely dependent upon local initiative. Their real friend was politics.

The 1946 US-CDN BSP, in essence a revised version of the wartime ABC-22 that dealt with continental defence, committed the Canadian government to providing one airborne or air transportable brigade group, including supporting air power. Whether motivated by recognition of the Soviet threat to establishing forward bases in Canada's North, or to keep an eye on American intentions on their soil, or economics, or all of the above, Canadian strategy had a significant, albeit short-lived, impact upon the operational priorities of the Canadian Army. The Liberal Government's decision to agree to this commitment forced the Canadian Army to plan for airborne operations in the North. As such, much of its early post-war Active Force

component was earmarked for this capability. After May 1949, this commitment included the immediate provision of one battalion group, followed by a second in 60 days, and a third in 120 days.[18] As explained below, this level of force commitment was never met. The bottom line was this: between 1948 and 1951, before higher defence priorities allowed it to mobilize conventional forces for Korea and NATO, the Army was directed to earmark, train, and exercise those very airborne forces it had rejected at the conclusion of WWII.

The Mobile Striking Force Comes Together

Trying to determine what exactly the Canadian component of the MSF looked like has been difficult. It is agreed that the initial plan to have a brigade group with three airborne battalions (including headquarters and supporting elements) was never realized. Sean Maloney suggests that the Army plan was built around an airborne battalion. This formation included combat support and combat service support units not normally assigned at a battalion level. A formation familiar to today's Army, it was referred to as a battalion group.[19] The designated Active Force battalion for the MSF was the Calgary-based Princess Patricia's Canadian Light Infantry (PPCLI). In the summer of 1948, the PPCLI had become the first battalion to be entirely trained in the airborne role. Still, from the sources available to this author, it seems unlikely that even the more modest battalion group plan progressed beyond the planning stage.

Due to a limited availability of troops and for flexibility of tasking, each of the three Active Force battalions (the PPCLI, the Royal Canadian Regiment, and the Royal 22nd Regiment) was to provide one airborne trained company.[20] There were discussions of increasing the formation to battalion level when the threat of an enemy lodgement was increased from platoon to company size. By the time this was seriously considered, the Canadian Army was confronted with its higher manning priorities for Korea and Germany. As concluded by Bernd Horn: "Contrary to the accepted conventional wisdom, the MSF was never established, nor intended, to consist of entire parachute battalions."[21]

If both the Army and RCAF were institutionally opposed to supporting an airborne tasking, the joint approach taken towards making the MSF work was one of its positive legacies. Command and control of the MSF was exercised by the Chief of the General Staff, through the Chiefs of Staff Committee. The execution of the MSF battle plan was the responsibility of the General Officers Commanding of Western and Eastern Army Commands and the RCAF's Tactical Air Group.[22] Responsibility for the full-time oversight of the MSF belonged to the Land/Air Warfare Committee (L/AWC) at Defence Headquarters. The L/AWC was a sub-committee of the Chiefs of Staff Committee. Its members were responsible for all joint doctrine, operations, and training within the Canadian Forces.[23]

It is true that the decision-making capability of the Canadian military in the 1950s was often cumbersome owing to competing designs of the three services within the countless committees and sub-committees. Even so, inter-service cooperation within the L/AWC was an exception. At least for the brief period that the MSF was the main preoccupation of both the RCAF and Canadian Army, joint planning and training was taken seriously. The RCN was also a member of this committee. Squadrons from the Royal Canadian Naval Air Service (RCNAS) were trained in the attack role. The L/AWC was chaired by a two-star flag officer on a rotational basis between the three services. Its membership ranged from one stars to lieutenant-colonels. The L/AWC was therefore one of the premier planning committees in national defence in the late 1940s, early 1950s.[24]

Reflecting the need to respond to Soviet lodgements in both the western and eastern Arctic, the two main MSF mounting bases were at Edmonton and Montreal. Further, to shorten lines of communication and increase response times, advance bases were set up at Whitehorse, Fort Nelson, Yellowknife, and Churchill.[25] Ironically, these forward bases were themselves vulnerable to attack. Their capture would provide the enemy just what they needed: airfields and aircraft fuel storage with which to attack Canadian targets further south.[26] There was, therefore, a need to balance the logistical utility of these forward bases with the need to adequately defend them. Command and control also was not ideal. Having the various units spread over Canada's

North responsible to the two distant geographic Army Commands was not what was originally called for. The MSF was to be centred in one location under command by Canadian Army Headquarters.[27]

The Canadian Joint Air Training Centre

For the brief period in question, the MSF was the operational focus of the L/AWC. Consequently, committee members paid much attention to the training and doctrinal development of joint and combined warfare. For the most part, the L/AWC directed and monitored these activities through one organization, the CJATC. The CJATC was created in April 1949. Due to the growing needs for joint training in support of the MSF, the CJATC inherited the RCAF and Army airborne training units of the Joint Air School (JAS) located in nearby Shilo. Similar to the mandate of the JAS, the CJATC was to "meet the joint requirements of training and development for the Canadian Forces in all aspects of the employment of air forces in tactical air support of ground forces and airborne / air transportable operations."[28] A tri-service sub-committee of the L/AWC—including the Staff Officer (Fighters) Naval Aviation, General Staff Officer (GSO) 1, Directorate of Military Training (Air), and the Senior Staff Officer Air Operations (Joint)—exercised operational control over the CJATC through the commandant, an RCAF group captain.[29]

In relative terms, both the Canadian Army and RCAF invested significant resources in joint training at the CJATC. By the mid-1950s, the personnel strength at this school was over 800. There were 411 RCAF personnel and 104 civilians. The Canadian Army made up the bulk of the remaining strength.[30] Training included the logistical, technical, and operational aspects of tactical air operations. To accomplish this training in an efficient manner and to meet the needs of the three services, the school was divided into four main wings: administration, ground, air, and technical training.[31]

Without the joint training carried out at the CJATC, and the attention this school received from all three services at Defence Headquarters, it is hard to image how any support for the MSF could have been realized. If the RCAF was never a willing participant in joint air support training, the CJATC did assist and facilitate the participation of RCAF Auxiliary squadrons in MSF exercises. Moreover, during the summer months, the CJATC hosted and trained RCNAS attack squadrons, Army aviation personnel, as well as RCAF Auxiliary squadrons. At the working level, the school's joint staff and students fostered lasting amicable relations. These allowed for better cooperation at the operational level. Still, it needs to be stressed that the institutional priorities and culture of the RCAF militated against airmen sharing the same level of commitment demonstrated by soldiers and sailors towards the joint program offered at the CJATC. On the one hand, this school undoubtedly aided the Canadian Army and the RCAF in MSF operations. On the other hand, this conclusion should not obscure the reality that tactical air support training at this school in the 1950s was appreciated considerably more by the RCN and Canadian Army than it was by the RCAF. As it turned out, naval aviators and Army pilots owed much of their tactical flying experience to the quality training they received at this school.[32]

What would arguably become the longest lasting and most practical legacy of the CJATC was the joint doctrine that was written. The ability to test and validate theory and doctrine through actual flying operations at Rivers was invaluable towards establishing an effective lessons learned process. Part of this process also included the testing and validation of new equipment required for air/land operations. Lessons on tactics and the results of equipment trials were forwarded to the L/AWC in Ottawa for approval. Tactical doctrine was then passed on to the MSF, and equipment recommended by the CJATC was procured for the MSF's operational units.[33]

To some degree, therefore, an argument can be made that training at the CJATC was both relevant and practical to the RCAF and to the Canadian Army. After all, both services invested considerable resources in both the MSF and the CJATC. However, such impressions mask reality. Both services were less than committed to operations in Canada's North.

Army and Air Force Culture

There is little doubt that Army rotary-wing and Air Observation Post (AOP) pilots were well served by the training received at the CJATC. Further, this training was received positively by the Canadian Army generally. However, the reasons this was so had little to do with the MSF commitment. First, once the Canadian Army was committed to providing a brigade to Germany (in wartime this commitment was raised to a full infantry division), the tactical air support training was viewed as being far more applicable and relevant to the European theatre than to defence of Canada operations. As it turned out, this training also became invaluable in Korea. One Canadian Army pilot attached to a British unit flew combat AOP missions in that theatre—the first to do so since WWII.[34] Second, as elaborated below, the view at the Chief of the General Staff level was that airborne training of the expanding Active Force infantry regiments required in support of the MSF came at the expense of basic infantry training.[35] In other words, once committed to manning the brigades in Germany and Korea after 1951, the priority for the Canadian Army was to train for conventional war.

Disinterest in the MSF by senior elements of the Canadian Army in fact existed before the MSF came together. In 1948, reflecting the views of most of his peers, the Director of Infantry was critical of the focus on airborne training by the PPCLI. Not only did he feel this function to be but a small part of infantry training, the fact that this regiment's training was to be the standard for the other two Active Force infantry regiments meant that all of his infantry forces would be deficient in how to fight in conventional warfare.[36] Major-General Vokes—a wartime infantry division commander and, at the time, General Officer Commanding (GOC) Western Command—challenged the need for even a company-sized force in Canada's North. Vokes felt that "a platoon or squad of 15 men well trained for northern operations would be a compact, hard-hitting group with greater mobility than one of normal strength."[37] If support for the MSF was wanting in the Army, the ability of this force to be operational was also hindered by means. From the beginning, the force lacked the requisite equipment, including gliders, snow vehicles, and even sufficient parachutes. Equally problematic was a constant shortage of instructors in a downsized post-war Army.[38]

Dedication to the MSF mission was equally short-lived from the perspective of the RCAF. Similar to the Canadian Army, the RCAF's commitment to providing a tactical air support capability to the MSF was constrained for technical and institutional reasons. Its only two Regular Force tactical support squadrons, 417 and 444, were disbanded by the end of 1949. They were absorbed first by the Joint Air School, and then by the Tactical Fighter Flight of the CJATC. These squadrons flew a mixture of Mustangs, Austers and Chipmunks.[39] The bulk of the combat-capable tactical support squadrons were from the western-based Auxiliary squadrons. The 418 (Edmonton) and 406 (Saskatoon) squadrons were equipped with Mitchell light bombers. The 402 (Winnipeg) and 403 (Calgary) squadrons were equipped with F-51 Mustangs. The 442 (Vancouver) Squadron was equipped with the air defence variant of the Mustang, but it regularly attended the summer gun camps at Rivers.[40]

While morale at these units was high, sustaining an operational capability was, from the beginning, a challenge. It was difficult for both aircrew and ground crew to be released from their primary employers. This was especially the case when crews were needed for extensive periods of time during the summer gun camps and for MSF exercises. Long-range planning for the latter was, therefore, almost impossible. Auxiliary squadrons were also plagued by low serviceability rates for their WWII vintage aircraft that lacked sufficient spares. In addition to these problems, Auxiliary pilots were frustrated over their lower pay scale in comparison to their Regular Force counterparts.[41]

At the Air Staff level there was recognition that the air power demands of the MSF necessitated organizational adjustments. Reflecting the western flavour of the Auxiliary squadrons assigned to the MSF, the RCAF submerged the existing Edmonton-based North-West Air Command into Tactical Air Group. Two years later, in the summer of 1953, Tactical Air Group was elevated to command status. Tactical Air Command (TAC) was the RCAF's primary controlling headquarters for planning and developing tactical operations. Clearly reflecting its main task of

supporting the MSF, the primary peacetime role of TAC was "testing, planning and organizing procedures and techniques that [would have reduced] to a minimum the problem encountered in providing the Canadian Army with air support, particularly in Canada's North."[42]

On a larger level, TAC theoretically provided the RCAF and Canadian military with a peace and wartime capability to command all tactical air offensive and transport operations. As it happened, the lifespan of TAC was tied to that of the MSF. As the importance of the latter diminished, so did that of the former. Other than supporting MSF operations in Canada, TAC was relegated to exercising its secondary role. This was to administer its subordinate units located in an area extending north from the 49th parallel to Alaska and the Arctic Seas, and west from Winnipeg to the Rockies. TAC also oversaw search and rescue operations, and was responsible for associated training, including para-rescue and survival techniques. Finally, this headquarters controlled and operated the Northwest Staging Route.[43] In other words, instead of realizing its potential at directing and controlling tactical support operations, TAC's mandate had not progressed much beyond that of North-West Air Command, which it had replaced.

If TAC reverted to the status of its geographically oriented predecessor by the latter 1950s, there was a brief period when the discussion of tactical air operations generated notable interest in this headquarters. Such awareness, albeit fleeting, was due to lessons being learned from the air war in Korea. While political and operational restrictions frustrated the proponents of strategic bombing, the nature of the war elevated the stature of tactical air support. Paradoxically, the praise of land commanders forced airmen to acknowledge the crucial role played by an air power role they did not care for. Both interdiction missions and direct air support proved decisive in the war against North Korean and Chinese ground forces. An article written in *The Roundel* in June 1951 made exactly this point. Not only did the author elevate the importance of tactical air power relative to that of strategic air power in Korea, he stressed the key to success was the level of cooperation within the air/land team.[44]

By the spring of 1951, staff officers in then Tactical Air Group were trying to convince their superiors that the Korean experience validated the need for a more robust tactical support capability in the RCAF. Training at the CJATC needed to be based upon the experiences of American and Commonwealth air forces fighting the communists. One memorandum stated: "Events in Korea have once again clearly demonstrated the necessity that all concerned in air/ground operations be agreed upon and familiar with the terminology, principles, organization and procedures used in this type of operation."[45] With plans being made by this time for sending an army brigade to Germany, the author of this memo saw the need for air/land cooperation and joint tactical support training for those units assigned to NATO as well as for those earmarked for the MSF. As it happened, such enthusiasm and logic ran counter to what the RCAF planned for its wings in Europe. Fundamentally, senior Canadian airmen were not going to pursue an air power role that threatened service independence.

Years after the last wartime long-range bombers were cut up for scrap metal, the Air Staff had not completely given up on this capability. While the RCAF accepted that a peacetime bomber force was no longer a viable option, senior airmen directed that such a component be retained in its early cold war mobilization plans.[46] The RCAF shared and promoted the views of the United States Air Force (USAF) and Royal Air Force (RAF) that wars could be won through strategic bombing alone. The politically seductive corollary was that air power precluded the need for expensive land and sea forces. Senior Canadian airmen would have agreed with what the Chief of the Air Staff for the RAF stated publicly in 1951. If Air Chief Marshal Slessor did recognize the crucial role air power played in support of land and naval forces during WWII, this concession in no way masked his main point. As far as Slessor was concerned, the war had proven that strategic bombing by itself was a decisive winning factor in modern war.[47] The following year, during a series of public speeches in Quebec and Eastern Ontario, a senior member of the Air Staff suggested that RCAF and RAF air power priorities were identical.

Air Commodore Clare Annis emphasized that destruction of enemy air power was the first priority of air forces. Ideally, this was accomplished by strategic bombing. Since Annis

understood that the RCAF did not possess such a capability, he reminded his audiences that air defence was an important contributor to the defeat of the enemy's air force. In contrast, Annis pointed out that tactical support of surface forces did not contribute to the battle for air supremacy. As such, for a small air force like the RCAF, expending resources on tactical air power was a dangerous strategy. It did not leave sufficient funding for air defence. After all, Canada was building up air defence squadrons in Europe and at home to protect Canadian cities and vital targets from Soviet strategic attack.[48]

So the message was clear. Similar to the Canadian Army, the RCAF was asked to provide support for the MSF at a time when to do so was institutionally and culturally unacceptable to airmen. Airmen abhorred the tactical support role as much as soldiers eschewed airborne operations. Once this cultural inertia combined with disinterest by the civilian leadership in the purpose and utility of the MSF, the demise of this formation and its role was inexorable. This became quite evident in the aftermath of a series of high profile MSF exercises between 1949 and 1950.

Exercises EAGLE and SWEETBRIAR

If one views the period from 1949 to 1950 as being the pinnacle of importance (or relevance) of the MSF, events during this time frame laid bare the reality that the future of this formation was in serious doubt. Defence Minister Claxton was never convinced of the argument that the Soviets posed a direct threat to Canada. He, therefore, saw no reason to spend much more on the MSF than was politically necessary. Before the collective angst of the West that erupted in the aftermath of the Korean War, Claxton kept defence spending in check. This was the case despite his country being a member and a key proponent of NATO. Prior to the summer of 1950, his motivation was to spend just enough on the MSF to keep the Americans happy, and by implication, out of Canada's North.[49] Unfortunately for the Defence Minister and the Liberal Party, their equivocal support of the MSF specifically, and of national defence generally, was questioned in the House and by the public in light of the first major exercise involving units of the MSF.

By the late summer of 1949, the Canadian Army wanted to confirm that the PPCLI was ready in its new role as an airborne/air-landed infantry battalion. Exercise EAGLE, held in the Peace River district, was to have one of the jump companies recover "captured" airfields at Fort St. John and River Bridge, British Columbia. The remainder of the PPCLI battalion was then to air land and join the parachutists in defeating the "enemy." Air support was provided by RCAF Auxiliary and Regular Force squadrons.[50] The exercise was a disaster. Worse for Claxton, the reality that neither the Army nor the Air Force was anywhere near capable of driving out the smallest of enemy lodgements in the North was witnessed and reported on by the media.

The airdrop and subsequent deployment of the Patricias showed that they needed considerably more training to be effective in their designated role. And once more, they were short of key equipment, including parachutes that had to be borrowed from the CJATC. The RCAF provided a total of 72 aircraft. But there were too few Mustangs and Mitchell bombers.[51] There were also insufficient numbers of Dakota transport aircrafts; this was a real concern considering these transport aircraft could carry less than 20 parachutists. Training in airdrop operations for the aircrew was also deficient. The lead Dakota missed the drop zone. Finally, "enemy" air overwhelmed the attacking air force.[52]

In the face of criticism, Claxton defended the results of EAGLE. He argued that it was only to test army-air cooperation. Further, in a real emergency, the PPCLI would be joined by other battalions. He did concede that the Dakotas were unsuitable as air transports, and made it known that larger C119 Boxcars were being purchased.[53] While most of what he said was not true, Claxton's spurious reply to his critics was driven by a complete intolerance for anybody questioning defence policy or the military. At the same time, he was furious at his generals. Claxton designated the wartime infantry division commander, Brigadier George Kitching, commander of the MSF. Kitching was to be given priority in equipping his formation.[54] There would be no more embarrassments like EAGLE.

The opportunity for redemption was at hand soon enough. In February and March 1950, a joint US-CDN exercise was held along the Alaska Highway. In Exercise SWEETBRIAR, thousands of US and Canadian air and land forces were to "recapture" the airfield at Northway, Alaska, and stop the southward movement of "enemy" forces threatening Whitehorse in the Yukon.[55] The PPCLI did perform better in this test. Noteworthy was a paradrop in below-zero weather, a necessity if airdrop operations were to work in the North. Criticized for its lack of firepower and insufficient forces generally in EAGLE, the Canadian Army bolstered the Patricias with an artillery battery and combat service support troops. Finally, the exercise was carried out at a large enough level that the experience validated the joint doctrine, procedures, and equipment recommended by the CJATC.[56]

Despite the concern that remained in the House and within the interested public, with the more positive results of SWEETBRIAR, Defence Minister Claxton was satisfied that he had deflected earlier criticism of the MSF and Liberal defence policy. Upon review of the Defence Minister's actions over the previous six months, one has to agree with the conclusion of David Charters. Claxton's and, by extension, the Liberal Party's interest in the MSF was limited to its political value.[57] Not surprisingly, therefore, following SWEETBRIAR, the government looked to other defence matters. Then in June of that year, with the outbreak of the Korean War, any interest there was in the MSF was irretrievably lost in the rush to build up forces for that war and in Europe.

Conclusion

If the government lost interest in the MSF, the Canadian military still had a responsibility to commit resources to this capability. Once Canada was absorbed by the priority of raising forces for Korea and NATO Europe, nobody would have disagreed with General Foulkes' statement that "Canadian defence policy was wholly concerned with NATO and the UN."[58] However, the Chairman of the Chiefs of Staff Committee and the Canadian government could not completely ignore their defence commitment agreed to in the 1946 Canada-US BSP. This is why both the Canadian Army and RCAF continued to support joint training at the CJATC at Rivers, and provided personnel for MSF exercises well into the mid-1950s.

Typical of these exercises were the BULLDOG and SUNDOG series, with the last, BULLDOG III, conducted at Yellowknife in January 1955.[59] RCAF Auxiliary squadrons continued to provide Mustangs and Mitchells. Regular Force squadrons were also represented. Lancasters from 408 Squadron provided long-range reconnaissance, while C119s and North Stars from 435 and 436 Squadrons fulfilled the air transport role.[60] Still, as far as the RCAF was concerned, these activities were a low priority. Airmen were busy manning and equipping their Regular Force air defence squadrons in the Air Division in Europe and at home. Even when it came to supporting the MSF, the Air Staff suggested that enemy lodgements in the North could be defeated by strategic air power alone.[61] The future of the MSF was doomed because of air force culture. At the same time, RCAF priorities and financial cuts spelled the end of the Auxiliary squadrons. Once WWII tactical aircraft were no longer sustainable the Auxiliary squadrons were stripped of their combat roles. Even those air defence squadrons equipped with Sabres were disbanded. These and the remaining tactical air support squadrons were then relegated to communication duties. By 1959, the Auxiliaries were terminated.[62]

By the early 1950s, the Canadian Army theoretically placed a higher priority on training for airborne and air-landed forces over that of regular conventional infantry operations. Institutionally, however, the Canadian Army never accepted these priorities. Conventional warfare, practiced in Korea or Germany, was what the Army needed to train for to protect its future as a viable military service. Consequently, it never liked its MSF commitment. And as Bernd Horn laments, this is why the airborne role had an uncertain future in the later cold war Canadian Army.[63]

As stated at the outset of this paper, previous works on the MSF agreed that this formation was obsolete by the mid-1950s. This should be no surprise. In a Department of National Defence (DND) publication in June 1955, it was concluded that the most probable threat to Canada

was by Soviet manned strategic bombers armed with atomic weapons.[64] This paper does not dispute the conclusion that the utility of the MSF was overtaken by a larger strategic threat, but it has also argued that the demise of the MSF needs to be understood in the context of service culture. For a brief period this formation provided the Canadian Army and RCAF a raison d'être for survival in a post-war military cut to the bone. However, once both services were given the opportunity to expand and be structured as full-time professional forces to confront the communist threats in Europe and Korea, institutional preferences were realized. Canadian airmen and soldiers were overjoyed: political direction that favoured air defence and a return to building up conventional ground forces matched their own cultural wishes. The immediate casualty was the death of the MSF. Collateral damage extended to the loss of RCAF expertise in tactical air support operations, a doomed RCAF Auxiliary, and the loss of support for airborne forces in the Canadian Army.

Notes

1. Brief on Canadian Defence Policy, 9 October 1949, File 112.3M2, The Directorate of History and Heritage (DHH).

2. "Mobile Striking Force Standing Operating Procedures," File 096-104-3, vol. 1, DHH.

3. "Supporting data for Air Staff Policy Committee," 18 June 1956, File 096-104-3, vol. 4, DHH.

4. See Sean M. Maloney, "The Mobile Striking Force and Continental Defence 1948–1955," *Canadian Military Journal* 2, no. 2 (Autumn 1993): 75–88; David A. Charters, "Five Lost Years: The Mobile Striking Force, 1946–1951," *Canadian Defence Quarterly* 7, no. 4 (Spring 1978): 44–59.

5. Bernd Horn, *Bastard Sons: An Examination of Canada's Airborne Experience 1941–1995* (St. Catherines: Vanwell Publishing Limited, 2001), 85–6.

6. Dr. George Schwarzenberger, *World Affairs*, no. 3 (July 1949): 236, quoted in Robert A. Spencer, "Triangle Into Treaty: Canadian and the Origins of NATO," *International Journal*, 14 (Spring 1959): 87.

7. "Confidential Diary Relating to Russian Espionage Activities," September 6 to October 21, 1945, *King Diaries*, MG 26, J 13, Library and Archives Canada (LAC).

8. Robert Spencer, *Canada in World Affairs, Volume V: 1946–1949* (Toronto: University of Toronto Press, 1959), 249–50.

9. J. W. Pickersgill and D. F. Forster, *The Mackenzie King Record, Volume 3, 1945–1946* (Toronto: University of Toronto Press, 1970), 265–66.

10. Charters, 44.

11. Memorandum to Cabinet, entitled "Proposals for Post War Royal Canadian Air Force," 10 December 1945, Records Group (RG) 24, vol. 5225, LAC.

12. Canada, DND, *Report of the Department for the Fiscal Year Ending March 31, 1947* (Ottawa: Supply and Services Canada, 1947), 43.

13. "Plan B – Post-war Plan for the Royal Canadian Air Force," Chapter 1, paragraph 1.01-1.04, File 181.004 (D44), DHH.

14. Air Staff memorandum from Air Member for Technical Services (AMTS) to the Acting Deputy Minister, 8 December 1947, RG 24, Series E-1-c Accession 1983-84/167, Box 6283, File 1038-180, vol. (Part) 3, LAC.

15. Horn, 70.

16. Ibid, 69–70.

17. Ibid.

18. "Operational Requirements of Airborne Forces for the Defence of Canada," 29 November 1948, File 112.3M2, DHH.

19. Maloney, 79–80.

20. "Mobile Striking Force Training Procedures," File 3201-151/M, vol.3, DHH.

21. Horn, 78.

22. "Mobile Striking Force Standing Operating Procedures," File 096-104-3, vol.1, DHH.

23. Minutes of the 13th Meeting of the Land/Air Warfare Committee, 24 October 1952, File 112.3M3 (D4), DHH.

24. Ibid.

25. "Mobile Striking Force Area of Operations," File 096-104, vol.2, DHH.

26. Ibid.

27. Horn, 82.

28. Joint Organization Order No.24 – Canadian Joint Air Training Centre, Rivers, Manitoba, 17 February 1954, File 79/83, DHH.

29. Ibid.

30. Historical Outline of the CJATC, prepared for the Land/Air Warfare Committee, 1957, File 112.3M3.003, DHH.

31. Ibid.

32. See Leo Pettipas, "Something for Everyone: JAS/CJATC/CFB Rivers," unpublished paper, Winnipeg, Manitoba, 1997.

33. Ibid, 14.

34. Author unknown, "Wings for the Canadian Army," *Canadian Army Journal* 16, no. 2 (Spring 1962): 1.

35. P. M. Simpson, "Introducing Canadian Joint Air Training Centre," *The Roundel* 7, no. 1, January 1955, 30.

36. Horn, 81.

37. Quoted in Horn, 81.

38. "Mobile Striking Force – Memorandum on Standardization of Air/Ground Training," File 096-104, vol. 1, DHH.

39. Historical Outline of the CJATC, prepared for the Land/Air Warfare Committee, 1957, File 112.3M3.003, DHH.

40. DND, *The Annual Report of the Royal Canadian Air Force for the Fiscal Year 1 April 1956 to 31 March 1957* (Ottawa: DND Canada, 1957), 25. This was the first annual review to mention tactical air operations since 1947. Discussion was limited to the RCAF's role at the CJATC. There was no mention of air force participation in MSF exercises, nor was there any comment on support to the Canadian Army. Also, Pettipas, 17.

41. Vaughan Arnold, *418 Squadron History* (Stittsville: Canada Wings Inc., 1984), 66.

42. Author unknown, "Tactical Air Command," *Canadian Aviation* 28, no. 6, 1955, 30.

43. Ibid, 62.

44. Author unknown, "The Air-Ground Operation in Korea," *The Roundel* 3, no. 7, June 1951, 2–3.

45. Mobile Striking Force – Memorandum on Standardization of Air/Ground Training, File 096-104, vol. 1, DHH.

46. Item 522, Minutes of 77th Meeting of Air Members held May 25, 1949, File 73/1223, vol.1820, DHH.

47. John Slessor, "Air Power Grows Up," *The Roundel* 2, no. 8, June 1950, 31–45.

48. These views were expressed by Air Commodore Claire Annis during a series of public presentations in Montreal and Trenton, Ontario, in February and March 1951. In three papers entitled *The Roles of the Air Force*, *The Role of the RCAF* and *The Dilemma of Air Power,* Annis was clearly expressing the views of the Air Staff regarding the dominant role air power played in the cold war. Since a

peacetime RCAF could not afford a long-range bombing fleet, Annis extolled the virtues of an air defence role that was being created in North America and Europe.

49. Horn, 81–2.

50. Charters, 46.

51. Ibid.

52. Horn, 81.

53. Charters, 46.

54. Horn, 82.

55. Charters, 46.

56. Ibid.

57. Ibid.

58. Quoted in Horn, 83.

59. Exercise BULLDOG II – Follow-Up Action from Tactical Air Group Headquarters, 15 March 1955, File 704-11-1, vol. 1, DHH.

60. Final Report Exercise SUNDOG III, held in Goose Bay – Fort Chimo area, February 1952, File 181.004 (D6), DHH.

61. Horn, 83.

62. Read R. P. Haskell's unpublished work entitled: "The Rise and Fall of the RCAF Auxiliary – An Examination of the Policy Decisions that led to the Creation and Subsequent Demise of Canada's Part-Time Air Force, 1946–1964," paper submitted as partial completion of MA in War Studies, Royal Military College of Canada.

63. Horn, 98.

64. DND, *The Annual Report of the Royal Canadian Air Force for the Fiscal Year 1 April 1954 to 31 March 1955* (Ottawa: DND Canada, 1955), 1; see also Maloney, 86; Horn, 85.

Raymond Stouffer

Major Raymond William Stouffer was born April 21, 1956 at Baden-Soellingen, West Germany. He is the only child of Chief Warrant Officer (retired) Norman Hollis Stouffer and Gertrud Waltraud Stouffer (nee Schneider).

Major Stouffer joined the Canadian Armed Forces on August 10, 1975 and attended the Royal Military College of Canada. He graduated in May 1979 with a Bachelor's Degree (Honours) in History. Major Stouffer was employed in the military as an Air Force Transportation Officer and specialized in tactical and strategic air lift operations. He is a qualified C130 Hercules Loadmaster. Over the course of his career, Major Stouffer filled a number of command and staff positions within Air Command and National Defence Headquarters. His last tour in Ottawa was as a member of the ill-fated Strategic Airlift Project Office that was to select a new strategic transport aircraft for the Canadian Forces.

In May 2000, Major Stouffer received his Masters Degree in War Studies from the Royal Military College (RMC). In September 2002 he enrolled as a full-time PhD student in the same programme at RMC. His three areas of academic study include air power, Canadian defence policy and Canadian history. Major Stouffer successfully defended his PhD thesis on January 28, 2005 and was awarded a Doctorate of Philosophy (War Studies) at the spring Convocation on May 20, 2005. He was employed as an Assistant Professor in the Department of History at RMC from September 2005 until December 2010 and, effective January 1, 2011, was appointed Registrar of RMC.

Major Stouffer is married and has two grown children, Kimberley and Alexander. Major Stouffer's family lives in Orleans, Ontario.

Chapter 5

The Roundel and Building RCAF Arctic Air Mindedness During the Early Cold War

Richard Goette

The Royal Canadian Air Force (RCAF) was heavily involved in flying in Canada's Arctic during the early cold war period (late-1940s and the 1950s). With much time and resources dedicated to military aviation in Canada's North, it was important for the RCAF leadership to raise the profile and awareness of the Canadian Arctic, what can be termed as generating RCAF Arctic "air mindedness." This goal was accomplished through a number of articles and features in the service's main publication, *The Roundel*, that dealt with Arctic and northern aviation-related issues of interest to Canadian airmen. Besides dealing with specific Arctic flying operations, Arctic air-minded articles in *The Roundel* during the early cold war also touched upon other vital issues, such as the ever-important concern of manning RCAF bases in the North and the living and working conditions at these establishments.

Moreover, the new enemy in the cold war was the Soviet Union, and the quickest way it could strike at North America's war-making capacity and population centres was for its growing fleet of long-range strategic bombers armed with atomic weapons to attack via the northern approaches to the continent. Canada's North was, indeed, as Ken Coates, Whitney Lackenbauer, William Morrison, and Greg Poelzer have noted, a potential "Arctic Front" in a war with the Soviet Union.[1] Therefore, the strategic rationale for Canada's requirement to deploy forces to the Arctic was also an important facet of developing Arctic air mindedness—especially amongst those RCAF personnel who were already stationed, or were soon be stationed, in Canada's North.

Indeed, after the Second World War (WWII) the Canadian military in general, but the RCAF in particular, was required to reorient its geographical strategic thinking from the traditional east-west threats to also include the growing Soviet threat from the north.[2] Typically, the RCAF had previously focused on military threats from Europe and Asia, and had primarily concerned itself with Canada's North in terms of non-kinetic domestic operations such as aerial mapping and other aid to the civil power roles.[3] With the growing Soviet strategic bomber threat in the early cold war period, however, the RCAF began to pay much more attention to its kinetic role of defending the continent's approaches from the North.[4] This article will argue that with this reorientation of the geographical strategic thinking towards the North in the early cold war period, Canada's air force leadership actively sought to generate Arctic air mindedness in the pages of *The Roundel* to raise awareness within the RCAF of the need to operate and work in the Canadian Arctic.

Methodology

This article adopts the methodology on Canadian aviation pioneered by University of Western Ontario history professor Dr. Jonathan Vance in his book *High Flight*. In this publication, Vance discusses the *idea* of aviation—what he calls "air mindedness"— in the minds of Canadians. This phenomenon included the efforts by those who were involved in flying, a group he calls the "air lobby," to raise awareness of aviation and its various uses to those who did not have a personal connection to aviation. According to Vance, these uses of aviation included—but were not limited to—entertainment (i.e., barnstorming and stunt flying), transportation (of people and cargo), civil service (such as mapping and forestry patrol), and the use of aviation in war (air power).[5] Focusing on the latter three uses of aviation, this article contends that the air-mindedness methodology can be applied by identifying the senior leadership of the RCAF as the air lobby that desired to raise awareness of the air force's presence and operations in Canada's Arctic amongst air force personnel.

The medium that Canada's air force brass utilized to generate Arctic air mindedness was the RCAF's service magazine, *The Roundel*. It was first introduced in November 1948, right on the heels of the Berlin Airlift Crisis and the subsequent heating up of the cold war. *The Roundel*

was published 10 times a year and was widely distributed within the RCAF. Moreover, it was produced in large quantities so that all Canadian air force personnel were expected to read it. The purpose of *The Roundel* was to avoid a narrow-minded specialist perspective amongst airmen in terms of their own trade or role in the service. Seeking a broader readership, the RCAF service magazine, therefore, had a more holistic approach, covering a variety of issues in short, readable articles that would appeal to individuals of every rank, community, and trade in Canada's air force. In the words of the Chief of the Air Staff (CAS) Air Marshal Wilfred Curtis in the inaugural issue, the air force brass hoped to encourage "extensive reading and discussion" of issues related to the RCAF in order to foster "a wider perspective which gives full meaning to its individual tasks."[6] Material covered in the publication varied from historical articles to pieces on current air power issues, but also photographs, cartoons and other illustrations, as well as short tidbits of current news relating to the air force. Importantly, *The Roundel* also included the use of humour, in written form and also in Ray Tracy's excellent cartoons, as a means to entice readership. As a result, as Canadian aviation historian Larry Milberry has noted, during the early cold war, *The Roundel* became "to most serving members [of the RCAF] as much a part of the Air Force as flight sergeants or Harvards."[7]

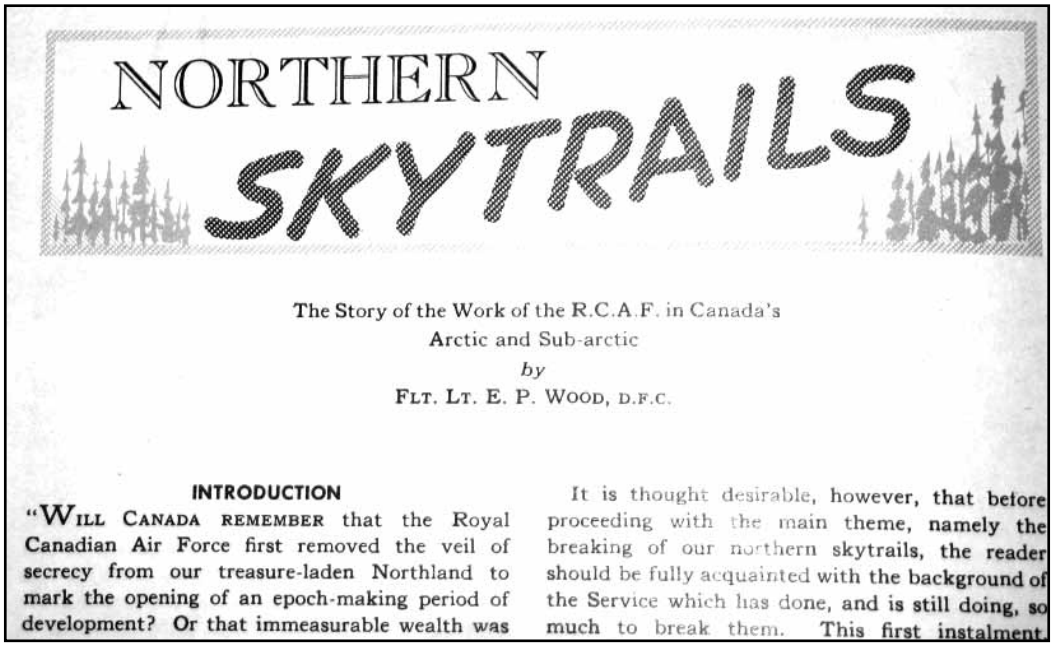
All of these measures to entice readership of *The Roundel*—especially humour—proved to be an effective means to generate Arctic air mindedness within the RCAF. A cursory examination of issues from the late 1940s and the 1950s shows numerous articles that dealt with the Arctic and Canada's northern regions. Although at first these articles seemed to appear in the RCAF's service magazine haphazardly, there was a concerted effort by the RCAF leadership to ensure that Canadian air force personnel began to think more about the Arctic. Accordingly, this article analyses features in *The Roundel* that focused on northern and Arctic-related matters, with particular attention given to developing Arctic air mindedness as it relates to pre-1945 Canadian air force history in the North, Arctic Strategy, northern aerial operations, and the living and working conditions for RCAF personnel at these establishments during the early cold war.

Figure 1. The Inaugural Issue of *The Roundel*: A Picturesque Arctic "Air-Minded" View[8]

Promoting Awareness of Canada's Air Force History in the North

If there was any question that the RCAF leadership was trying to encourage awareness of the North in the pages of *The Roundel*, the cover of the inaugural November 1948 issue of the magazine certainly put that notion to rest. Instead of showing a picture of a massive bomber or a high-powered fighter aircraft, the cover depicted a dogsled ploughing through the snow, with a ski-equipped RCAF aircraft flying overhead. This was quintessential imagery of Canada's northern flying.

Included in this inaugural issue of *The Roundel* was an article by Flight Lieutenant (F/L) E. P. Wood entitled "Northern Skytrails: The Story of the Work of the R.C.A.F. in Canada's Arctic and Sub-arctic."[9] This piece was the first in a series of articles under the "Northern Skytrails" banner describing the early history of the RCAF and especially its experiences in northern flying. The purpose of the series, the author explained, was "to give the reader a clear and factual conception of what is perhaps the more romantic, but also less publicized, aspect of the R.C.A.F.'s activities."[10] In other words, the motive behind the "Northern Skytrails" series was to promote Arctic air mindedness amongst RCAF personnel. Importantly, the rationale for this series came right from the top of the RCAF leadership; as F/L Wood explained, "the task of [the series'] publication was assigned by the Chief of the Air Staff to the Directorate of Intelligence (Air)."[11]



NORTHERN SKYTRAILS

The Story of the Work of the R.C.A.F. in Canada's Arctic and Sub-arctic

by

FLT. LT. E. P. WOOD, D.F.C.

INTRODUCTION

"WILL CANADA REMEMBER that the Royal Canadian Air Force first removed the veil of secrecy from our treasure-laden Northland to mark the opening of an epoch-making period of development? Or that immeasurable wealth was

It is thought desirable, however, that before proceeding with the main theme, namely the breaking of our northern skytrails, the reader should be fully acquainted with the background of the Service which has done, and is still doing, so much to break them. This first instalment

Figure 2. *The Roundel's* Northern Skytrails Series[12]

The first article in the "Northern Skytrails" series began with a brief early history of the RCAF, touching on such information as the Air Board, the Canadian Air Force, interwar training, the formation of the RCAF itself in April 1924, Civil Government Air Operations, and the "militarization" of the air force before the outbreak of WWII. The purpose here was to teach those who were unfamiliar with the RCAF's history up to that time and refresh the memory of those who were. The author's actual words delivered this message clearly, and used clever humour to grab the reader's attention: "it is thought, however, that before proceeding with the main theme, namely the breaking of our northern skytrails, the reader should be fully acquainted with the background of the Service which has none, and is still doing, so much to break them."[13] It was significant that the *first* historically based article in *The Roundel*—one that outlined the history of the RCAF to date—was written in a northern Canada context.

This theme was continued with the concluding article of the "Northern Skytrails" series. In it the author, F/L Wood, describes the RCAF's endeavours in the North in the years since the end of WWII, including continuous photographic survey flights, search and rescue (SAR) work, supply flights by Air Transport Command (ATC), Operation MUSK OX, and Operation INVESTIGATOR, to name a few. In concluding the series, Wood notes that the RCAF's "efforts are turned northward again" and that the "Polar Concept was just as real... in 1922 as it is in our minds today."[14] He emphasizes that Canada needed to develop and protect its Arctic areas. Concurrently, he notes the importance of engaging with the Americans in guarding Canada's

North: "the job is so gigantic that in some instances the United States' [US] aid has been sought and received, but it is the policy of the Canadian government to replace American with Canadian personnel, when the latter are available."[15] Inherent in the effort of the RCAF to promote Arctic air mindedness amongst RCAF personnel during the early cold war period was the important—and thorny—issue of collaborating with the US on defence measures in the Arctic.[16]

Arctic Strategy

Besides pieces on the history of RCAF flying in the north, *The Roundel* also included articles that specifically dealt with the Arctic itself in order to foster interest in the region amongst air force personnel. Indeed, *The Roundel* was a medium to explain the strategic reasoning for Canada's requirement to deploy forces to the Arctic to those RCAF personnel who were already stationed or may soon be stationed in Canada's North. In choosing these articles, the editor of the RCAF service magazine included pieces by air force personnel on the staff of *The Roundel*, Air Force Headquarters, and the various RCAF commands and units.[17] However, he also spread his net widely and re-published articles dealing with Arctic themes from other publications.

For example, the April 1950 issue of *The Roundel* featured an article entitled "The Strategy of the Arctic" republished "in considerably shortened form" from the October 1949 issue of *International Affairs*, the journal of the Royal Institute of International Affairs in England.[18] The piece was written by Group Captain (G/C) V. H. Patriarche, an RCAF officer with extensive civil and military service flying in Canada's North and one of the senior RCAF staff members of the Northwest Staging Route during WWII. In the article, G/C Patriarche begins by noting that "the strategy of the Arctic must deal with political and economic problems as well as purely military ones."[19] He specifically outlined the sovereignty issue in relation to the Canadian Arctic with other nations; in particular, he mentioned that other countries' arguments have little weight in comparison to Canada's claims. However, his main emphasis was on the problem (and high cost) of transportation—especially sea-borne and land-borne—and how the air force therefore plays a crucial role in bringing supplies to the Arctic.[20]

In terms of strictly military matters, G/C Patriarche notes that the Arctic "can be considered in two aspects: first, as a theatre of operations; and second, as a route of attack."[21] He plays down the former, largely due to the huge logistical difficulties, and puts more emphasis on the latter. However, he notes that there was a "lack of decisive targets" in the Arctic, and that the focus of operating in this theatre would be on interdicting potential enemy aircraft flying the Arctic air route with the objective of attacking vital targets further south.[22] This strategic assessment of the Arctic would later support the air defence concept of "defence in depth"; that it was necessary to intercept and engage the enemy as far away from his target as possible.[23]

Lastly, G/C Patriarche downplays the importance of the Arctic as a theatre of operations, probably not to provoke the Soviet Union. Nonetheless, he also does hint at the possibility of the Soviet threat to North America in his closing paragraph:

> We may take it, then, that the Arctic, *unless it becomes the only or the shortest route between the vital areas of two contending Powers*, is not likely to become the major theatre of military operations for some time to come. It fills, rather, a subsidiary role, although, depending on the circumstances of war, it could become a decidedly active area.[24]

Geostrategic concerns related to Canada's Arctic were therefore a frequent theme in issues of *The Roundel* during the cold war. However, air defence was not the only strategic issue examined in its pages.

The April 1951 issue of *The Roundel* reprinted an article from Britain's *Everybody Magazine*, written by retired Marshal of the Royal Air Force (MRAF) Viscount Trenchard. Addressing the cold war context, this British air power legend warned of the traditional east-west strategic geographic thinking based on the Mercator Projection map (which showed the world on a flat surface). Trenchard stressed that in the age of global reach provided by strategic air power, such

traditional perceptions amounted to a "Maginot Line Mentality," and he therefore cautioned "civilized powers" about ignoring threats from other—notably northern—orientations.[25]

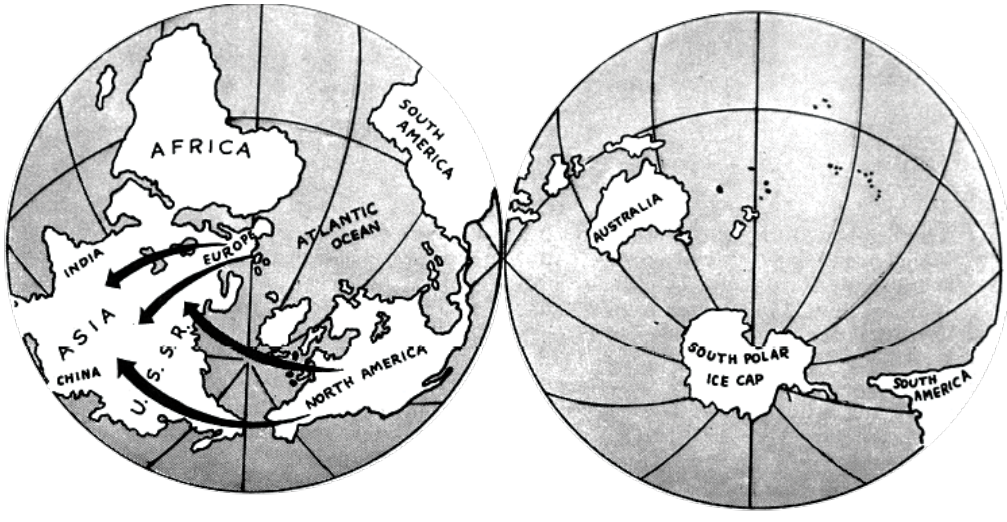


Figure 3. MRAF Trenchard's Air Power Perspective Map[26]

Alternatively, Trenchard stresses a more global strategic way of thinking. Instead of emphasizing air defence, it was no surprise that Britain's most famous strategic bombing theorist advocated for offensive use of the Arctic approaches by Western countries through a massive and quick build-up of their bomber forces. These strategic assets could then be utilized to either strike the Soviet Union in a time of war, or at least deter this cold war adversary from launching its own atomic attack.[27] Trenchard's overall theme was that of air power and geography, and he concludes with the following statement: "it is the greater range of aircraft and not the atom bomb that has changed warfare."[28] Therefore, even though Trenchard did not emphasize strategic air defence, which during the 1950s would be the main role of the RCAF, when highlighting the importance of the northern approaches in his *Roundel* article, he definitely fostered greater awareness of the Arctic amongst Canadian airmen.

Nonetheless, the RCAF's air defence mission was not ignored in *The Roundel* during the late 1940s and the 1950s. Various articles specifically focused on the important role of the RCAF to protect the North American continent from Soviet strategic bomber attack. These included features on a variety of air defence issues and roles, such as the Ground Observer Corps (which consisted of civilian observers tasked to keep an eye on the sky for enemy aircraft), the job of aircraft control and warning in the air force (many positions of which were, significantly, filled by female RCAF personnel), the Canada-US North American Air [now Aerospace] Defence Command (NORAD), and RCAF stations and the Mid-Canada and Distant Early Warning (DEW) radar lines in the Far North.[29] Particular attention also was given to updates on the development of RCAF all-weather interceptors that would operate in northern Canada in an air defence role such as CF100 Canuck and the CF105 Avro Arrow.[30]

In 1950, *The Roundel* also covered the RCAF's role in Exercise SWEETBRIAR, a Canada-US joint and combined continental defence exercise to test operational capabilities in the Canadian Arctic and Alaska. Army forces were under the command of the Chief of the General Staff, Lieutenant-General Charles Foulkes, while air force units came under the CAS, Air Marshal Curtis. SWEETBRIAR, however, did not solely focus on air defence: it was a truly joint operation to evaluate interoperability for tactical air support and tactical and strategic airlift capabilities in conjunction with army forces. Therefore, in addition to the RCAF's Vampire and Mustang fighters and the USAF's F-80 Shooting Star interceptors, a multitude of other aircraft—including Canadian B24 Mitchells, Avro Lancasters, DC4 North Stars, DC3 Dakotas, and American

P-82 Twin Mustangs, A-26 Invaders, and C-54 Skymasters—was involved in SWEETBRIAR.[31] However, instead of publishing an analysis of the exercise (likely, it is suspected, to avoid such accounts coming under Soviet eyes), *The Roundel* instead ran excerpts from the diary of RCAF Sergeant D. J. Blain, who worked at the Canadian Joint Air Training Centre in Rivers, Manitoba, and was assigned to assist the official umpires for the combined exercise.[32] According to the editor, the purpose of publishing this account from a non-commissioned officer's journal was for readers to have "a clerk's-eye view" and understand SWEETBRIAR "in a human and often amusing way."[33] Therefore, instead of intricate descriptions of the joint air force-army operations, the article described the daily accounts of an RCAF sergeant's role in the exercise. Again, the attempt here was to use humour and human interest accounts to educate the rest of the RCAF of the experiences, difficulties, and importance of the air force's responsibility to operate in the Arctic.[34] By giving this kind of an account from the ranks, *The Roundel* hoped to appeal to a wide audience.

Non-kinetic air power operations undertaken by the RCAF in Canada's North were not limited to transport missions during SWEETBRIAR. Indeed, articles in *The Roundel* frequently highlighted other important roles. For example, an article in the December 1955 issue brought particular attention to RCAF ATC's important Arctic operations. The article was written by ATC's public affairs officer, F/L J. D. Harvey, who outlined the various aircraft and squadrons engaged in Arctic operations. They included re-supply of RCAF units, Canada-US weather stations (see below), Royal Canadian Mounted Police detachments, and Department of Transport weather and radio bases. Further roles included photographic and navigational flights for the purposes of accurately mapping Canada's Arctic region, the government's SHORAN [short-range radio navigation system] programme, preparing sites for and supplying the Mid-Canada Line, ice reconnaissance patrols, training flights, and even the transportation of students from the RCAF Staff College and the National Defence College for "staff rides" to bases in Canada's North.[35] Significantly, F/L Harvey was careful to highlight the strategic importance of ATC operations in the region:

> The aircraft of Air Transport Command have been penetrating the Arctic Circle ever since the Command's early days as No. 9 (T[ransport]) Group, in 1947. Lately, however, the growing interest in Canada's Northland has added impetus to flights tracking 360 degrees. The northern shores of Canada remain uppermost in the minds of defence planning-teams when they discuss the most probable routes for bombers in the event of another war.[36]

By explicitly connecting these RCAF operations in the north to the strategic importance of the region, Harvey clearly showed that ATC was very much involved in and concerned about the Arctic.

The Roundel also included historical articles that provided essential context to contemporary air defence endeavours by outlining how the RCAF dealt with potential Axis aerial threats to Canada during WWII. For instance, in the May 1950 issue, Wing Commander (W/C) C. B. Limbrick, who was in charge of the air force's guided missile programme under the Chief of Armament and Weapons at Air Force Headquarters (AFHQ), wrote an article entitled, "Canada's Radar Outposts: A Little-known Chapter in the History of the R.C.A.F. during the Second World War."[37] The airman recalled how the air force in Canada's remote regions—with all of the communications, climate, and transportation challenges—managed to establish 50 radar stations to warn of any Axis attack.[38] By highlighting the important considerations that went into installing radar stations during WWII, Limbrick was, therefore, able to bring attention to the similar challenges faced by the RCAF of the 1950s in establishing an early warning system against Soviet attack. For example, with regard to the issue of where to site specific radar stations, he noted (with a touch of humour) the following:

> One couldn't go out and spot a radar at a site just because the fishing looked good or the local farmer had a couple of good-looking daughters. It was necessary not only to have height of land but also to have a combination of physical conditions and station-spacing

> which would provide suitable coverage and safety overlapping. Thus, while some sites were in nice civilized areas, the large majority were located in isolated and almost inaccessible places.[39]

In another instance, Limbrick highlighted the inherent dangers of accessing some of the distant radar stations, noting that "many of the units were so remote and desolate that merely to get on to them from the ship meant a brief scuffle with the Grim Reaper."[40]

Other relevant lessons from the RCAF's WWII radar post experiences included the requirement to, "alleviate the tough conditions and to provide amenities."[41] This consisted of simple things, such as the fostering of hobbies amongst radar personnel in remote locations, but also included a sustained effort by AFHQ to provide amenities, such as personal furniture, reliable and regular mail service, and entertainment, such as movie projectors and films. The RCAF brass also made provisions for newspapers and magazines, which included popular titles for reading but also the means "for the literary and artistic" to produce their own "unit" publications with unique and telling titles such as *The Isolationist*.[42] Organized recreation, such as wood carving, sports, and hunting and fishing competitions, also helped to relieve boredom. Significantly, the RCAF also provided alcohol to the isolated radar operators, and even ensured access to transportation for individuals for social gatherings and companionship. As Limbrick noted,

> of course there were, here and there, hardy souls who made heroic journeys on Saturday nights by trail, boat or dog sled, to small villages or canning factories for an evening of dancing or romance. Indeed, if the locations were not so isolated, I imagine some of the boys would be back there now.[43]

Limbrick concluded, that, thanks to the RCAF leadership's "general determination to defeat the monotony"[44] morale remained high at these radar stations.

Although these WWII radar chains were, for the most part, more southern than those established in Canada in the 1950s, they were also located in remote parts of the country. Therefore, the lessons on how the RCAF could deal with the inherent isolation and low morale for personnel living at these sites were important for post-war air force planners. Significantly, the RCAF took into account these kinds of concerns when preparing for the construction and manning of early warning stations in the Arctic.

Operating and Living in the Arctic

Besides raising awareness amongst RCAF personnel of the strategic reasoning for operating in and deploying to the Far North, another key facet of fostering Arctic air mindedness was addressing the issue of operating in the Arctic, and in particular the living and working conditions for air force personnel deployed to these northern establishments. The perceived harshness of Canada's North was a particular concern in certain articles in *The Roundel*, and authors sought to educate RCAF personnel about the advantages of a northern posting.

Page 14 of the first issue of *The Roundel* included a one-paragraph tidbit entitled "Our Genial North." Addressing preconceived notions of the frigid temperatures of the Arctic, the short piece begins by noting that the world's coldest spots were not in fact in the Arctic Circle—that record went to Riverside, Wyoming, at minus 90° Fahrenheit (F) [minus 67° Celsius (C)]—and that the lowest temperature in Point Barrow, Alaska, was a comparatively balmy -56°F (-48°C). Instead, the piece explains that the winter climate in the Arctic is "relatively dry" with little precipitation—what appeared to some outside visitors to be a blizzard was just previously fallen snow blown around by the high winds prevalent in the region.[45]

Along the same vein, G/C Patriarche's previously mentioned article on Arctic strategy dispels the myth of the Arctic as purely "a barren waste of snow and ice inhabited by polar bears, explorers and eskimos [sic]." Although noting that the weather can get nasty during the winter, "much of the land as far north as the tip of Greenland clears during the summer, vegetation and animal life thrive, and considerable open water is found."[46] Furthermore, noting the almost

continuous sunlight during the summer, Patriarche reveals that the spring thaw was quick and that the summer was much warmer and longer than popularly understood. "Life for both men and animals" he concludes, "presents no great problem other than that of the ever-present mosquito."[47]

Such considerations did not dispel geography and the obvious isolation and remoteness of northern operations. The psychological issue of operating in the High North away from home is a major theme of a 1950 *Roundel* article by RCAF Air Transport Command Warrant Officer Second Class (WO2) R. B. Hampton, entitled "Arctic Glimpses." Based on his own experiences while assigned to RCAF Station Resolute Bay, WO2 Hampton noted that the best way for air force personnel to counter feelings of desolation, loneliness, and depression—especially during the long periods of never-ending darkness during the winter months—was to establish "a regular Station routine" to take their minds off these drawbacks of northern deployments and focus on the work that needed to be done.[48] This kept men busy, as did rest and recreation during time off. "Most evenings," Hampton explained, "were spent in playing cards, darts, table hockey, or in reading or sleeping."[49]

Depression was uncommon, according to the young RCAF airman. If any man showed any signs of it, he was allowed "to remain in his quarters until he felt in a better mood." Importantly, recognizing the sensitivity of this depression issue and desiring to maintain productive and friendly relationships between these men deployed to an isolated location in the Far North, Hampton notes that all personnel "were careful not to 'rib' him at such times."[50] WO2 Hampton concluded by debunking the popular notion of a deployment to northern units such as Resolute Bay as a bleak experience. For an airman, the key to deploying to the Arctic was to "honestly tr[y] to preserve a healthy and cheerful attitude."[51] In particular, Hampton suggested that "the cultivation of a hobby or interest in the history and geography of the area helps to pass the time and can make the experience an educational and even a most pleasant one."[52] Moreover, in his closing sentence, "there is always the assurance that one's tour of duty is only temporary!"[53]

In fact, it was RCAF policy to ensure that deployments to the Far North "were shorter, consisted of more transfers, less security of tenure, and less continuity of operation than other peacetime service appointments."[54] Given the isolation and harshness of the winter during Arctic deployments, the RCAF leadership genuinely sought to maintain some kind of normalcy for deployed air force personnel.[55] It was crucial to eliminate preconceived notions about the ruggedness of living in RCAF stations in the far north by providing airmen a sense of modernity in their accommodations and daily lives.[56] An appealing article from the August 1949 issue of *The Roundel* entitled "So You're Going North?" addressed this very issue.[57] Written by Squadron Leader (S/L) D. Gooderham, it made excellent use of tongue-in-cheek humour. The goal was to eliminate "ignorance" amongst RCAF personnel "of all matters relating to the Canadian Arctic." In particular, the RCAF brass instructed Gooderham "to provide Enlightenment, that those who are posted or who may be posted into the North may read and take comfort. Gen [sic] them up so that they neither take fear at anything nor overlook those things that may make their sojourn therein more pleasing."[58] The author assumed this task with great enthusiasm, while promising to give as accurate an account of the Arctic as possible. In his own words: "Since I understand that most of the upper Brass can read, I cannot say just what I thought; but I can at least assure you that what I write below will in no way be coloured by any attempt to improve the picture."[59]

Squadron Leader Gooderham echoed the conclusions of WO2 Hampton by emphasizing that the first key to an Arctic posting was approaching it with a positive mental attitude:

> If you come here with the idea that maybe it won't be too bad and that it might even be interesting, you'll probably find it just that, and possibly even better. If, on the other hand, you come up firmly convinced that you won't like it, you will in all probability have a grim time for at least a part of your tour.[60]

Much like other *Roundel* articles, Gooderham broached the issue of weather, disassociating the word "north" with the word "cold." Although he admits that winter winds make Arctic stations

especially cold, he drew the analogy with Winnipeg—a relatively southern Canadian city known for its bitter winters. "There have, indeed, been occasions when [Arctic winters] approached the frigidity it frequently attains at the corner of Portage and Main, [in Winnipeg]," Gooderham explained, but "fortunately, unlike you effete types down south, *we* do something about it when it gets really cold. We even go to the ridiculous extreme of covering our ears."[61]

On the topic of heat inside buildings on northern bases, Gooderham observes that "the occupants have to struggle through as best they can with temperatures of 68° [F (20° C)]. Covertly emphasizing modernity, he clarified that "these dull, uninteresting temperatures are attained without benefit of blubber lamps. Being fresh out of blubber lamps, the Air Force has had to resort to steam heat or oil-burning stoves."[62] Moreover, one could not wash oneself in the traditional Arctic practice of "sewing oneself into the red flannels and applying whale oil to the face… [because] some sluggard in Supply" failed to procure the whale oil, so the airmen had to make do with "water systems, boilers, showers, wash-basins, and washing machines."[63] His humour preyed upon popular misconceptions that equated Arctic life with the traditional survival practices of the Inuit which, while ingenious in their own right, seemed anachronistic in the modern world.

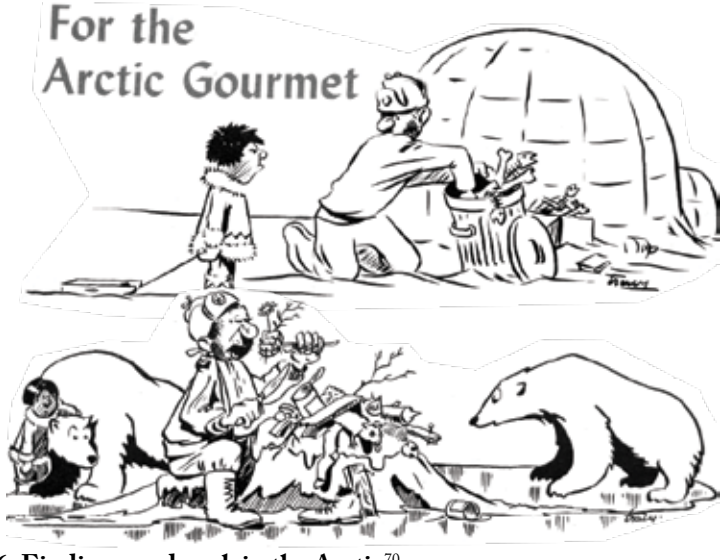
Figure 4. Ray Tracy's humorous attempt to address myths about amenities in the Arctic[64]

Gooderham also touched on the psychological issue of the long periods of daylight during the summer and the extended stretches of darkness during the winter. In particular, he mentioned that the summer was more difficult for air force personnel than the winter because extended periods of daylight make it difficult to sleep, a simple reality that tended to shorten tempers. Food, however, was no cause of worry. The RCAF officer reassured his air force brethren that "a combination of an expanded ration scale and top-flight cooks" means that food is better at these bases than at RCAF stations further south.[65] Gooderham also pointed out that the worst part about being posted to the North was the separation from family. Married quarters were not available for the most northern bases. To compensate, airmen benefited from a short tour of duty for northern postings (only six months compared to one or two years in more southern bases), fairly regular mail service, "radio messages for urgent occasions or when aircraft cannot get in," and air drops of supplies when aircraft were unable to land. In the latter case, "the odd bottle of beer gets broken in the process, but there is usually enough for the Saturday night party."[66]

Along the same lines, opportunities for recreation also played heavily into Gooderham's depiction of the "friendly Arctic" (to borrow Vilhjalmur Stefansson's famous characterization).[67] When the weather was favourable, this included fishing and hunting—activities that "many people would gladly pay much money" to do down south. Indoor activities were also popular, and they included movies, hobbies, crafts, music, sports equipment, and photographic equipment, although it was up to the individual to make the most of these opportunities. After offering a few more suggestions for RCAF personnel who might deploy to the Arctic, including assurances "that arrangements are made for adequate funds to be forwarded to your family," S/L Gooderham

concluded that "it is not altogether impossible that you will return from the North alive and healthy. If your sanity has suffered a slight decline, you will no doubt immediately be recommended for a posting to AFHQ. Good luck to you."[68] Clearly, being posted to Canada's North was not as bad as some RCAF personnel thought it would be, provided of course they were educated on the experience by articles that fostered Arctic air mindedness such as this one in *The Roundel*.

Articles and features in *The Roundel* also helped develop Arctic air mindedness by emphasizing modernity and normalcy for postings to the region. For example, there was an article in the March 1950 issue that discussed sustenance, in case a crew had to face a forced landing in the Arctic. Titled "For the Arctic Gourmet," this article used humour—coupled with Ray Tracy's clever cartoons—to outline a variety of edible plant and animal life available in Arctic climes.[69]



Figures 5 and 6. Finding good grub in the Arctic[70]

Another major theme was survival training for the northern climate. While some authors described the activities offered at the RCAF survival training school at Fort Nelson, British Columbia, others outlined tips for coping with the harsh climate at northern bases or surviving if an airman had to ditch his aircraft in the Arctic region.[71] Features on RCAF bases located in more northerly parts of the country, such as Whitehorse and Goose Bay, were common in *The Roundel* during this time period in "The Roundel Visits" series.[72] Other articles touched on efforts by the RCAF to enhance its Arctic operational capabilities, ranging from topics such as aircraft ski research at the National Research Council (NRC) to arming aircraft that operate in the Arctic, to name but a few.[73]

Figure 7. Ray Tracy makes light of aircraft ski research[74]

Efforts to bring normalcy and modernity were not confined to RCAF personnel operating in the Arctic. One of the most important roles that the air force undertook in Canada's northern region was the Arctic re-supply strategic airlift missions that ATC undertook every spring. Starting in 1955, *The Roundel* began detailing operation "Spring Re-Supply" by describing efforts of the air force to bring upwards of 1.25 million pounds of food, fuel, equipment, and personnel ranging from "cooks, radio operators, mechanics, and meteorologists" from Canada and the US to the five Canada-US weather bases at various points in the Arctic Archipelago (including Canadian Forces Stations Alert and Eureka on Ellesmere Island).[75] The articles reiterated that the cargo included recreational supplies to help the personnel pass by long periods of time at these isolated bases. With pride, *The Roundel* also reported how ATC crews had become efficient at quickly landing on the thick ice, offloading, and then taking off again for another supply flight. Importantly, the Arctic re-supply articles also detailed how, along with the supplies in one flight, came a dentist to provide annual oral hygienic care to personnel. As one article noted, "it was an interesting sight to watch the lines of patients anxiously awaiting his arrival."[76]

Efforts to bring southern Canadian normalcy and modernity to the North were not limited to RCAF personnel. They were also extended to the indigenous Inuit people of the Arctic. These endeavours included benevolence efforts, such as providing mercy medical flights for those who were ill and dental care for individuals whose teeth were hurting.[77] They also consisted of efforts to bring the joy—and gifts—of the holiday season to the Far North. These endeavours culminated in the mid-1950s with the famous Operation SANTA CLAUS, which saw ATC air drop "something extra" to both RCAF personnel and Inuit communities at Christmastime.[78] All of these northern-related topics were covered in *The Roundel*, ensuring that RCAF personnel were conscious of what it took to live in the Arctic during a posting to the region and the positive contributions that their service made to northern life.

Occasionally, small features in *The Roundel* gave tidbits of useful information to RCAF personnel on operating in the Arctic. For example, one feature brought to light the fact that de-icing one's aircraft was an absolute necessity:

> There is often a thin coat of ice under the fluffy blanket of snow which has accumulated on the wings of your plane. Don't depend on the snow blowing off during take-off, even the light kind, and check for ice. Falling snow sticks at temperatures above 10°F [-12°C]. It also forms a coat of ice between 32 and -10°F [0 and -23°C].[79]

Figure 8. De-icing was definitely required while operating in the Arctic[80]

Another feature warned about the perils of guessing the depth of snow on the ground from the air.[81] One informative piece suggested that aircrew flying in snowy conditions where it was difficult to determine the distance to the ground should carry a pine tree (or at least "some object of known size") with them to drop on the ground for use as a point of reference for landing.[82]

The Roundel also reported on efforts by RCAF personnel working in the Arctic to make the best of their operating conditions through the use of creativity and humour. For instance, some clever airmen began a custom in the early 1950s to invest individuals who had crossed the Arctic Circle by air into the Order of Airborne Ice Worm. Members of the order included such distinguished individuals as CAS Air Marshal Wilf Curtis and even the Duke of Edinburgh, who as official members received their own personalized Ice Worm certificates.[83]

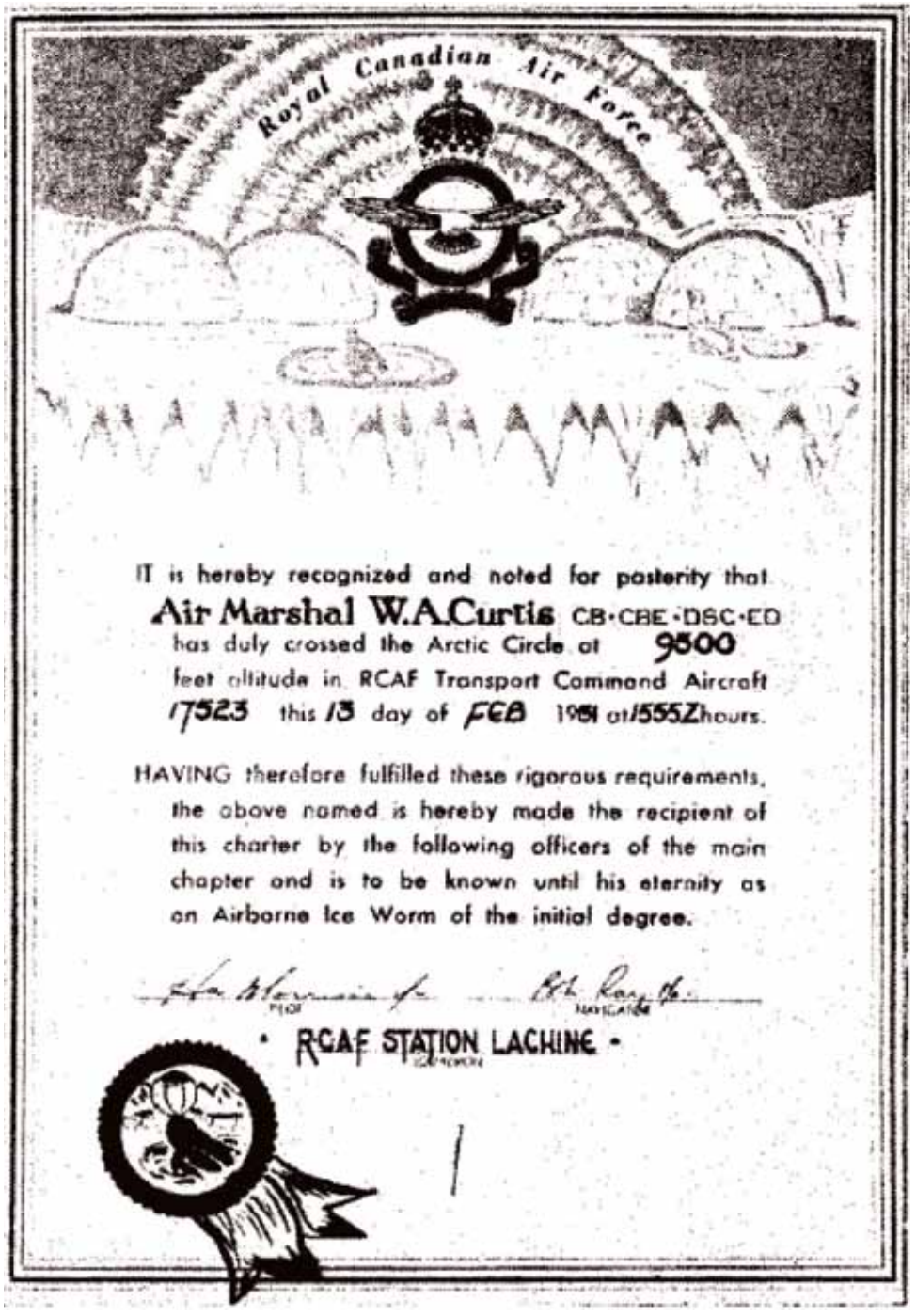


Figure 9. Air Marshal Curtis's official certificate of Membership of the Order of the Airborne Ice Worm[84]

Other RCAF personnel employed their literary skills by writing poetry about the conditions at their northern Canadian postings. For example, Corporal W. F. Kervin at RCAF Station Whitehorse penned a humorous poem entitled "Baby, It's Cold Inside." It was based on explicit restrictions against adjusting the thermostat, and a sample verse read:

Do not touch the many switches,
Do not fool around with knobs,
Do not change the calibration
– Muffle up your frozen sobs!

Do not kick it, do not bash it,
Do not lift it from the floor.
Just be careful how you treat it
And it might warm up some more.[85]

Additional short pieces consisted of expert reviews of books and manuals produced by the RCAF and the NRC on Arctic surveying and navigation (including publications by noted RCAF Arctic navigator W/C Keith Greenaway).[86] Others included announcements of honours for notable accomplishments by RCAF personnel during Arctic operations. For example, the August 1958 issue of *The Roundel* announced that the commanding officer of 408 Photographic Squadron, W/C J. G. Showler, had been awarded the 1957 Trans-Canada McKee Trophy for his unit's Arctic survey missions using SHORAN.[87] Unfortunately, *The Roundel* also had the sad duty to report on fatal air accidents that occurred in RCAF Arctic operations, such as the dedication of a memorial cairn to seven RCAF airmen and two civilians who lost their lives when their Lancaster crashed at Alert on Ellesmere Island in July 1950.[88] This piece was an unfortunate reminder of the difficulties of operating in Canada's northern region. Along with the variety of features mentioned above, it contributed to developing Arctic air mindedness amongst RCAF personnel.

Conclusion

The RCAF leadership utilized the service's magazine *The Roundel* to reorient strategic geographical thinking of air force personnel and inculcate a sense of Arctic air mindedness during the early cold war. Not only did *The Roundel* promote awareness of the strategic necessity for air force personnel to deploy to the Arctic, but articles addressed specific operations in Canada's North. By emphasizing normalcy and modernity, they also highlighted the surprisingly good living and working conditions at RCAF Arctic bases. Other features in *The Roundel* addressed issues such as tips for Arctic flying, survival in the harsh climate, while some RCAF personnel utilized their creative writing and humour skills to give a positive depiction of what may have otherwise been perceived as a dreary and depressing posting to an Arctic unit. In any event, having an outlet like *The Roundel* to examine issues relevant to the RCAF in Canada's North was something that the service's leadership and personnel both could appreciate, and it went a long way towards the development of an Arctic air mindedness amongst all who regularly read the service publication. Moreover, the publication of Arctic-themed articles did not cease after the 1950s. *The Roundel* continued to foster Arctic air mindedness until it was discontinued in 1965.[89]

The question that now must be asked is: should today's Canadian Air Force leadership make concerted efforts to raise awareness of operations over and deployments to Canada's Arctic like *The Roundel* did in the late 1940s and the 1950s? As recent literature has shown, with the impending end of Canada's Afghanistan mission in the summer of 2011, we know that the Arctic—and in particular, greater access to it due to the melting polar ice cap and the resulting apprehensions regarding sovereignty—will be a major concern for the Canadian government and the Canadian Forces in the decade ahead.[90] Moreover, the Canadian public has been made more aware of Arctic issues by the government and the media. Interestingly, some of this raised Arctic awareness amongst Canadians has even been developed subtly by non-government sources, with Shaw Media Global / History Television's series "Ice Pilots NWT" serving as a good example.[91] This article has given at least one concrete example of how Canada's air force leadership has brought awareness of the Arctic to its personnel. Perhaps it offers lessons learned on how this may be accomplished again today and in the future.

Notes

1. The authors are referring to Canada's Arctic as being a traditional front for defending Canadian sovereignty, but the label also applies in the military context. Ken S. Coates, P. Whitney Lackenbauer, William R. Morrison, and Greg Poelzer, *Arctic Front: Defending Canada in the Far North* (Toronto: Thomas Allen Publishers, 2008). The best account of the growing threat of Soviet strategic bombers to North America and Canada-US endeavours to counter it remains Joseph Jockel's *No Boundaries Upstairs*. Joseph Jockel, *No Boundaries Upstairs: Canada, the United States and the Origins of North American Air Defence, 1945–1958*, (Vancouver: University of British Columbia Press, 1987).

2. James Eayrs, *In Defence of Canada Volume III: Peacemaking and Deterrence* (Toronto: University of Toronto Press, 1972), 320–31.

3. See W. A. B. Douglas, *The Creation of a National Air Force: The Official History of the Royal Canadian Air Force Volume II* (Toronto: University of Toronto Press and the Department of National Defence, 1986), Chapters 2–4.

4. Jockel.

5. Jonathan F. Vance, *High Flight: Aviation and the Canadian Imagination* (Toronto: Penguin Books, 2002), vii–viii.

6. Air Marshal W. A. Curtis, Chief of the Air Staff, "A Message from the CAS," *The Roundel* 1, no. 1 (November 1948): 1. I also discuss the importance of *The Roundel* and the *R.C.A.F. Staff College Journal* for the RCAF leadership in fostering RCAF air power and air defence discourse in my previous article for the 2008 Air Force Historical Workshop. Richard Goette, "Air Defence Leadership During the RCAF's 'Golden Years,'" in William March, ed., *Sic Itur Ad Astra:Canadian Aerospace Power Studies Volume 1: Historical Aspects of Canadian Air Power Leadership* (Ottawa: Her Majesty the Queen as represented by the Minister of National Defence, 2009), 55–6.

7. Larry Milberry, *Sixty Years: The RCAF and CF Air Command 1924–1984* (Toronto: CANAV Books, 1984), 209.

8. *The Roundel* 1, no. 1 (November 1948): front cover.

9. F/L E. P. Wood, "Northern Skytrails: The Story of the Work of the R.C.A.F. in Canada's Arctic and Sub-arctic Part 1," *The Roundel* 1, no. 1 (November 1948): 28–32.

10. Ibid., 28.

11. Ibid. Interestingly, the author also notes that this series consisted of 500 typewritten pages in total and that as a result, "much material has been omitted as having little interest except for the historian or the arctic specialist."

12. Wood, 28.

13. Ibid.

14. F/L E. P. Wood, "Northern Skytrails: The Story of the Work of the R.C.A.F. in Canada's Arctic and Sub-arctic Part 11," *The Roundel* 1, no. 11 (September 1949): 9. For further information on early post-Second World War operations in Canada's North, see the following: Hugh Halliday, "Recapturing the North: Exercises ESKIMO, POLAR BEAR, and LEMMING, 1945, *Canadian Military History*, 6, no. 2 (Spring 1997): 29–38; Hugh Halliday, "Exercise 'Musk-Ox': Asserting Sovereignty North of 60," *Canadian Military History* 7, no. 4 (Autumn 1998): 37–44.

15. Ibid.

16. For details on the issue of the United States and Canadian Arctic sovereignty during the cold war, see Coates et al., *Arctic Front*, Chapters 2 and 3.

17. See, for example, the following from an airman with Air Transport Command H.Q.: W.O.2 R. B. Hampton, "Arctic Glimpses," *The Roundel* 2, no. 12 (November 1950): 38–42.

18. Group Captain V. H. Patriarche, "The Strategy of the Arctic," *The Roundel* 2, no 6 (April 1950): 38–42.

19. Ibid., 38.

20. Ibid.

21. Ibid., 40.

22. Ibid., 40–41.

23. *Nineteen Years of Air Defense*, NORAD Historical Reference Paper No. 11 (Colorado Springs: North American Air Defence Command, Ent Air Force Base, Colorado, 1965) Directorate of History and Heritage (DHH) 73/1501.

24. Patriarche, 42. Emphasis added.

25. Marshal of the R.A.F. The Viscount Trenchard, "Maginot Mentality," *The Roundel* 3, no. 5 (April 1951): 37. For background on Trenchard's theories on strategic bombing, see the following: Philip S. Meilinger, "Trenchard and 'Morale Bombing': The Evolution of Royal Air Force Doctrine Before World War II," *The Journal of Military History* 60, no. 2 (April 1996): 243–70; Phillip Meilinger, "Trenchard, Slessor and Royal Air Force Doctrine Before World War II," in Phillip S. Meilinger, ed., *The Paths of Heaven: The Evolution of Airpower Theory* (Montgomery: Air University Press, 1997), 41–78.

26. Trenchard, 38.

27. Ibid. Another British air power legend, MRAF Lord Arthur Tedder, made much the same conclusion regarding the importance of bombers in the cold war era in an additional article from *Air Clues* that was reprinted in *The Roundel* in 1950. MRAF Lord Arthur Tedder, "Air Defence: An Address to the Royal Empire Society," *The Roundel* 2, no. 9 (July–August 1950): 50–54.

28. Trenchard also strongly recommended that air force planners should read Alexander Seversky's most recent book, *Air Power: Key to Survival*, noting that it "is nearer to my own views on defence questions than anything I have heard or read, in this country or any other, about the future of world defence." Ibid., 38–39. Quotes from page 39.

29. S/L H. C. D. Upton, "The Ground Observer Corps," *The Roundel* 5, no. 8 (September 1953): 10–13; "The Ground Observer Corps," *The Roundel* 9, no. 10 (December 1957): 11–13; Squadron Leader J. E. Mahoney, "Aircraft Control and Warning in the R.C.A.F.," *The Roundel* 6, no. 4 (April 1954): 4–10; Flight Lieutenant A. T. Paton, "NORAD: International Guardian," *The Roundel* 11, no. 5, (June 1959): 2–9; "Canadians at Colorado Springs," *The Roundel* 11, no. 5, (June 1959): 10–13; S/L L. J. Nevin, "Operation Deep Freeze," *The Roundel* 10, no. 6 (August 1958): 20–23; F/O S. G. French, "The Mid-Canada Line," *The Roundel* [three parts] 10, no. 3 (April 1958): 2–5, 31; no. 4 (May 1958): 10–15; and no. 5 (June-July 1958): 12–18; S/L R. Wood, "Stand-by at Churchill," *The Roundel* 9, no. 1 (January-February 1957): 12–13.

30. A sampling includes: James Hay Stevens, "The Interceptor's Future," *The Roundel* 2, no. 9 (July/August 1950): 58–62; "The CF-100," *The Roundel* 2, no. 5 (March 1950): 3–4; Wing Commander H. R. Foottit, "File Analysis: AFHQ S60-3-63 The Avro CF-100," *The Roundel* 4, no. 9 (October 1952): 15–21; "Avro Arrow," *The Roundel* 9, no. 9 (November 1957): 25; "Arrow Pilot," *The Roundel* 10, no. 5, (June-July 1958): 28.

31. For more on Exercise SWEETBRIAR, see Milberry, *Sixty Years*, 215–16.

32. Sergeant D. J. Blain, Canadian Joint Air Training Centre, "Sweetbriar Diary," *The Roundel* 3, no. 10 (December 1950): 37–46.

33. Editor's Note, Ibid., 37.

34. Ibid., 37–46. Indeed, one of the most prevalent themes in the article was not the joint and combined operations, but the many instances where RCAF aircraft had to be deployed on search-and-rescue missions to look for and drop supplies to survivors of aircraft that had crashed in the harsh conditions.

35. F/L J. D. Harvey, "North of Fifty-Four: The Northern Operations of Air Transport Command," *The Roundel* 7, no. 11 (December 1955): 3. For another account of the RCAF's SHORAN programme in *The Roundel*, see: F/L. H. N. Astrof, "9-Year Job Ends," The Roundel 9, no. 8 (October 1957): 15–16.

36. Harvey, 3.

37. Wing Commander C. B. Limbrick, "Canada's Radar Outposts: A Little-known Chapter in the History of the R.C.A.F. during the Second World War," *The Roundel* 2, no. 7 (May 1950): 39–42. Limbrick

was a radar operator during the Battle of Britain, after which he was one of the RCAF officers responsible for building and operating an early warning radar system along Canada's east and west coast and the northern Prairie provinces, Ontario, and Quebec.

38. Ibid., 39–40. Interestingly, the author noted that a few of the radars were "intended for detection of submarines seeking entrance to larger rivers."

39. Ibid, 40.

40. Ibid.

41. Ibid.

42. Ibid., 42.

43. Ibid.

44. Ibid.

45. "Our Genial North," *The Roundel* 1, no. 1 (November 1948): 14.

46. Patriarche, "The Strategy of the Arctic," 38.

47. Ibid., 39.

48. Hampton, 39.

49. Ibid., 40.

50. Ibid., 42.

51. Ibid.

52. Ibid.

53. Ibid.

54. Goette, "Air Defence Leadership," 57–58.

55. DHH 74/649, "The Air Defence of Canada," 97.

56. For more on efforts by the Canadian government to bring greater modernity/modernism to locations in Canada's North see: P. Whitney Lackenbauer and Matthew Farish, "High Modernism in the Arctic: Planning Frobisher Bay and Inuvik, *Journal of Historical Geography* 35, no. 3 (July 2009): 517–544.

57. S/L D. Gooderham, "So You're Going North?" *The Roundel* 1, no. 10 (August 1949): 23–25.

58. Ibid., 23.

59. Ibid.

60. Ibid.

61. Ibid.

62. Ibid., 24. He adds, "it is understood that this deplorable state of affairs arose through a slight variance of opinion as to whether blubber lamps fall within the jurisdiction of CE or Supply."

63. Ibid.

64. Cartoon by Ray Tracy in Gooderham, 24.

65. Ibid.

66. Ibid., 24–25.

67. Vilhjalmur Stefansson, *The Friendly Arctic: The Story of Five Years in Polar Regions* (New York: Macmillan, 1922).

68. Gooderham, "So You're Going North?," 1, No.10 (August 1949): 25.

69. R. V. Dodds, RCAF Director of Public Relations, "For the Arctic Gourmet," *The Roundel* 2, no. 5 (March 1950): 38–40.

70. Cartoons by Ray Tracy in Dodds, 38, 39.

71. F/L S. E. Alexander, "RCAF Survival Training School," *The Roundel* 1, no. 6 (April 1949): 9–11; F/O L. W. F. Beasleigh, "The Complete Survivalist," *The Roundel* 5, no. 4 (April 1953): 40–42.

72. See, for example, the following: F/L T. J. MacKinnon, "The Roundel Visits: RCAF Station, Whitehorse," *The Roundel* 1, no. 10 (August 1949): 28–33 and F/L M. M. Lee, "The Roundel Visits: RCAF Station, Goose Bay," *The Roundel* 2, no. 7 (May 1950): 17–27.

73. G. J. Klein, "Aircraft Ski Research at N.R.C.," *The Roundel* 3, no. 3 (February 1951): 30–35; S/L E. N. Henderson, "The Arctic Armourer," *The Roundel* 4, no. 2 (February 1952): 1–5.

74. Cartoon by Ray Tracy in F/L E. P. Wood, "Northern Skytrails Part VII: Commercial Aviation in Northern Canada: 1920–1939," *The Roundel* 1, no. 9 (May 1949), 29.

75. F/L J. D. Harvey, "Spring Re-Supply in the Arctic," *The Roundel* 7, no. 8 (September 1955): 17–19; "Arctic Airlift," *The Roundel* 10, no. 3 (April 1958): 20-21; Corporal G. A. Walker and W. M. Noice, "Operation Re-Supply," *The Roundel* 11, no. 5 (June 1959): 16–17. Quote from first article, 17.

76. Ibid. Quote from Harvey, 18.

77. "Mercy Flight," *The Roundel* 9, no. 8 (October 1957): 2; Dr. P. E. Moore, Director, Indian Health Services, Department of National Health and Welfare, to Air Marshal Wilfred Curtis, Chief of the Air Staff, National Defence Headquarters, reproduced in "A Tribute to S.A.R.," *The Roundel* 3, no. 5 (April 1951): 47; Cover, *The Roundel* 5, no. 2 (February 1953).

78. F/L J. D. Harvey, Director of Public Relations, "Operation SANTA CLAUS," *The Roundel* 6, no. 2 (February 1954): 44–46; F/L J. D. Harvey, "Operation SANTA CLAUS," *The Roundel* 7, no. 2 (February 1955): 16–20; see also F/L S. E. Alexander, "How Father Creesimiss Came to Cambridge Bay," *The Roundel* 3, no. 1 (December 1950): 34–35.

79. "Take it Off!" *The Roundel* 4, no. 2 (February 1952): 32.

80. Ibid. Cartoon by Ray Tracy.

81. "Snow-Depth Can't be Guessed," *The Roundel* 4, no. 2 (February 1952): 1–5; "Take it Off!": 32.

82. "Don't Forget Your Pine Tree," *The Roundel* 4, no. 1 (January 1952): 35.

83. "Arctic Nature Note," *The Roundel* 4 no. 7 (July-August 1952): 46; "Ice-Worm Certificate," *The Roundel* 7, no. 1 (January 1955): 32.

84. "Ice-Worm Certificate," 46.

85. Corporal W. F. Kervin, "Baby, It's Cold Inside," *The Roundel* 4, no. 4 (April 1952): 5. This poem was reprinted from the RCAF Station Whitehorse newsletter the "Knee Bird."

86. Svenn Orvig, Review of Moira Dunbar and Keith R. Greenaway, "Arctic Canada From the Air" (Ottawa: Defence Research Board, 1956). Dr. Orvig was an associate professor in the Department of Geography at McGill University and the former Director of the Montreal Office of the Arctic Institute of North America. Greenaway, sadly, recently passed away after decades of service to his country. For a good account of his life, see Colonel Morris Gates, "The Passing of an Icon: Brigadier-General Keith R. Greenaway, CM, CD (Ret) 1916–2010," *Airforce Magazine* 34, no. 1 (Spring 2010): 9–23.

87. "W/C Showler Awarded McKee Trophy for Arctic Survey," *The Roundel* 10, no. 6 (August 1958): 31–32. For more on this unfortunate accident, see the article by Rachel Leah Heide in this publication.

88. "Dedication at Midnight," *The Roundel* 5, no. 10 (November 1953): 18.

89. "Special Arctic Issue," *The Roundel* 12, no. 4 (May 1960).

90. See, for example, Coates, et al, Arctic Front, Michael Byers, *Who Owns the Arctic?: Understanding Sovereignty Disputes in the North* (Toronto: Douglas & McIntyre, 2009), and also the articles by Whitney Lackenbauer and Rob Huebert in this book for more recent discussions of these issues.

91. Main Webpage, "Ice Pilots NWT," http://www.icepilots.com (accessed January 2, 2011).

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Chapter 6

Inuit-Air Force Relations in the Qikiqtani Region During the Early Cold War

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Historians chronically speak of the military opening up the Arctic, as if it had been a kind of locked and mysterious room before some clever army engineers happened by with the keys. Really, the military swept over the Arctic—first during World War II and more so during the Cold War—like an iron cloud, carpet bombing the place with boxes. Their job was the assertion of sovereignty. Every place a box landed became a beach-head for industrialized society. The boxes soon became the foundation for the Canadian government, which the military had given cause to worry about its sovereignty. Boxes were added, and more of our society—with its various virtues and vices, machines and organizations, ideals, morals, values and goals—were shipped north. What adult Inuit recall when they look back, not always in anger, is decade after decade when the skies rained boxes. The skies rain boxes still.

Kevin McMahon, *Arctic Twilight*[1]

The unfurling of polar projection maps at the end of the Second World War, when the wartime alliance between the Soviet and Western worlds began to unravel, focused unprecedented strategic attention on Canada's Arctic. Geographical isolation no longer afforded Canada the luxury of apathy when it came to its northland. The United States (US) clambered for access to bolster continental defences, and Canadian decision makers, cognizant of the need to work with their southern superpower neighbour or risk the prospect of the US acting on its own, proved accommodating allies.[2] Yet "neither the United States nor Canada looked on the North as a *place* to be protected because of some intrinsic value," strategist Kenneth Eyre astutely observed. "It was seen as a *direction*, an exposed flank."[3] Despite framing the Arctic as a vast, empty strategic space, decision makers still had to acknowledge that an indigenous population called the region home.

In 1946, geographer Trevor Lloyd recommended that Canadians should "see that none of the contemporary military activity in the Arctic is allowed to touch the lives of the Eskimos."[4] In practice, this wishful thinking proved impossible. The influence of military modernization[5] on Canadian northern peoples has often been noted but seldom explored in detail. Anthropologist John Hughes, in his sweeping 1965 article on cultural change amongst the Eskimo, observed that military construction was the key impetus for "the seemingly inexorable gathering of the Eskimo population into more permanent villages and the attrition of outlying settlements." Over the course of a single generation, these "settlement Eskimos" had become "oriented to a fundamentally different way of life."[6]

In their important studies on relocations and game management in the Arctic, Frank Tester and Peter Kulchyski see the state as a totalizing force, its mission underpinned by an ideology of progress. "Totalization of the state," they argue, "involved for the state, the transmutation of the need away from relations to animals and toward what so-called progress had to offer: wage employment, permanent housing, settlement living, and all that they entail. Undermining the hunting regime, as a way of meeting culturally constructed needs, was crucial to attempts to absorb Inuit by the Canadian state into dominant social forms."[7] During the cold war era, northern military projects were, as documentary filmmaker Kevin McMahon described, beachheads of modernism: sites of wage employment, new housing and Western technologies, and sources of disruption to Northern ecosystems and traditional patterns of life. Although not primarily designed to bring Aboriginal peoples under state control, defence initiatives—conceived from afar and implemented locally—had far-reaching impacts. Accordingly, scholars like Frances Abele have argued that "sovereignty and security policy decisions, in their immediate impact, have been and continue to be disproportionately costly to northern indigenous peoples."[8] Inuit spokesperson Mary Simon concurred that "too often, military projects are centralized undertakings that are unilaterally imposed on indigenous peoples

and their territories. Such actions are inconsistent with the basic principles of aboriginal self-government."[9] Militarization appears to fit within the framework of a coercive, totalizing, high modernist[10] state interested in re-engineering Inuit life to conform to modern priorities.

The federal government's approach to Arctic defence was paradoxical. Although the military in general, and the Air Force in particular, was not at the forefront of intentional social engineering, nor did its practices represent a well-orchestrated scheme to "civilize" the Inuit, its activities created or exacerbated dependencies on wage employment and Western goods, encouraged the sedentarization of the Inuit, and set up unsustainable expectations given the "boom and bust" cycles associated with defence work. The presence of military installations did circumscribe certain Inuit behaviours, but the coercion implied in recent literature on state-Inuit relations during the cold war seems strangely absent.[11]

This study examines how the establishment of Air Force installations affected Inuit in the Qikiqtani region during the first two decades of the cold war. "The outlook of the Eskimos… has been changing since the construction of the northern airfields, the weather and radar stations, and the D.E.W. [Distant Early Warning] Line, opened their eyes to the advantages of wage-employment," anthropologist Diamond Jenness observed in *Eskimo Administration*.[12] At Frobisher Bay, the military hub of the eastern Arctic, the presence of an airfield, weather station, radar station, and construction activities related to the DEW Line drew Inuit people into the web of modern urban life. Reports from government officials and oral histories reveal how the expansion of the military's footprint in the 1940s and 1950s reshaped boundaries, expectations, and tastes of Frobisher's inhabitants. It also changed the socio-economic and cultural geographies of southern Baffin Island more generally. In the High Arctic, the government-sponsored relocation of Inuit to Resolute aimed to support traditional harvesting practices. The establishment of the Inuit community immediately adjacent to a Royal Canadian Air Force (RCAF) base, however, had unexpected consequences. There, Inuit found a comfortable mixture of both tradition and modernity and quickly incorporated the wage economy into their daily lives. In some ways, Resolute served as a model for the transitioning Inuit society. These stories are a poignant reminder that Air Force projects, conceived for Arctic security reasons, can have dramatic impacts on indigenous populations living in remote communities.

Frobisher Bay (Iqaluit)

The Second World War had a transformative impact on Canada and on Aboriginal peoples in particular, (re)shaping social discourses and the physical and cultural geographies of interaction.[13] This was particularly evident in the Canadian Northwest, where military development projects brought a flood of outsiders (predominantly Americans) into the region. This incited a sovereignty panic in Ottawa, prompting Vincent Massey's famous claim that a US "army of occupation" had "apparently walked in and taken possession [of the North], in many cases as if Canada were unclaimed territory by a docile race of aborigines."[14] Massey's colourful commentary on the broad Canadian-American relationship also played upon a stereotypical image of Native peoples. In reality, Aboriginal groups were marginalized, their land rights ignored, and a distant federal government both regulated and protected them from outside threats.

In other areas, the effects of the war were less acute but initiated a process of military modernization that culminated during the 1950s.[15] Frobisher Bay (Iqaluit) was a temporary fishing spot for the Inuit of southern Baffin Island, but had never hosted a year-round settlement. Its first permanent incarnation was Crystal Two, an airbase and weather station at the head of the bay, and a stop on the Crimson Staging Route, the series of bases and depots that the US established (with Canadian approval) to facilitate the transfer of planes and other materiel from North America to Europe during the Second World War. By the time the Crystal Two station became operational in 1943, the installation was "virtually obsolete" for wartime purposes.[16] Nevertheless, the Crimson Route airfields were heralded as modern miracles. In the words of Malcolm MacDonald, the British High Commissioner to Canada, the Americans "treated… with indifference the obstacles which Nature—whose sovereignty in the Arctic is even more supreme than that of the Canadian Government—put in their way."[17]

The imprint of the Western military was particularly obvious to Inuit drawn to the new settlement. Tomassie Naglingniq encountered the Americans in 1941, when they first arrived in Frobisher Bay to find a location to build houses and an airfield. "The *Qallunaat* [non-Inuit] started giving us biscuits, sugar, tea, chocolate and Coca-Cola. They started opening pop and handing them to us," he remembered. "I took a sip when [one man with a long beard] told me to, and my tongue felt like it burned, but it was just Coca-Cola. When my tongue burned, I threw the pop inside our tent and it exploded. The next day the Americans gave out so many things, including cigarettes, to my family and everyone else."[18] Inuit were also exposed to Western popular culture:

> On a Saturday or a Sunday, when the Americans were not working, they took us to the ship and we watched a movie. We had never seen anything like that. Neither my grandparents nor my mother had ever seen anything like that before…. Once inside the theatre on the ship we saw a big white screen. It was really big. Niaquq, the man that spoke Inuktitut, told us to look at the screen… because we were going to watch a war movie. My mother and her family and a lot of other Inuit were watching. When the movie started, everybody started yelling "ajait ajait" [meaning I'm scared] because we never saw anything like that before. It was like the people in the movie were coming and shooting at us, and we were crying, us children anyway. We were even scared to look at the screen. My mother and my grandparents were yelling ajait when the people in the movies were shooting. The sound of the shooting sounded like "tuk tuk tuk tuk tuk tuk." The Inuit were ducking and taking cover, because they thought they were being shot at.[19]

The arrival of the Americans marked a turning point in the history of the region. Food, cigarettes, and movies (usually westerns) are common elements in Inuit narratives of their encounters with armed service personnel. Before the war, the only Qallunaat that Naglingniq's family had seen were the Hudson's Bay Company (HBC) employees at the local trading posts. They had never seen mechanized vehicles like bulldozers. "When they started unloading the ship, their vehicles just started moving on the ground even though they were made of metal," Naglingniq recounted. "Looking back, we must have thought they were from the moon."[20]

Historian Mélanie Gagnon's collection of Iqaluit elders' memories provides poignant insight into how the military presence at Frobisher Bay transformed lives of Baffin Island Inuit. Elijah Pudlu was about nine years old when he arrived in Frobisher Bay to find "lots of houses by the airport hangar where the Americans were." The Inuit he encountered living at the site seemed "very wealthy" compared to those living in outpost camps:

> They had all kinds of things such as candies. The Americans were here then. All the people that lived here were helped by the Americans very much. The Americans used to give us fuel for free. We used to get 45 gallons of fuel. Those fuel tanks weren't there when we came here. All the fuel tanks were by the church. There were a lot of barrels. They were refilled from a ship. Inuit didn't use fuel in their stoves back then. There were lots of American ships coming here. Whenever they arrived during the summer, they used to bring lots of supplies. It was like the ship was making babies. We used to watch them when the barges landed. It was like on a movie when they had their combat vehicles. There were a lot of ships that would arrive at once. They were all American. Whenever the combat vehicles were on the land, it used to be very noisy. They were the kind that could drive onto the land. Some of them were small. I heard that there was a war when the Americans were here. They even had a cannon on top of the hill because they were keeping watch. Also over by the airport where there was a military base for the Americans, I heard that they had a big cannon…. They were protecting the Inuit. This town probably wouldn't exist if the Americans hadn't come here to protect us.[21]

The comparison to a "movie" is telling, given the language of protection and how surreal the re-supply operations must have appeared to Inuit living in a comparatively desperate environment. This was not an invasion force. Indeed, elders recall disappointment when US Army Air Force personnel were replaced by a token Canadian staff sent to man the base in 1944. More

Inuit worked, but while the Americans tended to give out things like food for free, the Canadians insisted that Inuit pay. The jump in the price of a carton of cigarettes from $1 to $5 was a source of particular unhappiness.[22]

As relations cooled between the West and the Soviet Union at the end of the Second World War, the threat of a transpolar attack on North America became more real. The bilateral military bond between Canada and its southern neighbour tightened and basic agreements for shared continental defence took shape. In 1947, American authorities returned in strength (400 personnel) to refurbish runway no. 1 at Frobisher Bay.[23] This drew in more Inuit from the dispersed camps throughout the Qikiqtani region, but no one was coerced to move to Frobisher Bay to help with military construction.

Simonie Michael lived at Ukiallivialuk, an outpost camp 50 miles (80 kilometres [km]) from Iqaluit, before moving to Frobisher Bay to work. When news arrived that about 200 *Puatiki* (African Americans) would arrive,[24] the local Inuit were moved to a nearby island called Ukalirtulik. "We were forewarned about the Black people arriving, telling us that they were going to mingle with our women," Michael explained.

> That is what the Police Officer told us, because they would interfere with our women, he told us to move to the Island. We had to discuss better options, before Apex, we didn't even have any mode of transportation to move, we had absolutely nothing to move ourselves with! So our men formed their own group and my wife's father, Itorcheak, became the community leader. The Americans were located up there and Inuit would be located down there, I mean we were not that far away from each other. Perhaps a good walking distance to the end of the point of Iqaluit and that's how we got there, by walking. The white men were living up there and we lived down here, we didn't amalgamate in one place.
>
> There was a sign; the RCMP [Royal Canadian Mounted Police] officer made a sign stating "Do Not Enter Inuit Land" by anyone and when you go up a distance at the edge of Iqaluit area, there was another sign saying the same thing, that there were to be no entrance to Inuit land. If you entered Apex through Apex Hill or from the south side, it said the same thing, "Do Not Enter Inuit Land" all the way up to Iqaluit, even before we settled in Apex. When they put up those signs, we wanted to make Apex our settlement. Even when we advised them about wanting to move, we were stuck for quite a long time because we didn't have the means to move, to get off the Island. We didn't have the material to build our own house, qarmaq, I mean there was totally nothing! Those were the major problems for us![25]

They found Ukalirtulik "impossible to live in," with no water, harbour, or easy access to work on the mainland. They gathered scrap packing material and boxes to make houses, which were not insulated and only warmed by makeshift heaters furnished out of powdered milk tins. "Since we were told to work a regular job," Michael explained, most Inuit "couldn't constantly provide food for their dogs anymore, so most men couldn't afford to take care of their dog-teams."[26]

Andrew Thomson, controller of the meteorological division at the Department of Transport, visited Frobisher Bay in early April 1948. "The Eskimos run tractors and trucks, pump out oil daily from drums and distribute it to station personnel by truck," he reported to External Affairs. "The local laundry is operated by three Eskimos; one runs the dry cleaning section and the other two the washing and ironing section." The American officer in charge at Frobisher Bay said that without Inuit help it would be "a real problem" distributing the 15,000 barrels of oil taken ashore annually.[27]

About 185 Inuit lived in a village about half a mile from the weather station, an area that was strictly off-limits to military personnel—except "between 2:00 and 4:00 p.m. Sunday afternoon for taking pictures." Tourists who expected a romantic image of Inuit life were disappointed. Thomson found the living conditions deplorable, which he documented to convey "the extremely

difficult problem that is created by bringing in Eskimos to work at a weather station." The Inuit inhabited extremely dirty small frame huts, much less satisfactory than their snow igloos. "The Eskimo natives employed attempt to follow the white man's customs," he noted. They had replaced their traditional clothing with "woollen underwear and a fur parka; the woollen underwear is left on until, the RCMP told me, it fairly rots off. Normally, in the native state, the Eskimo would take off the clothing and hang it up outside in the cold and sleep in a sleeping bag; in the morning the Eskimo would beat out their fur clothing and get rid of the dirt." Fortunately, in Thomson's view, better access to medical care at Frobisher helped the Inuit to overcome "the health problems created by the change from their native habits and customs."[28]

Although the US military continued to operate the Frobisher airbase in the late 1940s, the RCAF had need for labour at its northern stations and contemplated employing Inuit for the first time. It was difficult to get Qallunaat men to serve for long lengths of time, after all, and differential pay rates compounded the high costs of transporting them in and out. Accordingly, commanding officers at various RCAF units in the far north requested authority to hire Inuit as local labourers and interpreters. The RCAF looked to be selective, identifying "only Eskimos of the non-nomadic tribes" who had received mission educations, and sought permission from its government counterparts to hire three Eskimos per Arctic unit.[29]

Hugh Keenleyside, the deputy minister at the Department of Mines and Resources (DMR), responsible for Eskimo Affairs at the time, explained to the Air Force that Inuit relied on hunting and trapping for subsistence. He worried that they would lose their hunting and trapping skills if they were withdrawn from the native way of life, even for a couple of years. This also affected childrearing for a traditional lifestyle. Accordingly, the Northwest Territories administration had tried to limit the amount of time that an Eskimo could be employed on "white men's work" and thus avoid difficulties associated with casual employment. At Frobisher Bay, for example, the US army employed about 25 Eskimos who lived with their families at the air base. "Their employment is rotated with other Eskimos in the region so that no native with a family can remain longer than one year at the air base," Keenleyside explained. "This seems to be the only possible arrangement in cases where there is no guarantee of long-term continuity of employment." This rotation would make sense for casual or temporary work, as long as men were not drawn away from gathering food for the winter, "otherwise they might face a winter of living on relief at the nearest post."[30] If young men with "special ability" had the option of permanent work, however, with the same old age security as other RCAF members, then they could be trained accordingly:

> The Eskimos are an ingenious race and many have marked inherent mechanical ability as evidenced in their care and operation of boat engines. It is our belief that, if continuity of employment could be assured, many of them could learn to handle maintenance work at air establishments, meteorological and radio stations, etc. In fact, in time, with education, there seems no reason why they might not be able to fill more technical jobs. If opportunity for permanent employment for Eskimos should present itself at any of your establishments in the north, we can see no objection to allowing young Eskimo men of proven ability to occupy such positions. This would be of advantage to the Eskimos by providing careers for them, and to their employer in not having to bring men out on furlough.[31]

The RCAF was cautious about any permanent arrangement, however, until it had more experience employing Inuit as casual labourers.

In the meantime, the DMR agreed to actually employ the men and attach them to the units, with the RCAF covering wages and expenses. So long as the RCAF work did not disrupt regular hunting and trapping, rates of pay fit with the department's norms, pay was credit with the local trader (preferably the HBC, "who are definitely interested in keeping the natives fit for trapping"), and the local RCMP were consulted, DMR supported it.[32] RCAF officers also had unique responsibilities to oversee the Inuit transition to modern "civilized" society, Keenleyside emphasized in early 1950:

> As you know, the Eskimos are a nomadic, comparatively primitive people and conditions of settled living and employment are a drastic change for them. They need encouragement, leadership, instruction and supervision in the big task of learning to live satisfactorily under settled conditions. For example, they need to learn the habits of cleanliness and sanitation, which are not necessary or at least, not practised, in their normal nomadic existence. There may be a tendency on the part of the Commanding Officers at bases where Eskimos are employed to look at the matter from the standpoint of securing labour without taking into account the fact that a profound change in the life of the native takes place when he accepts employment, and interest and help are required if he is to adjust to this change. The Commanding Officers where natives are employed can be of very great assistance in seeing that the native employees learn the proper techniques and discipline required in civilized living, techniques and disciplines which we take for granted. In particular, it may be pointed out that since the RCAF, as the employing organization, assists in providing living quarters for their Eskimo employees, we should be quite happy to see your officers insist upon the maintenance of adequate standards of cleanliness and sanitation amongst the Eskimo employees and their families. This matter would also have a bearing upon the general health and welfare of the whole establishment at the air bases concerned.[33]

Keenleyside expected that the Inuit would be drawn into the wage economy even more over time, and hoped that RCAF cooperation would help them "to make the transition successfully."[34]

When the RCAF took over the unit formerly operated by the US Air Force (USAF) at Frobisher Bay effective 1 August 1950, it proposed to employ five Eskimos on a continuing basis: three tractor operators, one as a labourer assisting the driver of fuel tender and on sewage disposal, and another to operate a small laundry. Furthermore, up to 40 men might be hired as labourers to help unload boats during the open water season (July to October). All of these men would be drawn from the native village a few miles from Frobisher Bay.

> The Officer Commanding the unit concerned will be instructed to work in conjunction with the RCMP constable in the district in obtaining the proper natives and will also be advised to ensure that natives employed by the RCAF have proper living accommodation and that such accommodation is kept in good condition. This will also be done in conjunction with the RCMP constable. It is not intended, however, that special accommodation be provided by the RCAF.[35]

These conditions were the same as those applied to the RCAF hiring natives in the western Arctic and at Fort Chimo, Quebec—with the added perk that Frobisher Bay Inuit received a small cash salary so that they could buy cigarettes and tobacco from the RCAF canteen.[36] The deputy minister at Mines and Resources was most pleased.[37]

Burgeoning federal plans for Frobisher Bay in the early 1950s prompted the RCAF to articulate its own views on military modernization and government policy towards the Inuit. Given the large air force presence in the community, the RCAF and the Defence Research Board participated in preliminary planning for a new Inuit town-site. The main requisites included a site that would not interfere with base operations but would be relatively accessible to it for employment reasons. Group Captain F. W. Ball, Commanding Officer of the RCAF station Goose Bay (of which Frobisher Bay was a satellite) doubted that Frobisher Bay was the best place for an Inuit settlement, given that "the surrounding countryside can support only a few hunters" and already many of the local Inuit had become "charity residents." He noted a "conflict in thinking about the future of the Inuit."[38] On the one hand, policy favoured keeping an Inuk "as close as possible to his original state so that he can hunt and adding only minor modern improvements to his way of life." On the other hand,

> the second policy seems to favour giving the Eskimo the full benefit of modern civilization and educating him to take his place beside any other Canadian. This second policy appears to have the brighter future and for this reason a move of such a centre further to

> the south is recommended. However, before any scheme of education or rehabilitation is undertaken it is felt the long term objective of the government must be made clear. It is believed there is no happy medium, either the Eskimo must be left in their natural environment or if they are to be given modern benefits a full and rigorous program must be instituted.[39]

Group Captain Z. L. Leigh completely agreed with this report and passed on the message that "the Frobisher Bay area is a totally unrealistic selection if it is the intention that the Eskimos remain as hunters." Only by moving the Inuit southward, closer "to areas where employment, medical coverage, etc, is reasonably close at hand," could Canada achieve the "eventual rehabilitation of the Eskimos."[40]

The federal government did not follow this line of advice (indeed, it relocated some southern Inuit to the far north, as we describe later), and growing American interest in Frobisher Bay (driven by changing geostrategic assessments arising from the Soviet detonation of an atomic device, and the outbreak of the Korean War in late 1950) prompted resurgent military activity. Command of the base returned to the USAF Northeast Air Command. The base served as a transhipment point during the construction of the massive American airbase at Thule, Greenland, and a radar station (the terminus of the Pinetree Line, which spanned southern Canada and ran up the Newfoundland-Labrador coast) was built near the Frobisher Bay airfield.[41] In 1953, the American 926th Aircraft Control and Warning Squadron arrived to maintain the radar site. With the arrival of more armed forces personnel came more restrictions on local mobility. Tomassie Naglingniq recalled walking too close to the upper base as a teenager hunting with some friends:

> It was scary when the Americans came with their guns. We were not supposed to be in that area with guns. We had caught a lot of ptarmigans. They took the ptarmigans from us. I guess they called the RCMP officer because he came. He was the only policeman at that time. When he took us, we thought we had been arrested, but he just took us home. The next day they did not return the ptarmigans, but they gave us pop and chocolate in return. That was a scary experience. We were scared. The next day they just told us not to go up there again.[42]

Similarly, Akisu Joamie recalled that the "Inuit were not allowed to go beyond where the breakwater is today." At that location, the Inuit would hand over to the RCMP officer goods and carvings they were trying to sell. The police would act as a liaison and offer them to the Qallunaat working at the base. Although Inuit-Qallunaat interaction was prohibited, this did not mean that service personnel were disinterested in the plight of their neighbours. Joamie and others remembered how service personnel "would pile up food, such as a hundred pounds of flour, or a hundred pounds of sugar," where they knew the Inuit visited.[43]

For their part, Ottawa officials lamented the growing dependency of the Inuit on the military and concomitant loss of traditional land skills. Although defence projects attracted indigenous people from the surrounding areas, it would be erroneous to presuppose that government planners sought Inuit sedentarization. Geoffrey Bruce, a member of the Defence Liaison Division at External Affairs, visited Frobisher in 1953. At that point, the site consisted of an Inuit settlement, RCAF and USAF buildings, a radio and meteorological building belonging to the Department of Transport, and a radar station. "The Eskimo community is a pitiful, pathetic site and one of the most perplexing and infectious problems facing the Northern Administration of the Department of Resources and Development," Bruce reported. "I understand that these Eskimos are almost completely dependent on the white settlement."[44] Many of the local inhabitants had worked at the station since 1942, and consequently had forgotten much of their old ways of life: hunting, fishing and trapping. Living in permanent, ramshackle houses made out of old scraps of material, they no longer migrated seasonally "but continue to live in increasing filth." Wage employment was not an equalizer. "Although a couple of Eskimos drove trucks, the great majority worked in the kitchens and around the buildings," Bruce observed. "It was pitiful and tragic in that the Eskimos have given up their own culture and have accepted, or are accepting, many of the material advantages but few of the non-material benefits of the 'Western World.'"[45]

In Bruce's eyes, the convergence of militarism and modernism had created an unavoidable storm. He insisted that "[s]ince it is quite clear that now it is too late to turn back, Canada has inherited an obligation to provide these people with something more than family allowances, a shovel, cigarettes, Coca-Cola, clothing, fuel and a healthy credit account at the Hudson Bay Company." The military had surpassed the whalers and fur traders as "the greatest employers" of the Inuit, and their clustering around defence installations had fundamentally disrupted their traditional patterns. "Before this development, there was probably some chance that these people could continue living their own life; now this is impossible," Bruce asserted. "Perhaps because there are only several thousand Eskimos in the entire Canadian Arctic the transition will be easy and painless. Possibly, it may be tragic."[46] This language of inevitable demise, which was inextricably linked to a sense of modern progress, was commonplace in the 1950s.

The apogee of military modernization came with the Distant Early Warning (DEW) Line, a string of radar stations along the Arctic coast built by the Americans from 1955 to 1957 to provide advance warning of a Soviet bomber attack on the North American heartland. During the early Canada-US negotiations that led to the construction of the system, Canadian officials expressed concerns about the effects that the military mega-project would have on the Inuit. At the request of the Department of Northern Affairs and National Resources (DNANR), the conditions for the building of the radar system included provisions to protect the Inuit from the fundamental disruption to their way of life and health.[47] Commentators took note. The government "insisted that no activity in any form should interfere with the Eskimos' normal way of life, or of making a living," Richard Morenus wrote in his epic 1957 book on the DEW Line. "Eskimos could be used as guides or as workers in certain types of jobs, but only after the Department agents had given their okay." He painted a positive portrait of "very intelligent" government support:

> These people, they explained firmly, were Canadian Eskimos, and Canada planned to have them stay that way. Eskimos, living as Eskimos have always lived, will remain a proud and valiant race with intelligent co-operative help. Canada will never allow her natives to become serfs or charges through assimilation if she can possibly prevent it…. They are not menials or servants. They are a proud people in their own land. The result is a splendid sense of equality among all the men working on the Line. There is no segregation, favouritism, or sense of superiority in one human over another. Up there in the Arctic there is a common bond in one world.[48]

Morenus suggested that the Canadian government was succeeding in insulating its Inuit from changes to traditional life, and that the Inuit were flourishing in a broader world. Others were less certain that fundamental transformation of Inuit life could be avoided. "The question whether the DEW Line will serve any useful military purpose has still to be answered, but there is no doubt that it will have a profound and lasting effect on the Arctic," C. J. Marshall, the director of the Northern Co-ordination and Research Centre (NCRC) of the DNANR,[49] anticipated the same year. "Inevitably, the lives of most of the Eskimos in the region will be drastically altered." Material prosperity brought benefits and temptations that would usher in a "new pattern of life" for the Inuit, but Marshall ended with optimism: "The adjustment will not be easy but with reasonable controls and guidance there is no reason why the D.E.W. Line should not be a boon to the Arctic even if it does not prove to be a shield for the rest of North America."[50]

In terms of an increased tempo of military activity, the DEW Line was "a boon" to Frobisher Bay, which became the communication and construction hub for the eastern section of the system. In April 1955, Pierre Berton found the Frobisher Bay base to be "a confused mosaic of men and machinery." He described huge planes on the runways, a great host of noisy vehicles and machines, and a list of southern food: "Coca-Cola, T-bone steaks, Irish stew, dumplings, grapefruit, pickles, ham and eggs, apple pie, and ketchup, ketchup, ketchup."[51] Alootook Ipellie recalled, as a child, going to the base "to wait outside their kitchen in hopes of being offered something to eat. We often succeeded and the smell of their food was like nothing that we had ever smelled before." Eventually, the tastes of Western society infiltrated Inuit dreams. "There came a time when at least once a day I would start to dream of having tons and tons of Qallunaat

food right in our little hut," Ipellie remembered. "Even if all of the food could not go in, I would think of becoming a genius at storing food and somehow get it all in there."[52]

The scale of DEW Line activities transformed Frobisher Bay, with profound implications for the Inuit of the region. In April 1956, *Edmonton Journal* reporter Douglas Leiterman predicted in a major article that "DEW Line Means End of Old Way of Life for 10,000 Eskimos in Canadian Northland." His story focused on the story of "Charlie" Sageeaktuk, for whom the DEW Line "came in a roar of engines from the south, and it brought with it for Charlie a white kitchen range, an outboard motor, and more wages in a day than his father had seen in a lifetime." It also foretold the end of his people's way of life. Sageeaktuk earned the reputation as "the best cat-skinner [bulldozer operator] in the eastern Arctic," but he was one of the first "victims" of the "$450,000,000 string of radar stations that guard the bombing route from Russia." He was also a happy victim. The Inuk was eager to trade "the harpoon for the west mop or the monkey-wrench and $1.67 an hour," but the Northern Service Officers (NSOs) and RCMP, "who have watched history harpoon the Eskimos," were less convinced. Holding Sageeaktuk up as an example of what was transpiring more broadly, "civilized Charlie" was "much less of a man than his father before him. At the half-way mark between seal-meat and sausages, he is chained to a way of life for which he is ill-prepared. He is ravaged by white man diseases. He lives a life of squalor and filth, a pitiful camp-follower, a mere blip on the radars built by the white man's fear." His "packing board shack surrounded by garbage and offal" could not be abandoned and rebuilt as easily as an "ancestral igloo." Sageeakdok owned "a shiny white range," but he had to "scrounge" for wood to fuel it. "His children wear mail-order shirt-tails under their sealskin parkas," the reporter noted, "but will grow up in a world in which they must always be outcasts." Echoing previous government and military commentators, he emphasized that the DEW Line set in motion an inevitable process of socio-economic and cultural change:

> Sociologists warn that changes as fundamental as these must be spread over decades for good results. "But how can we go slow," asks a northern service officer, "when the D.E.W. line is going ahead like an express train, and the Eskimo must change if he is to survive?" The change will be slow at first, and like the going of the sea-ice, it will be accompanied by much creaking and groaning. Nothing can stop it. The D.E.W. has cracked the face of the Arctic in 50 places, and the cracks will spread until the old life is swallowed up and the Eskimo becomes a first-class citizen.[53]

There is no simple answer whether the DEW Line was a net benefit or liability for the Inuit. Its transformative effects, however, were unmistakable. One RCMP officer noted:

> The fact that Eskimos at these points have been introduced to employment is not a matter subject to change. The policy to encourage Eskimos to take up employment as a means of livelihood is a part of that policy which acknowledges that employment and hunting and trapping can be the only sound economy for the Eskimos in the north. This of course is not to discourage the hunter from perusing his skills in taking animals from the sea and caribou from the land, but it is designed to provide him with some of the more substantial things which all Canadian citizens are entitled to enjoy—plenty of good food, security, a good home, medical treatment, and in some instances schools. Thus far all reports have tended to discredit the things which the D.E.W. line construction has brought to the Eskimos. These can be weighed only in the light of good that the same circumstances have brought. [54]

The Inuit were making between $350 and $650 a month working at the DEW line. They received Sundays off and were generally permitted to take a few days off at a time to go out hunting. The money earned permitted the Inuit to buy new tents, rifles, boats, gasoline, and other goods. In addition, the DEW line provided Inuit with training, and they were given the opportunity in some cases to get outside training. Northern Service Officer R. D. Van Norman noted: "All of these things are a far cry from just three years ago." Inuit had "a substantial means of livelihood, security and the opportunity to compete for equality in all matters."[55] How they spent this money, and whether employment would continue in perpetuity, was another matter.[56]

Although DEW Line stations provided limited employment for Inuit at other stations in the Qikiqtani region, the Qikiqtani Truth Commission recently concluded that the project as a whole had the greatest economic impact "in stimulating Iqaluit's growth as an administrative centre and forwarding point, and in the development of its airport."[57] The growth of the town was explosive in the late 1950s. Anthropologist Toshio Yatsushiro counted 258 Inuit in 1956, and 624 by 1958. By that point, 59 per cent of the Inuit residents lived in tents in summer and "wooden huts" in winter—mostly "shacks" or hovels of the worst imaginable type, with poor insulation and overcrowding."[58] By January 1957, only 19 families lived in camps away from the main settlement, while 42 resided at the air base and 17 at the new government town-site.[59] The Inuit were not the main priority for boosters who trumpeted Frobisher Bay's potential as the Alexandria of the North, located at a new "crossroad of the world," and hatched ambitious plans for the settlement.[60] The US Strategic Air Command (SAC), which operated the long-range strategic bombers protecting North America, and which sought to improve its in-flight refuelling capabilities in the northeast by stationing a squadron of KC-97 tanker aircraft at Frobisher Bay, began constructing a base in 1958. Cabinet approved a new town-site adjacent to the airfield that June, and the RCAF (which had transferred the airfield to the Department of Transport in late 1947) played an increasingly minor role in this bold planning.[61]

Grand visions built around the projected expansion of the airfield and an anticipated community of 5000 people "proved ambitious, misguided, and ultimately false," historian Jeff Noakes tidily summarized.[62] The signs were already clear by the end of 1958. After serving in Lake Harbour (Kimmirut) from February 1957 to September 1958, RCMP constable Terry Jenkin returned to find Frobisher a very different place than that which he had left:

> It was my request to go back to Iqaluit to get into real police work. I was shocked; it was very busy in a different sense. The D.E.W. Line and aircraft traffic had decreased. The non-Inuit population had decreased. The Inuit had also increased. In fact, I met a family that I had visited in Lake Harbour. I was shocked to see them there. There were other families that came from Lake Harbour. I guess there was accommodation on Apex…. I think the US had left and there was a small number of Canadian Air Force. The US still maintained the PINE Station. There was a larger government in the Apex hill area. I think a lot of the functions we [the RCMP] had as registrars was taken over by local government institution.[63]

Frobisher became an administrative centre, but its role as an essential refuelling base for transpolar Air Force and commercial traffic proved fleeting. By late 1960, long-range jet airliners, capable of flying to Europe directly, obviated the need for commercial airlines to use Frobisher as a "regular stop."[64] The government continued with a reduced urban development program, but when the Americans unexpectedly decided to withdraw from their SAC base in 1963, about half of Frobisher Bay's non-Native population—American and Canadian servicemen and their families—departed. "Sunk without a trace," historian Morris Zaslow noted, "were the grandiose futuristic plans for the experimental Polar City made proof against the Arctic weather."[65]

The military had proven to be yet another transient resident of the Arctic, but the experience at Frobisher also revealed how defence installations served as catalysts for cultural change.[66] The American and Canadian air forces had played the formative role in transforming Frobisher Bay from a fishing spot to the largest community in the eastern Arctic. By May 1960, the non-Inuit population of Frobisher was 590 and the Inuit population 800, nearly all of whom lived in the settlement.[67] Despite earlier RCAF admonitions that the local area was not suitable for subsistence hunting, and that the Inuit transition to modernization would only occur if they were relocated south, Frobisher Bay had changed from an air force facility born in the Second World War to a permanent administrative centre governing the Inuit of the eastern Arctic. Ironically, relocations of Inuit from the south to the far northern settlements of the Qikiqtani—particularly Resolute—represented a very different experience.

Resolute

In 1947, a joint Canada-US weather station was established at Resolute. Two years later, the RCAF established a base there. Built at a cost of approximately $1.5 million, the base became

the jumping off point for researchers, explorers, and government agents travelling in the High Arctic. In many ways, the establishment of the RCAF base at Resolute was an important step towards opening the High Arctic to human habitation and development.[68] By 1952, Resolute had a population of approximately 200, making it the second largest settlement in the Qikiqtani region. There were, however, no Inuit living in the immediate area.

The Canadian government was awakening from its long period of "absent-mindedness" about its North in the early 1950s, partly as a result of development interests and partly out of a responsibility towards its Inuit citizens. Reports of starvation and third world conditions in the eastern Arctic were carried back by American military personnel after the Second World War and popularized in southern newspapers, magazines, and books. Reading between the lines of sensationalism the message was clear: Inuit life was changing. The introduction of family allowances, the increasing reliance on imported technologies, and the crash of the fox fur market brought Inuit into a more dependent relationship with the state. The government, aware of the changing nature of the North, scrambled to address the problems of insufficient game resources, a health crisis that saw a large portion of the Inuit population in southern sanatoria, and a failing traditional economy.[69]

One government solution to the "Eskimo Problem" was to relocate Inuit from places where the game was dwindling to more abundant hunting grounds. The most famous of these government directed moves were the High Arctic relocations. The Canadian government organized to send seven families, 32 people, from Inukjuak in Northern Quebec to Craig Harbour and Resolute.[70] Aware the conditions in the High Arctic were different than in Northern Quebec, planners recruited three Inuit families from Pond Inlet, a more northerly settlement, to help the Inukjuak Inuit adjust to life in the High Arctic. The government intent for the relocations was to relieve the pressures on the Northern Quebec game, and to provide Inuit with a means to continue their hunting and trapping lifestyle. The plan was also, in part, "an experiment to determine how well Eskimos from southern areas could adapt themselves to conditions in the High Arctic."[71] By all accounts, the first years were difficult for the "relocatees." The stories of plenty that convinced them to relocate were not easily reconciled with the poor variety of game and other foods in the High Arctic, where Inuit faced extreme environmental conditions, colder temperatures, lack of wood, and (most significantly) three months of complete darkness.

Both the Resolute and Craig Harbour groups were accompanied by an RCMP constable, who was responsible to supervise the group's welfare and to report back to Ottawa on progress, challenges, and general developments. The groups were designed to be entirely self-sufficient. Inuit were sent north with supplies, and trading stores were established and run by the RCMP. Despite this, the RCAF worried that Inuit relocated to Resolute would become dependent on the base.[72] Whereas Inuit at Craig Harbour were moved 50 kilometres away from the RCMP post to discourage any tendencies to loiter and look for handouts, the Resolute Inuit settled just 5 kilometres away from the RCAF base. Despite this close proximity, Inuit and Qallunaat were kept apart intentionally. Interaction between base personnel and Inuit was to be avoided whenever possible for various reasons. Contact could lead to disease, social dislocations, and moral corruption. An RCAF Station Standing Order placed the Inuit village out of bounds "to all personnel except on business."[73]

The historical record of the relationship immediately after the relocation is confusing. On a tour of the Arctic Islands, just a week after Inuit arrived at Resolute, G. W. Stead of the Department of Transport commented:

> As soon as the Eskimo family arrived problems of their relationship to the military encampment began to appear. Where Military camps and Eskimo villages are adjacent, the Eskimos tend to be turned into "camp followers." The different moral bases of the two societies tend to exercise a harmful influence on both: junior members of the Armed forces attempt to get a corner on the output of handicrafts and so forth.[74]

The RCAF also commented on Inuit dependency on the base. Deputy Minister of Defence C. M. Drury reported several months after the relocation that Inuit had indeed become "more or less"

wards of the RCAF detachment.[75] These reports, however, contrast with those from the RCMP who monitored and reported on the day-to-day activities of the Inuit. Ross Gibson, the RCMP officer relocated with the Inuit, explained to RCAF representatives and DNANR administrators that the Inuit had been able to obtain sufficient food through hunting, and that income from trapping provided Inuit with enough money to purchase goods. The relocated Inuit "had been living their native way of life, had little or no contact with the base, and were so happy in their new surroundings that they were already talking of having some of the relatives from Port Harrison" join them.[76] By March 1954, more than six months after the group had disembarked at Resolute, the women and children had not yet left the camp. Inuit men, however, had been exposed to the Qallunaat presence on occasional hunting trips, organized and chaperoned by the RCMP.[77]

The archival record fails to provide us with any answers to why these accounts differ. Perhaps reports from the base about the initial assistance provided in setting up the Inuit camp were exaggerated. Possibly the RCMP was hesitant to report any assistance received for a fear that relocations would be considered a failure. What we do know, however, was that any contact they did have was supervised by the RCMP.

The most significant point of contact came through employment. The DNANR was interested in Inuit taking advantage of wage employment opportunities. Deputy Minister Gordon Robertson explained to C. M. Drury, the deputy minister of National Defence, that despite the self-sufficiency of Inuit and the experiment's emphasis on hunting and trapping lifestyle, the department "had not overlooked the possibility of some of the Eskimo at least finding employment." Casual employment would "not interfere greatly with the natives' present way of life and will enable them to add to their income during seasons when they have little else to do."[78] Ben Sivertz, a director with Northern Affairs, suggested that "in view of the rapidly changing conditions at Resolute Bay, and throughout the Arctic, it may be necessary to modify our thinking with respect to such groups and perhaps to encourage, rather than discourage, them in taking up employment at such places."[79] The Department felt that it was reasonable to allow Inuit to "engage in whatever casual employment that might be available at the base, or any related establishments, from time to time."[80] Accordingly, DNANR turned to the RCAF for support in fostering the Inuit economy. In January 1955, Robertson wrote Drury asking that the Inuit of Resolute be given instruction and practice with the machines at Resolute so that they could play a more useful role in unloading supplies during the annual sealift.[81]

Despite this emphasis on employment, the government was hesitant to unnecessarily interfere with Inuit hunting. Officials recognized that if the need for Inuit employment ever dried up, Inuit would have to rely on hunting once again. The most viable option for wage employment was to have Inuit work as stevedores during resupply shipments. By allowing seasonal workers part of the year to hunt, and full-time workers "sufficient time off for hunting throughout the year," the government could help ensure Inuit would "retain certain ethnic skills and be more content in their work." [82] The combination of a small amount of income earned through casual work and the harvest from hunting and trapping combined to make the economic life of the Inuit in Resolute quite stable, and allowed the Inuit of Resolute to escape a cycle of dependency.

As was the case in Inukjuak, Inuit were unable to afford modern hunting equipment without employment or good trapping grounds. Without this equipment, it was difficult to secure sufficient game for both food and trade. The RCAF base at Resolute provided Inuit with the opportunity to earn the necessary income needed to participate in the modern hunt. Gibson recounted the progress that one Inuk, Sudlavenick, had made since he came to Resolute. In Inukjuak, he had poor equipment, owned only three scrawny dogs, and lived entirely on family allowance and relief. After coming to Resolute, he had obtained a winter home, several dozen traps, a shotgun, a rifle, 10 strong dogs and a large sled. So much had his lot improved that Gibson suggested that he be returned to Inukjuak so that another less fortunate Inuk could take his place in Resolute.[83]

The Eskimo Affairs Committee recognized the success of the flourishing mixed economy at Resolute and planned to send a "few more families from Port Harrison to Resolute Bay to

meet a developing demand for casual labour."[84] Accordingly, the second phase of the High Arctic relocations sent another 34 people to Resolute in 1955,[85] and Inuit employment at the base became an increasingly important component of Resolute's mixed economy. When the RCAF employed outside help rather than Inuit in 1959, Robertson wrote his counterpart at Defence telling him that if Inuit had not been hired because they were insufficiently trained to work at the base, DNANR was prepared to provide education and training to bring Inuit up to an employable standard.[86] The following year, the RCAF once again employed Inuit during the annual sealift. Robertson's involvement in procuring several stevedore positions not only demonstrated the department's determination to ensure that Resolute would be successful, but also its realization that a mixed economy was integral to that success.

By 1960, both the RCAF and DNANR agreed that Inuit contact with the base was beneficial not only for Inuit but also for the base. The RCAF recognized that the pool could be tapped deeper if more Inuit received "on the job" or outside training.[87] The younger Inuit men received vocational training so that they could work in more technical positions at the weather stations, military installations, and with the growing oil industry. By May 1962, three men were receiving training from the base, one as a mechanic and two as mobile equipment drivers.[88] In addition to the ongoing employment of Inuit during shipping season, RCAF also employed several Inuit to help with the northern survival school that had been transferred to Resolute from Cambridge Bay in 1958. Inuit instructors taught RCAF and Northern Affairs personnel survival techniques in case they were forced to make an emergency landing in the Arctic environment.[89]

Beyond the economic sphere, Inuit derived other benefits from their close proximity to the base. The RCAF medical attendant accompanied the RCMP on all medical calls, providing professional treatment. In serious medical cases, Inuit patients were evacuated aboard C130 Hercules aircraft to Edmonton or Thule. In 1963 alone, four Inuit were evacuated by this method. As a result, in many cases, professional medical services for the severely ill were available within a matter of hours.[90] This stood in stark contrast to the other remote communities where it could take days, if not weeks, before outside assistance arrived. The base was also a focal point of entertainment. The RCAF provided weekly movie showings and hosted the social gathering of the year, the annual Christmas party. Base personnel also organized the first Boy Scout troop in Resolute. Known as the First Polar Troop, the 11 members attended weekly meetings at the base on Saturday afternoons. The governing committee of the troop was formed by four members of the RCAF, an Inuk, and the RCMP constable.[91]

For better or worse, the airbase at Resolute provided a closer link to the outside world. The regular flights to and from Resolute ensured efficient mail service. As a result, Inuit were "able to order a wide variety of clothing from stores such as Eaton's and Simpson-Sears at very low cost," RCMP officer R. R. Gordon commented. "The Resolute Bay Eskimo is well clothed as a result of a higher standard of living than most other Arctic towns."[92] By comparison, Grise Fiord Inuit, who were for several years unable to kill enough caribou to supply them with the necessary hides for winter clothing, had to rely on imported sheep skins purchased from the post store.[93]

As in many other Arctic communities with military installations, the base dump also influenced Inuit lives. Unlike other settlement dumps, however, the RCMP closely monitored the Resolute garbage pile. Inuit were welcome to set traps for fox that fed off the food wastage, but Inuit were strictly forbidden from taking clothing or food from the dump. They were permitted to collect scrap wood and other building materials for use in the construction of their homes, which often featured discarded RCAF furniture and even linoleum flooring.[94] At times, the base personnel chipped in and helped with the construction or improvements to the Inuit houses.[95] As a result, Inuit houses at Resolute were considered "well beyond the usual type of Eskimo dwelling constructed from scrap."[96]

Not all contact with the base was positive, however. Inuit who worked at the base, either permanently or temporarily, were entitled to base privileges, including access to the canteen and alcohol. Soon after Inuit found steady employment at the base, the police reported "a few drunken disturbances in the Eskimo village."[97] The base commander addressed this problem in

1961 when he disallowed the Inuit from buying liquor at the base. "It has been found that this has helped the people, although some will disagree, in their homelife [sic] and work," the RCMP commented. "The women are pretty well all agreed that the move was a good one and are quite happy to see it remain that way. Most state that the home and village life has been much better since the move was made."[98]

The success of Resolute was not a result of the coercive acculturation of Inuit into Western life; the government recognized that many Inuit wanted to maintain traditional lifestyles. Indeed, civil servants saw Resolute as a model for Inuit relocation programs. By contrast, the Administrator of the Arctic, C. M. Bolger, recommended that the Craig Harbour experiment should not be replicated.[99] The director of DNANR noted in 1960:

> While Grise Fiord [Craig Harbour] should be continued for sovereignty purposes, it should not be duplicated at other isolated locations. He considers, rather, that any new colonies to be established should be in the vicinity of established weather stations.... He also thinks that a logical development would be to start these colonies as satellites of the Resolute Bay community.[100]

These colonies were not created when the federal government officially ended relocations early that decade, recognizing that scarce game resources would not sustain a larger population. Nonetheless, Resolute grew modestly. Housing, education, and social services brought a closer integration into Western society, and a local RCMP officer boasted that progress had revealed to the Inuit "the benefits and security which employment provided compared to the hardships encountered in their old way of life."[101] Such optimism was offset by problems of settlement living—including alcoholism, social deviancy, and externally imposed governance—which challenged the developing community.

By the time the Air Force left Resolute on 1 April 1964, transferring the operation of its base to the Air Services, Civil Aviation Branch of the Department of Transport, the local balance between a hunting and wage economy was giving way to the dominance of cash work. The following year, 12 Inuit were permanently employed at the base complex, and by 1966 the community had only one full-time hunter. Part-time subsistence harvesting for food continued (and was facilitated by the introduction of motorized snow vehicles), with supplements from carving and trapping remaining important. Officials saw the community as economically viable and even prosperous by Inuit standards. "Compared with other settlements in the Arctic, the Resolute Eskimo is fairly well off and continues to possess articles that are not owned by a good many other Eskimos," one RCMP officer observed. "There are washing machines, tape recorders, record players, irons, sewing machines, transistor radios and 35millimetre cameras."[102] Less favourable was the lack of government support for the Port Harrison (Inukjuak) people who wanted to visit or move back to their original home. The federal government's recent apology for the High Arctic relocations and unfulfilled promises associated therewith,[103] however, should not be misapplied to the generally positive relationship between the Air Force and the Inuit in Resolute.

In evaluating the impact of the RCAF station on Inuit, we must consider not only the original intent of the relocation but also the evolution of government policy. The High Arctic relocations were an admitted experiment, but upon closer analysis, we see that there were really two experiments going on. One placed Inuit in a traditional economy and the other evolved into an experiment in a mixed economy. Frank Tester and Peter Kulchyski have argued that "in effect, a policy of using the Air Force base as a vehicle for establishing systematic integration of Inuit workers would have implied failure of the relocation project because the project was developed on the assumption that Inuit would be more able to be self-sufficient in this 'virgin' territory."[104] The archival record is clear, however, that casual employment of Inuit was always a possibility in the minds of planners. "Systematic integration" was not. Instead, the government attempted to provide Inuit who had become dependent on relief and other social transfers the opportunity to maintain as much of their traditional lifestyle as possible. They understood the importance of hunting in Inuit culture, not just as a means to procure food, but also in its social functions:

defining relationships, transferring knowledge, and maintaining cultural linkages. With the growing dependency on technological advances needed for hunting, and larger populations requiring access to a wider hunting range, wage employment was a key element in the new Inuit hunting economy. The best answer was to supplement the income obtained through traditional hunting and trapping with part-time employment. Many Inuit found in Resolute a balance between wage employment and traditional hunting practices.

A measure of Resolute's success is found in the government's analysis of the economic potential of the community in the second half of the 1960s. During this era, DNANR conducted area economic surveys across the Arctic, identifying potential revenue sources and resources. The survey for Resolute concluded:

> Resolute offers an example of a successful experiment in settlement of Eskimos in the Queen Elizabeth Islands.... The relative success of varied age groups of Eskimos in wage employment as exemplified in Resolute and on the DEW line suggest that relocation programs of moving Eskimos to areas of greater economic activity be stressed by the Department. Continued immigration of Eskimos should be predicated on the availability of wage employment rather than on the resource base.[105]

The RCAF base at Resolute provided an ideal opportunity for the government to experiment with this new economy. The infrastructure of Resolute alleviated much of the potential for disaster. Unlike Craig Harbour, where contact with the outside world was limited to the annual sealift, Inuit at Resolute had access to medical services, electricity, construction materials and assistance, and modern communications. In many ways, government officials saw how establishing an Inuit community near a military installation offered a model for achieving a mixed economy and allowing Inuit to succeed in the modern North.

Conclusions

By the 1960s, the military had largely withdrawn from the Arctic. Eyre observed that military interest in the Canadian North peaked in the late 1950s but declined with the arrival of the missile era following the Soviet launch of Sputnik in 1958. The military's footprint in the region, which had expanded since the Second World War, began to retract:

> The Navy gradually stopped its northern summer cruises. Army exercises ceased. The radio system and the Alaska Highway were turned over to civil departments of government. The Canadian Rangers were left to wither on the vine. Aerial surveillance flights were curtailed. In the later part of the Diefenbaker years, Canadian defence policy was dominated by the three N's: NORAD, NATO and nuclear weapons. Lester Pearson's Liberal administration during the following five years completed the process of withdrawal. By 1965, only the DEW Line stations remained.[106]

Technological advances expanded the distances that jets could fly without refuelling and shifted the continental defence emphasis from static radar lines to satellites and ballistic missile submarines. This allowed Canada to reduce its military presence in the region without concern that this would undermine its de facto control over its Arctic lands. As military personnel withdrew, new phalanxes of civil servants arrived to administer the growing appendages of the state extending northward to oversee Inuit housing, education, and health care. Despite high hopes for improved Inuit standards of living through wage labour (including work at defence installations), a transition from self-sufficiency to the welfare economy and dependency was a stark reality for many Inuit drawn into settlement life.

The case studies of Frobisher Bay and Resolute yield several lessons of policy and historiographical relevance. Air Force development projects, as part of the larger military thrust into the Arctic during and after the Second World War directly influenced Northern life in various ways. Direct impacts included transportation and communication infrastructure, as well as access to new supplies of food, clothing, and housing. Wage employment, even if only part-time, offered income which supplemented traditional economic pursuits such as hunting

and trapping. Although the military tried to minimize the impact of defence projects on Inuit in the Qikiqtani region, the construction and operation of air force installations had lasting effects. These included changes to the tastes and preferences of Inuit who congregated near military installations to seek employment, material goods, and medical services. These benign inducements led to the creation of sedentary communities which persisted long after the defence projects ceased to offer significant local employment opportunities. The culmination of the Inuit transition to settlement life occurred in the late 1960s, but military projects played a pivotal role in "modernizing" Arctic life in the preceding decades.

Perhaps the most basic message is the importance of considering impacts on local populations when conceiving military projects designed, from afar, for national security and sovereignty reasons. In response to the Conservative government's assertion that Canada faces a "use it or lose it" proposition in the Arctic requiring a bolder military presence, Aboriginal spokespersons have complained that this pithy phrase ignores their presence in the region, the "bedrock" of Canadian sovereignty,[107] and marginalizes their contributions domestically and internationally. Paul Kaludjak, the former president of Nunavut Tunngavik Inc., argued that investments in northern defence infrastructure "should be a component of a sovereignty strategy that engages northerners, not the strategy itself." Rather than a "use or lose it" approach that treats the Arctic as an empty frontier, he reminded Ottawa that "Inuit are here—use us or lose our support."[108] Indeed, a logical lesson learned from past military development in the North is the need to anticipate what projects and activities will mean for Aboriginal peoples. Military projects have tended to fit Mary Simon's characterization of "centralized undertakings that are unilaterally imposed on indigenous peoples and their territories," and Northerners have been disproportionately affected by "sovereignty and security policy decisions" in the past.[109] Although the impacts have not been uniformly destructive, the Canadian Forces should ponder previous relationships—both positive and negative—as they re-establish their presence in the region. Constructive engagement must be a key priority not just for the politicians but also for defence planners and service personnel who must implement the government's strategy in the Arctic in a manner that balances the needs and desires of the military and of the Inuit.

Notes

1. Kevin McMahon, *Arctic Twilight: Reflections on the Destiny of Canada's Northern Land and People* (Toronto, James Lorimer & Company, 1988), 11.

2. See Shelagh D. Grant, *Sovereignty or Security? Government Policy in the Canadian North,* 1936–1950 (Vancouver, University of British Columbia Press [UBC], 1988); David Bercuson, "Continental Defence and Arctic Sovereignty, 1945–1950: Solving the Canadian Dilemma," in *The Cold War and Defence*, eds. Keith Neilson and Ronald Haycock (New York: Praeger Press, 1990), 153–70; Peter Kikkert, "The Polaris Incident: 'Going to the Mat' with the Americans," *Journal of Military and Strategic Studies* 11, no. 3, 2009, 1–29; Gordon W. Smith, "Weather Stations in the Canadian North and Sovereignty," *Journal of Military and Strategic Studies* 11, no. 3, 2009, 1–63.

3. Kenneth C. Eyre, "Forty Years of Military Activity in the Canadian North, 1947–87," *Arctic* 40, no. 4, 1987, 294.

4. Trevor Lloyd, "Frontier of Destiny – The Canadian Arctic," *Behind the Headlines* 6, no. 7, 1946, 8.

5. "A state (or states) working to make a landscape *legible* so as to enroll it more effectively into governmental responsibilities… through projects backed by the authority of reason and the latest technologies, designed at a distance and implemented without sufficient attention to local nuance…." Matthew Farish and Whitney Lackenbauer, "Modular Modernization: The D.E.W. Line and the Construction of the Cold War Arctic," paper presented to the Canadian Association of Geographers annual meeting, Saskatoon, 31 May 2007.

6. John Hughes, "Under Four Flags: Recent Culture Change Among the Eskimos," *Current Anthropology* 6, no. 1, February 1965, 14–15.

7. Peter Kulchyski and Frank James Tester, *Kiumajut (Talking Back): Game Management and Inuit Rights, 1900–70* (Vancouver: UBC Press, 2007), 7.

8. Frances Abele, "Confronting 'harsh and inescapable facts,'" in *Sovereignty and Security in the Arctic*, ed. Edgar Dosman (London: Routledge, 1989), 189.

9. Mary Simon, "Militarization and the Aboriginal Peoples," in *Arctic Alternatives: Civility or Militarism in the Circumpolar North*, ed. Franklyn Griffiths (Toronto: Samuel Stevens, 1992), 60.

10. High modernism, to borrow James C. Scott's framework, sought "a sweeping, rational engineering of all aspects of social life in order to improve the human condition." James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1988), 88. See also M. Farish and P. W. Lackenbauer, "High modernism in the Arctic: Planning Frobisher Bay and Inuvik," *Journal of Historical Geography*, 2009, in press.

11. In this sense, our findings support those of David Damas in *Arctic Migrants / Arctic Villagers: The Transformation of Inuit Settlement in the Central Arctic* (Montreal: McGill-Queen's University Press, 2002).

12. Diamond Jenness, *Eskimo Administration : II. Canada* (Montreal: Arctic Institute of North America, 1964), 97.

13. R. S. Sheffield, *Red Man's on the Warpath* (Vancouver: UBC Press, 2004); Ken Coates and William R. Morrison, *The Alaska Highway in WWII: The U.S. Army of Occupation in Canada's Northwest* (Norman, OK: University of Oklahoma Press, 1992) and *Working the North: Labor and the Northwest Defense Projects 1942–1946* (Anchorage: University of Alaska Press, 1994).

14. Vincent Massey, *What's Past Is Prologue* (Toronto: Macmillan, 1963), 371.

15. On this theme, see Farish and Lackenbauer, "High Modernism in the Arctic."

16. See Robert V. Eno, "Crystal Two: The Origin of Iqaluit," *Arctic* 56.1, 2003, 72.

17. Quoted in Grant, 275.

18. Melanie Gagnon and Iqaluit Elders, *Inuit Recollections on the Military Presence in Iqaluit* (Iqaluit: Nunavut Arctic College, 2002), 37, 39.

19. Ibid.

20. Gagnon et al, 39. See also Joe Tikivik, interview with James Igloliorte, Iqaluit, 17 May 2008 (used with permission of the Qikiqtani Inuit Association [QIA]).

21. Ibid., 87.

22. Iqaluk Ipeelie and Simonie Michael, in Gagnon et al, 97, 99; Shaigiatuk, interview with Igloliorte, 17 June 2008.

23. Sheila MacBain Meldrum, "Frobisher Bay: An Area Economic Survey, 1966–1969" (Ottawa: Department of Indian Affairs and Northern Development (DIAND), 1975), 34.

24. On the Canadian state's response to African-American personnel and Aboriginal people, see Lackenbauer, "Politics of Race, Gender and Sex," in *Aboriginal Connections to Race, Environment and Traditions*, eds. Jill Oakes and Rick Riewe (Winnipeg: Aboriginal Issues Press / University of Manitoba Press, 2006), 3–16.

25. QIA, Simonie Michael, interview with Mathew Akavak and Mary Akpalialuk, Iqaluit, 26 January 2005. The Qikiqtani Truth Commission (QTC) generously granted the authors access to its research material which included more than 300 transcripts of interviews conducted by the Qikiqtani Inuit Association and the Qikiqtani Truth Commission. The opinions expressed in this paper are those of the authors and in no way reflect the opinions or work of the Qikiqtani Truth Commission. For more information on the Qikiqtani Truth Commission please see the website www.qtcommission.com (accessed September 29, 2010).

26. QIA, Simonie Michael, interview with Mathew Akavak and Mary Akpalialuk. Inuit began to gather around the Frobisher air base by the end of 1951. David Damas has identified three "modes of residence" that developed: a small minority of the families of permanently employed men, a larger group comprising families who lived around Frobisher through the summer months but returned to outside winter camps, and "those who prefer to follow the native mode the whole year." David Damas, *Arctic*

Migrants/Arctic Villagers (Montreal: McGill-Queen's University Press, 2002), 59–60. Eventually, Simonie Michael and his family moved to Apex Hill, the new Inuit town-site initiated in 1955 about 3 miles (4.8 km) from the air base.

27. Andrew Thomson to Under Secretary of State for External Affairs, "Notes Taken On Visit to the Arctic – April 5–15, 1948," 13 May 1948, Library and Archives Canada (LAC), Records Group (RG) 25, Vol. 6298, File 9061-A-40, Part 3 FP.

28. Ibid.

29. K. M. Guthrie to Chief of the Air Staff, 1 December 1947, LAC, RG 24, acc. 83-84/049, box 595, f.443-5, pt.1.

30. H. Keenleyside to W. Gordon Mills, 31 January 1948, LAC, RG 24, acc. 83-84/049, box 595, f.443-5, pt.1.

31. Ibid.

32. D. J. McCormick to Assistant Deputy Minister, 27 April 1948, LAC, RG 24, acc. 83-84/049, box 595, f.443-5 pt.1. Pay was comparable to what Inuit reindeer herders received in the western Arctic, and took the form of HBC credits because government officials did not believe that the Inuit could "be trusted to spend their money wisely, and for actual needs." Housing was another concern. "Particular care must be taken when moving this class of people into houses to see that the quarters are properly cleaned and heated to suit them, as they develop chest infections when so housed, which in some cases had lead [sic] to considerable tuberculosis," D. J. McCormick, the assistant director of civilian personnel for the RCAF, noted. The central housing systems used in RCAF stations would be too hot, and special quarters might be needed in cases of Eskimo employment. D. J. McCormick to Assistant Deputy Minister, 4 March 1948, LAC, RG 24, acc. 83-84/049, box 595, f.443-5, pt.1.

33. H. L. Keenleyside to C. M. Drury, 27 February 1950, LAC, RG 24, acc. 83-84/049, box 595, f.443-5, pt.1.

34. Ibid.

35. C. M. Drury to H. L. Keenleyside, 10 June 1950, LAC, RG 24, acc. 83-84/049, box 595, f.443-5, pt.1.

36. Ibid.

37. C. W. Jackson to C. M. Drury, 20 June 1950, LAC, RG 24, acc. 83-84/049, box 595, f.443-5, pt.1.

38. F. W. Ball to Air Operations Centre (AOC), Air Transport Committee Headquarters (ATC HQ), 3 October 1953, LAC, RG 24, acc. 83-84/049, box 595, f.443-5, pt.1.

39. Ibid. On the tension between these policy aspirations (framed in the theoretical construct of "totalization"), see also Tester and Kulchyski, *Tammarniit (Mistakes)* (Vancouver: UBC Press, 1994), 6–7. For more on the Advisory Committee on Northern Development (ACND) study of the Inuit in Frobisher, see ACND Document ND-64, "Eskimo Settlement at Frobisher Bay," 13 October 1953, LAC, RG2, vol. 6181.

40. Z. L. Leigh to Chief of the Air Staff (CAS), 19 October 1953, LAC, RG 24, acc. 83-84/049, box 595, f.443-5, pt.1.

41. Eno, 73; Meldrum, 34.

42. Gagnon et al, 55.

43. Ibid., 72.

44. "Arctic Province," August/September 1953, LAC, RG 25, vol. 3842, file 9061-J-1-40, pt.1.

45. Ibid.

46. "Arctic Province."

47. Annex to Exchange of Notes (May 5, 1955) between Canada and the United States of America Governing the Establishment of a Distant Early Warning System in Canadian Territory, Canada, Treaty Series 1955, No. 8.

48. Richard Morenus, *The D.E.W. Line: Distant Early Warning, The Miracle of America's First Line of Defense* (New York: Rand McNally, 1957), 82.

49. The NCRC was created in 1954 to report through the Secretary of the Advisory Committee on Northern Development. Its functions included collecting and disseminating scientific and technical data, as well as coordinating, sponsoring, and conducting scientific research. John Nicholas Harris, "National Defence and Northern Development," MA thesis (BC: Simon Fraser University, 1980), 195.

50. C. J. Marshall, "North America's Distant Early Warning Line," *The Geographical Magazine* 29, no. 12, April 1957.

51. Pierre Berton, *The Mysterious North* (New York: Knopf, 1956), 235–36.

52. Alootook Ipellie, "Frobisher Bay Childhood," *The Beaver*, spring 1980, 4–8.

53. Douglas Leiterman, "DEW Line Means End of Old Way of Life for 10,000 Eskimos in Canadian Northland," *Edmonton Journal*, 10 April 1956.

54. "Economic Conditions of Eskimos Living at or near D.E.W. line sites," June 10, 1957, LAC, RG 18, Acc. 1985-86/048, vol. 57, File TA 500-20-10-7.

55. Ibid.

56. Jenkins, for example, commented on the situation and the maladaptation of the Inuit to the wage economy. "It has been noticed on various sites of the D.E.W. Line that the Eskimo people in general tend to spend their money carelessly by purchasing confectionary goods and other luxuries which are of little value to them," he reported. "Possibly this situation will correct itself in the near future, when the Eskimos learn that candy, chewing gum, hair tonic, etc, is not of as much value to them as a good home, good education, and medical services." R. D. Van Norman, memo to Officer Commanding (OC), "Conditions Amongst the Eskimos – Frobisher Bay," September 24, 1956, LAC, RG 18, 1985–86/048, Vol. 57, File TA 500-20-10-7. On the difficulties of spending cash earnings in remote Baffin communities, see, for example, "Conditions Amongst the Eskimos – Frobisher Bay, Eskimo Conditions at Site 38 – DEW Radar Line," February 26, 1958 and July 15, 1957, LAC, RG 18, 1985-86/048, vol. 57, File TA 500-20-10-7.

57. Qikiqtani Truth Commission, "Government and Development in the Baffin Region, 1950 to 1975," http://www.qtcommission.com/actions/GetPage.php?pageId=37 (accessed September 29, 2010).

58. Toshio Yatsushiro, *Frobisher Bay 1958* (Ottawa: Northern Co-ordination and Research Centre, 1963). See also "The Changing Eskimo: A Study of Wage Employment and its Consequences Among the Eskimos of Frobisher Bay, Baffin Island," *The Beaver* 42, no. 1, 1962, 19–26.

59. Damas, 59–60.

60. On this theme, see Farish and Lackenbauer.

61. Meldrum, 34–35; Eno, 73; Noakes, 429–38.

62. Noakes, 436.

63. QTC, Terry Jenkin, interview with Jim Igloliorte.

64. See "Unveil High Arctic Town Plans," *Globe and Mail*, 26 July 1961, 3.

65. Zaslow, 343, 355. For a contemporary view, see Walter Gray, "Frobisher Bay Boom Ordered Suspended," *Globe and Mail*, 13 June 1963.

66. See, for example, John J. Honigmann, "Transforming the Arena of Action: Two Paths to Cultural Modernization Compared," *Dalhousie Review* 47, no. 3, 1967, 388. After the military departed, the growth rate in Frobisher continued through the 1960s, propelled by even more migration from neighbouring communities. Quinn Duffy noted that "by 1969 only 5 percent of the area's population was entirely dependent on the traditional way of life based on the fur trade." R. Quinn Duffy, *The Road to Nunavut: The Progress of the Eastern Arctic Inuit since the Second World War* (Montreal: McGill-Queen's University Press, 1988), 163.

67. Damas, 59–60.

68. One Arctic historian claimed that Resolute was the most important of all the northern weather stations and DEW Line airfields. Bruce McAllister, *Wings Above the Arctic: a photographic history of Arctic aviation* (Boulder, CO: Roundup Press, 2002), 86.

69. On the early 1950s, see for example Tester and Kulchyski; Duffy; Damas; Jenness; Richard J. Diubaldo, *A Historical Overview of Government-Inuit Relations, 1900–1980s* (Ottawa: Department of Indian Affairs and Northern Development, 1992); R. Gordon Robertson, *Memoirs of a Very Civil Servant: Mackenzie King to Pierre Trudeau* (Toronto: University of Toronto Press, 2000); and Mark O. Dickerson, *Whose North? Political Change, Political Development, and Self-Government in the Northwest Territories* (Vancouver: UBC Press, 1992).

70. The Craig Harbour relocatees would eventually form the community of Grise Fiord. The High Arctic relocations have been well documented in previous studies, most of which were written to encourage the federal government to apologize to and compensate the relocated Inuit. See, for example, Zebedee Nungak, "Exiles in the High Arctic," *Arctic Circle* (September/October 1990), 36–43; Alan R. Marcus, "Out in the cold: Canada's experimental Inuit relocation to Grise Fiord and Resolute Bay," *Polar Record* 27/163, 1991, 285–96; Canadian Arctic Resources Committee, "'Their Garden of Eden': Sovereignty and Suffering in Canada's High Arctic," *Northern Perspectives* 19, no. 1, spring 1991; Alan R. Marcus, *Out in the cold: The legacy of Canada's Inuit relocation experiment in the High Arctic* (Copenhagen: International Work Group on Indigenous Affairs, 1992); Tester and Kulchyski; René Dussault and George Erasmus, *The High Arctic Relocation: A Report on the 1953–55 Relocation* (Ottawa: Royal Commission on Aboriginal Peoples, 1994); Alan R. Marcus, *Relocating Eden: The image and politics of Inuit exile in the Canadian Arctic* (Hanover, NH: University Press of New England, 1995); and most recently, Melanie McGrath, *The long exile: A true story of deception and survival amongst the Inuit of the Canadian Arctic (*London: Fourth Estate, 2006). For critical responses, see F. Ross Gibson, "No reason to apologize to the natives," *Arctic Circle*, September/October 1991, 8; Doug Wilkinson, "The paradox of the Inuit relocates," *Arctic Circle*, summer 1993, 32–33; and Gerard Kenney, *Arctic Smoke & Mirrors* (Prescott, ON: Voyageur Publishing, 1994). To avoid obvious political bias, we have returned to the original documents to assess RCAF-Inuit relations in Resolute.

71. R. G. Robertson, letter to C. M. Drury, Deputy Minister of National Defence, re: relocation of Inuit families at Resolute Bay, LAC, RG 22, A-1-a, Vol. 298, File 40-8-1, pt. 4.

72. C. M. Bolger, Administrator of the Arctic, "Relocation of Eskimo Groups in the High Arctic," ca. 1960, NWT Archives, 263, N-1992-023, Box 24, File 10.

73. "Conditions Amongst the Eskimos – Resolute Bay, January 5, 1961," LAC, RG 18, Vol. 55, File TA 500-8-1-14.

74. G. W. Stead, "Confidential Report on Tour of the Arctic Islands, September 8–12, 1953," LAC, RG 22, vol. 176, file 40-20-20, pt. 3, 29 September 1953, 6, quoted in Tester and Kulchinsky, 153–54.

75. C. M. Drury, Deputy Minister, letter to R. Gordon Roverston, Department of Northern Affairs and National Resources, February 2, 1954, LAC, RG 22, A-1-a, Vol. 298, File 40-8-1, pt. 4.

76. R. G. Robertson, letter to C. M. Drury, Deputy Minister of National Defence, February 18, 1954, LAC, RG 22, A-1-a, Vol. 298, File 40-8-1, pt. 4.

77. "Conditions Amongst the Eskimos – Resolute Bay. March 26, 1954," LAC, RG 18, Vol. 55, File TA 500-8-1-14.

78. R. G. Robertson, letter to C. M. Drury, Deputy Minister of National Defence, February 18, 2010, LAC, RG 22, A-1-a, Vol. 298, File 40-8-1, pt. 4.

79. B. G. Sivertz, memorandum to F. R. Gibson, Conditions Amongst the Eskimos – Resolute Bay, re: RCAF Christmas Airlift, December 28, 1954, LAC, RG 18, Vol. 55, File TA500-8-1-14.

80. R. G. Robertson, letter to C. M. Drury, Deputy Minister of National Defence, re: transport of families to Resolute, January 18, 1955, LAC, RG 22, A-1-a, Vol. 298, File 40-8-1, pt. 5.

81. Ibid.

82. Bolger.

83. "Conditions Amongst the Eskimos – Resolute Bay, November 14, 1956," LAC, RG 18, Vol. 55, File TA 500-8-1-14.

84. Report, re: Economic Development and Actions Taken in 1953 and proposed for 1954, n.d., LAC, RG 22, A-1-a, Vol. 298, File 40-8-1, pt. 5.

85. Only one family of six people were sent to Grise Fiord, perhaps indicating the government's evolving preference for Resolute because of its mixed economy.

86. R. G. Robertson, letter to F. R. Miller, re: Eskimo Employment at Resolute Bay, LAC, RG 22, Vol. 895, File 250-45-1, pt.1.

87. Bolger.

88. R. R. Gordon, memorandum to OC, re: Conditions Amongst the Eskimos, January 12, 1962, LAC, RG 18, vol. 55, File TA 500-8-1-14.

89. Don Bissett, *Resolute: An Area Economic Survey* (Ottawa: Industrial Division, Department of Indian Affairs and Northern Development, 1968), 89.

90. "Conditions Amongst the Eskimos – Resolute Bay for the year ending December 31st, 1962, January 14, 1963," LAC, RG 18, Vol. 55, File TA 500-8-1-14.

91. Ibid.

92. R. R. Gordon, memorandum to OC, re: Conditions Amongst the Eskimos, January 12, 1962, LAC, RG 18, Vol. 55, File TA 500-8-1-14.

93. R. J. Baccus, memorandum to OC, re: Conditions Amongst the Eskimos Generally, LAC, RG 18, Vol. 55, File TA 500-8-1-5.

94. T. C. Jenkins, re: Conditions Amongst the Eskimos, January 4, 1960, LAC, RG 18, Vol. 55, File TA 500-9-1-14. All the houses had free electricity supplied by the Department of Transport.

95. "Conditions Amongst the Eskimos – Resolute Bay for the year ending December 31st, 1962," January 14, 1963, LAC, RG 18, Vol. 55, File TA 500-8-1-14.

96. Jenkins.

97. R. R. Gordon, memorandum to OC, January 5, 1961, LAC, RG 18, Vol. 55, File TA 500-8-1-14.

98. "Conditions Amongst the Eskimos – Resolute Bay for the year ending December 31st, 1962, January 14, 1963," LAC, RG 18, Vol. 55, File TA 500-8-1-14 (it should be noted that after the initial problems with alcohol, the community experienced continual problems with alcohol. At times it was imported from outside while at other times Inuit in the community made it through home brewing).

99. Bolger.

100. Ibid.

101. Lee Weissling, "Inuit Redistribution and Development: Processes of Change in the Eastern Canadian Arctic, 1922–1968" (unpublished PhD dissertation, University of Alberta, 1991), 206. On the government's decision not to establish communities near the weather stations, see also Tester and Kulchyski, 324.

102. Damas, 134–36. See also Qikiqtani Truth Commission, Resolute Bay Community History, www.qtcommission.com.

103. See, for example, Bruce Campion-Smith, "Ottawa apologizes to Inuit for using them as 'human flagpoles,'" *Toronto Star,* 18 August 2010; Deborah Tobin, "Harper brings apology to relocated Inuit," *Halifax Chronicle-Herald*, 18 August 2010; Bill Curry, "An apology for the Inuit five decades in the making," *Globe and Mail*, 18 August 2010; Jane George, "Canada says sorry to High Arctic exiles," *Nunatsiaq News*, 18 August 2010; and Indian and Northern Affairs Canada, "Government of Canada Apologizes for Relocation of Inuit Families to the High Arctic," News Release 2-3389, 18 August 2010.

104. Tester and Kulchyski, 55.

105. Bissett, 160.

106. Eyre, 296.

107. Mary Simon, "Inuit: The Bedrock of Arctic Sovereignty," *Globe and Mail*, 26 July 2007.

108. Paul Kaludjak, "Use Us," *Ottawa Citizen*, 18 July 2007.

109. Simon.

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His research interests lie in the evolving role of the RCMP during the modernization of the Eastern Arctic between 1940 and 1970. He has presented at conferences and authored background reports on the evolution of the RCMP, the role of Inuit special constables, Inuit mobility, and the history of settlement development in Baffin Region.

Chapter 7

Sovereignty for Hire: Civilian Airlift Contractors and the Distant Early Warning (DEW) Line, 1954–1961

Daniel Heidt and P. Whitney Lackenbauer

> *These air operations [associated with the construction and operation of the DEW Line] represented an unprecedented windfall for the Canadian air industry. One company [Spartan] secured a valuable contract for help with the preliminary air surveys and ground support operations, and eleven airlines, flying many types of aircraft, received very lucrative work during the hectic construction phase.… The high profits transformed some of the companies—Pacific Western, Maritime Central, and Transair—into sizeable regional air carriers. Air travel to and from the Arctic was made infinitely easier by all the installations after 1945 and by the considerable traffic the many stations generated.… The DEW Line itself was a busy air route for military and commercial aircraft delivering supplies, transferring staffs, and bringing in inspecting officers, doctors, clergymen, and visitors. By 1958, it was asserted, "as one measure of the profound change wrought by the DEW Line, you may now fly completely across the North American Arctic without losing sight of the lights of a human habitation, and rarely being more than 25 miles [40 kilometres (km)] from an airstrip."*
>
> Morris Zaslow, *The Northward Expansion of Canada*[1]

The Distant Early Warning or DEW Line, built from 1954 to 1957 and operated for three decades, still intrigues Canadians. Designed to detect Soviet long-range bombers flying over the North Pole, the scale of the megaproject was staggering. "Stretching for 2500 miles across the Arctic, it required the biggest task force of ships since the invasion of Europe and the largest air operation since the Berlin airlift to take in the supplies,"[2] Department of Northern Affairs and National Resources (DNANR) official C. J. Marshall trumpeted in a 1957 magazine article. "More than 7000 men laboured through two short Arctic construction seasons to complete the work on schedule. Small wonder that many consider the project one of the most dramatic engineering achievements of our time and a milestone in the development of the Arctic."[3]

The industrial logistics associated with the DEW Line were unprecedented in the Arctic, and had significant impacts on Canadian commercial air and sea carriers. "Support and resupply vitally affect the continuous, reliable, and economical functioning of the line," a 1955 report documenting the basic philosophy of DEW Line operations noted, "because of the geographical location of the stations, all equipment, materiel, supplies, including POL [petroleum, oil and lubricants] and sustenance items must be either flown in, delivered during the very short period of the summer by sea, or hauled laterally to a site by cat train operating in the winter season."[4] The DEW Line Agreement guaranteed that "Canadian commercial carriers will to the fullest extent practicable be afforded the opportunity to participate in the movements of project materials, equipment and personnel within Canada."[5] This proved to be a herculean task in practice. By the fall of 1956, 352,300 short tons (319,600 metric tonnes [MT]) of materiel had been delivered to the DEW Line. Aircraft were responsible for 106,000 tons (96,162 MT), and 84 per cent of the 24,612 commercial flights (covering 16.5 million miles [26.5 million km]) were Canadian.[6] It was the largest cargo airlift in the history of Canadian aviation, and the heavy volumes of air freight facilitated rapid expansion of Canadian aviation companies. Pacific Western Airlines (PWA, eventually Canadian Airlines) and Maritime Central Airways (MCA), which became the root company for Eastern Provincial Airways) "moved from being small bush lines to large integrated national airline companies."[7]

Although the project was joint, the United States (US) dominated much of the program and a variety of past journalists and present scholars have argued that Canada was too parsimonious and inactive to protect its sovereignty. These critics focus on government/military personnel and equipment sent to DEW Line stations. Even today the Harper government emphasizes a requirement for a strong Canadian military presence in the Arctic to defend our legal sovereignty.

This mentality overlooks alternatives, particularly opportunities for the Air Force to draw upon civilian assets to accomplish its Arctic mission. The vast commercial aspects of DEW Line operations are often forgotten,[8] even though civilian aircraft played a pivotal role in transporting equipment and personnel to the remote radar installations. To do so, the limited pre-existing Canadian northern airlift capacity had to be dramatically expanded and fierce competition ensued for these lucrative contracts. The Canadian government, conscious of nation-building possibilities, as noted above, secured guarantees from the US that Canadian carriers would be utilized to the fullest extent practicable. Canadian companies expanded to meet the new increased demand and fought to keep these contracts from American and Canadian rivals. Investments in new aircraft and the need for continued work ensured that Canadian companies jealously guarded and policed American airlift competition independently of Ottawa. In the end, American DEW Line contract dollars afforded Canadian commercial carriers the opportunity to buttress Canadian Arctic sovereignty.

Historian Michael Evans tidily summarized that the agreement "allowed the United States to build and operate the DEW line, protected the sovereignty of the Canadian government while offering financial subsidies to the Canadian economy and contributing to the development of the Canadian frontier."[9] But this is not the whole story. The decision to allow the US to pay for the resupply mission limited Canada's ability to influence specific decisions, such as the length of contracts, or the size of companies employed. While this decision did not compromise the American respect for the jurisdiction of Canadian governmental bodies such as the Air Transport Board (ATB) or compromise the Canadian presence generated by the airlift, it did compromise the full realization of the visions of Canadian departments such as the Department of Northern Affairs and National Resources. Finally, the lessons learned from this exercise in civil-military relations remain to be clarified. Although the joint nature of the DEW Line airlift lacks a modern parallel, many of the lessons learned concerning the employment of civilian contractors remain noteworthy. This story has particular relevance today as Air Force and Joint Task Force North planners assess the feasibility of contracting civilian aircraft to fulfil defence requirements in the Far North.

Background

As early as 1946, Canadian and American authorities had begun to consider the possibility of building a radar chain in the Arctic to give warning of any Soviet attack. At that time, the available technology could not guarantee complete coverage of the northern frontier or accurate tracking of aircraft, so investing huge sums in an ineffective early-warning system seemed wasteful. Conditions changed by 1949, however, and Canada and the US agreed to a cooperative effort, the Pinetree Line, consisting of 33 radar stations across the mid-north from Vancouver Island to Labrador. By the time this radar network was completed, the Soviets had upgraded their bomber force, prompting more ambitious plans to increase North American radar coverage by building stations further and further north. When the Soviets exploded their first hydrogen bomb in August 1953, the question became more urgent. Continental defences would be critical to deter communist aggression. "By extending the air defence system northwards such bombers could be engaged before reaching their intended targets," strategist R. J. Sutherland explained. "Almost equally important, by extending the area of radar coverage the risk of saturation of the defences could be reduced. Finally, by locating strike aircraft or refuelling aircraft on the northern bases, the range and speed of response of the strike forces could be improved."[10] In short, defence planners sought to achieve strategic defence in depth.

"Massive retaliation," a strategy outlined by US President Dwight Eisenhower in his January 1954 State of the Union address, depended upon adequate warning times so that the Americans could mobilize their strategic forces. Although a Maginot Line-type radar "fence" around North America was out of the question, multiple radar lines extending northward could offer adequate warning. The Liberal government in Ottawa was a willing partner. In June 1954, defence research scientists recommended the construction of a mostly unmanned Mid-Canada Line, along the 55th parallel, paid for entirely by Canada. This project was attractive for several reasons. First, the technology was available in Canada, and had been developed by Canadian scientists (hence its nickname of "the McGill Fence"). Second, building radar stations in the middle North would be

less expensive than building an Arctic chain. Canada could afford to build and support a sub-Arctic network. Third, a Canadian project averted the troublesome issue of American presence on Canadian soil—sovereignty would not be an issue. Accordingly, Canada built 98 Mid-Canada stations by 1957 at a total cost of $250 million.[11] The US, however, insisted on more lead time to mobilize their deterrent, which raised more significant sovereignty questions in Canada.

In June 1954, the Canada-US Military Studies Group urged that a radar network be built stretching more than 8,000 km from Alaska to Baffin Island. The US government had already contracted the civilian Western Electric Company (WEC) to design and construct an experimental system, which demonstrated its feasibility. Under pressure from its American allies and the Royal Canadian Air Force (RCAF), the Canadian government consented to these plans. The government, already stretched thin honouring its North Atlantic Treaty Organization (NATO) commitments in Europe, was committed to the Mid-Canada Line, and could not afford the kind of high-Arctic radar installations required to satisfy its superpower ally. The Americans would have to pay for and build the DEW Line network, even if three-quarters of it was in Canada. Before the year was out, the US Air Force (USAF) asked Western Electric to proceed as quickly as possible with building the entire system, with the ambitious target date of 31 July 1957. There was no time for Canada to carefully ponder its options in this case, as it had with earlier post-war Arctic defence projects. Time was of the essence.

Canada did not write a blank cheque, despite the concerns of some critics. Ralph Campney, the Minister of National Defence, explained the government's logic to the Cabinet Defence Committee on 20 January 1955. "It appears that the continuing aspects of the project are more important to Canada than the transient operations of a crash nature and that it would be desirable to have the RCAF take as substantial a share as practicable in the operation and manning of the line," he explained. "It also appeared desirable to have as much as possible of the continuing logistic support performed by Canadian agencies so that traffic in the Arctic should be, as much as possible, Canadian. This would be an effective way of exercising our sovereignty in a continuing manner."[12] Details remained unclear, but Campney emphasized the need to study issues of transportation and resupply during the operational phase "in order to ascertain the possible requirements and the possibilities and consequences of Canadian participation in them." Canada did not need to participate in construction and installation (its interests were protected by bilateral agreement), but planned to contribute substantially once it was actually completed.[13] Cabinet endorsed the Minister's recommendation on 26 January 1955, and sought a formal agreement with the United States. For its part, the US knew that "Canadian agreement and partnership on an adequate scale is essential to any effective continental defense system," otherwise the project would be "dead in the water."[14]

Ottawa's primary concern during negotiations that led to the creation of the DEW Line was sovereignty. All told, Canadian negotiators reached an advantageous agreement with the Americans, signed on 5 May 1955. All sites were jointly selected and Canada maintained ownership of all lands affected. The US bore the full cost of construction, but subcontracted to Canadian companies and hired Canadian civilian technicians and support staff. Moreover, Canada insisted upon the right of inspection, to approve any change of plans, and reserved the right to take over the operation of any (or all) of the Canadian-based stations at any time. Wildlife was also to be respected, and Canadian airspace protected. The United States committed to share geological, hydrographical, and other scientific data obtained during the construction and operation phases, and agreed that Canadian government ships and aircraft could use landing facilities at beaches and airstrips. All told, "the list of conditions read like a litany of Canadian sovereignty sensitivities and desire for control," historian Alexander Herd notes.[15] Of course, the real test of control would come after the bulldozers began digging into the permafrost.

Canadian Commercial Carriers and DEW Line Construction

The DEW Line was a military project financed by the USAF, but it contracted the WEC of New York to build the system. WEC divided the line into three sectors and sub-contracted the actual construction work to one American and two Canadian firms: Northern Construction Company and the Foundation Company of Canada. Once completed, the line would be operated and

supplied by a civilian contractor, with the Air Force's responsibility limited to supervision and control of the project.[16]

National Defence and Defence Production Canada concurred that the US should have sole responsibility for the construction phase. A single authority would more effectively manage the project, and Canada was already fully committed to the Mid-Canada Line. Furthermore, senior Canadian officials advised that Canada should not be mixed up in a project which might not work. Ottawa would assist the US authorities in organizing and using Canadian resources, and making available armed forces and government facilities, during the construction phase.

From the outset, the Canadian government recognized that the massive airlift required for the construction and subsequent operation of the DEW Line afforded a golden opportunity for the expansion of Canadian commercial aviation. It was not clear, however, whether the United States would agree to the use of Canadian carriers, or instead insist on using its own commercial or even military resources. Securing benefits for Canadian civilian companies required official support, and individuals like Deputy Minister of Northern Affairs and National Resources R. G. Robertson tirelessly promoted the Canadian commercial airlift cause.[17] He articulated his vision most fully in 1956, but had outlined it the year before. The DEW Line's airlift "arrangements will influence the transportation pattern in the north for many years to come," Robertson predicted.

> If the facilities established for the D.E.W. line can be used for civil purposes they will be of great assistance in the development of the north, but if they are such that they either exclude or hamper the easy flow of civilian traffic, the consequences could be unfortunate. We would never suggest that the U.S.A.F. adopt arrangements which would make their task of operating the D.E.W. line more difficult or more expensive, but we feel it should be possible to establish a transportation pattern which will satisfactorily serve both the military and civilian requirements at the same time. Economy to all concerned should result from a well-conceived plan.[18]

Robertson recognized that Canada could not achieve this goal by using military aircraft. He was also concerned about the vertical airlift routes, desiring that Canadian cities be used as bases of operation for northern airlift rather than American cities such as Fairbanks, Alaska.[19] The Department of Transportation (DoT) supported this vision.[20] The opportunities were also obvious to commercial carriers and journalists. "Officials of companies which flew the airlifts readily agreed that the financial arrangements offered for participation in the operations made the original challenge well worth accepting," journalist Ernie Hemphill explained. "But for the farsighted, the opportunity evidently went beyond that of immediate financial gain." Defence construction offered "an opportunity to test and prove air transport as the avenue for full scale development of Northern Canada's much touted industrial potential."[21]

The 1955 DEW Line Agreement promise notwithstanding,[22] for over a year Robertson worried that "Canadian carriers will score almost no business" because their inclusion in the annual airlift was not explicitly stated in American drafts of the DEW Line Logistics plan.[23] Thankfully, the Americans eventually committed to utilize Canadian carriers to their full capabilities for **all** airlifts. In addition, the logistics plan promised that "decisions as to the use of transportation services within Canada… will be made by the responsible United States authorities and the operating contractor in consultation with the Canadian Department of Transport and Air Transport Board."[24] In this sense, the DEW Line airlift would project Canadian sovereignty.

In early 1955, officials with the RCAF, DoT, and the ATB discussed plans with commercial carriers to ensure that Canadian companies could provide the necessary services to complete the herculean task. The 17 Canadian "A" class operators (those carriers licensed by the ATB to fly aircraft heavier than 18,000 pounds [8,165 kg]) were grouped under three prime contractors—Canadian Pacific Airlines (CPA), Associated Airways Limited, and MCA—for the main airlift, while WEC would directly contract with air carriers for special projects. (Spartan Airways was the first beneficiary, receiving a $600,000 contract to photo survey the line and transport the ground survey party.) Canadian companies were told to work through liaison agents (C. F. Burke

for MCA and T. P. Fox for Associated and CPA), who in turn would contact Wing Commander W. B. N. Millar of the RCAF to coordinate the Canadian contributions.[25]

The RCAF's direct contribution to the "largest cargo airlift in the history of Canadian aviation"[26] was modest. It appointed a representative to the WEC's DEW Project Office in New York to monitor the undertaking, protect RCAF interests, and keep Air Force Headquarters (AFHQ) updated on developments. Headquarters set up a DEW Monitoring Committee, the chairman of which sat on the federal government's DEW Coordinating Committee. Despite the Canadian government's commitment to focus its resources on the Mid-Canada Line, not the DEW Line, it did recognize the need to support the civilian airlift. During the construction phase, RCAF policy was to assist the civilian air carriers and USAF tactical air command as much as it could without impairing RCAF activities or commitments. This included beacons and other navigation aids for safety, communications facilities, and "administrative machinery for coordinating northern air transportation."[27] It also supplied fuel to the carriers when critical supply issues emerged, particularly at Churchill. "The RCAF played little part in the actual freight lift, though civilian operators pay high tribute to the services it did provide," a reporter noted as the first stage in the airlift wound to a close in mid-1955. "These included landing facilities at the 'base' end, tower control operators, coordination, and a mass of expert knowledge."[28] The RCAF provided hangar space at the Edmonton and Mont Joli airports, accommodations and hangars at Fort Nelson, Coral Harbour, and Churchill, and aviation fuel at various northern airfields. It also helped with weather forecasting, and loaned equipment, including flying clothing, heaters, and a ski-wheel installation.[29] In practical terms, however, the DEW Line airlift would be a civilian enterprise, supported by large USAF aircraft (such as C-124 Globemasters) for oversized items such as 21-ton (19 MT) bulldozers and other heavy equipment.[30]

The public learned about the role of the civilian contractors months before the final DEW Line agreement with the Americans became public. "Two Canadian construction companies are now leading the assault on the Arctic which dwarfs anything ever before attempted in the Canadian North," journalist Michael Barkway informed readers of the *Financial Post* on 12 February 1955. "Stations will be installed in regions where nothing more complex than a dog-team has ever penetrated, and on sites which are completely unknown." Canadian air carriers were acquiring "big multi-engined freight planes" and agreed to pool resources to fulfil the "mammoth air lift" requirements of the line. The USAF would play a supplemental role, as would the navy in the heavy sea-lift. The key challenge, readers learned, would be logistics:

> Most immediate problem is to move in the mass of materials and equipment which will be needed for this unprecedented construction effort. The open season for supply by sea is only a few weeks in high summer, and the air lift has to be concentrated in the months before break-up.
>
> Thousands of tons have to be air-lifted in the next few months, and Canadian air-carriers are preparing to take the greater part of it. Under the supervision of Western Electric Co., the two Canadian prime contractors will each let "air-lift subcontracts." Other carriers with suitable equipment will then back up the contractor.[31]

For the western section, Northern Construction Company awarded contracts to Canadian Pacific Airlines and to Associated Airways of Edmonton. For the eastern section, Foundation Company awarded the contract to MCA of Charlottetown. Several other western air carriers were expected to join in, and "British Yorks and some U.S. C46s will be added to Canadian fleets to carry the heavy traffic promised." Maritime Central Airways had already begun advertising for "qualified pilots experienced on medium and heavy multi-engined aircraft."[32]

Ottawa officials hoped that the arrangements would benefit Canadian commercial operators, but by the summer of 1955 critics began to suggest that Canada's class "A" carriers were failing to meet their commitments, and that US airlines had to be called in to help them out. Over the previous six months, an editorial entitled "Canada's Bungled Airlift" noted Canadian officials had predicted that the Canadian part of the airlift "would be gigantic—the most stupendous thing of its kind this

country had ever undertaken." Although only equipped at the onset with a handful of small aircraft, promoters had promised that Canada's civilian "northern air fleets" would acquire multi-engined aircraft, providing "a tremendous shot in the arm for air cargo development in this country" once the DEW Line lift ended. Critics argued that this did not transpire because

> some managed to scrape up a modest number of obsolete or inadequate aircraft which, while being twin-engined or four-engined, could not be described as "multi-engined equipment" by a modern classification. That was as far as they could or would go. Needing more capacity, many hungry carriers secured a great proportion of the aircraft they required by the simple expedient of sub-contracting to American carriers. The United States airlift pay is so profitable, moreover, that both parties to such an arrangement can make a pot of money—the American carrier by doing the actual work; the Canadian carrier merely by letting the sub-contract, under the airlift priority it enjoys in virtue of holding a Canadian class "A" certificate.[33]

Notions that the Canadian carriers would modernize and professionalize were misleading, *The Edmonton Journal* editorialized. Most Canadian companies operated their newly purchased aircraft in the bush style of the thirties, with disastrous results. "For weeks at a time, the Canadian carriers with these planes floundered around in the mud of primitive northern airstrips," the editor alleged, "from which they insisted on trying to operate in the Arctic, or were grounded by the exhaustion of the limited aviation fuel at their chosen northern bases."[34]

When it was over, the *The Edmonton Journal* predicted that Canadian commercial aviation would be left without "a single *worthwhile* addition to their 'fleets.'"[35] After the construction phase was completed, the editor expected that the "essential and high-priority" military work would continue to be completed by American planes and crews. The Canadian commercial transport industry would hardly benefit. "The Americans are in no way at fault; indeed, they have been extraordinarily generous. Canada is simply seeing the results of its aviation policy and of the airlift arrangements negotiated by its Air Transport Board, on instructions from the government in Ottawa, and at the request of the Air Industries and Transport Association of Canada." Accordingly, the editor noted, "the government owes the public an explanation of this bungling—and a real one."[36]

That fall, the government and some industry officials painted a more optimistic portrait. On 7 November 1955, Transport Minister George Marler told a luncheon meeting of the Air Industries and Transport Association (AITA) that Canadian carriers had flown more than 17,000 tons (15,422 MT) to supply DEW Line, and that 1955 would be record year. Fox, president of AITA, emphasized that radar building had provided more impetus to Canadian aviation. "Canada's non-scheduled transport has increased from a handful of freighters to over a dozen four-engined aircraft and over thirty twin-engined machines, with a consequent enlargement of personnel and facilities," he touted. "The immediate rush is over, but the more steady supply phase is in the offing." He predicted that this would strengthen the civil network of services, reduce transportation costs (once facilities and overhead costs were written off), and would stabilize demand for auxiliary service and equipment suppliers to the commercial aviation industry.[37]

Not every industry stakeholder was convinced that the DEW airlift was advancing Canadian aviation. Instead of providing Canada with a large air transport reserve, the head of the Canadian Air Lines Pilots Association's policy committee said, "[W]e'll have 10 new millionaires and the biggest collection of junk ever assembled on a Canadian airfield." He accused the AITA of choosing "the 'gravy train' over the future good of Canadian aviation," while the US bankrolled "a laboratory to solve the problems of air freight in the north."[38] The US offered 80 cents a ton mile to fly supplies to the DEW line, compared to the US air freight rate of 18 cents a ton mile. In turn, the AITA spent hundreds of thousands of dollars buying "a hodge-podge of obsolescent York transports and C-46s." When the airlift fell behind, two squadrons of massive USAF C-124s had to move in to carry the freight that should have been dealt with by Canadian aircrews. Had the Canadian government asked the pilots association for 50 crews to man 50 DC-4s "we could have handled all the freight thrown at us," the policy chairman boasted.

> Instead, we end up mired in the mud… while the C-124s fly back and forth. Instead of using our know-how we have a bunch of U.S. pilots taking up residence in Edmonton and the 'reserve' aircraft are Americans no matter how they are camouflaged. Canadian aviation has been retarded instead of advanced.[39]

The AITA retorted that the Pilots Association's accusations were "unfounded and untrue." Fox, the retiring president, explained that "when the DEW Line was initiated, there was a demand for immediate action on the part of the carriers, and sufficient suitable equipment for the long haul to Arctic areas was not available." The fleet of aircraft amassed to mount the airlift was not ideal, but he insisted that it included modern aircraft and was "the best that could be obtained on such short notice." All told, he believed that "the Canadian carriers in the face of tremendous physical difficulties have done a very commendable job on the DEW line."[40] More gruffly, Donald McVicar, owner of World-Wide Airways (WWA), questioned "where in hell could they get 50 DC4s and the crews to man them to finish the job in time to convince the Russians they'd better not bring their damn atom bombers over us?"[41]

The ongoing debate resumed the following year, when the April 1956 issue of the *Canadian Air Line Pilot* (the official publication of the Pilots Association) said that Canada's DEW Line record was "deplorable" and that the government and carriers "muffed" the opportunity to properly study the economic problems of air freighting. Transport officials rejected these charges and insisted that the DEW Line airlift was a tremendous boost to the industry. Air tonnage grew by more than 300 per cent between 1946 and 1954. Furthermore, high density flights in the US bore no resemblance to the movement of freight from places like Mont Joli and Knob Lake to the Arctic. "Freight movements in the North are sporadic, airstrips cannot be compared to city airports, aids to navigation are fewer in the North, ground maintenance is more difficult, and winter flying has to be utilized to take advantage of ice strip landing fields," Irwin Shulman reported in the Montreal Star. "In spite of this, 52,960,000 ton-miles were flown in 1955."[42] Canadian carriers had not indulged in a "wild scramble" for equipment and personnel, had made clear from the beginning that the USAF would move large special equipment, and the 80 cents a ton mile rate was for a one-way haul, with the planes having to return empty. Furthermore, any suggestion that new and modern transport should have been acquired was nonsensical, given that delivery of new, large planes took two to three years. Was the Pilots Association simply distorting the facts to try to obtain a share of the DEW Line work?[43]

Even if self-interests were in play, this debate reflected the complex reality that characterized the airlift. Canadian commercial airlift capabilities did improve because of DEW Line business. Companies such as PWA and Transair developed significant northern capabilities. The statements of government officials, however, trumpeted Canadian successes but concealed limitations. Americans ultimately decided to continue to employ commercial aircraft on a charter rather than unit toll basis (and thereby frustrate the vision of Canadians such as Robertson). Americans also determined which Canadian companies received transportation subcontracts, the length of their contracts, as well as the Canadian hubs that supported the airlift.

Sovereignty for Hire

In reality, Canadian commercial carriers dominated the DEW Line airlifts, and the Canadian north benefitted from the industry's growth and professionalization. The Canadian firms in the region were formerly bush flying firms, operating small fleets of single- or two-engine aircraft, and were only beginning to develop into credible airlines by the early 1950s. The promise of DEW Line work provided these small companies with the credibility to borrow huge sums and build sizeable fleets of aircraft. Some companies, such as Associated Airways, purchased unreliable Avro Yorks and suffered heavy losses. Many companies, such as WWA or MCA purchased more reliable two-engined aircraft such as DC3s and C46s as well as four-engined aircraft such as DC4s for use in Canada's north. These aircraft were flown night and day. "It was not uncommon for a pilot to be back at base after having flown 95 hours in ten days," aviation historian Peter Pigott notes. "Life was flying, sleeping, and more flying."[44] This injection of American dollars into the Canadian industry dwarfed the industry's old environment. Jim Spilsbury, founder of the previously struggling Queen Charlotte Airlines (QCA) writes that DEW Line work

> was bringing in more money than we'd ever dreamed of, quite literally. I just couldn't *believe* the revenue figures we were chalking up. In 1955 I remember looking at an interim balance sheet… [with] a projected gross [profit] for the year of eleven million [dollars]. This was over five times what we'd earned in any previous year… It was just a matter of time before we had the airline back in the black. With cash in the bank and our new operational prowess, things were suddenly starting to brighten up. We would soon be in a position at add some new equipment and expand our routes.[45]

Growth also took the form of consolidation. Pacific Western Airlines was able to buy out Spilsbury's company as well as Associated Airways in 1955, and thereby was able to reinforce its position within the Arctic for several years.[46] Moreover, the quality of services provided by Canadian carriers also improved. "[A]s time went on, it was evident that through the combined efforts of everyone, the company [Pacific Western Airlines] was making the transition from bush flying to airline operations. There were still mistakes being made but, on the whole, we were improving."[47]

Despite this dramatic expansion, American aircraft were also employed when Canadian companies lacked the necessary capability. For instance, in 1956, due to a shortage of C47s and unfavourable weather, Canadian companies lacked sufficient aircraft capable of landing large loads at small airstrips. The USAF therefore provided several C-123 Provider aircraft to fill the gap.[48] Canadian firms also subcontracted American commercial carriers to fill gaps in Canadian airlift capabilities. In the first year, Canadian regulations were limited, and many Canadian companies subcontracted American companies to operate in Canada under their names in return for a share of the profits. These close corporate relationships created widespread concerns that Canadian companies were becoming mere fronts to facilitate American operations. For instance, the men and aircraft for QCA's 1955 operations were entirely supplied by the California-based company Flying Tiger Line. The Canadian DoT, however, quickly tightened its regulations to encourage real growth within the Canadian airlift industry while still allowing for legitimate American commercial participation when absolutely necessary.[49] For example, in 1956, MCA subcontracted work for a single aircraft from the United States Overseas Airlines. Their contract recognized that American carriers "will only be employed when the Canadian carriers are not capable of handling the work and that as soon as the need for their services in Canada is ended, their aircraft will be returned to their own Country."[50] The contract also specified that American aircraft were to use Canadian facilities when in Canada (thereby creating more Canadian jobs), respect Canadian laws, and work under the operational control of MCA.[51] By May of that year, many American aircraft were withdrawn, and MCA notified its Canadian subcontractors that the airlift was American-free by 19 June.[52] So long as governmental regulations were properly managed, eager Canadian carriers proved to be effective transmitters of Canadian sovereignty.

Although such American companies were employed, they did not jeopardize Canadian participation. Sometimes, the ATB determined that Canadian carrier capabilities were underutilized, and rejected the requests of Canadian carriers to subcontract work to American firms.[53] More often, Canadian companies familiarized themselves with the rules that dictated the tender process and each fought to ensure that their companies received as much DEW Line business as possible. Knowing that Canadian firms could only subcontract American companies if **all** Canadian carriers were unable to fulfil the resupply schedule, they objected to any American competition if their aircraft were less than fully utilized. Although many companies complained about the presence of American aircraft, the most vocal was WWA, owned by McVicar. On 14 March 1957, McVicar complained that an American-owned Zantop Airways aircraft was being used by MCA "WHILE OUR CANADIAN OWNED AIRCRAFT ARE IDLE."[54] That July, WWA complained that seven of its aircraft were idle and requested that "NO FURTHER IMPORTATION" of American aircraft be permitted.[55] In this case, the ATB assured McVicar that "the Board does not permit the entry of U.S. aircraft until satisfied that available Canadian aircraft of the type required is utilized."[56] Undeterred, McVicar complained later that same month that Canadian Dorval Air was operating an American aircraft while WWA aircraft were unused.[57] The ATB investigated this later case, and it turned

out that the aircraft was only chartered as backup and therefore did not contravene the DEW Line agreement. Still convinced that something clandestine was afoot, WWA "respectfully request[ed] again that the [Air Transport] Board take appropriate action to have this aircraft operate within the confines of its temporary licenses here in Canada."[58]

Such complaints generally lacked validity and were likely false accusations based on impressions and rumours designed to generate additional work for the accuser. On at least one occasion, however, the allegations seem to have been valid. Canadian-based Wheeler Airlines improperly acquired two aircraft and crews from the American company Riddle Airlines Incorporated. According to McVicar, in return for 15 per cent of the gross profits, American companies like Riddle provided their aircraft and crews to Canadian companies. "Then to prove what some call the 'Canadian content' of the aircraft they'd give me a dated, signed bill of sale and I was supposed to give them an undated one back."[59] In this case, the ATB investigated the matter more thoroughly, but their findings are not part of the archival record.[60] The fierce competition for DEW Line work generated considerable jealousy that caused Canadian carriers to behave as non-appointed watchdogs for the Canadian government by reporting any violations, and deterred any consistent illegal use of American aircraft at the expense of Canadian capabilities.

On only one other occasion does there appear to have been any infringement of the DEW Line agreement. In 1958, the Federal Electric Company (FEC) chartered American aircraft on a case-by-case basis to satisfy emergency flights of materiel to DEW line sites so that uninterrupted construction could continue.[61] When the ATB questioned the use of American aircraft, the USAF insisted that the FEC had behaved properly, and pointed out that Canadian carriers were moving more freight than ever before, and that while Canadian companies would continue to be used to the fullest extent possible, American companies could still be required in future emergencies.[62] In response, the ATB provided a list of Canadian carriers that it believed could have carried out the work and again asked that past precedents be followed.[63] Whether the ATB was unconvinced or merely posturing is unclear. Regardless, it seems the Americans got the hint: the archival record contains no further examples of American emergency freight flights. Canadian companies continued to dominate the airlift, and thereby fortified Canada's presence in its Arctic. Moreover, though reminders were required on occasion, American officials respected the wishes and jurisdiction of the ATB.

The Limits of Canadian Influence

The Canadian government did not, of course, have ultimate control of the DEW Line airlift. Ralph Allen, the editor of *Maclean's* magazine, wrote an oft-cited article posing the core question: "Will the DEW line Cost Canada its Northland?" He thought it would. "It is the charter under which a tenth of Canada may very well become the world's most northerly banana republic," Allen asserted. "For a sum of money that has been officially estimated at four hundred million dollars we have at least temporarily traded off our whole northern frontier. In law we still own this northern frontier. In fact we do not."[64] In his view, we did not simply allow our American allies to take control, but insisted that they do so. This was not a passive loss of sovereignty, but the Canadian government's decision to "thrust it on a friend who did not really want it, but who, having been forced to take it, must inevitably use it in ways that will impair our friendship." For roughly the amount of tobacco taxes that Canadians would pay between 1954 and 1957, the country "handed the expense and operation of this radar network—perhaps obsolete already—to the United States," Allen lamented. Canada's "paper" agreements were insufficient guarantors of Canadian sovereignty "on the ground."[65]

In practice, the Americans did not run roughshod over Canadian wishes and bilateral agreements, and they worked hard to accommodate Canadian interests. There were, however, limits to American goodwill. For example, the United States' financial control of the airlift limited Canada's ability to influence operations. The ATB reviewed all tenders from Canadian companies, approved those that possessed the appropriate licences and capabilities, and then passed them to the Americans. Although American governmental and corporate officials consulted Canadian departments throughout the tendering process (and there is no evidence of

Americans ignoring Canadian suggestions), the FEC decided which company received the lateral transportation contract, and the USAF selected the vertical airlift subcontractor.[66] This reliance on American finances vis-à-vis the DEW Line airlift occasionally led to decisions that adversely affected some Canadians. The Canadian government may have preferred different actions, but recognized that since the American decisions were reasonable expressions of their own interests, and since Canadian sovereignty was not threatened, it was unreasonable to object.

The Canadian air carriers that benefitted from DEW Line work did extend their services into the Canadian North by performing additional non-DEW Line flights. The USAF worked to ensure "that the airlift pattern will coincide with Canadian desires,"[67] and promised that the FEC would direct its vertical airlift from Canadian airfields (later Edmonton and Montreal). As a result, considerable Canadian, rather than American goods, were purchased and shipped to DEW Line stations in Canada using Canadian air carriers.[68] Robertson, however, was unsatisfied with this limited expansion. Thus, in July 1958, he asked the ATB to "re-examine the contracts… between the Federal Electric Company and the air carriers to ensure that they allow any space in the aircraft to be used for common carriage" because "the integration of D.E.W. with other traffic requirements in the north would greatly benefit the development of the north."[69] Even in 1961, when the Department of National Defence (DND) began to doubt the viability of such a plan due to the alleged incompatibility of military-civilian interests, and the DoT believed the public had sufficient access under the existing system, DNANR still hoped that an integrated system was possible.[70]

The Americans were reluctant to accommodate the Canadian vision because they believed that it would compromise the responsiveness of Canadian carriers to DEW Line requirements. Both the USAF and FEC insisted on contracts that chartered aircraft. The FEC preferred this method because it "did not envisage too much available space for commercial purposes and contemplated that this would be restricted to use by government departments such as Northern Affairs."[71] While the USAF was interested in cutting costs, they similarly doubted "that the unit toll basis of charge… will… enable the degree of control that is necessary to insure reliability and support for the primary DEW Line mission."[72]

Alternatively, DNANR increasingly pushed for a unit-toll arrangement whereby the Canadian government, the private sector, or private citizens, could purchase excess capacity on DEW Line flights, and access areas of the north that would have otherwise generated insufficient demand to legitimize a flight. By 1960, Nordair also picked up on the idea to try lowering their rates and become the major vertical airlift subcontractor. They hoped to add commercial flights to Frobisher and Cape Dyer and "thereby enable us [Nordair] to increase the frequency of our services available to the public in general and to reduce our rates for all people using it."[73] Maintaining its desire for uncompromised control, the USAF rejected this scheme and continued to insist on charter-based contracts. Thus, by 1961, Canada still lacked the integrated system that could have maximized access to the North at the lowest possible prices.[74] Given the American willingness to pay for a less cost-efficient system, and since these decisions still respected the Canadian government's jurisdiction and utilized Canadian carriers, the Canadian government had little choice but to accept the status quo.

Other aspects of American preferences concerning Canadian DEW Line airlift contracts were also beyond Canada's control. The Americans insisted that only large companies could bid on DEW Line transportation subcontracts. This resulted in an umbrella-like contract structure wherein the winning Canadian company, itself too small to fulfil the contract's full obligations, would subcontract to other Canadian and even American companies. Although the Canadian government recognized that winning DEW Line contracts put these companies "in a very strong position to the point where other operators were discouraged from extending into the far North either charter or regular unit toll services," there was little it could do.[75] Some Canadian companies became dependent on DEW Line work due to the relatively small scale of alternative contracts in the region. According to air carriers that were not awarded DEW Line contracts, these favoured companies also used their status to access facilities that were otherwise unavailable.[76] Other owners have insisted that their companies remained competitive, but that the

political connections of larger firms such as the Dorval Air Transport and Wheeler Airlines (who combined to form Wal-Dat to receive the initial resupply subcontracts for the eastern section of the DEW Line) resulted in favouritism. "In losing the DEWline [sic] contract you might say that instead of spending so much time in the Arctic I ought to have been in Ottawa kissing asses and greasing palms," McVicar noted sarcastically.[77] As time passed, already large Canadian companies grew larger; as a result, smaller companies such as WWA found themselves out of work. Whether these smaller companies were cost-effective or not remains unclear. That these contracting decisions were, at the end of the day, the responsibility of Americans, should not obscure the fact that the principles of the DEW Line agreements remained in place: Canadian carriers continued to dominate the airlift; and, the Canadian government was consulted throughout the airlift's duration.

The repercussions of these decisions were not limited to the Canadian aviation industry. Some Canadian towns, such as Mont Joli, became dependent on DEW Line work. During the construction phase many Canadian carriers, such as WWA, operated from Mont Joli, generating considerable prosperity for the town in the process. With the construction phase complete, the resupply for the DEW Line's eastern section was centralized in Montreal. Both the Junior and Senior Chambers of Commerce in Mont Joli sent petitions to Ottawa requesting that the federal government "study… [the] possibilities to establish new air lift at Mont Joli" since "Mont Joli airport was giving employment to a great part of [the] population of Mont Joli and the surrounding" area.[78] Aside from a letter from the prime minister's office acknowledging the problem, nothing resulted.[79] The greater administrative efficiency that resulted from centralized operations trumped local concerns.

The one-year duration of airlift contracts also created uncertainty for Canadian carriers and the federal government. The Canadian Minister of Transport, George Hees, asked Major General J. C. Jensen, Chief of the USAF Central Coordinating Staff, whether contracts of two or three years could be awarded. Hees believed longer contracts would lead to better service, lower rates, and prevent disruptions during transition periods between contractors. He also expressed concern about the destabilizing effects for Canada's airfreight industry caused by changing subcontractors.[80] Although Jensen acknowledged the validity of Hees' arguments, he explained that the "funds which are provided to the USAF by Congress for the procurement of airlift services are available for obligation only in the fiscal year for which appropriated and limited to the procurement of services and supplies to meet the bona fide needs of that fiscal year."[81] Both parties agreed that longer contracts were desirable, but they were impossible. This American idiosyncrasy influenced Canada's airfreight industry in ways that were contrary to what both Canadian and American officials preferred. Nevertheless, the American military and private contractors did all that they could to accommodate Canadian preferences and requirements. The airlift continued to use Canadian firms to their full capacity and Canada's northern transportation infrastructure did grow because of DEW Line work (albeit much more conservatively than the DNANR had hoped). While Canada was unable to exploit the fullest potential of the DEW Line's airlift, it nonetheless realized considerable gains.

The United States did not get everything their way. They continued to pay the higher freight rates of Canadian companies instead of insisting on American companies. "Perhaps the most ethically questionable position from the American point of view was the implicit belief on the part of Canadian negotiators that United States defense purchases were to be used to subsidize Canada's defense related industries," historian Michael Evans observed. Despite these concerns about "financial profiteering" from a system paid for by American taxpayers, Canadian industry reaped substantial benefits.[82] As early as 1955, the rates of Canadian carriers were considered "on the excessive side," especially given the airstrip improvements that eased transportation since 1954.[83] Indeed, Canadian carriers initially refused to consider reducing their rates. The following year, the President of Yellow Transportation Company Limited described the transportation rates as "whoppers."[84] Although some reductions were realized, rates remained high. By 1960, "the American authorities… [were still] spending at least twice as much as they need on the transportation of DEW Line supplies" to certain sections of the line.[85] Even the Deputy Minister of Transport J. R. Baldwin conceded that if the USAF "wanted to take a firm stand I think it would

be very difficult to enforce the use of Canadian carriers [given the freight rates the Americans were paying]. It is therefore essential that the U.S. government be given the best economic treatment possible if we are to avoid placing it in a position where it insisted on using its own or Canadian military services instead of commercial services."[86]

The Americans eventually took action. In the name of cost cutting, the annual vertical airlift was consolidated from Edmonton and Montreal into a single centralized operation out of Winnipeg (and Churchill). In 1960, the FEC and TransAir Limited each studied DEW Line operations and realized that its dual operations in Edmonton and Montreal resulted in significant duplication. The FEC estimated that it would save $800,000 to $1,000,000 per year by centralizing the DEW Line resupply in Manitoba. Priority goods would be flown out of Winnipeg, and bulk goods would be sent by rail to Churchill and then flown to DEW Line sites. The new plan would not, however, compromise Canadian participation. "[U]nder the new plan the volume of purchasing in Canada would **not** decrease, nor would there be any decrease in the number of Canadians employed on the line."[87] Manitoba's Minister of Industry and Commerce Gurney Evans was excited by the opportunities for the province's suppliers and transportation facilities.[88] As per the DEW Line agreement of 1955, Canadian carriers would continue to be used to the fullest extent practicable. Given this continued interest in satisfying Canadian demands, G. Y. Loughead, Superintendent for Finance in DND, commented that given the "substantial administrative savings," this was "the sort of thing that could be expected to result after the experience gained during the course of operating the line, and it did not reflect any changes with which the Canadian departments could take exception."[89]

The relocation also favoured some companies at the expense of others. TransAir based in Winnipeg, a past advocate of consolidation, received the 1961 vertical airlift contract. The Canadian government regretted the "heavy economic impact" on previous subcontractors, but considered the change reasonable.[90] The USAF also found it "regrettable that their [Canadian carriers'] operations have been so greatly dependent upon DEW airlift" and attempted to alleviate consolidation's impact on Canada's airfreight industry by offering both of the previous vertical airlift subcontractors, Nordair and Pacific Western Airlines, subcontracts for the lateral airlift.[91] Again, the United States did its best to accommodate Canadian needs without unduly sacrificing its own interests.

Different American interests did not compromise Canadian sovereignty. At the time, Canadian bureaucrats and politicians recognized that America's financial stake in the program afforded it some level of decision-making power. Conversely, American officials were careful to accommodate Canadian wishes whenever possible, not to overstep reasonable limits, and to avoid provoking a sovereignty crisis. In short, because the DEW Line was in the interests of both countries, they sought ways to satisfy the other's sometimes contrary needs and preferences.

Conclusions

Scholars who remain fixated on American intentions or threats to Canadian sovereignty are misplaced in pointing to the DEW Line experience. The DND legal adviser Eric Wang visited the line in May 1969 and concluded that Canadian sovereignty had been strengthened rather than weakened as a result of the DEW Line's existence. Canadian journalists' "masochistic pleasure" in alleging that "the higher degree of financial, administrative and military influence and control exercised by U.S. authorities has in practice reduced Canadian powers to influence and control activities on the Line" was misleading.[92] Wang concluded that the Canadian and American interests in the radar network were compatible and mutually beneficial. In his assessment, anecdotal evidence of sovereignty encroaches and bilateral friction had been overblown.

> American policy towards the DEW Line appears to be based on a desire to accommodate themselves as harmoniously and as constructively as possible into the Canadian setting in which they have to operate. This policy is firmly founded in their own self-interest in maintaining the highest level of Canadian cooperation and support for joint North American defense programs. Perhaps it may be possible to detect some sour notes by diligent searching. I wonder, however, whether any such problems would weigh

> very heavily against the important benefits which accrue to Canada from this project in the development of the North, not to speak of its essential contribution to our security. Indeed, we might be tempted to congratulate ourselves... for enjoying a "free ride" at least in this area of our defense activities on our own soil, without any unpleasant side effects.[93]

Canadian diplomats and defence officials did not sell out vital national interests—they secured them through quiet diplomacy, a functional approach, and a process that was generally "cordial, respectful, and mutually beneficial."[94]

Despite the American influence and limited participation of Canadian government assets (such as the RCAF) in the DEW Line airlift, sovereignty was protected. Canadian civilian air carriers comprised a major portion of the airlift, and their contributions were highly valued by American officials.[95] While Canada's official influence was limited in the actual construction of the radar network and operation of the airlift, the simple reality that the US was paying for the DEW Line required Canadian adaptation. Ottawa could not change the length of contracts, the employment of aircraft on a charter rather than unit toll basis, or the selection of large Canadian companies at the expense of their smaller counterparts. This, however, did not compromise Canadian sovereignty. Despite their critics, Canadian commercial carriers continued to dominate the consolidated DEW Line airlift and to expand their operations in the Arctic. Moreover, the ATB contributed to the tendering process and ensured that all carriers abided by Canadian laws. The US held the purse strings, but Canada benefitted. "If you want to write a story about Americans taking over the Canadian Arctic, you have come to the wrong place," a Canadian construction boss noted in April 1956. "Not only are we holding onto our Arctic, but we're opening up in two years what would have taken centuries. We're learning more about Arctic flying than anybody in the world."[96] Rhetorical excess aside, Canadian contributions to the DEW Line not only expanded its commercial air capacity but its Arctic domain awareness more generally.

In the midst of another round of concerns regarding Arctic sovereignty and security, the federal government in general—and the Canadian Forces in particular—is looking to the private sector to leverage its capabilities in demonstrating Canada's Arctic presence. The contracting of civilian air assets (fixed-wing and rotary) to support Operation NUNALIVUT north of Ellesmere Island in April 2010 is a prime example. This is hardly unprecedented, and present-day decision makers should be aware of the lessons learned from the DEW Line experience. For example, past practices suggest that long- rather than short-term contracts are more conducive to stable and cost-efficient transportation infrastructure. Crash programs are expensive and force companies to adopt half measures to meet requirements in an ad hoc fashion. Furthermore, the contract structure itself is fundamental to the type of transportation infrastructure that results. When government regulations concerning American carriers were less stringent, Canadian carriers exploited the gap for their own financial gain. Once these gaps were closed, different companies with different strengths came to the forefront. In the case of the DEW Line, large companies were consistently selected, in part because their size made coordinating the large airlift more convenient. The result, however, was the elimination of smaller airlines from the Arctic region. Indeed, even southern Canadian towns such as Mont Joli were dramatically affected by DEW Line business. While it is difficult to determine whether utilizing larger or smaller carriers was ultimately more beneficial to Canada's Arctic transportation infrastructure, it is important to acknowledge the costs to both the aviation industry and towns reliant on airlift contracts. Furthermore, operating regulations need to be clearly communicated and enforced to ensure a fair economic environment.

On a more general level, the DEW Line experience reveals how commercial carriers, politicians, journalists, and scholars are susceptible to a civilian form of "mission creep." Once part of the airlift was Canadianized, southern Canadian commentators increasingly expected that Canadian crews and aircraft should conduct the entire airlift. Although the original intention may have been to develop and use Canadian assets where practical, this changed to "Canada-only" expectations that may have been unreasonable and unfeasible. Accordingly, another lesson

learned suggests that, where possible, the federal government and the military should communicate their expectations concerning future operations clearly, early, and based on predefined goals. Finally, and of continuing relevance today, government departments need to communicate their needs and capabilities so that a coherent, sustainable Arctic policy can be implemented. A proactive strategy will integrate civilian and military assets to achieve national aims, and will be informed by past experiences as well as anticipation about the future.

Notes

1. Morris Zaslow, *The Northward Expansion of Canada, 1914–1967* (Toronto: McClelland and Stewart, 1988), 328.

2. C. J. Marshall, "North America's Distant Early Warning Line," *Geographical Magazine* 29.12 (1957), 616.

3. Ibid.

4. "Basic Philosophy on the Operation of the DEW Line," c.1955, Library and Archives Canada (LAC), Records Group (RG) 24, acc. 1983–84/049, box 105, f.096-100-80/9 pt. 4.

5. See http://pubs.aina.ucalgary.ca/aina/DEWLineBib.pdf (accessed September 9, 2010).

6. Jeffrey David Noakes, "Under the Radar: Defence Construction (1951) Limited and the Military Infrastructure in Canada, 1950–1965" (unpublished PhD dissertation, Carleton University, 2005), 343–44; J. R. Baldwin, Memorandum for File – DEW Line Supply Figures, 5 October 1956, LAC, RG 12, vol. 2407, file 14-13-9-1 pt.5.

7. David Neufeld, Canadian Parks Service, "BAR-1 Distant Early Warning (DEW) Auxiliary Station, Komakuk Beach, Yukon Territory," Report on file at the Parks Canada Western Arctic Field Unit, Inuvik, NT, 16–17; Alexander W. G. Herd, "As Practicable: Canada-United States Continental Air Defense Cooperation, 1953–1954" (MA thesis, Kansas State University, 2005), 92–93.

8. A rare exception is Noakes' doctoral dissertation examination of Defence Construction (1951) Limited, but his discussion of the DEW Line focuses on construction and equipment and provides little analysis of the airlift. Noakes, chapter 4.

9. Michael William Evans, "The Establishment of the Distant Early Warning Line, 1952–1957: A Study of Continental Defense Policymaking" (MA thesis, Bowling Green University, 1995), 72.

10. R. J. Sutherland, "Strategic Significance of the Canadian Arctic," in *The Arctic Frontier,* ed. R. St. J. MacDonald (Toronto: University of Toronto Press, 1966), 267.

11. On the radar chains, see Joseph Jockel, *No Boundaries Upstairs: Canada, the United States and the Origins of North American Air Defence, 1945–1958* (Vancouver: UBC Press, 1987); Matthew Farish, "Strategic Environments: Militarism and the Contours of Cold War America" (unpublished PhD dissertation, University of British Columbia, 2003); and Noakes.

12. Memorandum from Minister of National Defence to Cabinet Defence Committee, 20 January 1955, *Documents on Canadian External Relations*, vol. 21 (1955), doc. 324.

13. Ibid.

14. National Security Council (NSC) 159/4, quoted in Evans, 61.

15. Herd, 86.

16. Marshall, 616–17.

17. In early 1955 he expressed strong desires for Canadian participation in the DEW Line's resupply. Robertson, "Appendix D," 23 February 1955, LAC RG 25 Vol 5926 File 50210-C-40 pt. 3.1.

18. Jackson to Miller, 30 August 1956, LAC RG 12 Vol 2407 File 14-13-9-1 pt. 5, 2; see also Robertson to Matthews, 27 September 1956, Directorate of History and Heritage (DHH) 77-576 File 21.

19. By this means, he hoped to better service places such as Knob Lake, Yellowknife, Norman Wells, Aklavik and Frobisher Bay. Ibid.; Robertson to Baldwin, 22 June 1955, LAC RG 12 Vol 2406 File 14-13-9-1, pt. 2, 2.

20. Baldwin to Miller, 31 August 1956, "Re: DEW Line Logistics Plan," LAC RG 12 Vol 2407 File 14-13-9-1 pt. 5, 2.

21. Ernie Hemphill, "Air Transport Crossroads," *Canadian Aviation* (June 1957), 41.

22. Statement of Conditions to Govern the Establishment of a Distant Early Warning System in Canadian Territory, Article 17, annex to Exchange of Notes (May 5, 1955) between Canada and the United States of America Governing the Establishment of a Distant Early Warning System in Canadian Territory, Canada, Treaty Series 1955, no. 8.

23. Robertson to Miller, 23 March, 1956, LAC RG 12 Vol 2407 File 14-13-9-1 pt. 4, 2; "Logistic Plan: Land Based Segment," 1 December 1955, LAC RG 12 Vol 4238 File: Logistics Plan – Land Based Segment – Dew Line, 11–12.

24. "Logistic Plan: Land Based Segment," 4 January 1956, LAC RG 12 Vol 4238 File: Logistics Plan – Land Based Segment – Dew Line, 16.

25. Report of a Meeting on the Participation of Canadian Civil Air Carriers on the Airlift for the DEW Line held at AFHQ on Thursday, 27 January 1955," 1 February 1955, LAC, RG 24, 83-84/049, box 955, f.530-100-80/9 pt.1. On Spartan Air Services' contributions, see Larry Milberry, *Air Transport in Canada*, vol. 1 (Toronto: CANAV Books, 1997), 444–55.

26. Director of Air Services to DRAE, DoT, 2 February 1955, LAC, RG 12, v.2408, f.14-13-9-5 pt.1.

27. R. G. Robertson to J. R. Baldwin, 22 June 1955, LAC, RG 25, vol.5926, file 50210-C-40 pt. 4.2.

28. Michael Barkway, "Here's a New Saga of the North," *Financial Post*, 21 June 1955.

29. Report of RCAF Activities in Connection with the Construction Phase of the Distant Early Warning Line, 7 March 1955, LAC, RG 24, 83-84/049, box 105, f. 096-101. Canadian civilian air carriers operated out of or staged through Edmonton, Fort Nelson, Norman Wells, Hay River, Yellowknife, Cambridge Bay, Coral Harbour, Mont Joli, Churchill, Frobisher Bay, Knob Lake, and Fort Chimo.

30. "Building the DEW Line," *Engineering and Contract Record* (June 1957), 62–63.

31. Michael Barway, "Canada Gets Ready to Build Dew-Line," *Financial Post*, 12 February 1955.

32. Ibid.

33. "Canada's Bungled Airlift," *Edmonton Journal*, 14 July 1955.

34. Ibid.

35. Ibid. (italics in original)

36. Ibid.

37. "17,000 Tons Flown to Arctic to Supply Canada's DEW Line," *Montreal Gazette*, 8 November 1955, 8.

38. "Airplane Pilots Say Canada Falling Down on DEW Line," *Quebec Chronicle Telegraph*, 9 November 1955.

39. Ibid.

40. Fernand Renault, "Pilots Association's 'Collection of Junk' Assertion Labelled Unfounded, Untrue by Air Association," *Montreal Star*, 10 November 1955.

41. Donald M. McVicar, *Distant Early Warning* (Dorval: Ad Astra Books, 1992), 120.

42. Irwin Shulman, "Ottawa Defends DEW Airlift Record," *Montreal Star*, 31 May 1956.

43. Ibid.

44. Peter Pigott, *Wing Walkers: The Rise and Fall of Canada's Other Airline*, 2nd ed. (Madeira Park: Harbour Publishing, 2003), 203.

45. Howard White and Jim Spilsbury, *The Accidental Airline: Spilspury's QCA* (Madeira Park: Harbour Publishing, 1988), 237–38 (emphasis in original).

46. Duncan D. McLaren, *Bush to Boardroom: A Personal View of Five Decades of Aviation History* (Winnipeg: Watson and Dwyer, 1992), 171.

47. Ibid., 173–74.

48. The exact number is unclear. The possible number ranges from 6 to 16. Consult "Operations Order Number 18-56," 30 August 1956, DHH 92/1 File 18, 1; Devine to Deputy Minister, 12 October 1956, LAC RG 12 Vol 2407 File 14-13-9-1 pt. 5, 1.

49. White and Spilsbury, 236; Belcher to Chairman, "Riddle Airlines, Inc. Prospectus involving aircraft operated by Wheeler Airlines Limited," 19 March 1957; Chairman to Minister of Transport, 2 April 1957, DHH 77/576 File 18 pt. 1.

50. Contract between Maritime Central Airways and United States Overseas Airlines, 19 March 1956, DHH 77-576 File 18 pt. 2, 3.

51. Ibid., 4–5.

52. Lefrancois to Belcher, 2 May 1956, DHH 77-576 File 18 pt. 2; Lefrancois to Secretary (ATB), 19 July 1956, DHH 77-576 File 18 pt. 2.

53. Belcher to McGrail, 21 February 1957, DHH 77-576 File 21.

54. Note: the text from this quote is from a telegram and thus all uppercase in the original. McVicar to Belcher, 13 March 1957, DHH 77-576 File 18 pt. 1.

55. Note: the text from this quote is from a telegram and thus all uppercase in the original. As quoted in Quirt to McVicar, 8 July 1957, DHH 77-576 File 34, 1.

56. Ibid.

57. McVicar to Secretary (ATB), 26 July 1957, DHH 77-576 File 34.

58. McGrail to Secretary (ATB), "Re: Operation of American Licensed DC4 in Canada," DHH 77-576 File 34.

59. McVicar, 53.

60. Belcher to Chairman, "Riddle Airlines, Inc. Prospectus involving aircraft operated by Wheeler Airlines Limited," 19 March 1957; Chairman to Minister of Transport, 2 April 1957, DHH 77/576 File 18 pt. 1.

61. Quirt, 18 August 1958; Quirt, 8 September 1958, DHH 77-576 File 36.

62. Reynolds to Wiseman, "Dew Line Carriers, Special Requirements," 15 September 1958, DHH 77-576 File 36.

63. Quirt to Wiseman, 1 October, 1958, DHH 77-576 File 36.

64. Ralph Allen, "Will DEWline Cost Canada its Northland?" *Maclean's*, 26 May 1956, 16–17, 68–72.

65. Ibid. Contrast also Leslie Roberts' two articles: "The Great Assault on the Arctic," *Harpers Magazine* (July 1955). Roberts spoke glowingly about Canadian-American cooperation, while in "Should We Bring Our NATO Troops Home?" *Saturday Night*, 29 October 1955, he accused the Canadian government of failing to safeguard Canadian interests.

66. Distant Early Warning Co-ordinating Committee: Progress Report No. 9, 20 July 1956, LAC RG 12 Vol 2407 File 14-13-9-1 pt. 4, 2–3; Logistic Plan, Land-Based Segment, Distant Early Warning System (DEW Line), 1 December 1955, LAC, RG 12, vol. 4238, file Logistics Plan – Land Based Segment, DEW Line; Loughead to Quirt, 16 December 1958, DHH 77-576 File 21, 1; Quirt to Wiseman, "Re: Air Transportation Services by Canadian Air Carriers – Dew Line Resupply FY 1960," DHH 77-576 File 39 pt. 2, 2.

67. Jensen to Chief of the Air Staff, 13 September 1956, LAC RG 25 5928 50210-C-40 pt. 8.

68. For example, regular flights between Mont Joli, Quebec and Frobisher Bay were established. Robertson to Matthews, 27 September 1956, DHH 77-576 File 21, 1. Pacific Western Air Lines also

considered its flights to Cambridge Bay to be "in support of public interest" for civilian as well as military purposes. Davoud to Taylor, 19 May 1960, DHH 77-576 File 22, 1.

69. Robertson to Matthews, 11 July 1958, DHH 77-576 File 21, 2.

70. Distant Early Warning Coordinating Committee, "Minutes," 17 January 1961, RG 24 vol 21422 File 1855.5.1 pt. 1, 1–2.

71. Belcher to Loughead, "Commercial Air Services into Frobisher," 17 June 1957, LAC RG 24 Acc 1983-84/049 Vol 955 File 530-80/9 pt. 1, 1.

72. Taylor to Davoud, 15 February 1960, DHH 55-576 File 22, 1.

73. Lefrancois to Secretary (ATB), 15 March 1960, DHH 77-576 File 22, 2.

74. As a result, for example, Pacific Western applied to the ATB to suspend operations out of Parry Point "on the grounds that the level of activity and the civilian population do not merit service at the present time." Davoud to Taylor, 19 May 1960, DHH 77-576 File 22, 2.

75. Baldwin to Deputy Ministers, Draft," n.d. (c. January 1960), DHH 77-576 File 51 pt. 1, 1.

76. Lefrancois to Secretary (ATB), 15 March 1960, DHH 77-576 File 22, 3–4.

77. McVicar, 178.

78. Note: the text from this quote is from a telegram and thus all uppercase in the original. Mont Joli Junior Chamber of Commerce to Diefenbaker, 22 January 1958, LAC RG 25 5928 50210-C-40 pt. 10.

79. Bedson to President, Senior Chamber of Commerce of Mont Joli, 27 January 1958, LAC RG 25 5928 50210-C-40 pt. 10.

80. Hees to Jensen, 23 December 1958, DHH 77-576 File 36, 1.

81. Jensen to Hees, 12 February 1959, DHH 77-576 File 36.

82. Evans, 87–88.

83. Lohman to Willamson, 15 November 1955, LAC RG 24 Acc 1983-84/216 Vol 3061 File 895-80/9 pt. 2, 1.

84. Harcout to Alexander, 8 March 1956, LAC RG 24 Acc 1983-84/216 Vol 3061 File 895-80/9 pt. 4.

85. Turner to Davoud, 25 March 1960, DHH 77-576 File 22, 1.

86. Baldwin to Davoud, 15 June 1960, DHH 77-576 File 22, 1.

87. Loughead to Deputy Minister, "Re: DEW Line Administrative Organization in Canada and Vertical Aerial Re-Supply," 28 December 1960, LAC RG 24 Acc 1983-84/216 Vol 3061 File 895-80/9 pt. 2, 2 (emphasis in original); see also Raylor to Loughead, 11 January 1961, LAC RG 24 vol 21422 File 1855.5.1 pt. 1.

88. Evans to Balcer, 7 December 1960, LAC RG 24 Acc 1983-84/216 Vol 3061 File 895-80/9 pt. 2.

89. Loughead to Brown, "Re: DEW Line Administrative Reorganization," 30 January 1961, LAC RG 24 Acc 1983-84/216 Vol 3061 File 895-80/9 pt. 2.

90. Balcer to Paille, 14 April 1961, DHH 77-576 File 25.

91. Taylor to Davoud, 19 April 1961, DHH 77-576 File 25. PWA ultimately rejected this offer because of its minimal profits. Nordair seriously considered the offer and struggled to offer acceptable rates, but their final decision is unclear. Chairman (ATB) to Minister of Transport, "Re: Lateral DEW Resupply;" Harris to Davoud, 11 May 1961 DHH 77-576 File 25.

92. E. B. Wang, "The Dew Line and Canadian Sovereignty," 26 May 1969, LAC, RG 25, f.27-10-2-2 pt.1.

93. Evans, 76.

94. Ibid.

95. In 1957 the Foundation Company of Canada praised MCA for its management of the Eastern Section airlift during the DEW Line's construction phase, emphasizing that "without your effort the building of the DEW Line would have been impossible." Shaw to Burke, 23 July 1957, DHH 77-576 File 18 pt. 1. In 1959, the Federal Electric Corporation was also impressed by "the calibre, attitude and zeal" of the personnel of Canada's Pacific Western Airlines. Sowell to Robbins, 27 February 1959, DHH 77-576 File 49.

96. Douglas Leiterman, "Americans Take Back Seat In DEW Line Development," *Edmonton Journal*, 11 April 1956.

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Chapter 8

Frigid Ambitions: The Venture of the Alert Wireless Station and Lessons Learned for the *Canada First* Defence Strategy

Rachel Lea Heide

Northern Strategy and Policy

Canada's Arctic has recently become more of a focus of Canadian government policy with the publication of the *Canada First* Defence Strategy (*CFDS*). With climate change and the consequent opening up of the Northwest Passage, increased shipping, resource exploitation, and economic activity are expected to occur in the Arctic region. With this comes potential illegal activity, security concerns, and sovereignty violations. Consequently, the *CFDS* expects that additional military presence will be needed in the Arctic.[1] Means of increasing the Canadian Forces (CF) presence in the North include initiatives such as an Army training centre in Resolute Bay, a deep-water berthing and fuelling facility in Nanisivik, new Arctic patrol ships and ice breakers, and Polar Epsilon—a space-based wide area surveillance and support program by the Department of National Defence.[2]

Canada's Northern Strategy, published in 2009, is comprised of four priorities for the Canadian government: exercising Arctic sovereignty, promoting social and economic development, protecting the environmental heritage of the North, and giving Northerners a greater voice in their destiny by improving and devolving Northern governance.[3] Exercising Arctic sovereignty requires the Canadian government to strengthen its presence in the North. Key tenets for achieving this include operations in the North by the Canadian Forces and other government departments and agencies (e.g., Operation NANOOK), regular surveillance and security patrols, the North American Aerospace Defence Command's (NORAD's) monitoring and controlling of Northern airspace, and the "[maintenance of] the signals intelligence receiving facility at Canadian Forces Station (CFS) Alert, the most northern permanently inhabited settlement in the world."[4]

Introduction

This paper will give an overview of the history of activities at CFS Alert, from both government records and personal accounts. Little academic research has been conducted on this piece of Canada's military history. Nevertheless, Alert's narrative includes many interesting stories as well as relevant information for today's Arctic defence initiatives, such as considerations for construction of infrastructure in the north; the logistics of supplying remote establishments; maintaining the welfare and morale of personnel in remote and extreme conditions; and ensuring search and rescue capabilities in the event of air crashes. By looking at these themes in the case study of the station at Alert, this paper will identify lessons that can inform today's activities in the Arctic under *CFDS* and *Canada's Northern Strategy* initiatives.

This paper will follow more of a thematic approach than a strictly chronological narrative. To set the context, the first part of the paper will give a brief history of the station itself: why it was located in Alert, changes in which service commanded the station, how the station was laid out, and how it had to function being in a remote and harsh environment. Next, the paper will look at specific themes linked directly to the challenges of operating in the North: supplying the station, maintaining morale, and conducting search and rescue missions. The end of the paper will highlight other themes relevant to operating in the North in a whole of government / comprehensive approach manner to which further study into this—and similar—case studies can elucidate.

Background – The Cold War and Evolution of the Station

Canadian Forces Station Alert is located at 82°30′06″ north latitude and 62°19′47″ west longitude on the north-eastern tip of Ellesmere Island. Just 450 nautical miles (or 517 statute miles [724 kilometres (km)]) from the North Pole, CFS Alert's claim to fame (or perhaps infamy) is that it is the most northern permanently inhabited settlement in the world. The closest Canadian

city is Edmonton, which is 2,160 miles (3,476 km) away. The American base at Thule, Greenland (420 miles [675 km] south-east) is closer than Resolute Bay, which is 650 miles (1,046 km) south-west. Alert is actually closer to Moscow, the capital of Russia, than it is to Ottawa, the capital city of Canada (2,500 miles vice 2,580 miles [4,023 km vice 4,152 km]).[5]

Alert was named to commemorate a survey expedition that took place in the winter of 1875–1876. Captain Sir George Nares of the Royal Navy guided HMS [Her Majesty's Ship] *Alert* to Cape Sheridan (eight miles [12.8 km] from the CFS Alert location) and wintered there. Being the first expedition to land on northern Ellesmere Island, these men mapped the island's northern coast and the north-east coast of Greenland.[6]

In the late 1940s, the Meteorological Services Branch of Canada's Department of Transport and the United States Weather Bureau decided to jointly establish weather stations in the Arctic. In search of a site, the first reconnaissance of the northern coast of Ellesmere Island took place in the summer of 1948 by an icebreaker. The location that would become Alert seemed promising, and some supplies were left, including fuel, rations, and a tractor. Construction work to actually establish the radio and meteorological station commenced in the spring of 1950. The tractor was used to create a landing area on the ice, and supplies were airlifted from Thule. Until the United States built an emergency landing strip on Cape Belknap between 1950 and 1951, supplies were dropped by parachute to the Joint Arctic Weather Station from aircraft. It was on one such mission that Royal Canadian Air Force (RCAF) Lancaster KB 965 crashed on 31 July 1950. All nine people aboard died when the parachute got caught in the tail.[7]

The location and infrastructure of Alert became strategically important as the cold war intensified because of its close proximity to the Soviet Union, which was using its Arctic possessions for missile testing, naval bases, and first-strike capabilities. The station at Alert was able to pick up radio communications between Soviet bases, submarines, ships, and aircraft; hence, the possibility of intercepting radio signals and the potential for intelligence gathering led to the creation of a Canadian military presence in the Arctic at Alert.[8]

In 1956, the RCAF established its signals intelligence operations listening post 500 yards [457 metres] to the north of the joint Department of Transport / United States Weather Bureau data collection site. Initially, the RCAF station only had one building—the operations centre. In 1957, the RCAF and the Royal Canadian Navy jointly manned the station, and another five buildings were soon added: a mess, three accommodations barracks, and a building for the power house and vehicle maintenance facilities. At this time, around 25 people would be stationed in Alert—a combination of radio and telegraph operators, radio equipment technicians, teletype and cypher technicians, and support and maintenance staff.[9] The Canadian Army took over running the station in 1958. Eight more buildings were erected in 1959, and the station was manned on a tri-service basis.[10]

Upon unification in 1968, the wireless station became CFS Alert, and all three services continued to provide the personnel for the station. At its peak, the station's complement of personnel exceeded two hundred. The weather station would eventually be manned solely by Canadians. In 1976, there were nine Department of the Environment civilians. By 1997–98, CFS Alert was downsized to 74 personnel; CFS Leitrim remotely controlled radio-intercept operations. Hence, only six of the people posted to Alert were responsible for operations; most personnel were involved with airfield operations, construction, engineering, food services, logistics, and administrative support. Renewed interest in the facilities at Alert has come about from the terrorist threats since September 2001 and from the government's renewed commitment to Arctic sovereignty and security, as seen in 2008 and 2009 policy announcement and strategy documents. Responsibility for CFS Alert was taken over by 8 Wing Trenton on 1 April 2009. In addition to gathering signals intelligence to support military operations, the station's radio facilities support search and rescue, Environment Canada weather services, and Arctic researchers. As of September 2009, 55 people were living at CFS Alert: 21 military personnel, 30 commercial contractors, and 4 Environment Canada employees.[11]

The crest for CFS Alert is comprised of a plethora of symbols that describe the day-to-day realities of the station's location. The musk ox is a local animal that migrates to the area in the summer months. The black and yellow backgrounds represent the six-month period of total darkness and the six-month period of perpetual sunlight. The two black peaks denote Crystal Mountain and Mount Pullen, located to the south of the station. The white peaks are the Western Mountains. The wavy blue and white bands are meant to signify the Lincoln Sea, the water, and the ice pack that surround Ellesmere Island. The motto "Inuit Nunangata Ungata" means "The land beyond the land of the people."[12]

Because of Alert's far northern location, it experiences a period of total darkness, commencing in October, where the sun does not rise for approximately 147 days. The sun appears again in March, and after a twilight period of 34 days, there is period of total daylight when the sun does not set below the horizon for 147 days (through to September).[13] Alert's climate is very cold and very dry. July is the warmest month, with an average high of 6°C (degrees Celsius); the coldest months are January through March, when the average high approaches -30°C and the average low is between -35°C and -37°C (see Table 1). The record high was 20°C in July, and the record low was -50°C in February. High winds and severe storms can happen at short notice, reducing visibility to zero. On average, only about 1.5 metres of snow falls over the course of the year; most of the snow arrives between July and October.[14]

Month	Average High (°C)	Average Low (°C)
January	-28.8	-35.9
February	-29.8	-37.0
March	-28.7	-36.1
April	-20.5	-28.2
May	-8.7	-14.9
June	1.6	-3.2
July	5.9	0.7
August	3.3	-1.8
September	-6.0	-12.2
October	-15.8	-22.8
November	-22.8	-30.0
December	-26.4	-33.7

Table 1. Average Temperatures

The terrain is rugged and undulating, and steep ravines, high cliffs, ice caves, hills, and valleys mark the land surrounding Alert. Slate and shale make up the rocks of the area; these easily break down to form ravines and plateaus. Summer pack ice, seen offshore in the warmer months, freezes solid in the winter. Although the land is frozen approximately 10 months of the year, the ground thaws to a depth of three feet in summer, where approximately 70 species of plants grow. Miniature flowers grow in the shallow and rocky soil, dotting the area with red, purple, white, and yellow colours. The most common plants are blue grass, chickweed, Arctic poppy, saxifrage, and Arctic willow.[15]

Due to the scarcity of food, only small numbers of wildlife live this far north. These include Arctic hare fox, wolves, musk ox, caribou, lemmings, and weasels. Seals are rarely seen, and the sighting of a polar bear in 1969 was hailed as the first seen since 1953. Birds nest in summer and migrate south again by September; species include Arctic terns, jaegers, sandpipers, and knots. The only insects noted are swarms of flies that hover a few inches off the hillside rocks heated by the sun. The lakes are filled with land-locked salmon called char.[16]

Station Layout and Infrastructure

All of Alert's buildings were pre-fabricated (and painted orange). The most common building type was the general purpose building which had plywood sides and rested on wooden sills mounted on blocks; these blocks were set a few inches into the ground. Quonset huts were made of corrugated galvanized iron sheeting and shaped as half a horizontal cylinder; these, too, rested on wooden sills. Butler buildings were also constructed with corrugated metal sheeting, but these buildings were mounted on more substantial foundations. Portable trailers were mounted on wooden sills. Eventually, two-story buildings were introduced as accommodation barracks. One such building housed 70 people in individual rooms. Previously, personnel accommodations were general purpose buildings, where two people slept in each room, and five to seven rooms surrounded a common area (which provided space for recreation, eating, and a bunk bed for people waiting to get a room assigned). The station itself was eventually made up with a headquarters; the operations centre; construction, engineering, transport, and supply facilities; food services; three messes; a recreation centre; a curling club; and living quarters.[17]

Diesel-powered generators provided the station's electrical power. Primary and backup power systems were in place, and other standby diesel-powered generators were available for critical facilities (such as at the lake pump house and at the runway). Buildings were heated by forced air oil furnaces; each building had at least two heating units so that one could act as a standby capability in case of a maintenance problem or equipment failure. Water tanks were also heated by oil furnaces. Seeing as Arctic fuel oil supplies—which were suitable for diesel engines and oil furnaces—were airlifted to Alert from Thule only twice a year, the station required large storage facilities. Fuel was transported by Hercules aircraft in large rubber fuel bladders and would be pumped into two 5,000-gallon [18,927-litre] tanks located at the end of the air strip at Alert. After, the fuel would be pumped into the station's nine 50,000-gallon [189,271-litre] storage tanks through a four-inch [10.1-centimetre (cm)] aluminum pipe. To distribute this fuel to individual buildings, an elevated 10,000-gallon [37,854-litre] tank and gravity feed system were used.[18]

The station's water supply came from Upper Dumbbell Lake, which was located 2.5 miles [4 km] south-west of the station. Three plastic suction lines—each 40 feet [12 metres] long—were surrounded by a metal culvert (made of oil drums) for protection and were fed into the lake to a depth of 18 feet [5.4 metres] below the lake's surface. Water was pumped along these electrically heated lines (to prevent freezing) into a pump house built on the north shore of the lake. Originally, the water was hauled from the pump house to the station using an 800-gallon [3,028-litre], 2.5-tonne water truck in June, July, and August, and by a sleigh pulled by a tractor the rest of the year. Round trip from the pump house to the station and back was 1.5 hours. The water truck or sleigh would deliver water to each building that had its own water tanks. This was satisfactory when monthly consumption ran between 50,000 and 80,000 gallons [189,271 and 302,833 litres]. Once consumption increased to 20,000 gallons [75,705 litres] a day, an automatic system was imperative. Water could not be hauled if there was a severe snow storm, but supplies in the camp were sufficient for five days. At the pump house, the water's temperature was heated to 60°F [degrees Fahrenheit (15.5°C)] before sending it along 8,000 feet [2,438 metres] of two-inch [5 cm] diameter aluminium pipe to the station's water house. This pipe was covered by 2.5 inches [6.3 cm] of insulation, heavy building paper, and aluminum sheeting, and it ran above ground through wooden utilidors. The station's water house contained a 17,500-gallon [66,245-litre] storage tank, and the distribution lines to all the buildings also ran above ground in wooden insulated utilidors. Heating cables attached to the water and sewage lines in the utilidors kept both from freezing.[19]

In November 1976, the water supply system malfunctioned when part of the pipe froze. The entire pipeline between the lake and pump house (8,000 feet [2,438 metres]) was disconnected (in 20-foot [6-metre] sections), thawed out in a warehouse at CFS Alert, and then relaid in -30°C temperatures. While repairs were occurring, water was taken from the fire fighting reservoir; it was transported in 500-gallon [1,892-litre] tanks by over-snow vehicles.[20]

Originally, before sewage lines were laid, toilets were built over 45-gallon [170-litre] oil drums. When these were full, they would be removed, frozen outdoors, thrown over the cliffs at Shwilets

Bay off the Arctic Ocean onto the ice, and discarded at the bottom of the water when the ice melted in the spring. Garbage was also dumped on the seashore and bulldozed onto the ice, to be disposed of in the same manner when the thaw came. There were some concerns in 1961 that waste was falling out of some garbage barrels and contaminating the hillside used. A suggested solution was the construction of a ramp to serve as a guided slide for the barrels. Eventually, sewage lines were installed, run through wooden, above-ground electrically heated utilidors, and output over a steep slope that led to the ocean. The hillside was apparently cleansed on an annual basis by spring run-off.[21]

Supplying the Station (Operation BOXTOP)

Sea shipments were not possible due to ice conditions in the Robson Channel and Lincoln Sea. Initially, Alert was supplied by dropping supplies from an aircraft. With runway improvements, RCAF aircraft were able to make regular deliveries approximately every six weeks in 1958 and then twice a month—with 8,000-pound [3,628-kg] payloads—in 1959.[22] Large quantities of frozen and dry goods were stored at the American base in Thule[23] and then airlifted into Alert in smaller portions two times a year; these shipments became Operation BOXTOP.[24] Supply shipments were planned two years in advance, and the actual shipment was made to Thule by sea one year before it would be airlifted to Alert. One resupply mission took approximately two weeks, where two to three aircraft flew 7 to 13 flights a day. The 6–20 August 1963 operation flew 3,266,947 pounds [1,481 tonnes] of general stores, building materials, and fuel from Thule to Alert.[25] Adverse weather at either the American or Canadian base could ground all flights and delay the resupply flights. It was found that the best weather for these flights occurred in spring (around April). Summer months were subject to deteriorating weather over open waters, and the winter months (November to February) were characterized by no daylight and extreme cold, which hindered flying, aircraft loading, and maintenance. A supplementary lift was conducted in the fall.[26]

Eventually, Operation BOXTOP was expanded to three airlift operations; the spring and fall shipments concentrated on fuel replenishment while the summer airlift was dedicated to transporting dry cargo. Most of the fuel products were purchased from the headquarters of the United States Aerospace Defense Command so that the Canadian fuel requirements were included in the stocks delivered to, and stored at, the American base at Thule. Fuel was originally shipped in drums but later was transported in rubber fuel bladders that could hold 1,000 US gallons [3,785 litres]. Five bladders could be fit into one aircraft. It took approximately 20 to 30 minutes to fill up the bladders at Thule from trucks that hauled the fuel from the storage tanks. Pumping the fuel out of the bladders took 15 minutes at Alert. The average return trip time in the fall of 1977 was four hours, where 103 flights transported 370,000 gallons [1,400,000 litres] of diesel fuel and 7,000 gallons [26,498 litres] of aviation fuel. Operation BOXTOP is still conducted today. Run by Canada Command, the operation takes place twice a year, in the spring and at the end of summer.[27]

Such large shipments of goods in such adverse conditions were not without challenges. Weather was the greatest uncertainty. Storms could shut down either Thule or Alert, and hence, all flights would have to cease until both bases could receive aircraft again. Heavy traffic on the runways at Alert sometimes led to the runways being shut down for days while repairs were made. Aircraft unserviceability was another factor, brought about most often by either the extreme cold, the age of the aircraft, or the tempo of flights. Usually, repairs were minor and caused only short delays.[28]

Frozen food supplies were requisitioned two years in advance and shipped to Thule one year before they would be delivered to Alert by the BOXTOP series of airlift missions. Calculations were made according to the estimated quantity an average man would consume in a year, and this was multiplied by the strength of the station (see Table 2).[29] Frozen meat selections were ordered by the thousands of pounds [kilograms], as were the most popular canned vegetables and fruits.[30] Fresh fruits and vegetables were airlifted to Alert twice each month; items in the highest demand were brought in by the hundreds of pounds [kilograms] (see Table 3).[31] Adjustments would be made to future orders when items were in more demand than first

estimated; less popular items' quantities were reduced or eliminated altogether.[32] It was a serious matter if a shipment was short; if a supplementary shipment could not be flown up to Alert in a timely manner, the station would have to dip into its reserve rations and might still run out of meat (for example) before the shortage was replaced.[33]

Food Selection	Weight (lbs)	Weight (kg)
boneless beef wet cuts	5,560	2,522
wieners	625	284
chicken	3,125	1,418
turkey	3,125	1,418
pork loin cuts	2,843	1,290
spare ribs	1,875	850
smoked ham	1,750	794
veal	2,738	1,106
lamb	875	397
side bacon	4,085	1,853
lard	1,176	533
shortening	3,113	1,412
butter	7,148	3,242
evaporated milk	10,000	4,536
instant milk powder	4,160	1,887
chocolate syrup	6,150	2,790
strawberry jam	900	408
peanut butter	1,000	454
spaghetti	880	399
instant bread mix	20,000	9,072
ready-to-eat cereal assortment	1,348	611

Table 2. Selected Frozen and Dry Food Order

Food Selection	Weight (lbs)	Weight (kg)
eggs	5,000 units	—
potatoes	1,800	816
carrots	150	68
turnip	100	45
green onion	30	13.5
lettuce	200	91
celery	100	45
tomatoes	200	90.7
radishes	30	14
cabbages	100	45

Food Selection	Weight (lbs)	Weight (kg)
cucumbers	80	36
green peppers	30	14
apples	400	181
oranges	150	68
grapes	100	45
lemons	50	22.5
squash	35	16
corn on the cob	100	45

Table 3. Selected Fruits and Vegetables

Having goods damaged during shipment was another frustrating challenge, but an event that was not surprising, considering the tonnes of goods that were transported to this remote location. Overall, the track record for Operation BOXTOP was commendable; reports of damage were not frequent and not overly extensive. For example, in July 1963, those who packed the crates for shipping took a number of individual items out of larger packaging and put these items into the crates loosely in order to fill the spaces between other cases of rations. Soup and mincemeat tins were dented; boxes of soda crackers, corn meal, and gravy base were crushed; and spices in cellophane and dry mustard in paper bags were ruined. In July 1964, pallets became snow-caked when off-loaded at Alert because of recent heavy snowfall. Consequently, flour, sugar, and powdered milk contents were ruined and upholstered furniture in crates lacking waterproof lining got wet.[34] As the supplies passed through so many hands and travelled such long distances, experience helped improve packing and handling methods.

Recreation and the Maintenance of Morale

With Alert being so remote, and with the extreme cold and prolonged periods of darkness restricting outdoor activities for extended periods of time, military leadership recognized the importance of recreation activities and entertainment. With most military personnel working eight-hour shifts, there were many hours of potential boredom (and cabin fever) to be filled.[35] Newsreels, taped television programs (see Table 4), and movies (see Table 5) were shipped to the station on a weekly basis.[36]

"Country Hoedown"	"Juliette"
"Don Messer"	"Red River Jamboree"
"Front Page Challenge"	"Some of Those Days"

Table 4. Selected TV Shows

A Town Like Alice	*House of Secrets*	*Rockets Galore*
Arctic Flight	*I'll Meet by Moonlight*	*Sea of Sand*
Desert War	*Mad About Men*	*Square Peg*
Doctor at Large	*Queen of Babylon*	*Tread Softly Stranger*
End of the River	*Queen of Outerspace*	*Up in the World*
Good Time Girl	*Racing Blood*	*Wicked Wife*
Gorilla at Large		

Table 5. Selected Films

At times, there were complaints that programs selected were of little interest to the men; often the films were very old (e.g., *Tarzan* from the 1920s) or they were so brittle that they broke or

they came spliced together too many times, thus spoiling continuity.[37] Nevertheless, people still watched these reels as a means of breaking up the monotony at the end of the workday. The Royal Canadian Legion helped establish the library at Alert by donating pocket novels and 400 hard-covered reference books. Such donations were invaluable, since regimental funds and non-public funds could not purchase all the books and other recreational equipment desired. A variety of magazines were ordered for the men to purchase at their leisure and included:[38]

- *Argosy*
- *Electronics World*
- *Esquire*
- *Field and Stream*
- *Ladner Optimist*
- *Liberty*
- *Life*
- *Look*
- *Maclean's*
- *National Geographic*
- *Popular Mechanics*
- *Reader's Digest*
- *Sports Illustrated*
- *Time*
- *US Camera*

Because of Alert's limited medical facilities, contact sports were not allowed. This did not stop the personnel at Alert from organizing a variety of team sports or from using exercise and weight lifting equipment at the gymnasium.[39] During the summer months, outdoor activities were popular, including skiing, tobogganing, and hiking in the mountains; fishing took place all year round. The curling rink was eventually accommodated in a heated building.[40] For those preferring indoor temperatures, Alert's selection of games grew over the years and included:

- bingo
- crokinole
- cards
- checkers
- chess
- cribbage
- darts
- horseshoes
- mechanical hockey game
- ping pong
- Scrabble
- shuffleboard

Various clubs and hobbies were also well-attended and included:[41]

- aluminium working
- arts and crafts
- copper working
- lapidary club (work on crystals and other rocks)
- leather craft materials, leather, leather lining
- photography club with darkroom
- spinning reel
- weaving
- woodworking

Alert had its own radio station where volunteers hosted programs and served as disc jockeys. The Polar Amateur Radio Club operated a ham radio service that enabled personnel to patch telephone calls back home to friends and family. The station sanctioned the operation of ham radioes as long as the security regulations were followed—such as no last names, no strength numbers, and no description of work being done. This service assisted Italian explorer Guido Monzino in 1971 as he travelled to the north pole by dog sled.[42] Other morale boosters included day trips to Thule, shows put on by travelling entertainment troupes, the creation of a station magazine, and the interest in the adventures of the dogs kept at the base to scare off wolves.[43]

Challenges for Search and Rescue

Although the station at Alert had only two fatal aircraft crashes in its history, both of these tragedies illustrate the challenges of providing search and rescue services in a remote and austere area. On 31 July 1950, RCAF Lancaster KB 965 was flying to Alert on a resupply mission. Seeing as there was no landing strip at the time, supplies were being para-dropped. The pilot erroneously made the drop with too short a static line, and consequently, the parachute became entangled in the starboard elevator. The aircraft nose-dived out of control, and in four seconds, it crashed and exploded, killing all nine passengers—seven airmen and two scientists. An American aircraft was sent to recover the bodies and fly them back south for burial in their home

towns. Unfortunately, this second plane crashed during landing on the makeshift landing strip on the rough ice. There were no fatalities in this second crash; nevertheless, it was decided that the bodies from the original crash would be buried just off the runway, marked with large white crosses. Runway expansion to the north in 1957 necessitated the moving of these graves to a site 250 yards (230 metres) to the west. When the bodies were relocated, a memorial cairn was erected, and a special dedication ceremony was held.[44]

The second deadly crash took place on 30 October 1991 during a BOXTOP mission. The Hercules aircraft from Canadian Forces Base Edmonton was flying from Thule and was carrying 13 passengers, 5 crew members, and 3,400 litres of diesel fuel. While making the descent for landing, the pilot decided to make a visual approach instead of relying on the instruments. Unaware of how low the aircraft had been flying, the Hercules crashed, broke apart, and burst into flames. Five people died—four within an hour of the crash, and one later on due to exposure. After the fire died out, all but two survivors moved into the tail section of the aircraft to find shelter from the cold; two people could not be moved because of spinal cord injuries.[45]

Because the crash had occurred so close to Alert—only 20 km away—and because the next BOXTOP flight flew over the crash site only 30 minutes later, the survivors expected a quick rescue. Unfortunately, by the time the search and rescue (SAR) aircraft with SAR technicians (SAR Techs) arrived from Edmonton and Greenwood—about eight hours after the crash—an arctic blizzard had blown in. Aircraft kept circling the crash site, but visibility was so bad that rescue teams could not risk jumping. Ground rescue attempts failed because of white-out-conditions. Unsure they were even going in the right direction—since compasses do not work this close to the magnetic north pole—ground vehicles had to keep turning back to Alert before they ran out of fuel. One team only covered 6 km in 7.5 hours of travel. Another team was headed in the wrong direction and would have fallen over a 30-foot cliff if radio contact with a rescue aircraft had not warned and re-oriented them. Thirty-two hours after the crash, SAR Techs began to jump in less than ideal conditions: winds were 40 knots [74 kilometres per hour (km/h)], and the plane's altitude was 800 feet [244 metres]; normal safety limits at the time were 10 knots [18.5 km/h] and 1,500 feet [457 metres] altitude. Eventually, 26 SAR Techs would arrive on scene, and the ground rescue crew arrived 21 hours after setting out. A Twin Huey was able to airlift out the 13 survivors in 3 five-minute trips 2 days after the crash had occurred. The most severely injured were evacuated to Thule and then Ottawa for medical treatment.[46]

Conclusion

From weather station to signals intelligence interception and collection, the story of the station at Alert has a romantic adventurous allure. Its remote location and austere environment offer a challenge to even the hardiest of humans' psychological and physical endurance. While posted to the station, the men formed life-long friendships, created a sense of community amongst disparate strangers from across the country, and showed great ingenuity in entertaining themselves and surviving the harsh environment.

Although these individual and collective stories form a fascinating glimpse into a unique piece of Canada's military heritage, further focus on CFS Alert is warranted because of the lessons such a detailed case study can provide those undertaking to expand northern initiatives, presence, and infrastructure. Lessons can be learned about the challenges of building in frozen ground and permafrost, as well as the difficulties of getting infrastructure supplies and construction equipment into the Arctic, let alone actually working as manual labourers in the extreme temperatures of the north.

The experience in Alert illustrates what is involved in supplying a remote northern location: supplies must be carefully calculated far in advance; then the supplies must be transported; adequate storage facilities must exist; and the aircraft used to airlift the supplies must be available and able to endure the temperatures and tempo that will be encountered in resupply missions. The dangers of both the isolated location and austere conditions are highlighted if an emergency occurs: are search and rescue aircraft available and situated close enough to ensure survivors of a crash will live long enough to be rescued? What is the maximum acceptable travel time from rescue aircraft's home base to the crash site? What is an acceptable financial cost for being ready

to answer a call for help in the north in the event that such an infrequent emergency happens again?

Other relevant lessons can be learned as well from studying CFS Alert. The Canadian Forces not only worked closely with another government department (the Department of Transport), but also worked even closer with its ally, the United States, in arranging to use the American base at Thule for storage, stopovers, airlift, and emergency medical evacuation.[47] The case study of Alert also includes the challenges of attracting and accommodating civilian employees up north, as well as the experience of hiring Inuit civilians and how they coped away from their own home communities to the south.[48]

Studying the challenges and successes of other northern military establishments—both inside and outside Canada—will provide much insight into all aspects of modern day government northern initiatives. From construction to supply, from psychological endurance to medical rescue, from civilian and inter-departmental integration to multinational cooperation, the venture of the station at Alert can certainly guide future ambitions.

Notes

1. Canada, *Canada's Northern Strategy – Our North, Our Heritage, Our Future.* (Ottawa: Department of Indian Affairs and Northern Development, 2009).

2. Ibid., 10.

3. Ibid., ii.

4. Ibid., 11.

5. "CFS Alert" entry on Wikipedia, http://en.wikipedia.org/wiki/CFS_Alert (accessed March 20, 2012); *Canadian Forces Station Alert Information Booklet*, DHH File R A Alert CFS Ellesmere Island, NWT, n.d.; *CFS Alert Station Information Booklet*; Operation BOXTOP Diary: Visit Report by Brereton Greenhous, DHH File 77/15, 12–15 November 1976; Canadian Forces Station Alert Magazine *Pole Talk* Issue 1, DHH File 78/76, 16 January 1978.

6. *Canadian Forces Station Alert Information Booklet*; *CFS Alert Station Information Booklet*; *Pole Talk* Issue 1.

7. *Canadian Forces Station Alert Information Booklet*; Report on Transportation Situation at Alert Wireless Station by Lieutenant E. H. Heavens (Oshawa Wireless Station), LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 29 October 1958; *Pole Talk* Issue 1.

8. Jerry Proc, "CFS Alert" website, http://jproc.ca/rrp/alert.html (accessed March 20, 2012); "CFS Alert" entry on Wikipedia.

9. Jerry Proc, "CFS Alert"; *Canadian Forces Station Alert Information Booklet*; Brief on Alert Wireless Station, LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 9 December 1958; *Pole Talk* Issue 1.

10. Submission to Governor General in Council by Minister of National Defence, LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, unknown date in 1958; Memorandum on Alert Wireless Station Turnover by RCAF to Canadian Army by Major-General J. V. Allard (Vice Chief of the General Staff), LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 9 July 1958; Administrative Instruction for Alert Wireless Station by Major-General G. Walsh (Quartermaster-General), LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 17 July 1958; Brief on Alert Wireless Station, LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 9 December 1958; Administrative Instruction for Alert Wireless Station Administrative Support by Major-General G. Walsh (Quartermaster-General), LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 14 January 1959; Memorandum on Alert Wireless Station Expansion by Major-General J. V. Allard (Vice Chief of the General Staff), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 19 March 1959; Administrative Order for Alert Wireless Station Expansion Programme by Major-General G. Walsh (Quartermaster-General), LAC File RG 24 Accession

1983-84/215 Volume 291 File 2001-584/A28 Part 2, May 1959; Memorandum on Morale and Welfare at Alert Wireless Station by Captain H. M. McIntosh, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 2, 30 September 1959; Administrative Instruction for Alert Wireless Station Administrative Support by Major-General R. W. Mencel (Quartermaster-General), LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 1, 26 October 1959.

11. "CFS Alert" entry on Wikipedia; "Op BOXTOP: Canada Command Takes it to the Top" on Canada Command website, http://www.canadacom.forces.gc.ca/nr-sp/ar-ar/box-box-eng.asp (accessed March 20, 2012); Operation BOXTOP Diary: Visit Report by Brereton Greenhous.

12. "CFS Alert" entry on Wikipedia; Jerry Proc, "CFS Alert" website.

13. Jerry Proc, "CFS Alert" website; *Canadian Forces Station Alert Information Booklet*; Memorandum on Morale and Welfare at Alert Wireless Station by Captain H. M. McIntosh.

14. "CFS Alert" entry on Wikipedia; Jerry Proc, "CFS Alert" website; *Canadian Forces Station Alert Information Booklet*; *CFS Alert Station Information Booklet*.

15. Jerry Proc, "CFS Alert" website; *Canadian Forces Station Alert Information Booklet*; *CFS Alert Station Information Booklet*.

16. *Canadian Forces Station Alert Information Booklet*; *CFS Alert Station Information Booklet*; Memorandum on Morale and Welfare at Alert Wireless Station; Canadian Forces Station Alert Information Bulletin by Major P. B. Anderson (Commanding Officer), DHH File 78/259 Box 1 Folder 2, 6 August 1969.

17. *Canadian Forces Station Alert Information Booklet*; *CFS Alert Station Information Booklet*; Operation BOXTOP Diary; Personal conversations with RCAF/CF Master Warrant Officer Mervin Douglas Heide (Retired) [teletype technician at CFS Alert, February – August 1971], May 2010.

18. *Canadian Forces Station Alert Information Booklet*.

19. Ibid.; Medical Officer's Report on Visit to Alert by Major F. R. Cullen, DHH File 113.052 (D2), 2 March 1960; Report on Water System – Alert Wireless Station by Lieutenant-Colonel E. H. Brown (Army Fire Marshal), LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 10, 23 November 1962.

20. Operation BOXTOP Diary; Visit to CFS Alert Report by William McAndrew, DHH File 77/15, 13–15 November 1976.

21. Jerry Proc, "CFS Alert" website; *Canadian Forces Station Alert Information Booklet*; Medical Officer's Report on Visit to Alert by Major F. R. Cullen; Report on Hygiene by Colonel M. Fitch (Regional Surgeon), LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 2, 25 April 1963; Interview with RCN Commander William Hillaby (Retired) by Mack Lynch, DHH Biography File.

22. Instructions for the Movement of Supplies and Material by Sea and Air to the Alert Wireless Station by Major-General G. Walsh (Quartermaster General), LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 17 July 1958; Report on Transportation Situation at Alert Wireless Station by Lieutenant E. H. Heavens (Oshawa Wireless Station), LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 29 October 1958; Instructions for the Movement of Supplies and Material by Sea and Air to the Alert Wireless Station by Major-General R. W. Mencel (Quartermaster General), LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 1, 26 October 1959; Memorandum on Transportation of Fresh Rations to Alert Wireless Station by Captain V. B. Loney (Officer Commanding), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 3, 5 November 1959; Report on a Visit to Operation BOXTOP III/77 by O. A. Cooke and M. V. Bezeau, DHH File 77/670, 4–11 November 1977.

23. Thule Air Base was part of the United States' Aerospace Defense Command's first ballistic missile early warning system. Initially an emergency landing strip in the Second World War, it was expanded in 1950 into a modern base. At its peak, the base housed 12,000 American service personnel. By the mid-seventies, personnel strength was reduced to 250 American service personnel, 3 Danish military personnel, and 1,150 Danish and American civilians. *Thule Air Base Greenland 1975–76 Information Booklet*, DHH File 77/670.

24. Report on Operation BOXTOP 1964 by Captain B. P. Uglow, LAC File RG 24 Accession 1983-84/167 Volume 5807 File 5001-584/A28 Part 11, 3 August 1964.

25. Report on Operation BOXTOP 7 (6–20 August 1962) by Major D. A. Elliot (Commanding Officer), LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 9, 21 August 1962.

26. Memorandum on Resupply of Alert Wireless Station by Air Commodore L. J. Birchall, LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 9, 26 April 1962.

27. "Op BOXTOP: Canada Command Takes it to the Top"; Visit to CFS Alert Report by William McAndrew.

28. Report on BOXTOP VI (March 1962), LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 9; Report on a Visit to Operation BOXTOP III/77 by O. A. Cooke and M. V. Bezeau.

29. Memorandum on Ice Cream at Alert Wireless Station by Lieutenant-Colonel D. M. Pilley, LAC File RG 24 Accession 1983-84/048 Volume 2510 File 6001-584/A28 Part 7, 17 July 1961; Memorandum on Resupply of Alert Wireless Station by Air Commodore L. J. Birchall; Memorandum on Alert Wirelss Station Fresh Rations by Major D. A. Elliott (Commanding Officer), LAC File RG 24 Accession 1983-84/048 Volume 2096 File 5503-584/A28 Part 1, 24 July 1962; Alert Wireless Station Annual Resupply 1963–64 by Colonel L. E. Sarantos (Director of Supplies and Transport), LAC File RG 24 Accession 1983-84/048 Volume 2096 File 5503-584/A28 Part 1, 13 March 1963.

30. Alert Wireless Station Annual Resupply, 13 March 1963.

31. Memorandum on Alert Wireless Station Fresh Rations, 24 July 1962; Memorandum on Alert Wireless Station Fresh Rations by Captain H. Ross (Commanding Officer), LAC File RG 24 Accession 1983-84/048 Volume 2096 File 5503-584/A28 Part 1, 5 March 1963; Memorandum on Alert Wireless Station Fresh Rations by Colonel L. E. Sarantos (Director of Supplies and Transport), LAC File RG 24 Accession 1983-84/048 Volume 2096 File 5503-584/A28 Part 1, 7 March 1963.

32. Memorandum on Alert Wireless Station Rations and Miscellaneous Requirements by Colonel L. E. Sarantos (Director of Supplies and Transport), LAC File RG 24 Accession 1983-84/048 Volume 2096 File 5503-584/A28 Part 1, 7 February 1963.

33. Memorandum on Alert Meat Supply by Colonel F. D. Smith, LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 9, 19 July 1962.

34. Memorandum on Damaged Goods by Major A. Tilley, LAC File RG 24 Accession 1983-84/048 Volume 2096 File 5503-584/A28 Part 2, 29 August 1962; Report on BOXTOP 8 by Lieutenant-Colonel A. S. Findlater, LAC File RG 24 Accession 1983-84/048 Volume 2096 File 5503-584/A28 Part 2, 6 September 1963; Teletype Message from Alert Wireless Station, LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 13, 31 July 1964.

35. Submission for Provision for Exercise and Recreational Equipment by Colonel P. D. Smith, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 3, 9 January 1964; Memorandum on Army Central Fund Special Grant For Alert Wireless Station by Army Central Fund Administrative Committee, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 3, April 1964; Operation BOXTOP Diary.

36. Submission to Treasury Board by Minister of National Defence, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 1, 6 August 1959; Letter from B. Shields (16 mm Booker, Twentieth Century Fox Corporation) to Colonel T. De Faye (Director of Administration, Army Headquarters), LAC File RG 24 Accession 1983-84/048 Volume 3540 File 8001-584/A28, 5 September 1962; Memorandum on Provision of T.V. Episodes for Alert Wireless Station by Colonel T. de Faye (Director of Administration, Army Headquarters), LAC File RG 24 Accession 1983-84/048 Volume 3540 File 8001-584/A28, 24 June 1963; Letter from Andrew Cowan (Director, Northern Armed Forces Service, Canadian Broadcasting Corporation) to Colonel S. C. Waters (Director of Administration, Army Headquarters), LAC File RG 24 Accession 1983-84/048 Volume 3540 File 8001-584/A28, 18 October 1963; Teletype Message from 2 Company RCASC Toronto to Alert Wireless Station, LAC File RG 24 Accession 1983-84/167 Volume 5807 File 5900-584/A28 Part 11, 2 December 1964; Teletype Message from 2 Company RCASC Toronto to Alert Wireless Station, LAC File RG 24 Accession 1983-84/167 Volume 5807 File 5900-584/A28 Part 11, 7 December 1964; Teletype Message from 2 Company RCASC Toronto to

Alert Wireless Station, LAC File RG 24 Accession 1983-84/167 Volume 5807 File 5900-584/A28 Part 11, 5 January 1965; Teletype Message from 2 Company RCASC Toronto to Alert Wireless Station, LAC File RG 24 Accession 1983-84/167 Volume 5807 File 5900-584/A28 Part 11, 12 January 1965; Teletype Message from Alert Wireless Station to 2 Company RCASC Toronto, LAC File RG 24 Accession 1983-84/167 Volume 5807 File 5900-584/A28 Part 11, 13 January 1965.

37. Memorandum on Alert Wireless Station by Lieutenant-General S. F. Clark (Chief of the General Staff), LAC File RG 24 Accession 1983-84/048 Volume 2510 File 6001-584/A28 Part 6, 15 November 1960; Memorandum on Provision of 16 mm Entertainment Films by Colonel P. S. Cooper (Director of Administration, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 2, 18 November 1960; Final Report and Recommendations for Alert Wireless Station (19 November 1962 – 10 June 1963) by Captain H. Ross (Commanding Officer), LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 11, 10 June 1963.

38. Report on Recreational Welfare at Alert Wireless Station, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 2, 27 October 1960; Memorandum on Army Central Fund Assistance for Alert Wireless Station by Colonel F. D. Smith, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 3, 10 January 1964.

39. Teletype Message from Alert Wireless Station, LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 11 August 1958; Memorandum on Welfare at Alert Wireless Station by Colonel R. B. McDougall (Director of Administration), LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 1, 14 August 1958; Report on Recreational Facilities at Alert Wireless Station by Lieutenant E. H. Heavens (Oshawa Wireless Station), LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 30 October 1958; Memorandum on Recreational Facilities at Alert Wireless Station by Captain H. M. McIntosh, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 1, 13 April 1959; Memorandum on Recreation and Sports Equipment, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 1, 30 August 1959; Memorandum on Annual Resupply for Alert Wireless Station – Hobby Equipment by Captain V. B. Loney (Commanding Officer Alert), LAC File RG 24 Accession 1983-84/048 Volume 2509 File 6001-584/A28 Part 4, 11 February 1960; List of Physical Fitness Equipment, LAC File RG 24 Accession 1983-84/167 Volume 5409 File 4307-584/A28, 17 December 1961; Memorandum on Physical Fitness Equipment at Alert Wireless Station by Colonel T. de Faye (Director of Administration, Army Headquarters), LAC File RG 24 Accession 1983-84/167 Volume 5409 File 4307-584/A28, 1 February 1962; Teletype Message from Alert Wireless Station, LAC File RG 24 Accession 1983-84/167 Volume 5409 File 4307-584/A28, 7 March 1962; Memorandum on Curling Rink at Alert Wireless Station by Colonel P. D. Smith, LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 9, 16 August 1962; Report on Visit to Alert Wireless Station by Colonel M. Fitch (Regional Surgeon), LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 2, 25 April 1963; Memorandum on Visit to Alert – Report by Regional Surgeon on Recreational Welfare, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 2, 29 May 1963; Memorandum on Army Central Fund Special Grant for Alert Wireless Station by Army Central Fund Administrative Committee, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 3, April 1964; Canadian Forces Station Alert Information Bulletin by Lieutenant-Commander C. B. Webb (Commanding Officer) 1 July 1970; Canadian Forces Station Alert Information Bulletin by Major A. Bredahl (Commanding Officer), DHH File 78/259, 3 September 1970; Visit to CFS Alert Report by William McAndrew, DHH File 77/15, 13–15 November 1976.

40. Report on Recreation and Sports Equipment and Summary of Recommendations, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 2, 30 August 1959; Memorandum of Construction of Curling Rink at Alert Wireless Station by Brigadier H. E. T. Doucet (Deputy Adjutant-General), LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 1, 23 February 1960; Alert Wireless Station Final Report (Period 17 October – 10 April 1961) by Major C. C. Baker (Commanding Officer), DHH File 326.052 (D1), 10 April 1961; Memorandum on Curling Rink at Alert Wireless Station by Colonel G. K. Wade (Director of Works), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 7, 30 November 1961; Memorandum on Curling Rink at Alert Wireless Station by Colonel P. D. Smith, LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 7, 22 February 1962; Teletype Message from Alert Wireless Station to Canadian Army 1962, LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 10, 9 October 1962.

41. Teletype Message from Alert Wireless Station, LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 11 August 1958; Memorandum on Welfare at Alert Wireless Station by Colonel R. B. McDougall (Director of Administration), LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 1, 14 August 1958; Report on Recreational Facilities at Alert Wireless Station by Lieutenant E. H. Heavens (Oshawa Wireless Station), LAC File RG 24 Accession 1983-84/215 Volume 290 File 2001-584/A28 Part 1, 30 October 1958; Memorandum on Recreational Facilities at Alert Wireless Station; Memorandum on Recreation and Sports Equipment, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 1, 30 August 1959; Memorandum on Annual Resupply for Alert Wireless Station – Hobby Equipment by Captain V. B. Loney (Commanding Officer Alert), LAC File RG 24 Accession 1983-84/048 Volume 2509 File 6001-584/A28 Part 4, 11 February 1960; List of Physical Fitness Equipment, LAC File RG 24 Accession 1983-84/167 Volume 5409 File 4307-584/A28, 17 December 1961; Memorandum on Physical Fitness Equipment at Alert Wireless Station by Colonel T. de Faye (Director of Administration, Army Headquarters), LAC File RG 24 Accession 1983-84/167 Volume 5409 File 4307-584/A28, 1 February 1962; Teletype Message from Alert Wireless Station, LAC File RG 24 Accession 1983-84/167 Volume 5409 File 4307-584/A28, 7 March 1962; Memorandum on Curling Rink at Alert Wireless Station by Colonel P. D. Smith, LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 9, 16 August 1962; Report on Visit to Alert Wireless Station by Colonel M. Fitch (Regional Surgeon); Canadian Forces Station Alert Information Bulletin by Lieutenant-Commander C. B. Webb (Commanding Officer), 4 February 1970; Canadian Forces Station Alert Information Bulletin by Lieutenant-Commander C. B. Webb (Commanding Officer), DHH File 78/259, 4 May 1970.

42. Jerry Proc, "CFS Alert" website; Memorandum on Alert Wireless Station Amateur Radio Station – Terms of Reference by Major J. G. Berry (Commanding Officer), LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 9, 5 April 1962; News Release, DHH File 77/15, 1 November 1976.

43. Teletype Message from Alert Wireless Station, LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 9, 23 July 1962; Report on Operation BOXTOP 7 (6–20 August 2962) by Major D. A. Elliott (Commanding Officer), LAC File RG 24 Accession 1983-84/215 Volume 292 File 2001-584/A28 Part 9, 21 August 1962; Canadian Forces Station Alert Information Bulletin by Major G. L. Jenkins (Commanding Officer), 10 October 1968; Canadian Forces Station Alert Information Bulletin by Major D. W. Edmunds (Commanding Officer), 8 April 1969; Canadian Forces Station Alert Information Bulletin by Major D. W. Edmunds (Commanding Officer) 11 June 1969; Canadian Forces Station Alert Information Bulletin by Major P. B. Anderson (Commanding Officer) 6 August 1969; Canadian Forces Station Alert Information Bulletin by Major P. B. Anderson (Commanding Officer) 7 October 1969; Canadian Forces Station Alert Information Bulletin by Major P. B. Anderson (Commanding Officer) 5 November 1969; Canadian Forces Station Alert Information Bulletin by Major P. B. Anderson (Commanding Officer) 3 December 1969; Canadian Forces Station Alert Information Bulletin by Lieutenant-Commander C. B. Webb (Commanding Officer); 4 February 1970; Canadian Forces Station Alert Information Bulletin by Lieutenant-Commander C. B. Webb (Commanding Officer) 1 July 1970; Canadian Forces Station Alert Information Bulletin by Major A. Bredahl (Commanding Officer), DHH File 78/259, 3 September 1970; *Pole Talk* Issue 1.

44. LAC File RG 24 Volume 21977 File 59-40 Part 1.

45. Wilma De Groot, "Arctic Nightmare: One Grad's Story," *Queen's Alumni Review* (March–April 1992), 8–12, DHH File 92/56; Marsha Dorge, "Saviours and Survivors," *Sentinel* 28.1, 2–6, DHH File 92/57; Vic Johnson, "High Arctic Heroism," *Air Force* 16.1 (April-June 1992), 17–20, DHH File 92/77.

46. Ibid.

47. Memorandum on Administrative Arrangements Thule Air Base by Lieutenant-Colonel P. E. Amyot (Commanding Officer Vancouver Wireless Station), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 3, 12 May 1959; Memorandum on Administrative Arrangements Thule Air Base by Colonel J. Wallis (Director of Movements), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 3, 29 May 1959; Memorandum on Administrative Arrangements on Personnel MTU Thule to Alert by Brigadier P. Tremblay (Director General of Medical Services), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 3, 2 June 1959; Memorandum by Wing Commander W. J. F. Young, LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 3, 18 June 1959; Memorandum on Alert Medical Care by Air Commodore A. A. G. Corbet, LAC File RG

24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 3, 21 July 1959; Memorandum on Medical Evacuation from Alert to Thule Air Force Base by Brigadier P. Trembley (Director General of Medical Services), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 3, 11 August 1959; Administration Report on Recreation and Sports Equipment, and Summary of Recommendations, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 2, 30 August 1959; Report on Medical Evacuation from Alert to Thule Air Force Base by Major-General K. A. Hunter (Canadian Forces Surgeon General), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 3, 14 September 1959; Memorandum on Morale and Welfare at Alert Wireless Station by Captain H. M. McIntosh, LAC File RG 24 Accession 1983-84/167 Volume 4907 File 3125-584/A28 Part 2, 20 September 1959; Report on Visit to Alert Wireless Station by Colonel M. Fitch (Regional Surgeon).

48. Letter from D. W. Stapleton (Secretary, Operations Group) to H. A. Tombs (Assistant National Secretary), LAC File RG 24 Accession 1983-84/167 Volume 4928 File 3150-584/A28, 9 March 1954; Minute of Treasury Board Meeting by R. B. Bryer (Clerk of the Privy Council), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 14 January 1959; Letter on Manning Alert Wireless Station with Civilian Personnel from Major M. E. Watson (Commanding Officer) to Director Royal Canadian Corps Signals, LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 25 March 1959; Memorandum on Manning Alert Wireless Station by Lieutenant-Colonel P. E. Amyot (Commanding Officer Vancouver Wireless Station), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 9 April 1959; Letter on Employment of Civilians at Alert by Lieutenant-Colonel P. E. Amyot (Commanding Officer Vancouver Wireless Station), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 17 April 1959; Report on Alert Wireless Station Establishment, LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 8 May 1959; Letter from Assistant Secretary of Treasury Board to E. B. Armstrong (Deputy Minister of National Defence), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 6 March 1961; Memorandum on Rations and Quarters at Alert Wireless Station by G. H. Avery (Director of Civilian Personnel Army), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 8 May 1961; Memorandum on Rations and Quarters at Alert Wireless Station by Colonel J. B. Clement (Director of Signals), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 12 May 1961; Teletype Message from Alert Wireless Station to Canadian Army Headquarters, LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 22 September 1961; Letter from E. B. Armstrong (Deputy Minister of National Defence) to G. G. E. Steele (Secretary of Treasury Board), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 1 November 1961; Letter from E. B. Armstrong (Deputy Minister of National Defence) to G. G. E. Steele (Secretary of Treasury Board), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 2 November 1961; Letter from G. G. E. Steele (Secretary of Treasury Board) to E. B. Armstrong (Deputy Minister of National Defence), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 27 November 1961; Minute of Treasury Board Meeting by R. B. Bryer (Clerk of the Privy Council), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 30 November 1961; Letter from E. B. Armstrong (Deputy Minister of National Defence) to G. G. E. Steele (Secretary of Treasury Board), LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, 28 December 1961; Letter on the Discontinuance of Free Rations and Quarters at Alert Wireless Station by James Sharpe (Assistant Deputy Minister) to Executive Assistance of Minister of Defence, LAC File RG 24 Accession 1983-84/215 Volume 291 File 2001-584/A28 Part 2, January 1962; Memorandum on Terms of Service of Civilian Personnel at Alert by G. H. Avery (Director of Civilian Personnel Army), LAC File RG 24 Accession 1983-84/167 Volume 4928 File 3150-584/A28, 5 June 1962; Memorandum on Employment Conditions at Alert by J. L. Stevens (Acting Director of Civilian Personnel Army), LAC File RG 24 Accession 1983-84/167 Volume 4928 File 3150-584/A28, 3 April 1964; Memorandum on Employment Conditions at Alert by Colonel P. D. Smith, LAC File RG 24 Accession 1983-84/167 Volume 4928 File 3150-584/A28, 13 April 1964.

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Chapter 9

SITREP: The Morning Light Has Been Extinguished

William P. Sparling

Author's note: In researching Operation MORNING LIGHT, I found that this operation was more than simply a response to a crashed satellite. It encompassed scores of varied and intensely interrelated aspects that could easily consume the researcher and lead to the creation of many learned works, and more than a few lurid fictionalizations. For example, Colonel General Yuriy Vsevolodovich Votintsev (Retired) would have us believe that "the [Soviet] space monitoring Center [sic] precisely determined the time of fall of fragments—at 1512 hours on 24 January 1978 in an uninhabited mountainous area on the territory of Canada, from where we removed them."[1] While a great wealth of material, including newly declassified documents, has recently been made available through Natural Resources Canada and the Canadian Forces' Directorate of History and Heritage, despite the recent declassifications, there are still files that remain classified and under long-term seal (i.e., the Prime Minister's Office [PMO] files of Prime Minister [PM] Trudeau). With that in mind, I have chosen to approach this paper partially as a "narrative" rather than a purely academic paper. Concentrating on the role of the Air Force, I will also make mention of significant political, civil, and international matters that influenced operations. Operation MORNING LIGHT was a significant event in recent Canadian history and has important lessons, not just for the Canadian Forces but for the world. As Lieutenant-General William Carr (Retired) recorded, "there was no historical precedent for Operation MORNING LIGHT."[2] Given the preponderance of orbital assets, it is only a matter of time until the next incident occurs.

Any discussion of the Canadian north inevitably brings to mind a number of images: snow, cold, the aura borealis, and the inevitable host of cuddly creatures, such as polar bear cubs. The actual conditions are more severe than most people realize. In the upper reaches of the Canadian Boreal Forest zone, even before factoring in wind chill, the winter temperatures average minus 30 degrees Celsius (°C) or colder. Blowing snow carried by strong winds combine with limited daylight hours to limit visibility, and the snow tends to settle in deep, solid drifts. The relatively featureless landscape has few distinguishing features and is poorly mapped, which makes navigation without sophisticated aids difficult. Of course, communications are also problematic due to distance, magnetic flux, a generally sparse population, and a lack of communication aids, such as modern satellites. This, then, was the environment of Operation (Op) MORNING LIGHT and a fact of life in our Canadian north.

"SITREP: THE MORNING LIGHT HAS BEEN EXTINGUISHED."[3] With this message, the military component of Op MORNING LIGHT was declared to be at an end. Although there still remained some work for other government departments (Natural Resources, Foreign Affairs, Indian and Northern Affairs, the Royal Canadian Mounted Police [RCMP], Health Canada, and the Atomic Energy Control Board [AECB]), the mission of the Canadian Forces (CF), mainly the Air Force, in one of the most hostile environments on earth was over. V. J. Walton, Director General Emergency Planning Canada, speaking in a North Atlantic Treaty Organization (NATO) forum in June 1978 expressed it as "...a bit like looking for a needle in a haystack … under the most trying conditions. The tiniest pieces were radioactive. There was always the intense cold to contend with. Temperatures of the order of minus 40 degrees centigrade caused batteries to freeze and instrument cables to snap."[4] This demanding operation, under the most arduous of conditions, tested the ability of the Air Force to operate in the continent's most extreme environment without the aids taken for granted today; a test the crews passed with "flying colours."

The Air Force presence and operations were a necessary part of Canadian government policy to safeguard the population and enforce Canadian sovereignty. However, too many of the lessons that were, could, and should have been learned institutionally have been lost over time. The CF, as a whole, is now engaged in re-learning how to operate in the Arctic and the Air Force will

likely have to lead the way. Additionally, while the possibility of another satellite crash on populated Canadian territory is low, it still exists. The ability to monitor our aerospace, track airborne objects, chart debris impacts, and respond appropriately anywhere in Canada, especially in isolated areas, will prove crucial in the future. The high arctic is no longer as remote as it once was, and the ability to operate there remains a critical capability. This paper will briefly review the major events of Op MORNING LIGHT, highlighting the realities of operating in one of the world's most unforgiving environments.

To properly appreciate the circumstances and problems of MORNING LIGHT, it is necessary to consider the subject in context. The possibility of orbital satellites being used for various purposes was first proposed by writer Sir Arthur C. Clarke in 1949.[5] This innovative approach to the problem of mass communication relays became a worldwide phenomenon and branched out into other areas, including scientific purposes, military usage, and intelligence gathering. Since 1957, satellites from various countries, beginning with Sputnik I, have been used with varying degrees of success. Unfortunately, the laws of orbital mechanics mean that satellites in low-earth orbit are subject to orbital decay and eventual re-entry, as with Sputnik I after its 22-day lifespan. This brings up another concept of Sir Arthur's: "Project Spaceguard." Postulated earlier but published in his 1973 novel *Rendezvous with Rama*, the essence of the fictional Project Spaceguard was to protect humanity from the disastrous effects of the re-entry of space hardware and its potential kinetic strike damage to populated areas, following the destruction of a city by a re-entering rocket.[6] This would seem to remain in the realm of science fiction, were it not for the actual experiences of the Columbia space shuttle accident, the Skylab re-entry over Australia, and—most relevant to Canadians—the impact of Cosmos 954's debris in the Northwest Territories on 24 January 1978.

Operation MORNING LIGHT, as it was termed, was the single largest, multi-agency operation ever to take place in the Canadian Arctic. It involved the CF, Natural Resources Canada, the RCMP, public health, the AECB and other Canadian government departments, the United States Air Force (USAF), and the Department of Energy (DOE) of the United States (US) government. Although representatives of the US government were involved, "Canadian organizations provided the command and control, flight and ground operations and recovery activities."[7] The search for debris covered an area greater than 124,000 square kilometres (km^2) and more than 5200 hours of Canadian Air Force flying time were logged in CC130 Hercules, CC138 Twin Otter, DC-3, CH115 Buffalo, CP107 Argus, CC137 Boeing, CF5 Freedom Fighter, T33 Silver Star, CC109 Cosmopolitan, and rotary-wing aircraft (CH147 Chinook, CH1136 Kiowa, and CH135 Twin Huey). Operating in Canada's most hostile environment, the Air Force carried out demanding operations in support of Canadian sovereignty, intelligence gathering, and other government departments—in an exemplary manner. Although Cosmos 954 was mainly destroyed and burned up on re-entry, enough radioactive material survived to present great risk to life and the environment had recovery and remedial action not been taken. Therefore, "under control of the AECB, recovery actions were conducted" by the CF, with the Air Force as the lead service.[8]

The actual events of MORNING LIGHT were preceded by a series of events that set the stage for potential disaster; averted only by luck and circumstances. In the beginning, Kosmos[9] 954 was designed as a nuclear powered Radar Ocean Surveillance Satellite (RORSAT) to monitor the oceans for ship movements. Intended to occupy a 65 degree inclined equatorial orbit at 275 km altitude and with an orbital period of approximately 90 minutes, it would have been able to monitor the majority of the earth's ocean surfaces, relaying its data to a reception station inside the Soviet Union. Considered a routine launch, two days following its companion (Kosmos 952), 954 was launched from the Tyuratam space facility at 0848 hours Eastern Standard Time (EST), 18 September 1977 and was, like all satellites, tracked by North American Aerospace Defence Command (NORAD). Despite 952 being moved from its operational orbit to a "decay" orbit[10] in early October, 954 did not behave according to plan, instead beginning an uncontrolled re-entry. On 29 October 1977, NORAD informed the US government that 954 was decreasing in altitude with a tentative date of re-entry estimated for April 1978.[11] It was further reported 10 days later that 954 had failed to jettison its onboard reactor, a normal precaution in the event of satellite

malfunction.[12] Despite this, Canadian authorities were not informed by their American counterparts (including within NORAD) until 30 November 1977.[13] By January 1978, the re-entry prediction had been refined, but still reflected a large window of potential orbits. Briefing the most senior personnel at the political level, including Prime Minister Trudeau,[14] led to the decision that should the satellite impact Canadian territory, the CF would be the lead agency, in an "aid to civil power" type role. Other agencies tasked included the RCMP, Atomic Energy Canada, Natural Resources and Emergency Planning Canada. Concurrently, in the US, the DOE's Nuclear Emergency Search Team (NEST) was ramped up and provided with additional resources and strategic airlift. Warning orders, classified SECRET, were transmitted to regional commanders and bases within Canada which had Nuclear Accident Support Teams (NAST), but remained deliberately vague, as the PMO made the political decision to keep events secret as long as possible—including providing no warning to other levels of government. On 23 January, Canadian Forces Base (CFB) Edmonton's Commanding Officer (CO), Colonel (Col) David Garland, put his NAST team on two-hour standby. In the interim, the Privy Council Office (PCO) held, at 1430 hours in Ottawa,

> the first, and only Canadian pre-entry interdepartmental meeting…. Present were the directors or their deputies of an impressive cross-section of Canada's public service: External Affairs; Intelligence Advisory Committee; National Health and Welfare; Emergency Planning Canada; DNDs [sic]Directorate of Scientific and Technical Intelligence; Atomic Energy Control Board; Royal Canadian Mounted Police; and the Canadian Force's [sic] sole representative.[15]

Although the Soviet authorities steadfastly denied any public danger, they did confirm the satellite was out of control. All re-entry predictions were voided when 954 began to tumble from increased atmospheric resistance, accelerating its orbital decay, leading to a new prediction of 23 January, plus or minus one day. The actual re-entry was 0454 hours Mountain Standard Time (MST) on 24 January beginning north of the Queen Charlotte Islands, on Canada's Pacific coast, with a three minute burn time and final fragmentary impacts between Great Slave Lake and Baker Lake in the North West Territories.[16] Even with re-entry having occurred over Canadian territory and the RCMP receiving reports of "fireballs" in the sky, the PCO still did not inform civil authorities, ministries, or other levels of government, although a bare-bones press release was made, at 0953 in Ottawa, **after** the news had "broken" elsewhere. From this point, MORNING LIGHT was an ongoing operation.

In the contingency planning for 954, Air Command, under Lieutenant-General (LGen) William Carr, was designated as the CF's lead, with all necessary authorities delegated to Garland as CO of the nearest active base with a NAST.[17] In the conduct of the operation, Carr was clear in his expectations of Garland:

> I appointed Col Garland, the CO CFB Namao (Edmonton) and gave him all the authority I had to facilitate his work. Told him only to keep us advised of progress and any needs he had which were beyond the authorities I had delegated to him … some senior staff in CFHQ [Canadian Forces Headquarters] weren't too enamoured with this approach.[18]

Garland and his personnel would have to deal with an increasingly aggressive press, the general public, and other agencies of the Canadian government, not to mention the "well intentioned assistance" of Ottawa and CFHQ. Luckily, Carr was well positioned to act as a buffer between Edmonton and other authorities, allowing Garland's team to concentrate on relevancies. Warning orders were dispatched to 450 Squadron, equipped with CH147 Chinooks, to prepare to redeploy personnel and aircraft from their winter training camp to active operations in the Arctic.

The first airborne search was launched at 1400 hours, 24 January 1978; a round-trip distance of over 1800 km in an extremely hostile environment. Seen as being very similar to a classical search and rescue (SAR) mission, these flights could be better defined as assistance to civil government department missions, carrying out tasks civil agencies could not. The initial search

criteria was based on the re-entry data and limited visual observations, with the intent of searching for airborne radioactive contaminants, ground sources, and visual impact markers or debris. Anything that was found would be investigated and cleaned up as required. According to the interim report on MORNING LIGHT, "the reactor core released a significant amount of particulate at high altitudes which spread in the upper winds over and south of Great Slave Lake, probably in a fine distribution into Northern Alberta and Saskatchewan below 60 [degrees] N[orth] latitude."[19]

The first Hercules was rapidly equipped to begin a gross area search for airborne radioactive particles, ground sources, and impact markers / debris. The initial search area was determined according to the re-entry and meteorological data and visual observation reports, such as was provided by RCMP Constable Phil Pitts of the Hay River, Northwest Territories (NWT) detachment:

> a large, bright, glowing object trailing approximately 15–20 smaller glowing particles. This object was travelling on a horizontal plane from S/W [South/West] to N/E [North/East]. They observed it 3-4 minutes with it disappearing N/E of the mouth of the Hay River over the Great Slave Lake.[20]

Concurrently, the CF tasked one CH147 Chinook helicopter for Arctic deployment with Major H. Coulter of 440 (SAR) Squadron assuming duties as search master. The USAF, with Canadian permission, launched KC-135 and U-2 reconnaissance air sampling missions over central Alberta and north-west Saskatchewan.[21] The US also dispatched three C-141 Starlifters carrying the DOE's NEST and their detectors, and "at 1000 EST [24 January 1978], US aircraft commenced a second air sampling mission over Michigan and northern Ontario (results showed no abnormal radiation levels),"[22] while CFB Edmonton's NAST deployed to Yellowknife. By 1530 hours, the time of the first MORNING LIGHT SITREP, the search operation was well under way, air assets were either already committed or in movement, logistic support was ramping up, and the NAST was on the way to the Yellowknife airhead.[23] According to Garland, the NAST "provided the backbone of the Operation for radiation monitoring and physical labour in debris recovery operations."[24] This was to include the briefing and inspection for contamination of ten communities, seven of which were decontaminated.[25]

In preparing for the airborne search, the plan initially called for the use of the DOE airborne gamma radiation spectrometers, as it was believed that Canada did not have this classified equipment. Unfortunately, adapting the DOE equipment to Canadian aircraft was somewhat problematic, until the decision was made to simply fit a DOE helicopter, with spectrometer, inside the Hercules cargo deck.[26] Ironically, Dr. Bob Grasty reported that "EMR/GSC (Energy Mines & Resources / Geological Survey of Canada) had a 'very sophisticated airborne gamma monitor' available" and that it was superior to the DOE equipment.[27] Once this detector was transferred from Ottawa and installed, the full airborne search for radiation sources was under way. By the time the airborne search ended on 11 April 1978, this "remarkable instrument would have flown 'approximately 23,000 of the 40,000 line kilometres'" (57.5 per cent) of the airborne fine search without any major failures.[28]

In staging from the Yellowknife airhead, it was deemed necessary to rent hangar space from Wardair due to the temperatures. Not merely a convenience in the ambient minus 30°C temperatures, the hangar was considered vital for the helicopter squadrons, and later the fixed-wing aircraft. The shelter kept the aircraft warm and serviceable and enabled the technicians to maintain them in relative comfort. Working conditions for aircrew and maintainers alike were extreme, with the Herman Nelson heaters themselves needing to be warmed before they could pre-heat the aircraft engines. The Herman Nelson heaters having proved to be less than ideal, a request for electric heaters was made to replace them. Unfortunately, the request was never granted.

The first verified "hit" in the search, there having already been one major false positive, was recorded by the GSC spectrometer in the early morning of 27 January over Great Slave Lake.[29] Later recovered, this piece of debris was buried in 13 centimetres of snow and emitted 200 Roentgens per

hour. On recovery, it was found to be a small metal plate, aptly dubbed the "hot plate."[30] Eventually enclosed in a lead-lined container fabricated at Edmonton's Cross Cancer Institute, it was airlifted to Winnipeg for transfer to AECB custody. On 28 January, the search teams received unanticipated aid from two adventurers who reported having stumbled across a large piece of debris (one having touched it).[31] This object, later nicknamed the "antlers," required immediate action as knowledge of the find rapidly became public. The two adventurers, Michael Mobley and John Mordhorst (who would later be hired as local area guides and advisors), were rapidly airlifted out from Warden's Grove, NWT to Edmonton in order to ascertain their medical status after exposure.[32]

Isolated from the press, first by urgent medical necessity and then at their request, this contributed to the increasingly confrontational attitude of a ravenous press corps. The area was placed under quarantine with notices to airmen (NOTAMs) being issued; however, plans were quickly hatched by a disgruntled press corps to rent aircraft in order to fly to the site. (In addition, there were concerns that the Soviets would take unilateral action to recover any sensitive materials from the impact area.) The response was to parachute soldiers in to secure the site.[33] Solicitor General Francis Fox, having just resigned in a scandal, complicated things, but eventually permission for this "aid to civil power" mission was granted. In the pre-dawn hours (0600) of 31 January 1978, Sergeants John Phillips, Douglas Riddell, and Christopher Cabelguen, and Corporal John Wickstrom of the Canadian Airborne Centre, parachuted into Warden's Grove to secure the site. Authorization for lethal force granted.[34] Having survived a hazardous night jump, the troopers established their camp and set up area security despite the extreme conditions. Like the other security posts to follow at other sites, resupply of critical materials, such as stove fuel and rations, became an issue where those responsible for setting supply priorities often "forgot" that the regular resupply was an urgent necessity rather than a luxury. Other sites would also have to be guarded later, however, in these cases the RCMP and CF largely worked together. Site security was considered vital for reasons other than merely frustrating the media. In the early part of the operation there was serious concern over the possibility of a Soviet incursion to recover sensitive components; such an incursion potentially constituting an act of war. Additionally, there was also the potential for the curious to carry away contaminated materials, endangering their community. The Directorate of History light-heartedly illustrates the dangers of souvenir-hunting on this operation with "an interesting story...told of the officer who retrieved a rock sample as a souvenir only to discover at some later time that this particular rock sample was not an unexpected occurrence in the vicinity of a bulldozed outdoor urinal."[35]

The complicated and challenging airborne search ran from 30 January through to 10 February 1978 and was complicated by the lack of adequate maps and navigational aids. Although navigational equipment such as Omega, Doppler, and the Along-and-Cross Track computer were extensively employed, "visual map reading was used as a check but was seriously limited by flat, snow covered terrain and maps that lacked detail."[36] The Omega systems were "borrowed" from other CF programs, but were not efficient in the harsh arctic conditions. Luckily, the DOE contingent had brought a microwave ranging system (MRS), which allowed for pinpoint navigation accuracy within the search area. The downside of MRS was that it had to be sited and moved, as well as maintained, by helicopter. The search itself required demanding pilot and navigator concentration, as search lanes were 50–80 km long and flown in close formation at 500–750 feet [152–228 metres (m)] above ground, although some solo runs were also undertaken.[37] This gave the searching Hercules an accuracy of plus or minus 100 feet [30.5 m].[38]

The fine search, even with the MRS as an aid, was a gruelling effort for search aircrews and the helicopter support teams. The microwave transponders required heavy batteries and, despite the conditions, had to be sited with precision. To add to the general misery, the batteries discharged rapidly in the extreme cold, making change and recharge on an accelerated schedule necessary. In spite of the difficulties, the "MRS did however provide the accuracy required for guaranteed coverage" of the search area.[39] And despite the difficulties posed by weather, terrain, and manpower, the MRS controlled flights were a success, with the final mission flown on 8 April. The overall results as of that date were 200 hits, 108 of which had been investigated and recovered and 4 still to be investigated, and a total area searched of 5,667 square miles [9,120 km^2].[40]

Airborne photo-mapping of the area was intended to address the dearth of useful maps and air photos. For this purpose, Argus 736 of Maritime Command's air component was tasked to provide this necessary capability. Unfortunately, the Argus proved unsuitable for arctic service, as it could not be "hangared" at night and cold often rendered it unserviceable.[41] With 157.8 mission hours, the Argus crews did their best to provide useful aerial photos; however, the aircraft was not designed for low-level over-ground flight—when it was able to fly at all. Using the RC-8 photo-mapping camera, the Argus flights covered approximately 5596 square miles,[42] although the output product proved to be of limited utility. Use of the Argus was "discontinued because its navigation equipment proved no more accurate than that of the CC130 plus the Argus suffered a high unservicability rate in the cold temperatures."[43]

Confronted with the difficulties of dealing with the debris from the Yellowknife airhead, and the greater distance of Edmonton, the decision was taken to establish a camp at "Satellite One" (later named Cosmos Lake) and supply it through use of the low altitude parachute extraction system (LAPES). A high-risk procedure, especially over unknown ground, LAPES was the only means possible to provide the large quantity of fuel necessary to support the camp and helicopter operations. In addition to fuel, a mountain of supplies, equipment (including 2 bulldozers needed to construct a runway on the lake ice), and materials were LAPESed in. Despite some *very* close calls, the LAPES missions were successful, and survivable, with over 255 tons [231 metric tonnes] of cargo delivered by this means, alone to Cosmos Lake. Garland reported "All LAPES missions were able to be completed on schedule, with remarkable accuracy, and exceptional load survivability despite adverse snow drift conditions on some of the extraction zones."[44]

The actual construction of the Camp (named Camp Garland over Col Garland's objections) fell to the Pioneer Platoon of the 1st Battalion, Princess Patricia's Canadian Light Infantry (PPCLI), led by Lieutenant C. Edward K. Bain, with construction starting 6 February.[45] The ice runway itself proved to be a rare undertaking for the CF, as "on no earlier occasion had the Royal Canadian Air Force (RCAF) / CF ever operated the CC130 off a fresh water ice runway, constructed by military personnel alone."[46] This was accomplished with advice from the personnel of Pacific Western Airlines, who regularly operated civilian CC130s from ice runways. Construction of the runway took nine days, with two D-4 bulldozers (one working for the full nine days, the other for six days); the finished runway was "4,900 feet [1493 m] long by 130 feet [40 m] wide … plus turnaround dumbbells at each end approximately 600,000 square feet [182,880 m^2]."[47] It is worth noting that the dozer operators worked continuously in open cabs, partially due to the danger of the machine breaking through the ice, under extreme conditions of cold and wind-blown snow limiting visibility, trading off in 30-minute stints over the entire nine-day construction period. The runway was tested at 0845 hrs, 16 February 1978, by "touch and go" transit followed by a complete landing of a fully laden Hercules; the ice held and the strip was declared open.[48] Once completed, the runway was marked and remained open during daylight hours for all MORNING LIGHT aircraft, from the venerable Twin Otter to the heavy lift Hercules, as well as the various helicopters, some even remaining overnight on the ice. Before the operation was over, there would be 90 landings on Cosmos Lake alone and Camp Garland was the hub for the field effort of the operation.

The camp itself was a typical winter encampment, based on modular tentage, albeit much colder. It was necessary, in temperatures that reached minus 50°C, to run full-time heating simply to allow personnel to function. Eventually, several "ATCO [air traffic control officer]" style trailers were brought in to serve as ablution huts, although the inhabitants probably wished for similar shelters for sleeping arrangements. Under these conditions, the possibility of accident was a constant worry that was fated to be realized. At 1125 Zulu (or Greenwich Mean Time), 7 March, the Edmonton Command Post was notified that Camp Garland had suffered a fire in the tent complex.[49] Although there were no injuries, a relief and medical team was dispatched. Investigation revealed that an incorrectly sited and fuelled Herman Nelson heater had started the fire which spread to the tent complex, causing about $143,000 damage. A second fire, of undetermined cause, at 0258 hrs on 17 March, destroyed the maintenance tent and 10 MRS battery sets, which hampered the MRS searches, but again there were no injuries.[50]

In the end, approximately 1 per cent of the satellite weight was recovered, including 75 per cent of the reactor core, which had high radioactivity. Included in the recovered weight are 3134 separate particles, of which about 90 per cent were smaller than 1 millimetre in diameter and had low radioactivity, some of which were recovered from several small communities outside the expected impact area. Garland reported that, despite the extreme environment, the search of over 47,000 square miles [76, 000 km^2] of the NWT resulted in 204 separate, verified radiation sources, leading to 94 recovered fragments, *and* 110 natural sources, which were then further studied by Natural Resources Canada.[51] In the end, it was found that "the pattern of satellite debris discovered to date indicated that it was scattered along a fairly definite line probably no more than ten miles either side of the trajectory line."[52]

Cabinet decided on 18 April 1978, expressed in Cabinet Decision 207-78RD, that the active search phase was complete and that AECB would take over lead responsibility for post-search operations.[53] The handover to the AECB was quickly accomplished, and the CF began to withdraw from the operation proper, entering the post-operation cleanup phase. All landing sites, including Camp Garland, were thoroughly cleaned up for inspection by the environmental authorities, recovery and return of fuel drums was completed, and the dreaded mountain of paperwork and after action reports were dealt with. The final transfer of radioactive material was accomplished on 17 April, the day prior to the above Cabinet decision, with a flight to Winnipeg capping off more than 5100 hours of continuous operational flying (see Table 1) that began with the initial search mission on 24 January 1978.

Country	Aircraft Type	Flying Hours
Canada	CC130 Hercules (207 sorties)	1784.9
	CH115 Buffalo	135.9
	CP107 Argus	157.8
	CC138 Twin Otter	294.6
	CC137 Boeing	3.7
	CF5 Freedom Fighter	13.6
	T33 Silver Star	4.2
	CC109 Cosmopolitan	13.2
	CH147 Chinook	498.8
	CH136 Kiowa	540.0
	CH135 Twin Huey	1678.5
	Total Canadian flight time	**5125.2**
United States	USAF KC135	8 missions, hours unknown
	DOE Convair	39.9
	USAF U2	5 missions for air sampling, hours unknown

Table 1. The Aircraft of Operation MORNING LIGHT[54]

Logistically, the operation was a success, although some shortcomings were highlighted. The movement, purely by air, of such a large quantity of material was unprecedented in Canadian experience, exceeded only by the Berlin Airlift and the current effort in Afghanistan. Movement of time-critical supplies, although some glitches were experienced, was largely accomplished according to time-critical schedules, with CFB Edmonton's traffic technicians doing yeoman service around the clock, using their experience and expertise to purpose-build drop pallets and

load aircraft for each mission. "[The] airlift was completed in 36 operational chalks between 20 Mar and 02 Apr 78 [with a] total of 791,941 lbs [359,218 kilograms] of cargo and 135 passengers... airlifted."[55] The CF supply system was able to outfit personnel, including civilians and RCMP, with most of the essential arctic gear, clothing, sleeping bags, and so on; however, it was still necessary to locally purchase some important material such as balaclavas, eye protection in the form of sunglasses, and to arrange for local fabrication of critical items that were unavailable, such as lead-lined receptacles for contaminated materials. Out of the total cost for Op MORNING LIGHT ($13 million), the Air Force's share was in excess of $6 million. Of that, fuel alone was over $500,000, with personnel and miscellaneous costs of $5,362,897.40 (see Table 2).

Category	Detail	Expense
Supply Requirements	ice augers, lead drums, etc.	$243,879.13
Fuels	JP4 Drummed 43,360 gallons	$40,988.34
	JP4 Bulk 1,213,849 gallons	$506,175.03
Other Petroleum, Oil and Lubricants		$42,170.91
Write Offs (including fire losses)	fire losses: 2 fires ($224,415.86)	$381, 747.19
Personnel Costs & Misc		$5,362,897.40
Total Air Command Expenditure		**$6,577,858.00**
Final Bill Including Civilian Agencies:		**>$13,000,000.00**[56]

Table 2. Costs to Air Command[57]

Characteristic of Op MORNING LIGHT was the continuing shortage of appropriately trained personnel. Also characteristic was the typical Canadian attitude of "making do" and "getting the job done." Despite conflicting demands (the active operation, support for the ARCTIC EXPRESS[58] exercise which ran concurrently, and normal domestic operations), the Air Force managed to find sufficient personnel to carry out the operation. Of the personnel involved in this operation, from various Canadian government departments, two civilian guides (Mobley and Mordhorst), the RCMP, the USAF, DOE, and the CF, all made significant contributions. CFB Edmonton's NAST (45 personnel) was augmented by NAST personnel from other bases (28 personnel). Additionally, although there were many CF personnel peripherally involved, 1200 CF members were directly tasked to and took an active role in MORNING LIGHT.

Significantly, there were no serious injuries, including from the two Cosmos Lake fires; no crashed aircraft, despite the two near accidents involving LAPES CC130s, the high operational tempo, and the arduous conditions; and the material losses were relatively light at $381,747.19. Garland noted that the difficulties encountered were:

> ...cold, weather, distance, aircraft shortages, aircraft under-equipped for navigation, trained manpower, the pitting of resources against the cold, and the general lack of deployable equipment to support such a field operation. Despite all of these and the dangers inherent in the operational milieu, the Operation was completed as measured above without major aircraft accident, radiation, over exposure or serious injury. Two fires at Cosmos Lake constituted the only significant loss due to misadventure.[59]

With the handover of the operation to the AECB, the CF withdrew from the cleanup operations and MORNING LIGHT officially ended with the final SITREP. Although the AECB and other departments of the civil government still had work to do, the role of the CF in this regard ended... until the next time. With the growing prominence of the Canadian Arctic in the public and political consciousness, one can only hope that the institutional lessons being relearned regarding Arctic operations are not lost in their turn.

Notes

1. Yuriy Vsevolodovich Votintsev excerpt from "Unknown Troops of an Extinct Superpower," article appearing in *Voyenno-Istoricheskiy Zhurnal* no. 11 (1993), http://www.fas.org/spp/starwars/program/soviet/jpuma031_94019.htm (accessed January 31, 2012).

2. C. A. Morrison, *Voyage into the Unknown: The Search for and Recovery of Cosmos 954* (Sittsville, Ontario: Canada's Wings, 1982), 1.

3. SITREP: the abbreviated form of situation report, used as a message header.

4. V. J. Walton, "Canada's Response to COSMOS 954: An account of what happened when a satellite re-entered the earth's atmosphere and fell in the Canadian Northwest." Unpublished presentation made to the North Atlantic Treaty Organization (NATO) Senior Civil Emergency Planning Committee meeting, held in Brussels, 27 June 1978, 6.

5. Arthur C. Clarke, "V2 for Ionosphere Research" in Letters to the Editor, *Wireless World* 11, no. 3 (February 1945): 58. His famous prediction on the future in his proposal of geostationary satellite communications can be viewed online at http://lakdiva.org/clarke/1945ww/ (accessed January 10, 2012). From this, he is credited with "inventing" the communications satellite.

6. A. C. Clarke, *Rendezvous with Rama* (New York: Harcourt Brace, 1973). Project Spaceguard is now an existing international project to locate and study large near-earth asteroid bodies, with an eye toward predicting and preventing impacts.

7. Canada, Department of National Defence, Colonel D. Garland, "Operation Morning Light, Interim Report," unpublished document, 30 June 1978, 8.

8. Ibid., 4.

9. Throughout this paper, the spelling of Kosmos/Cosmos will change according to the context. When referencing the former Soviet Union, Russian language spelling will be used (Kosmos). When referencing a Western context, the North American / European (Cosmos) is used.

10. A decay orbit is an orbit designed to deliberately re-enter the spacecraft on a trajectory that will destroy the craft and ensure that no debris reaches the surface.

11. Morrison, 6.

12. Government of Canada, Privy Council Office (PCO), "The Re-Entry of COSMOS 954: Review of Procedures," 6 June 1978, 1.

13. Morrison, 6.

14. Trudeau maintained, despite evidence to the contrary, that he was never briefed at this time. C. A. Morrison reports that the PM was "thoroughly briefed" according to NORAD Commander-in-Chief General (USAF) James Hill, while the PM was on a ski vacation in Colorado over Christmas 1977. See also "Nation: Cosmos 954: An Ugly Death" in *Time Magazine*, 6 February 1978, http://www.time.com/time/magazine/article/0,9171,945940-1,00.html (accessed 10 January 2012).

15. Morrison, 13.

16. United States, Department of Energy (DOE), "Operation Morning Light: A Report of United States Participation," July 1978, 8.

17. Morrison, 21.

18. Personal correspondence, LGen W. Carr (Ret'd) and the author.

19. Garland, 1.

20. Morrison, 19.

21. Ibid., 22.

22. DOE, 14.

23. Morrison, 24.

24. Garland, 11.

25. The decontamination and inspection activities of the NAST are not addressed in this paper, but I would encourage someone to study not only what they accomplished but how it was done.

26. Morrison, 26.

27. Natural Resources Canada, "Radiation Geophysics: Operation Morning Light - A Personal Account," 3, at http://www.gsc.nrcan.gc.ca/gamma/ml_e.php (link no longer active).

28. Morrison, 28–31.

29. R. L. Grasty, ND. The search for Cosmos-954. Ottawa: Energy and Resources Canada. (Undated internal report obtained under access to information and privacy [ATIP] from the Government of Canada. Fond No. 000485).

30. Morrison, 37.

31. Ibid., 42.

32. Ibid., 46–7.

33. Ibid., 47.

34. Government of Canada, DND, "Operation Morning Light Summary (Sequence) of Events," 30 Jan 1978, 0600 hrs MST, unpublished log. (Obtained under ATIP from Directorate of History and Heritage, DND).

35. Canada, National Defence Headquarters (NDHQ), Directorate of History and Heritage (DHH), File 3350-165/M14(DHIST), "Operation Morning Light - Preparation of a Historical Report," 18 January 1979, 4.

36. Garland, 12.

37. Morrison, 69.

38. Garland, 11.

39. Ibid., A/1/B(2)-1.

40. Morrison, 118.

41. Ibid., 51.

42. Garland, A/1/C-1.

43. Ibid., 10.

44. Ibid., A/1/B(5)-2.

45. Morrison, 74. Although the Cosmos Lake camp was needed, Morrison reports that, with hindsight, it should have remained a small temporary detachment with the "main advance airhead at Fort Reliance", which was better located to support the overall mission.

46. Garland, A/1/B(3)-1.

47. Ibid., D/1/C-3.

48. Morrison, 95.

49. Ibid., 109. To preclude confusion by operating over different time zones, military operations normally use Zulu or GMT as a standard time reference.

50. Ibid., 115.

51. Garland, 21.

52. Ibid., 11.

53. Canada, AECB, File 15-200-24-0, 26 April 1978, 1.

54. Garland.

55. R. H. Ashton, "Post Operation Report - Cosmos Lake Redeployment," 11 April 1978, File No. 3030 - MORNING LIGHT, 1.

56. Refer to the Statement of Claim presented to the Soviets by Canada.

57. Garland.

58. ARCTIC EXPRESS was the annual NATO exercise run in Norway. The exercise was essentially a winter warfare exercise combined with a simulated wartime NATO reinforcement into Norway with the troops and equipment slated to defend against aggression from the Warsaw Pact. Significantly, ARCTIC EXPRESS was also a drain on resources such as aircraft (and aircrews) that were critical to the success of both the exercise and MORNING LIGHT.

59. Garland, 23.

William Sparling

Master Seaman (MS) William (Bill) Sparling, CD, MA AScT, has been a serving member of the Canadian Forces since 1981. Bill has served in every ship class (steamers, 280s, maritime coastal defence vessels and Canadian patrol frigates) except submarines and auxiliary oiler replenishment (AOR) ships, around the world, as a naval weapons technician (gunner). His experience includes active service in the Arabian Gulf (Gulf War 1), anti-piracy patrols off south-east Asia and Korea, instruction at all levels from basic recruit training / officer training through senior levels of his occupation specialty, as well as briefing/instructing senior officers.

Offered a commission, MS Sparling elected to remain in the ranks. He completed his BA (Canadian History / Political Science) from the University of Manitoba under the Canadian Forces University Program and his MA from Royal Military College of Canada (War Studies). As odd as it might seem for a sailor to provide commentary on aerospace issues, MS Sparling is the son of a Second World War bomb aimer, who rose through the ranks to warrant officer first class in post-war service. As such, he absorbed the concepts of air power long before adulthood and has developed this knowledge since. He has been published internationally, in journals such as Marine Corps Gazette*, and is a repeat contributor to this publication.*

He is presently posted to the Canadian Forces Fleet School (Esquimalt) – Combat Systems Engineering (CSE) Division, as the CSE Student Divisional Admin NCO, for his final posting before retirement. Bill is also pursuing further studies towards a second MA through Royal Roads University in disaster and emergency management specializing in civil defence, which will be his next career path.

Chapter 10

Arctic Alternative Futures

Daniel Lachance

Author's note: An alternative future is a possible future that occurs when certain events or other influences cause a deviation from the general direction in which a trend is moving. Alternative futures can also be caused by revolutionary breakthroughs or by a strategic shock (a sudden and/or unexpected and often powerful event or driver [an event or human activity that provides impetus or motivation to fuel or sustain a trend] that causes the trajectory of a trend to significantly deviate from its existing course) or a wild card event.

Editor's note: For a version of this article with colour illustrations and photographs, see the Spring 2011 issue (Vol. 4, no. 2) of The Canadian Air Force Journal, available online at http://www.rcaf-arc.forces.gc.ca/CFAWC/eLibrary/Journal/Vol4-2011/Iss2-Spring/AF_JOURNAL-Vol4-2011-Iss2-Spring_e.pdf#Page=22

Never let the future disturb you. You will meet it, if you have to, with the same weapons of reason which today arm you against the present.

Marcus Aurelius Antonius[1]

Introduction

Projecting trends[2] into the future can be fraught with flaws, especially the longer the outlook. Inaccuracies in prediction often prove to be the result of forecasters' inability to accurately predict human adaptation to change and, even more frequently, the failure to envision unpredictable events (the so-called wild card[3] events) and revolutionary breakthroughs. Projecting trends in a shorter outlook (10 years or less), however, is also fairly challenging because it is often hard to distinguish meaningful differences between a short-term future and the reality of today and, again, because of the possibility that unpredictable events can completely change the course of a future trend.

In the case of the Canadian Arctic, projecting trends in this dynamic environment is certainly not an easy task. One thing is certain, though, and that is if current future security trends in the Arctic continue to progress as forecasted, the next decade will be challenging to the Air Force as we may find ourselves to be increasingly present in the Canadian high north. Military planners are currently busy setting the conditions for our future participation based on what we think the future will be, but what if the current predictions were wrong? What if the Arctic was to get way colder or warm up much faster than anticipated? Will we be ready to face these alternative futures?

This paper is intended to make the reader think about what might come to pass if the current future security trends in the Arctic are displaced by some unforeseen events. By conducting an alternative futures analysis on future Air Force Operations in the Arctic, this paper will point out the implications that a best case and a worst case scenario would have on the Air Force.

Alternative Futures

Examination of the future environment is an important practice for institutions that wish to remain relevant and capable over the long term. This practice is particularly important for the Air Force, as the lead time required to acquire capabilities can be lengthy. Examining future trends and imagining futures scenarios is often employed in order to assist in the identification of future capabilities.

But what is an alternative future? If, as shown in Figure 1, one were to plot a trend on a timeline, based on what we know, the most likely future would fall in the realm of the Probable. Note that the further out one peers into the future, the greater the Probable realm gets. This has to do

with the inherent uncertainties that are present in the current trends, and the fact that no matter what, predicting the future is certainly not an exact science.

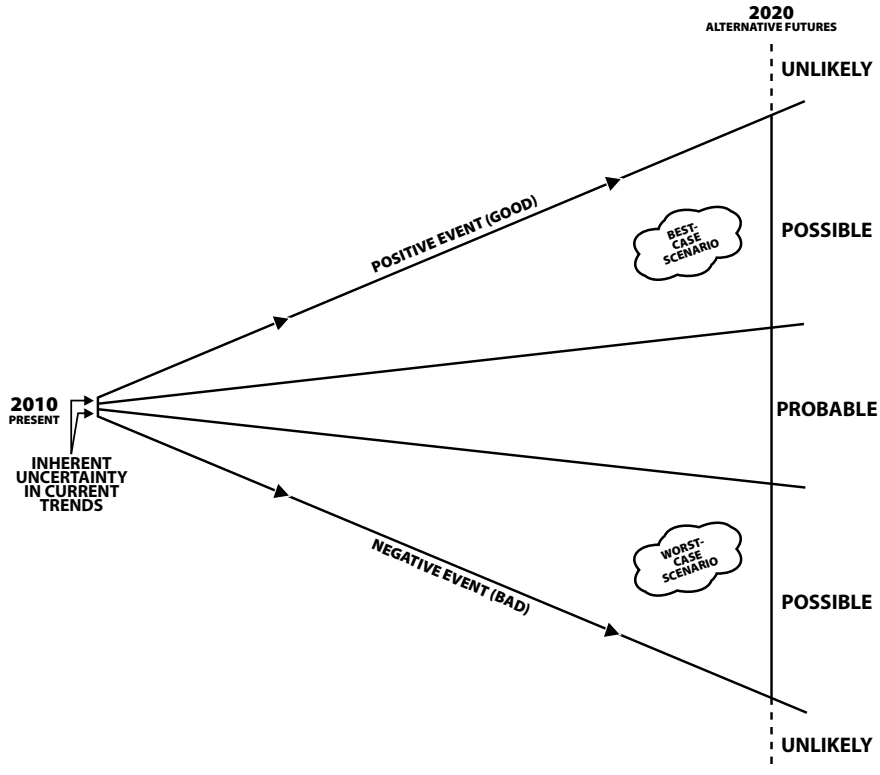

Figure 1. Trend Line Projection to 2020 and Alternative Futures

Alternative futures occur when events displace the trend line outside of the Probable zone. If the events all collide to produce good effects, then the trend line is moved towards a Best Case Scenario. Conversely, events that are all producing negative effects would push the trend line towards a Worst Case Scenario. For the purpose of this paper, the imagined events and their resulting scenarios had to be deemed sufficiently plausible so that the ensuing alternative futures were deemed Possible rather than Unlikely. Consequently, examining alternative futures can be useful to military planners since, theoretically, the majority of all situations that we may reasonably expect to encounter in the near future should fall somewhere within those possible extremities.

Key Factors

Before each scenario is presented, key factors[4] need to be identified. Key factors are thought to be the most important contributing features of the future security trend. There might very well be other factors at play, but in order to keep this exercise manageable, the scenarios will only play with the factors considered key to Arctic futures. To create the scenarios, the key factors were made to have extremely positive or negative effects (while remaining plausible), which created a best (utopian) and a worst case (dystopian) scenario, or if you wish, the alternative futures. Undoubtedly, how these key factors develop over the next 10 years will shape the future of Air Force operations in the Arctic.[5]

When it comes to future Air Force involvement in the Arctic, it was thought that the following three factors will affect the framework of all possible scenarios. Consequently, the key factors are:

a. **Climate.** Not surprisingly, climate is the first key factor. The rate of climate change over the next 10 years is subject to significant debate. See the vignette about

"Runaway Global Warming" to get a sense of an alternative future created by a wild card event. In any case, there is considerable scientific evidence that the Arctic climate will continue to follow a warming trend, but notwithstanding the above, it should be noted that there is also a growing body of academic opinion arguing that we are on the verge of a new cooling period. Lastly, there is also a noted correlation between the level of human activity and temperature. The greater the shift towards warmer temperatures, the more we can expect human activity to increase. Conversely, colder temperatures will temper human activity.

b. **Governance.** Governing an extremely vast territory with limited fiscal resources, sparse population, and few developed assets can be an extremely daunting endeavour. With the deadlines for the United Nations Convention on the Laws of the Sea (UNCLOS)[6] fast approaching, Nordic states are staking their Arctic claims, many of which are overlapping. Some analysts are warning of potential confrontation while others are seeing signs of increased cooperation.

c. **Resources.** The Arctic not only possesses significant reserves of fossil fuels, it is also rich with large coal deposits and strategic minerals. Extracting these resources can be very expensive and is directly related to the market price of these commodities, the harshness of the environment, and the level and quality of governance of the region.

Wild Card Alternative Future: Runaway Global Warming

By 2019, following years of record high temperature in the Arctic, most scientists are now predicting that within five years, the current trends in global warming will lead to massive permafrost melting. Aside from considerable infrastructure damages, as most buildings, pipelines, roads, rails, and runways in the Arctic are built on permafrost, the melting of the permafrost will lead to substantial release of methane which is stored in the permafrost. In turn, this methane will cause abrupt and severe global warming as methane is a powerful greenhouse gas which will lead to more permafrost melting and more methane release. In fact, there is enough methane stored in the Arctic permafrost that if only 10 per cent of the stored methane were to be released, it would have an effect equivalent to a factor of 10 increases in atmospheric CO2 concentrations. Compounding the problem is the fact that methane is 20 times more effective than CO2 at trapping heat in the atmosphere.

By 2022, global efforts to sequester carbon are proving insufficient and mean global temperatures have increased by an astonishing 3.5° Celsius since 2010. As a consequence of melting Greenland, Arctic, and Antarctic glaciers, sea levels around the globe have risen by an average of 7.5 centimetres in the last 10 years. By 2027, most of New Orleans is lost, joining suburbs of Bangkok and Dhaka which have already been submerged, while many other low lying cities around the globe remain threatened by rising sea levels.[7]

Best Case Scenario – The Arctic Frozen Hinterland

General. Because it is predicted that the Canadian Forces (CF) and the Air Force are likely to continue having limited means to operate in the North, the best case scenario (from an Air Force point of view) would be a scenario where there are few reasons for the Air Force to increase its presence in the North. In such a scenario, the Arctic remains frozen in some sort of economic hinterland where even good governance is not enough to kick-start any sustainable economic development due principally to the harshness of the environment.

Let us now transport ourselves to the world of 2020 and imagine a future best case scenario for Air Force operations in the Arctic by considering how the three key factors may have collided in order to produce this alternative future.

Climate. In 2020, global warming continues to be a highly debated topic. Most scientists now believe that climate changes are occurring unevenly around the globe. While the western shores of North America are warmer and drier than 20 years ago, its eastern shores are colder

and much wetter. In fact, the Eastern Canada winters of 2017 and 2018 have both produced the largest snowfall seasons ever recorded. Many renowned academics are now theorizing that years of global warming have introduced a large amount of fresh water to the North Atlantic, which has disrupted the thermohaline circulation[8] of the North Atlantic Drift, also known as the Ocean Conveyor. In 2019, Britain recorded the coldest month of June since 1652. Consequently, many are now forecasting the return to a mini ice-age.[9]

And so, after several years of warming trends, Canada's Arctic mean temperature has stabilized and has actually started to cool down drastically since the record highs of 2012. The Northwest Passage never really became a practical maritime transport route due to the constant presence of icebergs and unpredictable ice flows. In fact, most commercial companies have preferred the relatively safer waters of Russia's Northern Sea Route.[10]

Governance. In this scenario, most surveillance of the Arctic is accomplished by space and near-space assets. Aside from routine fishery patrols and the occasional sovereignty patrols, the Air Force has little requirement to deploy in the Arctic. This is fortunate because the Air Force is facing serious budgetary constraints and had to significantly reduce the yearly flying rate (YFR) of several aircraft fleet. Although the government cancelled its plans to develop the port of Nanisivik in 2013, there are still requirements for the Air Force to support the logistical resupply of Canadian Forces Station (CFS) Alert and the newly opened Canadian Forces Arctic Training Centre (CFATC) at Resolute Bay.

Due to the resurgence of particularly harsh winters, the Northwest Passage has been essentially impracticable since 2016. Consequently, there have been very few challenges to our sovereignty, although there have been rumours of undersea patrols by American, Russian, and Chinese nuclear submarines and unmanned underwater vehicles (UUVs).

But in the end, the Government of Canada has had few reasons to deploy its Air Force north. Cooperation by Arctic states has increased significantly in recent years as states realized that there was much more to gain by cooperating instead of competing when it came time to filing their respective UNCLOS claims.[11]

Lastly, the region as a whole has declined as a priority for the last few federal governments and has gone back to being almost ignored by an Ottawa that has been preoccupied by more urgent matters. The Great Recession of 2008 has left the federal finances in dire states. In this scenario, pressed to balance budgets, the government has invested little to improve the Canadian Forces and Air Force capabilities to operate in the North. To save money, the government has progressively come to rely on space assets as well as long endurance, near-space unmanned systems for surveillance of the Arctic instead of boots on the ground and new aircraft.

Resources. Although the price of commodities has steadily increased since the end of the Great Recession, the costs to extract those resources in the Arctic have continued to make them economically unviable. Aside from diamond, gold, and uranium mines (all located near Yellowknife), there has been little commercial appetite to explore and open new mines much farther away. Despite desperate attempts by provincial, territorial, and municipal governments to promote the region for business, the return of extremely harsh weather conditions has hampered any potential development. Even oil, which recently touched $200 per barrel, is still considered too cheap to warrant the staggering costs and environmental difficulties of extracting it from the Arctic.

Summary. And so, the Arctic remains frozen in some sort of economic hinterland. The Northwest Passage does not become a practical transport route and very few challenges to Canadian sovereignty have occurred. Most Arctic intelligence, surveillance and reconnaissance (ISR) is accomplished by space and near-space assets. And while interest in Northern commodities such as oil and gas are still prevalent, the costs to extract them from a frozen Arctic have made extraction economically unfeasible. Good governance and cooperation prevail, and accordingly, the government has few reasons to deploy the Air Force in the North. This is a good

thing because in this scenario, due to budget constraints, the Air Force has limited means to operate in the high north.

But what if the key factors had arranged themselves in such a way that the Air Force was required to constantly deploy in the North? Let us now turn our attention to this worst case scenario.

Worst Case Scenario – Arctic Gold Rush

General. The worst case scenario from an Air Force point of view is one in which the Air Force is ill prepared to operate in the Arctic. In this alternative future, global warming is making the region more accessible, and a plethora of human activities, including tourism, mining, and criminal activities, put enormous strain on the infrastructure and the governance of the region. Furthermore, Arctic states are not cooperating, and various overlapping claims are creating tensions in this gold rush to extract Arctic resources. Let us again imagine the world of 2020 and how the three key factors may have collided in order to produce this alternative future.

Climate. In 2020, the continuous melting of sea ice that started several decades ago is not showing any signs of reversal. In fact, in September 2019, the extent of the summer Arctic ice cap was at a near-record low, only 6 per cent greater than the record low of 2017, and 47.6 per cent below the average extent of sea ice from 1980 to 2000. As a consequence of melting Greenland and Arctic glaciers, sea levels around the globe have risen by an average of 3.5 centimetres in the last 15 years, significantly affecting weather patterns in unprecedented ways. The most active hurricane season ever recorded was in 2018, with 32 tropical cyclones formed, of which a record 19 became hurricanes (including the massive category 1 Hurricanes *Erika* and *Michael* that both devastated the Yucatan Peninsula only three months apart).

Governance. In this scenario, there is minimum (if any) cooperation amongst the Arctic nations and many territorial disputes[12] are taxing the International Court. In 2016, Russia ceased to participate in Arctic Council[13] affairs to protest against North Atlantic Treaty Organization (NATO) threats of retaliation after the Svalbard[14] Crisis earlier that year. In fact, military analysts are now referring to the current crisis between Russia and the West as Cold War II. North American Aerospace Defence Command (NORAD) assets (and especially Canadian assets) are constantly being tested by Russian manned and unmanned vehicles. As well, numerous Russian submarines and nuclear powered icebreakers have been violating Canadian and American territorial waters. In 2017, a Canadian Arctic surveillance unmanned vehicle took pictures of an artificial iceberg just north of Inuvik with what appeared to be an encampment of Russian scientists. In the time it took NORAD to despatch several aircraft to investigate, the mysterious iceberg and its occupants had vanished.

> **Planting flags.** Are these early signs of confrontation? In 2002, Denmark erected its flag on Hans Island. In 2005, Canada did the same on the disputed island. More recently, in 2007, Russia planted its flag at the bottom of the Arctic Ocean, a move that angered many nations.

Virtually ice-free since the summer of 2016, the Northwest Passage is fast becoming a preferred shipping route between Asia and Europe. Even though the Canadian government has declared the Northwest Passage part of our territorial waters, with very little capability to enforce our sovereignty, it is not uncommon to find American, Asian, and European vessels operating within the Canadian Arctic Archipelago. The worst case scenario from an Air Force point of view is one in which the Air Force is ill prepared to operate in the Arctic, and this became quite clear when a Polish tanker hit a small iceberg in the summer of 2016 and spilled millions of litres of crude oil into Baffin Bay. Most of the oil spill washed out onto the western shores of Greenland, and Ottawa was severely criticized by the international press (and especially by Danish politicians) for its inability to respond to the emergency. In 2018, a German tourist died as a result of an accident near Cambridge Bay on board a small cruise ship. Again, the government was embarrassed as search and rescue (SAR) assets took well over 30 hours to respond to the emergency.[15]

Arctic tourism on the rise. In November 2007 a small (Canadian owned) cruise ship hit a chunk of ice and sunk off the coast of Antarctica. All passengers and crew were rescued by a nearby ship, but what if this had happened in our high Arctic? Would we have been able to respond in time?

The Russian mafia is also widely rumoured to be trafficking Canadian diamonds using mini-unmanned submarines and aircraft. Organized crime may also be involved in the illegal traffic of oil by tapping into pipelines on-shore and off-shore in the Beaufort Sea. In 2015, the American government formally called on the Canadian government to do more to stop the flow of illegal immigrants and Russian criminals into Alaska, but again, with very limited means, there were few options available to a cash-strapped government.[16]

Resources. Warmer climates are highly favourable to human activity, and by 2020 the Arctic is booming with activities ranging from exploration and tourism to fishing and mining. Accelerated by the impact of global warming and unprecedented high commodity prices, we are witnessing a "no-holds-barred" rush among nations for oil, fish, diamonds, and access to shipping routes.[17] As peak oil[18] occurred earlier than expected, in 2012, oil companies are now furiously engaged in active competition to secure rights to lucrative petroleum and natural gas reserves below the sea floor. Unfortunately, in their rush to extract the oil, many have shown a complete disregard for Canadian laws and environmental concerns. Due to its limited capabilities, Canada has been unable to enforce meaningful sanctions. Many fish stocks are also showing grave signs of stress due to overfishing and resource mismanagement. By 2016, stocks of Arctic char have been depleted so much that it is doubtful that the species will be able to support commercial fishing activities again.

In this scenario, UNCLOS has reached an impasse as almost every single Arctic nation filed overlapping and conflicting claims. Note that claims in the Arctic already overlap and many countries have yet to establish their official position on claimed areas. Furthermore, Canada, Denmark, and Russia have all used the outer edge of ice formations in drawing their Arctic baselines. As ice recedes, revealing new coastal geography, questions over the legitimacy of existing baselines will add further complexity to claims over seaward jurisdiction.[19]

By 2020, most nations have filed appeals with the International Court and it will be many years before any rulings are expected. Meanwhile, the Russian Navy and the US Navy have deployed large naval task forces in the contested zone in the Beaufort Sea near the Lomonosov Ridge[20] even though the contested zone straddles mostly into Canadian waters.

Summary. In the worst case scenario, the Air Force is ill prepared for northern operations while the Arctic becomes an area of increased activities. Increased global warming leads to increased human activities ranging from mineral and oil exploration to fishing and tourism as well as illegal activities. In this scenario, the Canadian government has limited capabilities to enforce its sovereignty and environmental laws. There is little, if any, cooperation between Arctic nations and there are increased tensions between Russia and the West over Arctic claims.

Take Away – Air Force Operations in the Arctic

And so, our voyage into the future alternative worlds of 2020 is nearing its end. While these two scenarios are purely fictional, they are based on the current trends and scientific evidence. While the scenarios were taken to the far end of the Plausible, they were developed as a think piece in order to assist military planners. Below is a list of "take aways" that are derived from studying both scenarios.

Climate change. On the one hand, climate change will dictate Air Force involvement in the Arctic, as a warmer climate will translate into increased activities in the North. On the other hand, a harsher climate may reduce human activities, but it will increase the difficulties to operate in that region should the Air Force be required to deploy into the Arctic.

Arctic surveillance. Upwards of 50 per cent of the world's undiscovered resources are estimated to lie in the Arctic. Should the Arctic experience an economic boom as a result of resource exploration and extraction, then governance, policing, and surveillance will be challenging given the sheer size of the region. As costly as this task will be, it will remain essential for the Air Force to consider the best possible options from high altitude airships (HAA), to tethered aerostats, unmanned vehicles, and satellites. Note that, should a threat be detected, securing our remote Arctic border will be a monumental task.

SAR requirement. The Air Force will need to develop a more agile and robust response to SAR incidents in the Arctic. At the moment, SAR response time and capabilities in northern regions remain problematic. Clearly, increased permanent presence, tourism and economic activities in the Arctic as well as expanding trans-polar air routes will ultimately require greater SAR resources in the North and greater Arctic-hardened air mobility support. A permanent SAR capability may even become a future requirement.

Increased requirement for Arctic operations. The government's proposed CFATC in Resolute Bay is expected to house approximately 100 full-time personnel. It is logical to assume that the level of Air Force effort to sustain and support the new CFATC will be more or less on par with that of CFS Alert.[21] Likewise, the deepwater seaport at Nanisivik will require some level of airlift to sustain operations at the new base, albeit at a lesser level.

Potential for conflicts. Mineral extraction and shipping will likely be a source of tension and dispute in the future. New shipping routes may also reshape the global transport system. While these developments offer opportunities for growth, they are also potential sources of competition and conflict for access and natural resources. Currently, the CF has few capabilities to project hard power in our High Arctic. For the Air Force and the Navy, and to a lesser degree the Army, the High Arctic may become a permanent theatre of deployment located at strategic range.

Notes

1. Marcus Aurelius Antonius (Roman Emperor A.D. 161–180), *Meditations* (written in 200 A.D), http://www.quotationspage.com/subjects/the+future/ (accessed February 17, 2011).

2. A trend is a tendency or movement towards something or in a particular direction.

3. A wild card (sometimes also called a black swan) event is a high impact, low probability event that would have dramatic consequences if it actually occurred. Wild cards are rare events, beyond the realm of normal expectations, which makes them almost impossible to predict. 9-11 (using commercial aircraft as missiles) is often cited as being a wild card event because of the impact it had on all our lives.

4. Key factors are thought to be the most important contributing features of a future security trend. The key factors are used to create the scenarios. They are made to have either extremely positive or negative effects (while remaining plausible), which create a best (utopian) and a worst case (dystopian) scenario—the alternative futures.

5. Note that the best and worst case scenarios presented in this paper are from the perspective of future Air Force involvement in the Arctic and not, necessarily, from the point of view of the local population, the environment, world politics, etc.

6. The United Nations Convention on the Law of the Sea is an international agreement that defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The Convention, which came into force in 1994, has important ramifications for Arctic states. It allows those states to claim the right to harvest mineral and non-living material in the subsoil of its continental shelf beyond the current 200 nautical miles economic zone. Note that once ratified, states have 10 years to file their claims for access and jurisdiction based on geological and other evidence.

7. More than two-thirds of the world's large cities are in areas vulnerable to global warming and rising sea levels, and millions of people are at risk of being affected by flooding and intense storms, according to a recent study published in the journal *Environment and Urbanization*. In all, 634 million

people live in the threatened coastal areas worldwide. See "Cities at risk from rising sea levels, scientists say," CBC News, http://www.cbc.ca/technology/story/2007/03/28/tech-flood.html (accessed February 17, 2011).

8. The term thermohaline circulation refers to the part of the large-scale ocean circulation that is driven by global density gradients created by surface heat and freshwater fluxes. The adjective thermohaline derives from *thermo* referring to temperature and *haline* referring to salt content, factors which together determine the density of sea water.

9. This is in reference to the climatological era known as the "Little Ice Age," a period that began about 1350, in which average wintertime temperatures abruptly turned cooler in the North Atlantic region and persisted that way for roughly 500 years.

10. Estimates indicate that the Arctic routes could reduce transportation costs by an average of 40 per cent on key Asian-European routes and cut distances by two-thirds. The simple use of economic data indicates that such reductions imply that Arctic open water could attract up to 80 per cent of the global transportation market.

11. The US has yet to ratify this agreement.

12. Canada is currently disputing sovereignty over Hans Island with Denmark, the ownership of the undersea Lomonosov Ridge with Russia and Denmark, as well as the location of its maritime boundary in the Beaufort Sea with the US, and the status of the Northwest Passage with the international community. These disputes will not be easily resolved and are expected to continue over the next decade. See also note 17.

13. The Arctic Council is an intergovernmental forum for Arctic governments and people. The member states are: Canada, Denmark, Finland, Iceland, Norway, Sweden, Russia, and the US.

14. The Spitsbergen Treaty (which came into force in 1925) recognizes the full and absolute sovereignty of Norway over the Arctic archipelago of Spitsbergen (now called Svalbard). There has been a long-running dispute, primarily between Norway and the Soviet Union (and now Russia) over fishing rights in the region. Note that Norway also claims that the archipelago is a part of mainland Norway's continental shelf, a position that Russia is also disputing.

15. SAR in the Arctic is a grave concern for the Air Force as the region is lacking even the most basic infrastructure of road networks, airfields, staging/supply bases, or medical facilities. The potential for SAR in the High Arctic is far more likely now and in the future than at any time in the past. Because a sparse population creates a statistically low risk, it would be inefficient to locate SAR assets in the Arctic. It should be noted, however, that more than 100,000 people fly over the Canadian Arctic each day on high-latitude routes to Europe and Asia. In case of a major air disaster, it would take at least six hours for a Hercules aircraft based in southern Canada to reach the Arctic, and much longer for helicopters (even if they were shipped by C17, as some reassembly would be required).

16. The former US ambassador to Canada, Paul Celluci, has warned that terrorists might use an ice-free Northwest Passage to traffic in weapons of mass destruction. See Michael Byers, "Wanted: Mid-sized Icebreakers, Long-range Choppers, Perspective," *Globe and Mail*, 12 June 2009.

17. Unexploited resources in the Arctic account for about 22 per cent of the undiscovered, technically recoverable resources in the world. It accounts for about 13 per cent of the undiscovered oil, 30 per cent of the undiscovered natural gas, and 20 per cent of the undiscovered natural gas liquids in the world. About 84 per cent of the estimated resources are expected to occur offshore. Continued warming of the Arctic implies that the accessibility and profitability of these resources will increase significantly. See US Department of the Interior, "90 Billion Barrels of Oil and 1,670 Trillion Cubic Feet of Natural Gas Assessed in the Arctic," (United States Geological Survey, July 23, 2008), http://www.usgs.gov/newsroom/article.asp?ID=1980 (accessed February 17, 2011).

18. "Peak oil" refers to the point in time when oil production has peaked and only half of proven reserves remain. The significance in this lies in the fact that the remaining known quantity is finite and the laws of supply and demand indicate greater demands for dwindling supplies, which ultimately translates into higher prices. The date when the world reaches global peak oil production cannot be pegged exactly. The projected dates vary between the most pessimistic in 2010 and the most optimistic in 2035.

19. United Kingdom, Ministry of Defence, *The DCDC Global Strategic Trends Programme 2007–2036,* (Development, Concepts and Doctrine Centre, December 2006), 51, http://www.cuttingthroughthematrix.ca/articles/strat_trends_23jan07.pdf (accessed February 17, 2011).

20. The Lomonosov Ridge is an unusual underwater ridge of continental crust in the Arctic Ocean. It spans 1,800 km from the New Siberian Islands over the central part of the ocean to Ellesmere Island of the Canadian Arctic islands. As part of their respective UNCLOS submissions, Russia claims that the Lomonosov Ridge is an extension of the Eurasian continent. Canada asserts that the ridge is an extension of its continental shelf. Danish scientists also hope to prove that the ridge is an extension of Greenland, which would make Denmark another claimant to the area.

21. CFS Alert is the most northern permanently inhabited settlement in the world. It is situated on the northeastern tip of Ellesmere Island in the Canadian Arctic Archipelago. In 2008, CFS Alert housed approximately 70 full-time personnel. Twice a year, the station receives major replenishments. Operation BOXTOP is the name given to the biannual resupply of CFS Alert. Using USAF Base Thule in Greenland as a staging point, for two to three weeks every spring and fall, the Air Force operates day and night to fly fuel and supplies to the station. In the past several years, a typical BOXTOP operation moved over 950,000 pounds of freight and more than 305,000 imperial gallons of fuel into CFS Alert. To accomplish this level of activity, four CC130s, one CC150, and one CC177 aircraft flew in total more than 500 hours and moved more than 130 chalks of freight. In addition, CC130 aircraft regularly fly into and out of CFS Alert (approximately every week) to transport perishable supplies. These flights originate from 8 Wing Trenton, and they contain food, medical supplies, and CF personnel rotating through CFS Alert.

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List of Abbreviations

°	degrees
A/V/M	air vice-marshal
acc	accession
ACRSA	Association civile de recherche et de sauvetage aériens
AFHQ	Air Force Headquarters
AITA	Air Industries and Transport Association
ANS	Air Navigation School
AOP	Air Observation Post
ATB	Air Transport Board
ATC	Air Transport Command
BSP	Basic Security Plan
C	Celsius
CAF	Canadian Air Force
Capt	captain
CAS	Chief of the Air Staff
CASARA	Civil Air Search and Rescue Association
CDC	Cabinet Defence Committee
CF	Canadian Forces
CFATC	Canadian Forces Arctic Training Centre
CFB	Canadian Forces Base
CFDS	*Canada First* Defence Strategy
CFS	Canadian Forces Station
CGS	Canadian Coast Guard Ship
CJATC	Canadian Joint Air Training Centre
cm	centimetre(s)
CNT	Celestial Navigation Trainer
CO	commanding officer
Col	colonel
CPA	Canadian Pacific Airlines
DEW	Distant Early Warning
DMR	Department of Mines and Resources
DNANR	Department of Northern Affairs and National Resources
DND	Department of National Defence
DOE	Department of Energy
DoT	Department of Transport
EANS	Empire Air Navigation School
EST	Eastern Standard Time
F	Fahrenheit
F/L	flight lieutenant
F/O	flying officer
FEC	Federal Electric Company
G	Grid
G/C	group captain
HBC	Hudson's Bay Company
JAS	Joint Air School

kg	kilogram(s)
km	kilometre(s)
km^2	square kilometres
km/h	kilometres per hour
L/AWC	Land/Air Warfare Committee
LAPES	low altitude parachute extraction system
LF	low frequency
LGen	lieutenant-general
LORAN	long-range aid to navigation
Ltd.	Limited
m	metre(s)
MB	Manitoba
MCA	Maritime Central Airways
MCC	Military Cooperation Committee
mph	miles per hour
MRAF	Marshal of the Royal Air Force
MRS	microwave ranging system
MSF	Mobile Striking Force
MST	Mountain Standard Time
MT	metric ton
N	north
NAST	Nuclear Accident Support Team
NATO	North Atlantic Treaty Organization
NCRC	Northern Co-ordination and Research Centre
NEST	Nuclear Energy Search Team
no	number
NORAD	North American Aerospace Defence Command
NRC	National Research Council
NT	Northwest Territories
NWAC	North West Air Command
NWT	Northwest Territories
OC	officer commanding
ON	Ontario
Op	Operation
PCO	Privy Council Office
PM	Prime Minister
PMO	Prime Minister's Office
PPCLI	Princess Patricia's Canadian Light Infantry
QCA	Queen Charlotte Airlines
QIA	Qikiqtani Inuit Association
RAF	Royal Air Force
RCAF	Royal Canadian Air Force
RCC	rescue coordination centre
RCMP	Royal Canadian Mounted Police
RCN	Royal Canadian Navy
RCNAS	Royal Canadian Naval Air Service
RFC	Royal Flying Corps
RTW	residual transport wander

S/L	squadron leader
SAC	Strategic Air Command
SAR	search and rescue
SAR Tech	search and rescue technician
Sgt	sergeant
SHORAN	shore-based aid to navigation; short range radio navigation system
Spec N	Specialist Navigation
T	True
TAC	Tactical Air Command
UBC	University of British Columbia
UK	United Kingdom
UN	United Nations
UNCLOS	United Nations Convention on the Laws of the Sea
US	United States
USAAF	United States Army Air Force
USAF	United States Air Force
W Comd	wing commander
W	west
W/C	wing commander
WEC	Western Electric Company
WO2	warrant officer second class
WWA	World-Wide Airways
WWII	Second World War