



Niobe Papers

The RCN in the Arctic: A Brief History

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In 2005 Rob Huebert, a political scientist at the University of Calgary, proclaimed a “renaissance in Arctic security.”ⁱ After a decade of inactivity, the Canadian Armed Forces (CAF) had begun to reassert itself in the Far North, deploying warships and ground forces into parts of the Arctic Archipelago which had not seen a grey hull since Brian Mulroney was Prime Minister. This ‘renaissance’ was part of a pattern for the military in the North. Since the Second World War, Canada’s presence in its Arctic waters has been driven by a boom-and-bust mentality, with surges into the region during times of perceived military or political danger, followed by lengthy absences as those threats receded.ⁱⁱ In each instance the Navy fought to acquire the specialized skills needed to work in the icy waters of the North, only to lose them, and acquire them again during the next generation of northern operations.

The Royal Canadian Navy’s (RCN) history in the Arctic is therefore a story of discontinuous learning and experimentation, rediscovering many of the same problems time and time again. In the 21st century, the RCN has taken on new tasks with new equipment, yet it faces many of the same vexing logistical and environmental problems as in decades past. As it works to build real capability in one of the world’s most dangerous maritime environments, with new ships and a long-term vision, the RCN is looking to overcome that boom-bust pattern and stake a more permanent role in the Canadian Arctic.

Learning to Operate in Ice: The 1940s and 1950s

In the aftermath of the Second World War, Canada was left with a large and capable navy, though one notably lacking in ice-strengthened ships. That deficiency was a concern because the recent war had shown the value of the Arctic to continental defence while the early Cold War years witnessed a continued American interest in the northern waters. In 1946 Canadians watched as *Operation Frostbite* took the American carrier USS *Midway* and her escorts into the Davis Strait. That same year, in *Operation Nanook*, American vessels travelled as far north as Viscount Melville and Lancaster Sound.ⁱⁱⁱ While hardly a security threat, the American presence worried Canadian policymakers, many of whom were still uncertain of Canada’s sovereignty in the region and its ability to regulate American activities in those waters.⁴

These political sensitivities, coupled with a recognition of the North’s emerging strategic value, led to the first Canadian naval deployments to the region. In 1948 the carrier HMCS *Magnificent* was joined by the *Tribal*-class destroyers HMCS *Nookta* and *Haida* for a sail into Hudson Strait in September 1948. *Magnificent* had been ‘arcticized,’ though this only meant that the ship’s working and living quarters were prepared for low temperatures. This passage marked

the first time any RCN warship had entered Canadian Arctic waters. There was not much of military significance to be done in the region and the mission's stated objectives were very general: to familiarize the RCN with the area while conducting scientific and hydrographic studies. The doctor on *Magnificent* took the opportunity to treat the sick at local settlements and her engineer repaired a missionary's radio antenna.⁵ Soon afterwards the carrier sailed for home, leaving the destroyer escorts to proceed to Churchill, making them the first RCN ships to enter Hudson Bay. While a successful expedition, none of these ships could conduct serious operations in the High Arctic.

A more permanent presence was a necessity. Defence construction in the Arctic Islands was increasing. The Joint Arctic Weather Stations (JAWS) and long-range navigation facilities (LORAN) were established in the late 1940s and, by the early 1950s, plans were in the works for the massive Distant Early Warning (DEW) Line. To support the construction and maintenance of these facilities, and to be sure that the government of Canada maintained a presence in a region with an increasing American presence, the government committed to the Navy's first purpose-built Arctic vessel, HMCS *Labrador*.

HMCS *Labrador*, an upgraded *Wind*-class icebreaker, was the Navy's second largest ship at 6,790 tons and capable of 10,000 horsepower. It was a notable departure for a fleet that had dedicated itself to hunting Soviet submarines in defence of the Atlantic convoy lanes.⁶ It was a cutting-edge design and when the ship began its duties in 1954 it quickly proved itself to be a versatile and capable platform. As the RCN's only vessel in the region it had a wide array of official duties, from assisting in DEW Line construction to scientific missions, search and rescue, and salvage services.⁷

As the major Canadian presence in the northern waters, *Labrador* had a strong symbolic importance. Just as importantly, the ship provided invaluable service to continental defence efforts, while ensuring that jobs like the DEW Line sealifts, hydrographic surveys, and escort duties were not undertaken entirely by the US Coast Guard and Navy. The significance of *Labrador*'s maiden voyage is well stated in the ship's unofficial history:

It marked the first incursion of a Canadian naval vessel into waters which the US Navy and Coast Guard might well be excused for considering *mare nostrum*. For a good many years, particularly since the establishment of the Joint US-Canadian weather stations in 1947, the only ships seen in the waters of the Canadian Arctic Archipelago, apart from a few government supply ships, were those flying the Stars and Stripes. In 1954 for the first time Canada had a ship patrolling her northern waters.⁸

Despite *Labrador*'s importance, the ship never quite fit into the RCN's blue-water, Atlantic orientation and its time in the RCN was short lived. In October 1956, the Canadian Naval Staff accepted arguments put forward by Captain William Landymore and others that the Navy did not need an icebreaking capability and recommended a departmental transfer. In the summer of 1957, the Department of Transport offered to take over operations and in 1958 *Labrador* was transferred to the Canadian Coast Guard.⁹

This move met with some objections within the RCN. Captain T.C. Pullen criticized it harshly, cursing "those devils at HQ. Bill Landymore has had his way. VCNS, Radm. Lay too. Blast their eyes." According to Pullen, *Labrador*'s place in the Navy made sense. He believed that a military vessel made a more convincing symbol and demonstration of sovereignty than a Coast Guard ship. The icebreaker also offered the RCN a unique suite of capabilities that it could not

easily replace and its withdrawal meant that the Navy would lose “the ability to expand on its hard-won wealth of northern knowledge and operating experience.”¹⁰

The Late Cold War: From Trudeau to Mulroney

Pullen was correct in his assessment. With the loss of *Labrador* the Navy exited the Arctic and abandoned much of the corporate knowledge built up in the 1950s. For the RCN, that was a small price to pay to focus on its more important Atlantic duties. And, in the years that followed, the focus seemed to be justified. In many ways the 1960s represented a lull in Arctic security concerns. During that time, inter-continental ballistic missiles (ICBMs) replaced bombers as the main threat to North America, rendering the DEW Line less essential. Meanwhile, the Soviet Navy remained a small coastal defence force, hardly a threat to the Canadian Arctic.

This strategic calculation started to change in the early 1970s as new maritime threats emerged. In 1972 the Soviet Navy was deploying the new SS-N-8 missile. With a range of 7,800 kilometres, it was able to strike North America from firing positions in the Arctic.¹¹ In 1975, the development of the SS-N-8 model two, with a range of 9,100 km, meant the new *Delta*-class submarines could strike the entire United States from as far away as the North Pole. These new missiles also made the Arctic an ideal launch position and, in some cases, the only one from which Soviet submarines could attack both European and North American targets.¹² There is also evidence that the Soviet Navy was beginning to use the Arctic as a regular transit route, permitting Soviet nuclear-powered attack and ballistic missile submarines (SSNs and SSBNs) to avoid the heavily monitored and defended Greenland-Iceland-UK (GIUK) gap en route to patrol stations in the Atlantic. In the mid-1970s this shift seems to have been confirmed by NATO listening posts in the gap as detections dropped sharply.¹³ In 1972, Waldo K. Lyon, the senior under-ice submarine expert in the United States, noticed that this growing Soviet threat had prompted a reaction from the Canadian government and that Ottawa was starting to take northern defence seriously once more.¹⁴

At roughly the same time, the Arctic waters regained their political importance. The voyage of the US icebreaking tanker SS *Manhattan* through the Northwest Passage in 1969 rekindled the Canada-US dispute over the legal status of the Arctic waters, leading to a renewed push to assert Canadian control over the region’s maritime space.¹⁵ The Department of National Defence’s 1971 White Paper (*Defence in the 70s*) placed a new focus on the North and gave the military a new mission, to counter the ‘threat’ to Canadian independence and sovereignty from environmental degradation and foreign economic and maritime activity.¹⁶ The result was a rapid and substantial increase in the RCN’s deployments – as part of a CAF-wide reorientation to the North.

In response, the Navy launched its new annual (or sometimes semi-annual) series of northern deployment (NORPLOYs) in 1970. Warships and supply vessels were sent north on 10 NORPLOYs between 1970 and 1989, as well as three separate surveillance and resupply operations into the Canadian Arctic.¹⁷ The mission objectives varied from year to year, but were generally listed in planning documents as demonstrating military presence in support of sovereignty, performing resupply or scientific duties in the region, and gaining experience in Arctic operations.¹⁸ In 1970, for instance, the Navy deployed a task force consisting of HMCS *Protecteur*, *Skeena*, *Annapolis*, and *Okanagan* which carried out port visits in the Hudson Bay and Strait area as far south as Churchill. The stated objective of the operation, according to Rear-

Admiral H.A. Porter, Commander Maritime Command, was to allow sailors and airmen to gain experience in northern operations and provide a “tangible presence” in the Canadian North.¹⁹

Apart from the political dividends paid from this renewed presence, there were obvious benefits to Canadian security – though those remained harder to see, buried as they were beneath the ice. In response to the new (or anticipated) Soviet ability to operate in the North American Arctic, the Canadian government spent the 1970s and 1980s working to establish an under-ice listening system in the channels of the Arctic Archipelago.²⁰ The first prototype listening devices were deployed by the Defence Research Establishment – Pacific (DREP) in 1969. This test ‘barrier’ of sono-buoys (donated by the United States) was laid in Viscount Melville Sound and M’Clure Strait to determine how effective buoys would be in the icepack and whether they might be useful as an interim detection system.²¹

The Navy’s sovereignty operations in the North were a convenient vehicle to support these tests and the RCN worked hand-in-hand with the Defence Research Establishment over the course of the 1970s and 1980s to develop a functioning detection system. By the mid-1970s this research program was gaining momentum. The experiments undertaken over the previous few years had resulted in much useful data and in 1974 and 1975 Canadian replenishment ships (AORs) traveled to Barrow Strait and Jones Sound to begin laying the sound surveillance (SOSUS) nets.²² By the early 1980s the defence scientists had likely developed a somewhat functional prototype as a US report authored by Waldo Lyon cited a Canadian detection capability involving acoustic and magnetic sensors in chokepoints “which have been tested against U.S. submarines many times.”²³

The NORPLOY exercises also served to rebuild the fleet’s lost Arctic skillset. Many of the difficulties of operating in the North were the same as they had been in the 1950s. Logistics were stretched, communication was difficult, and ice clogged vital channels. New problems naturally arose as the RCN sent thin-skinned destroyers and supply ships where *Labrador* had once travelled with relative ease. The destroyers and frigates were also hindered by their limited range and sustainment capabilities, requiring the assistance of supply ships or Coast Guard icebreakers to maintain them so far from naval infrastructure.

Twenty years of regular Arctic deployments came to an end in 1989 with the collapse of the Soviet empire (and the 1991 collapse of the Soviet Union itself). The removal of the Soviet military threat seemed to have eliminated the strategic threat to (or through) the Canadian Arctic while the Mulroney government’s negotiation of the Canada-US Arctic Cooperation Agreement in 1988 appeared to have removed the danger of an American challenge to Arctic sovereignty.²⁴ The experimental detection systems laid down in the late Cold War were abandoned in the early 1990s and the NORPLOYs ceased.

As had been the case in the 1960s, the lack of an obvious strategic or political threat to Canada in or from the Arctic led the government and Navy to abandon these expensive and difficult operations in the 1990s. The government wanted a peace dividend in the wake of the Cold War and cutting northern expeditions fit the bill. As had been the case in the past, however, new strategic and political concerns soon shifted the government’s gaze back North.

The Navy in the 21st Century

In the early 21st century, the RCN’s return to the Arctic was prompted in part by climate change. In the 2000s, the rapid and visible decline in sea ice led to ambitious expectations of open sea routes while sky-high resource prices and shipping day-rates, sustained by China’s phenomenal

economic growth, seemed to make a renewal of northern development inevitable. Appearing in lockstep were new calls for Canada to defend its sovereignty from the challenges expected to arise from this increased shipping and human activity.²⁵ In the face of these calls, the government had very little with which to respond. In 2000, the Department of National Defence (DND) conducted a broad survey of its Arctic capabilities. This *Arctic Capabilities Study* (ACS) concluded that the CAF's capacity to monitor and respond to threats in the North had decreased to the point of virtual non-existence.²⁶

As had been the case in the 1970s, this mixture of perceived political and strategic threats led to a renewed requirement for navy Arctic operations. In the summer of 2002, the answer was *Operation Narwhal*. As part of this exercise, HMCS *Goose Bay* and *Summerside* sailed into the Canadian Arctic for the first northern deployment since 1989. The mission objectives were modest, including limited training with the Canadian Rangers and port visits during a time of year when ice conditions were relatively favourable. Despite the cautious approach, a host of technical and operational difficulties quickly became apparent, revealing just how limited the Navy's capabilities North of 60° really were. While unsettling, these limitations came as no surprise, Canadian warships were not designed for Arctic operations and whatever skills and knowledge had been acquired in decades past had dissipated.

Narwhal was always intended to be the first of many northern deployments and the series continued two years later with *Narwhal* (2004), which was expanded to include roughly 500 military personnel, Griffon helicopters, the frigate HMCS *Montreal*, and the icebreaker CCGS *Henry Larson*. *Operation Hudson Sentinel* followed in 2005 and then *Operation Lancaster* in 2006. Each time, the exercises grew in size and complexity, involving more equipment, more ambitious objectives, and closer engagement with other government departments. Skills grew and lessons were learned from these modern Arctic voyages, though many of the problems faced by commanders were unchanged from earlier generations.

In 2002, even in the relatively benign waters of the Labrador Sea, HMCS *Goose Bay* and *Summerside* encountered some of the same problems that had vexed commanders since Arctic operations began in earnest in the 1940s. Some of the most obvious issues were logistics and communications. Interoperability and basic safety demanded that ships, shore parties, and air support maintain reliable communications but procedural and technical problems intervened and this proved a struggle.²⁷ Air support was 50% less than planned due to poor weather and mechanical difficulties, logistical issues prevented the smooth movement of goods from the South, and mechanical problems proved difficult to manage so far from naval supply lines.²⁸ Compounding these issues, the *Kingston*-class vessels were clearly unsuited for Arctic operations and were ordered to avoid heavy weather areas to mitigate the dangers of Arctic navigation.²⁹

In 2004, communications problems continued and, at one point, the region's topography forced HMCS *Montreal* to move its anchorage after the high horizon blocked vital satellite connections.³⁰ Navigation was also a nervous affair aboard the warship and a sharp eye had to be kept for the 'growlers' and 'bergy bits' (small and hard chunks of ice). *Montreal's* greatest concern, however, was fuel. Thousands of kilometres from the nearest Canadian port, the ship's options were limited. It was unable to get alongside at Iqaluit, as planned, and had to fill its bunkers from the CCGS *Henry Larsen*. Fueling by tanker, while done regularly by the Navy, can be dangerous in the Arctic, where fast moving ice sometimes requires a ship to take evasive action.

In 2005, the RCN also returned to northern fisheries patrols with a voyage by HMCS *Fredericton* into Davis Strait. The voyage prompted one Canadian fisherman to note that he had not seen an inspector there in over ten years. In his account of the operation, Lieutenant

Commander Ian Anderson wrote that news of *Fredericton's* presence spread rapidly and the command crew received the distinct impression that it was a welcome addition to the area.³¹

The objective of these missions was, in part, to see and be seen – to assert Canadian sovereignty through the Navy's presence while regaining the operational competency to exercise a more effective level of control over an area expected to become busier and more important as time went on. On the surface, it was a simple objective. In practice, delivering that control, was far more complex. The *Arctic Capability Study* of 2000 was followed by several CAF and DND strategies and operational policies, all of which anticipated that future Arctic security concerns would be unconventional in nature.³² Rather than state-based military threats, Canadian concerns revolved around search and rescue, environmental preservation, trespassing, and criminal activity. Because the CAF did not have a direct mandate for most unconventional security issues, it was placed in a supporting role to other government departments with the relevant mandates.³³

The military's response to this role was the *Nanook* series, begun in 2007 and still ongoing 13 years later. *Nanook* is the government's annual joint and combined Arctic operation focused on building the whole-of-government cooperation needed to respond effectively to modern Arctic safety and security threats. Over more than a decade the RCN has worked with agencies and departments to practice its response to oil spills, grounded cruise ships, poaching, and all manner of different unconventional threats.

Despite real progress, the RCN's ability to support these operations remains limited. Canada's Arctic waters are poorly charted, restricting the movement of larger vessels like frigates to the short summer season and the relatively open eastern Arctic. During *Operation Nanook 08* the after-action report noted that even in areas as well travelled as Frobisher Bay, navigational charts required more soundings. Rather than a frigate, it was recommended that the Navy employ a *Kingston*-class Maritime Coastal Defence Vessel (MCDV) with an echo sounder.³⁴ In some areas, warships were even preceded by a ship's boat carrying a GPS and forward-looking sonar.³⁵ The distances involved in northern operations remain daunting as well. Sailing from Halifax to Resolute is roughly the same distance as Halifax to London.³⁶ Fuel and supplies remain limited and Canadian warships traditionally refuel in Greenland or alongside a Canadian Coast Guard icebreaker. These Coast Guard ships are designed with northern distances in mind hence they carry more fuel and the CCG transports fuel via barges to the North in support of major CCG northern deployments.

To remedy some of these longstanding problems, the government of Canada has embarked on a building program to return a purpose-built Arctic capability to the Navy for the first time since the loss of HMCS *Labrador*. Announced in July 2007, the Arctic Offshore and Patrol Vessels (AOPVs) are intended to increase the RCN's ability to operate across the Northwest Passage and support other CAF units and government agencies in carrying out their mandates. These vessels will be able to operate safely in first-year ice and do more than simply pop into the eastern Arctic during *Operation Nanook*. The AOPVs will be able to support the RCMP, for instance, in policing maritime traffic in the Northwest Passage while providing a platform for Transport Canada, Fisheries, and other departments with safety and security mandates in the region.³⁷ Rear-Admiral David Gardam, Commander of Maritime Forces Atlantic, once described the AOPV as, in essence, "a big empty ship" that can "embark doctors, dentists, scientists, marine biologists, police and fisheries officers, environmentalists, and many other personnel with an interest in, or a mandate for, the development and sustainment of Canada's north."³⁸ This kind of versatile platform should be well suited to the CAF's evolving northern security requirements and would certainly have benefited the Navy's Arctic operations during its late Cold War surge.

Supporting the AOPV and other RCN and Coast Guard vessels will be a new deep-water refuelling station at Nanisivik in northern Baffin. Slated to open in 2019, Nanisivik Naval Base will provide vital seasonal fueling designed to extend the range and sustainability of the Navy in the Arctic Archipelago. With new purpose-built vessels and logistical support, the RCN will have a greater capacity to move and operate in the Arctic waters than at any time in its history. Even still, northern operations will remain challenging as the RCN and CAF continue to refine interoperability and whole-of-government command frameworks. From an operational perspective, new northern communications technologies and equipment still need to be developed while the slow process of charting the Arctic seafloor remains a vital component to safe movement.

The RCN's long, if inconsistent, history in the Arctic has shown how intractable these problems are and how much operational friction and risk must be managed when working in the North. New equipment and technology have set the Navy on a positive course in the 21st century though the greater impact might be made by the sustainable interest which the government and people of Canada now seem to have in the North. Rather than the boom-bust of the Cold War, the RCN may now be committed to white-water operations for the long-haul. As the northern sea ice melts and shipping and development activity increases, that presence is going to be essential.

Notes

1. Rob Huebert, "Renaissance in Canadian Arctic Security?" *Canadian Military Journal*, 6:4 (Winter 2005-2006), pp. 17-29.
2. This history of surge and withdrawal is laid out in detail in: Lajeunesse and Lackenbauer, *Canadian Armed Forces Arctic Operations*, Introduction.
3. Elizabeth Elliot-Meisel, "Arctic Focus: The Royal Canadian Navy in Arctic Waters, 1946-1949," *Northern Mariner*, 9:2 (April 1999), p. 28.
4. For a detailed analysis of the sovereignty issue, as well as the original documentation surrounding the issue see: Peter Kikkert and P. Whitney Lackenbauer eds., "Legal Appraisals of Canada's Arctic Sovereignty: Key Documents," *Documents on Canadian Arctic Sovereignty and Security 2* (Calgary: CMSS, 2014), pp. 38-42.
5. Kenneth Eyre, *Custos Borealis: The Military in the Canadian North*, PhD Dissertation, University of London King's College, 1981, p. 184.
6. Canada, Department of National Defence, *Canada's Defence Program 1949* (Ottawa: DND, 1949).
7. Eyre, *Custos Borealis*, p. 188.
8. Quoted in Eyre, *Custos Borealis*, p. 190.
9. Adam Lajeunesse, P. Whitney Lackenbauer, and Jason Delaney eds., *HMCS Labrador: An Operational History*, *Arctic Operational Histories* (Antigonish: Mulroney Institute, 2017), p. xx.
10. Quoted in Ernest Cable, "HMCS Labrador Opens Canada's Arctic," *Soundings* (May 2009), p. 6. See also Lajeunesse et. al., *HMCS Labrador*, p. xx.
11. For more on this subject see: Bryn Ranft and Geoffrey Till, *The Sea in Soviet Strategy* (Annapolis: Naval Institute Press, 1983); and Bruce Watson and Susan Watson, eds, *The Soviet Navy: Strengths and Liabilities* (Boulder: Westview Press, 1986).
12. Harriet Critchley, "Polar Deployment of Soviet Submarines," *International Journal* 34 (Autumn 1984), p. 842.

13. John Honderich, *Arctic Imperative: Is Canada Losing the North?* (Toronto: University of Toronto Press, 1987), p. 92.
14. Waldo K. Lyon, "Possible Utilization of Submarine (NR-1) in Support of Arctic Surveillance Missions," October 6, 1972, Navy History and Heritage Archive (Washington DC), Waldo K. Lyon Papers.
15. For the best examination of the *Manhattan's* voyage see: Ross Cohen, *Breaking Ice for Arctic Oil* (Fairbanks: University of Alaska Press, 2012); and John Kirton and Don Munton, "The Manhattan Voyages and their Aftermath," in Frankly Griffiths, ed., *Politics of the Northwest Passage* (Kingston: McGill-Queen's University Press, 1987).
16. Department of National Defence, *Defence in the 70s* (Ottawa: DND, 1971), p. 6.
17. For the most comprehensive list of these activities see: Michael Whitby, "Deployments by Ships of the Royal Canadian Navy into Canadian Northern Waters, 1949-2014," *Canadian Naval Review*, Broadsides Forum (November 22, 2014).
18. See for instance: DND/DRB Interest in Baffin Bay, 1973, Library and Archives of Canada (Ottawa), RG 24, file 3250-2, vol. 2 (1973); and J.W. Barlow, "NORPLOY 86 Discussion Paper," September 11, 1985, LAC, RG 24, file 3250-NORPLOY 1 (85).
19. J.L. Wilson, "Our Ships Head into the Arctic Seas Again," *Sentinel*, 6:10 (November-December 1970), p. 6.
20. For the most in-depth work on these systems see: Adam Lajeunesse and Bill Carruthers, "The Ice has Ears: The Development of Canadian SOSUS," *Canadian Naval Review*, 9:3 (Fall, 2013); and Lajeunesse, *Lock, Stock, and Icebergs*.
21. J.H. Granton to Chairman, Defence Research Board, "Sonobuoys for Arctic Use," December 11, 1969, LAC, RG 24, vol. 24033, file 3801-06.
22. Letter from J.A.F. Wilson to ship repair unit, Halifax, February 25, 1975, LAC, RG 24, file 3250-NORPLOY 2 (75).
23. Waldo K. Lyon and Allan Beal, "Proposal for Forward Area Logistic Support of Submarines in the Arctic," August 1, 1983, NHH, Waldo K. Lyon Papers.
24. For more on this agreement see: Christopher Kirkey, "Smoothing Troubled Waters: The 1988 Canada-United States Arctic Co-operation Agreement," *International Journal*, 50:2 (Spring 1995).
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26. Canadian Forces Northern Area (CAFNA), *Arctic Capabilities Study*, 2000, p. 9.
27. Exercise Narwhal ACC Post Ex Report, 2002.
28. Joan Taylor, AA Comd CFNA, "Op Hudson Sentinel 2005 Post Operation Report," October 24, 2005.
29. Bruce MacLean, "MARLANT/CFNA Joint Exercise Directive Ex Narwhal 2002," May 28, 2002.
30. Nathan VanderKlippe, "Glitches Teach Valuable Lessons," *Edmonton Journal*, September 5, 2004, p. A2.
31. *Ibid.*, p. 12.
32. For a fuller analysis on unconventional Arctic security see: P. Whitney Lackenbauer and Adam Lajeunesse, "The Emerging Arctic Security Environment: Putting the Military in its (Whole of Government) Place," in Heather Nicol and P. Whitney Lackenbauer eds., *Whole of Government through an Arctic Lens* (Antigonish: Mulroney Institute of Government, 2017).
33. *Ibid.*

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34. Lt. Cmmdr NH Hanratty, “Post Deployment Report, Operation Nanook 2008,” September 11, 2008.
 35. Cmmdr Arctic Council Grant, “Post Deployment Report – Op Nanook 08,” September 11, 2008, Enclosure 1.
 36. Approximately 5,000 kilometres.
 37. Adam Lajeunesse, “The Canadian Armed Forces in the Arctic: Purpose, Capabilities, and Requirements,” CDFAI, May 2015, p. 8.
 38. David Gardam, “The Admiral’s View of the Arctic and Offshore Patrol Ship,” *Canadian Naval Review – Broadships* (February 12, 2012).