



Securitization of the North: Applying Principles of Air Power in Defending Canada's Arctic

Lieutenant-Colonel Malcolm Carl MacDonald

JCSP 50

Exercise Solo Flight

Disclaimer

Opinions expressed remain those of the author and do not represent Department of National Defence or Canadian Forces policy. This paper may not be used without written permission.

© His Majesty the King in Right of Canada, as represented by the Minister of National Defence, 2024.

PCEMI n° 50

Exercice Solo Flight

Avertissement

Les opinions exprimées n'engagent que leurs auteurs et ne reflètent aucunement des politiques du Ministère de la Défense nationale ou des Forces canadiennes. Ce papier ne peut être reproduit sans autorisation écrite.

© Sa Majesté le Roi du chef du Canada, représenté par le ministre de la Défense nationale, 2024.

CANADIAN FORCES COLLEGE - COLLÈGE DES FORCES CANADIENNES

JCSP 50 - PCEMI n° 50
2023 - 2024

Exercise Solo Flight – Exercice Solo Flight

**Securitization of the North: Applying Principles of Air Power in
Defending Canada's Arctic**

Lieutenant-Colonel Malcolm Carl MacDonald

“This paper was written by a candidate attending the Canadian Forces College in fulfilment of one of the requirements of the Course of Studies. The paper is a scholastic document, and thus contains facts and opinions which the author alone considered appropriate and correct for the subject. It does not necessarily reflect the policy or the opinion of any agency, including the Government of Canada and the Canadian Department of National Defence. This paper may not be released, quoted or copied, except with the express permission of the Canadian Department of National Defence.”

« La présente étude a été rédigée par un stagiaire du Collège des Forces canadiennes pour satisfaire à l'une des exigences du cours. L'étude est un document qui se rapporte au cours et contient donc des faits et des opinions que seul l'auteur considère appropriés et convenables au sujet. Elle ne reflète pas nécessairement la politique ou l'opinion d'un organisme quelconque, y compris le gouvernement du Canada et le ministère de la Défense nationale du Canada. Il est défendu de diffuser, de citer ou de reproduire cette étude sans la permission expresse du ministère de la Défense nationale. »

Securitization of the North: Applying Principles of Air Power in Defending Canada's Arctic

The Arctic has long been regarded as a remote barren wasteland, which is sparsely inhabited and largely inaccessible. However, over the past decades' climate change has exposed a vast treasure of resources and opened the accessibility to the region.¹ Without ice-worthy ships and limited ice-free windows to explore the north, Canada's claim would remain relatively uncontested. Minimal development of infrastructure and controversial resettlement efforts would define a weak passive policy of ownership until the mid-twentieth century. With advances in ice-going maritime vessels, long-range aviation, and a greater understanding of the region, this ambivalent attitude toward the north is no longer possible.

General Walt Natynczyk, the Chief of Defence Staff (CDS) from 2008-2012, stated "If someone were to invade the Canadian Arctic, my first task would be to rescue them."² Given the attitude in 2009, when General Natynczyk made these remarks, Canada's Arctic was viewed as such an inhospitable place that an incursion would not be possible. By 2022 the current CDS, General Eyre, would amend this statement indicating the threat was very low but, that risk may increase in the coming decades.³ This slight change in the narrative in just over a decade indicates the realization that the Arctic is changing, however, it is still not an imperative concern. Examining national will, challenges in developing infrastructure in the north, and population scarcity, Canada must take the necessary measures to safeguard both territorial and economic claims in the region or risk weakening their sovereign claim.

Utilizing air power doctrinal concepts as a framework, this paper will argue that Canada can more effectively employ the Royal Canadian Air Force's (RCAF) air power to uphold its obligations and commitments in the Arctic. This paper will support this argument by examining current realities and likely future challenges. It will begin by explaining why Canada tends to have an ambivalent attitude towards the Arctic. This will be followed by outlining what the current threats to the region are both internally and externally. It will then utilize the air power doctrinal concepts of Reach, Speed, Persistence and Elevation supported by Sustainment to demonstrate the key role the RCAF can play in safeguarding and enhancing Canadian Arctic security.

¹ Landrum, L., Holland, M.M. Extremes become routine in an emerging new Arctic. *Nat. Clim. Chang.* 10, 1108–1115 (2020). <https://doi.org/10.1038/s41558-020-0892-z>

² Jeff Collins, On the Arctic Watch: Why we need to protect Canada's sovereignty and security in the Far North: Jeff Collins for Inside Policy, Macdonald-Laurier Institute, January 17, 2022, <https://macdonaldlaurier.ca/what-we-need-vs-what-we-have-assessing-canadas-defence-capabilities-in-the-arctic-jeff-collins-for-inside-policy/>

³ Sarah Turnbull, Threat of Russian invasion in Canada's North 'very low' but that could change: Defence chief, CTV News, March 10, 2022, <https://www.ctvnews.ca/politics/threat-of-russian-invasion-in-canada-s-north-very-low-but-that-could-change-defence-chief-1.5814612>.

Framing the Problem

Canada is a vast country. In fact it's the second-largest country in the world, with the longest coastline.⁴ However, due to national demography, limited accessibility to northern travel coupled with exorbitant cost, only a very small number of Canadians get to appreciate the majesty and expanse of the nation. Following geographic features, waterways, and lines of communication, the expansion and settlement of Canada largely developed very close to the 49th parallel.⁵ This has grown into modern-day distribution with almost 90% of Canadians living within 160 km of the United States border. Surprisingly, more than 60% of Canadians live south of Seattle.⁶ Conversely, the Arctic comprises close to 40% of Canada's land mass but is home to only 150,000 people.⁷

All these factors play into a more popular misconception and apathetic approach toward the Canadian Arctic. It could be summarized that Canadians believe that they are a Northern Nation which includes the Arctic, however, they place its security and development relatively low in regards to national prioritization.⁸ This is potentially in stark contrast to the Government's narrative, which is "The Arctic is central to Canada's national identity, prosperity, security, values and interests."⁹ This was further reiterated in the Defence Review Update issued by the Department of National Defence (DND) in 2024.¹⁰ This places the government in a challenging position. The vast majority of the nation is detached and does not fully understand the enormity of the challenges to develop the north, to allocate sufficient resources to ensure Arctic security, or even be aware of the present and looming security threats to Canada's north.

The Threat

Historically the north has been preserved by its sparsely settled region and inhospitable environment. Both the 1845 Franklin expedition to explore the Northwest Passage and the 1875 British Arctic exploration under Sir George

⁴ Live & Learn, 11 basic facts about Canada, June 8, 2015 <https://livelearn.ca/article/about-canada/10-basic-things-to-know-about-canada/>

⁵ Jacobs, Frank, "Most Canadians live south of Seattle and other mental map surprises", Big Think, 7 June 2023, <https://bigthink.com/strange-maps/canadians-south-seattle-mental-map-surprise/>

⁶ Ibid

⁷ Robert Sinclair, Arctic Council: Canada, <https://arctic-council.org/about/states/canada/>

⁸ Landriault, Mathieu, "Public Opinion on Canadian Arctic Sovereignty and Security", *Arctic* 69, No. 2 24 August 2015, P. 160-168.

<https://journalhosting.ucalgary.ca/index.php/arctic/article/view/67604>

⁹ https://www.international.gc.ca/world-monde/international_relations-relations_internationales/arctic-arctique/index.aspx?lang=eng

¹⁰ National Defence, "Our North, Strong and Free: A Renewed Vision for Canada's Defence", Minister of National Defence, 2024, <https://www.canada.ca/en/department-national-defence/news/2024/04/our-north-strong-and-free-a-renewed-vision-for-canadas-defence.html>

Nares would suffer the cruelty of the North.¹¹¹² Explorers would learn through vessels being trapped and crushed in the winter ice and crew members dying of exposure and starvation that the Arctic was not an environment which would provide a quick and easy alternative to existing sea routes.¹³ This narrative would remain the norm for some time and only be challenged with the advancement of long-range aviation.

For many generations, Canada's policy for the Arctic has relied on the inaccessibility to resources as well as the region. In the 1950's Canada adopted a policy of resettlement and moved Inuit further north to strengthen the Nation's claim on the territory.¹⁴ Stations like the Joint Arctic Weather Station were created where CFS Alert stands today.¹⁵ RCMP posts were created and villages such as Resolute Bay, Pond Inlet and Grise Fiord were developed through enticing, coercion and tricking Inuit communities in northern Quebec to relocate. While still sparsely settled, Canada was able to strengthen its hold on these territories.¹⁶

The challenge for Canada is the changing conditions in the Arctic. Melting polar caps and decreasing sea ice have revealed investment opportunities for corporations and states are becoming increasingly interested in navigation of ice-free waters. This reality places obligations on Canada which tax its existing capabilities and in some cases pose a challenge to Canada's claim on its sovereign territory.¹⁷

Canada is a founding member of the Arctic Council formed in 1996 and is comprised of eight nation-states which border the Arctic Ocean.¹⁸ The

¹¹ Têtu, P. L., Lasserre, F., Pelletier, S., & Dawson, J. (2019). 'Sovereignty' over submerged cultural heritage in the Canadian Arctic waters: case study from the Franklin expedition wrecks (1845-48). *Polar Geography*, 42(2), 71-88. <https://doi.org/cfc.idm.oclc.org/10.1080/1088937X.2019.1578288>

¹² Freeze Frame Logo - Historic Polar Images, British Arctic Expedition 1875-6, <https://www.freezeframe.ac.uk/resources/expeditions/arctic/british-arctic-expedition-1875-6/british-arctic-expedition-1875-6>

¹³ Têtu, P. L., Lasserre, F., Pelletier, S., & Dawson, J. (2019). 'Sovereignty' over submerged cultural heritage in the Canadian Arctic waters: case study from the Franklin expedition wrecks (1845-48). *Polar Geography*, 42(2), 71-88. <https://doi.org/cfc.idm.oclc.org/10.1080/1088937X.2019.1578288>

¹⁴ Russel Lawrence Barsh, High Arctic Relocation: International Norms and Standards, <https://data2.archives.ca/rcap/pdf/rcap-11.pdf>

¹⁵ Gray, David, Alert Beyond the Inuit Lands: The Story of Canadian Forces Station Alert, Borealis Press, Ottawa, 1997 p 13

¹⁶ Janice Cavell, "Consolidation and Control of All Eskimo Income": The Motive for the 1953 High Arctic Relocation, University of Toronto Press, Vol 55 Issue 1, Winter 2021, pp. 118-151, <https://utpjournals-press.cfc.idm.oclc.org/doi/10.3138/jcs.2020-0018>

¹⁷ National Defence, "Our North, Strong and Free: A Renewed Vision for Canada's Defence." Minister of National Defence, 2024, <https://www.canada.ca/en/department-national-defence/news/2024/04/our-north-strong-and-free-a-renewed-vision-for-canadas-defence.html>

¹⁸ Arctic Council, About the Arctic Council, <https://arctic-council.org/about/>

organization is designed to offer agreement on structure and order within the Arctic and covers a multitude of topics. The conduct of maritime and aeronautical Search and Rescue (SAR) is one such subject which was agreed upon in 2011.¹⁹ This agreement outlines national obligations when vessels and aircraft are transiting their portions of the Arctic Ocean. The Royal Canadian Mounted Police (RCMP) are responsible for ground search and rescue (GSAR) in their respective districts, however, can call upon air and sea assets as required. The Royal Canadian Air Force is responsible for air-related SAR events, and the Canadian Coast Guard responds to all maritime distress. The agencies all work cooperatively and are coordinated by the Joint Rescue Coordination Centres. Historically the Arctic has not had a high volume of traffic, and Canada has stationed its' marine and air SAR assets in locations to best service the population. Unsurprisingly this places them within the 150 km region along Canada's southern border. This posturing, while useful for the National SAR response leaves the Arctic extremely vulnerable. In October of 1991, a Canadian Hercules aircraft crashed fifteen nautical miles southeast of CFS Alert, Nunavut. It took the rescue aircraft and ground team 36 hours to get to the crash site.²⁰

Events like this would repeat themselves such as First Air Flight 6500 in August 2011 which crashed into a hillside near Resolute Bay, killing 12 people.²¹ Marine incidences would also occur such as the passenger ship *Akademik Ioffe* running aground in August of 2018 west of the Gulf of Boothia near Kugaaruk, Nunavut with 171 people onboard.²² Large events such as these are denoted as Major Air Disasters (MAJAID) or Major Maritime Disasters (MAJMAR) and result in multiple SAR units being dispatched and travelling thousands of kilometres into the Arctic. The repositioning of SAR assets results in gaps in the SAR network creating vulnerabilities. The Government of Canada and the SAR enterprise now assume a risk of leaving Canadians vulnerable or facing international criticism for failing to meet agreed-upon responsibilities. While the simple answer would be to increase the SAR enterprise in both numbers and positioning, the SAR community is currently experiencing significant challenges in modernizing its fleet let alone expanding it.²³

If Canada can resolve the safe passage of the Arctic, it now must negotiate the challenges of stewardship against economic growth. On 1 April 2024, the

¹⁹ Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic, 12 May 2011, <https://oarchive.arctic-council.org/server/api/core/bitstreams/ba22a423-2d69-4ae0-8a54-0241a7539a6c/content>

²⁰ Robert Mason Lee. *Death and Deliverance*. Macfarlane Walter & Ross, 1992 (77)

²¹ Wikipedia, First Air Flight 6560, 24 February 2024, https://en.wikipedia.org/wiki/First_Air_Flight_6560

²² Katie Toth, Investigators, experts ask questions after ship grounded in Arctic, *CBC* 28 Aug 2018, <https://www.cbc.ca/news/canada/north/investigators-kugaaruk-nunavut-ship-run-aground-1.4801273>

²³ Dayna Fedy-MacDonald, Initial operational capability of Canada's CC-295 FWSAR aircraft delayed to 2025-26, *Skies Magazine*, 4 May 2022, <https://skiesmag.com/news/initial-operational-capability-canadas-cc-295-fwsar-aircraft-delayed-2025/>

Canadian Federal Government signed the devolution of the land of Nunavut to the Nunavut Government.²⁴ This now provides them with greater control over land, waterways and mineral rights. This has resulted in past clashes where indigenous rights and way of life have been threatened against the economic benefits of collecting mineral resources.²⁵²⁶ With the limited number of constabularies in the north, these situations can develop into larger issues which are not easily contained. The Federal Government must now intervene and play the role of negotiator, arbitrating between indigenous rights, and economic growth. The obvious risk lies between favouring one side over the other and either being seen as disregarding indigenous agreements or stifling the economic growth of Canada. As the Arctic develops and grows, investment in more constabulary will be required.²⁷

These challenges are largely internal issues which either play out in negotiations or sometimes in the courts. Very seldom do they make headline news and stir any great outrage from Canadians. There are however additional external threats to Canada's claim on the Arctic from both expected and even unexpected nations. Relations between Canada and the Kingdom of Denmark would normally be characterized as very amicable with a "like-minded partner" sharing "rich historic and cultural links."²⁸ This relationship has allowed many NATO exchanges; however, Canada and Denmark have been embroiled in land disputes for almost five decades. What could be described as an insignificant island in the Nares Strait between Ellesmere Island and Greenland has been the "battleground" for the "Whiskey Wars."²⁹ This polite dispute over this territory underscores that even close allies will disagree when it comes to vested interests over resources and navigation of strategic waterways. This would also be a reality with Canada's closest North American partner, the United States. For many years the United States Navy has conducted freedom of navigation exercises through the North West Passage (NWP). Canada claims this waterway as littoral waters, however,

²⁴ Emma Tranter, It's high time': Nunavut officially takes over land, resource responsibilities from feds, CBC News, Jan 18, 2024, <https://www.cbc.ca/news/canada/north/nunavut-trudeau-sign-devolution-agreement-1.7086272>

²⁵ Brown, Beth, "Nunavut mine says it's not allowed to harm Inuit harvesting" CBC News, 17 Feb, 2021, <https://www.cbc.ca/news/canada/north/nunavut-mine-says-it-s-not-allowed-to-harm-inuit-harvesting-1.5916186>

²⁶ Rebecca Spring, Inuit Speak out Against Expansion of the Arctic Iron Mine, Community Concerned over Wildlife. Impacts, World Wildlife Fund Canada, February 2, 2021, <https://wwf.ca/stories/inuit-speak-out-against-expansion-of-arctic-iron-mine/>

²⁷ CBC News, RCMP looks at building Arctic intelligence network, CBC News, 22 Jul, 2009, <https://www.cbc.ca/news/canada/north/rcmp-looks-at-building-arctic-intelligence-network-1.792292>

²⁸ Government of Canada, Canada-Denmark Relations, <https://www.international.gc.ca/country-pays/denmark-danemark/relations.aspx?lang=eng>

²⁹ Ian Austen, Canada and Denmark End Their Arctic Whisky War, *New York Times*, June 14, 2022, <https://www.nytimes.com/2022/06/14/world/canada/hans-island-ownership-canada-denmark.html>

the United States does not acknowledge this claim.³⁰ This dispute has been ongoing since the 1970s, and while the discord between the NORAD partners has been very peaceful, this contestation has now opened the discussion to other less friendly nations wishing to exploit an increasingly accessible and ice-free waterway. In addition to navigational access, there is the desire by various nations to explore natural gas deposits on the seabed. If these quarrels occur between our closest allies, what can we expect from adversarial nations?

The adversarial nature between the Russian Federation and NATO countries is often envisioned as taking place in Europe where former satellite states fear renewed aggression as seen in the war in Ukraine. While their fear is justified, Canada also shares the Arctic Ocean with Russia and is only separated by sea ice and space between them. Russia has employed several methods toward controlling and claiming the Arctic Ocean challenging maritime law and positioning military forces. Russia has challenged legal claims in the Arctic, where in August 2007, two mini submersibles were sent to the Arctic seabed. Mir-1 and Mir-2 dove 4,300 feet into the Arctic Ocean collecting soil samples and concluded their mission by planting a Russian flag on the seabed. This then launched a legal claim to the UN that the seabed was a continuation of the Siberian continental shelf and therefore Russia was entitled to a larger portion of the Arctic Ocean.³¹ This would essentially expand their 200-mile economic exclusion zone giving them more marine navigation rights. As expected, this sparked US interest and promoted their own series of claims.³² As these great powers launched submarines and icebreakers demonstrating presence and capability, Canada lacking an Arctic-equipped fleet was left to object through words alone.³³

While Canada and Russia claim the largest portions of the Arctic coastlines, their development, occupation, and use of the territory are quite different. Canada has done relatively little to both develop and occupy the north. It established scientific stations such as CFS Alert and Eureka in the 1950s, as well as the Canadian High Arctic Research Station (CHARS) in Cambridge Bay.³⁴ In an effort to expand its presence in the north a deep water port was

³⁰ Robert Hage. "Rights of Passage: It's Time the U.S. Recognizes Canada's Arctic Claim." Canadian Global Affairs Institute, September 2018,

https://www.cgai.ca/rights_of_passage_its_time_the_us_recognizes_canadas_arctic_claim

³¹ Callum Hoare. "North Pole: How Russian submarine planted flag below Arctic waters in territory claim." *Express*, Jul 11, 2019, <https://www.express.co.uk/news/world/1152287/north-pole-russia-submarine-flag-arctic-ocean-territory-claim-vladimir-putin-fire-spt>

³² Yereth Rosen. "Russian objection to U.S. territorial claims off Alaska complicates maritime relationship." *Alaska Beacon*, April 6, 2024, <https://www.yahoo.com/news/russian-objection-u-territorial-claims-120045774.html>

³³ Emma Tranter. "'You cannot claim any more:' Russia seeks bigger piece of Arctic." *CBC News*, Apr 11, 2021, <https://www.cbc.ca/news/canada/north/russia-arctic-ocean-canada-united-nations-continental-shelf-1.5983289>

³⁴ Government of Canada, "Canadian High Arctic Research Station now fully managed and operated in the North." 7 June 2023, [Link](#)

developed in Nanisivik and the Arctic Warfare Centre in Resolute Bay, however, due to cost and the sheer enormity of the challenges of building in the north the Nanisivik port is still not finished. When looking at military presence in the north, there is only a small custodial team in Iqaluit and CFS Alert which can range from about a hundred in the summer to a few dozen in the winter.³⁵ Canada's Navy is not capable of operating in the north as it lacks ice-breaking capability and its submarine fleet is not capable of under-ice operations. While the acquisition of the Harry DeWolfe class Arctic patrol ships does change this some, it has only been a recent addition. In total Canada only has five icebreakers significantly limiting its abilities. The government has done relatively little to encourage growth in the north except for some questionable resettlement efforts.³⁶ The only real growth has been mining where the governments have been very agreeable to allow the industry to exploit mineral deposits. The reality, is Canada has taken a very laissez-faire and passive approach when it has come to the north.

In contrast, some of the other Arctic nations have heavily invested. The United States has developed significant strategic bases in Alaska. Air power proponents such as William "Billy" Mitchell, describe it as "the most important strategic place in the world."³⁷ The US Navy can send nuclear submarines under the ice year-round and conducts biannual Ice Exercises (ICEX).³⁸ Russia has taken significant steps to modernize its hold in the Arctic with the refurbishment of over fifty bases. They have heavily invested in infrastructure to allow sustained force projection of the Northern Fleet, as well as their strategic bombers throughout the Arctic region. This is coupled with developments in their sea and air domain awareness technology enhancing their monitoring of the north. Russia's icebreaker fleet is the largest in the world enabling the Northern Fleet freedom of movement in the winter. Their fleet is greater than the totality of all the other Arctic nation's fleets, with 46 vessels which are younger, more modern, and capable of traversing multi-year ice^{39,40}. Russia views the North Sea Route (NSR) as a key component in its national and economic strategy. The north offers a strategic advantage to frustrate NATO forces in the North Atlantic, as well as

³⁵ Gray, David, *Alert Beyond the Inuit Lands: The Story of Canadian Forces Station Alert*, Borealis Press, Ottawa, 1997

³⁶ Jane Sponagle, 'We called it 'Prison Island': Inuk man remembers forced relocation to Grise Fiord, *CBC News*, Jun 30, 2017, <https://www.cbc.ca/news/canada/north/forced-relocation-high-arctic-inuit-1.4182600>

³⁷ Byron King, Alaska: "The Most Important Strategic Place in the World," Part III, *Daily Reckoning*, 22 Feb, 2008, <https://dailyreckoning.com/the-importance-of-alaska-part-ii/>

³⁸ Jon Schlosberg, Tommy Brooksbank, Kayna Whitworth, and Leda Alvim, Navy launches training exercise in Arctic Circle as global tensions rise, *ABC News*, March 15, 2022, <https://abcnews.go.com/US/navy-launches-training-exercise-arctic-circle-global-tensions/story?id=83439828>

³⁹ Conley, Heather A., Melino, Matthew, and Alterman, Jon B., *The Iron Curtain Russia's Arctic Military Presence*, 26 March 2020 <https://www.csis.org/analysis/ice-curtain-russias-arctic-military-presence>

⁴⁰ United States Coast Guard, "Major Icebreakers of the World", 1 May 2017. <https://www.dco.uscg.mil/Portals/9/DCO%20Documents/Office%20of%20Waterways%20and%20Ocean%20Policy/20170501%20major%20icebreaker%20chart.pdf>

provides a tremendous economic opportunity as an alternative to the existing flow of commerce.

While nations with territory bordering the Arctic Ocean making claims over the region seems a natural part of statecraft, there has been an emergence of new nations making claims. Countries such as China who see the future potential in the north have now declared themselves as “near-Arctic” nations.⁴¹ China has begun to rapidly expand its submarine fleet in an effort to expand its maritime domain awareness.⁴² While it's unclear to what end this fleet will be used for, it is clear that these advances would give them a decisive advantage in an environment they have expressed interest in growing.

NORAD Modernization

While the Soviet Union and the Warsaw Pact represented a threat to neighbouring countries in Europe during the Cold War, Canada and the United States became aware that long-range aviation traversing the Arctic posed a very real “over the pole” threat. With the introduction of the Tupolev Tu-95 “Bear” strategic bomber in 1956, specifically designed to have the range and the payload to threaten both the United States and Canada, it became clear that the Cold War threat was not isolated to the European continent.⁴³ This, among other provocative displays of aggression, would forge the foundation of the only bi-national command with the creation of the North American Aerospace Defense Command (NORAD) in 1957.⁴⁴ Through joint ventures of cooperation, Canada and the US developed early warning and domain awareness sites such as the “Pine Tree Line” and the “Mid-Canada Line”. These Radar picket lines were developed in 1955 and 1958 respectively. Both these systems were plagued with operational issues and had limitations with regard to low-level detection. It wouldn't be until the construction of the Distant Early Warning (DEW) Line, which extended along Canada's Arctic coastline, that NORAD was able to develop a functional air domain awareness system. The DEW line would remain operational until the construction of the North Warning System which would see the old sites remediated and modernized with long-range radars.⁴⁵ Sadly these sites would remain the operating systems until the present day with only minor upgrades. The

⁴¹ Tristin Hopper, Declaring itself a 'near-Arctic state,' China to build a 'Polar Silk Road' off Canada's north, *National Post*, Jan 30, 2018, <https://nationalpost.com/news/canada/declaring-itself-a-near-arctic-state-china-to-drive-a-polar-silk-road-off-canadas-north>

⁴² Philippe Legasseé, Justin Massie, Don't Count on Us: Canas's Military Unreadiness, War on the Rocks, April 11, 2024, <https://warontherocks.com/2024/04/dont-count-on-us-canadas-military-unreadiness/>

⁴³ Wikipedia, Tupolev Tu-95, https://en.wikipedia.org/wiki/Tupolev_Tu-95#cite_note-Monino-2

⁴⁴ Goette, Sovereignty and Command in Canda – US Continental Air Defence 1940-57 p192

⁴⁵ Charron, Andrea. "Canada, the Arctic, and NORAD: Status Quo Or New Ball Game?"

International Journal 70, no. 2 (06, 2015): 215-231.

doi:<https://doi.org/10.1177/0020702015572998>.

<https://login.cfc.idm.oclc.org/login?url=https://www.proquest.com/scholarly-journals/canada-arctic-norad-status-quo-new-ball-game/docview/1692916349/se-2>.

Americans would consistently develop and advance their air superiority fighters over the decades coupling them with air-to-air refueling extending their range and augmenting their surveillance with airborne radar platforms. Conversely, Canada would make its last investment with the purchase of CF-18 fighters in the 1980s and retrofitting of the CC-150 Polaris strategic transport aircraft with air-to-air refuelling capabilities in 2008.⁴⁶ As such Canadian NORAD assets are capable of reaching the “North Slope”, however, they often have limited loitering time once established on station.

Maritime domain awareness has undergone a long disappointing development path since it was incorporated into NORAD’s mandate in 2006. The development of the Nanisivik Naval Facility on Baffin Island was first announced in 2007.⁴⁷ While unforeseen events like the COVID pandemic played a role in delaying the project, cost overrun and battling the elements resulted in the project being drastically cut in scope and taking almost sixteen years to accomplish.⁴⁸ The port is now expected to be operational in 2024, almost a decade after its planned opening. These complications and delays may highlight the challenges of overcoming the difficulties in building in the Arctic, as well as Canada’s national will to develop the north. This however is just one port developed in the Arctic Archipelago. As such the Commander of the Royal Canadian Navy, Vice-Admiral Topshee, continues to describe domestic naval operations in the high Arctic as expeditionary.⁴⁹ Due to limited infrastructure, services, and an ability to resupply, operating in Canada’s high Arctic can be more challenging than operating overseas.

Possibly spurred by Russia’s invasion of Crimea in 2014 or Ukraine in 2022, Canada and the United States have made a series of spending announcements on NORAD modernization.⁵⁰ Realizing that much of the infrastructure is old and reaching end-of-life, and investing in future capabilities would be the only way to keep the organization relevant, the Minister of National Defence announced 38.6 billion in expenditures. These funds are earmarked for the modernization of the North Warning System with updated radar systems, advancements in communication relays, procurement of advanced missile systems

⁴⁶ Christopher Cowan & Dr. Andrew Davies, *Buying Vintage: Examining the RCAF’s Acquisition of F/A-18 A/B Fighters from Australia*, 14 December 2017, CDA Institute, <https://cdainstitute.ca/buying-vintage-examining-the-rcafs-acquisition-of-f-a-18-a-b-fighters-from-australia/>

⁴⁷ CBC News, *Arctic naval refuelling station set to open in 2024*, Jan 19, 2023, <https://www.cbc.ca/news/canada/north/nanisivik-naval-base-nunavut-2023-update-1.6717971>

⁴⁸ The refurbishment of an abandoned supporting airfield was removed from the plan at an estimated cost of 100 million dollars.

⁴⁹ Center for Strategic & International Studies, *Interview between Dr. Seth G. Jones, CSIS Sr VP and Commander of the Royal Canadian Navy, Vice-Admiral Angus Topshee*, Nov 3, 2023, <https://www.youtube.com/watch?v=H8yr6xma7Kg&t=957s>

⁵⁰ Gov of Canada, *NORAD modernization project timelines*, 24 Mar, 2023, <https://www.canada.ca/en/department-national-defence/services/operations/allies-partners/norad/norad-modernization-project-timelines.html>

and airborne platforms, as well as Deployed Operating Base (DOB) infrastructure improvements.⁵¹ The radar systems, Northern Approaches Surveillance System (NASS) which will eventually include the Arctic Over the Horizon Radar (A-OTHR) and Polar Over the Horizon Radar (P-OTHR). These systems will replace the ageing NWS which has been in place for the last 30 years. These systems will employ newer technology which allows a greater field and range of vision, enhancing domain awareness. Currently, these systems are expected to come online between 2030 and 2036.⁵² Communication systems such as the High Frequency/Low-Frequency Communications (HFLF) and Enhanced Satellite Communication – Polar (ESCP-P) will be incorporated into the Future Combined Aerospace Operations Centre (FCC) modernizing the current Operations Centre. This is scheduled to be developed between 2032 and 2035.⁵³ Lastly, a number of platforms modernize the RCAF’s capabilities. The workhorse of the fighter fleet, the aged CF-18 Hornet will be replaced with 88 CF-35 Lightning II. They will be complimented with a modernized arsenal of missiles. The CT-130 Hercules (Tanker) and the modified CC-150 Polaris will be replaced with 9 dedicated CC-330 Husky A330 transport/refueller aircraft.⁵⁴ The RCAF will add a new fleet of 11 MQ-9B “Sky Guardian” Remotely Piloted Aircraft Systems (RPAS).^{55,56} Finally, the Deployed Operating Bases in the north will receive modernization to accommodate these platforms. All of these projects are scheduled to take place over the next 20 years, before 2040.

Applying Principles of Air Power

These announcements are welcome news as we see Russian aggression continue for the second year in Ukraine, and China make provocative manoeuvres in the South China Sea. The challenge which is faced, is that Canada has a history of making announcements, however is short on delivery. Past replacement projects such as the Fixed Wing Search and Rescue platform, the CH-149 Cormorant, and even the F-35 underwent significant delays and cost overruns resulting in delayed entry into service. The Nanisivik Naval Facility would be delayed by sixteen years and reduced in scope and still isn’t operational.⁵⁷ Given this history, it may be optimistic that these programs will meet the implementation timelines indicated.

⁵¹ Ibid

⁵² Ibid

⁵³ Ibid

⁵⁴ Chris Loh, The Canadian Air Force's Incoming A330 MRTTs: What We Know So Far, Simply Flying, Mar 17, 2024, <https://simpleflying.com/rcaf-airbus-a330-mrvt-husky-update-march-2024/>

⁵⁵ Murray Brewster, Canadian military buying armed drones for \$2.49B, CBC News, Dec 19, 2023, <https://www.cbc.ca/news/politics/armed-drone-canadian-armed-forces-1.7063989>

⁵⁶ General Atomics Aeronautical, Government of Canada Orders the MQ-9B Sky Guardian RPAS from GA-ASI, Dec 19, 2023, <https://www.ga-asi.com/government-of-canada-orders-the-mq-9b-skyguardian-rpas-from-ga-asith>

⁵⁷ CBC News, Arctic naval refuelling station set to open in 2024, Jan 19, 2023, <https://www.cbc.ca/news/canada/north/nanisivik-naval-base-nunavut-2023-update-1.6717971>

Canada must be prepared to counter these current real-world threats and demonstrate its national will to assert dominance in the Arctic region. While best intentions and plans are admirable, employing the tenets of air power can offer immediate action to the north.

“Reach. Air power can be projected globally, unimpeded by surface features such as mountain barriers or water expanses. The global reach of air power is a distinct characteristic that provides strategic options and contributes to the Canadian Armed Force’s power projection.”⁵⁸

Reach is an essential concept in the defence of the Arctic. Canada’s fighter bases are located at 4 Wing Cold Lake, Alberta, and 3 Wing Bagotville, Quebec. To begin the journey into the Arctic, they first must travel two thousand kilometres to their Deployed Operating Bases. This task alone requires the assistance of an air-to-air tanker aircraft. The RCAF’s tanker fleet consists of a modified CC-150 Polaris fleet and a CC-130 Hercules Tanker. The Polaris fleet has been in service since the 1990s and was only modified in 2008.⁵⁹ The purchase of nine CC-330 Huskies, an A330-200 airframe, as part of the NORAD modernization, allows for more autonomous deployments of the fighter fleet to much greater ranges. They also come at a very timely period where the Polaris is showing its age, and the Hercules Tanker was supposed to discontinue operations in 2020.⁶⁰ Due to the long distances between the limited airfields, tanker aircraft are essential when operating in the high north. On July 4th 2015, multiple TU-95 “Bear” bombers performed an out-of-area flight along the west coast of Canada and the United States.⁶² It was the KC-135 Stratotanker fleet which enabled the fighters and surveillance aircraft to remain airborne during this far-reaching mission. This fact is further highlighted in the 2002 White House release indicating that in the first year of Operation Noble Eagle, the air defence of North

⁵⁸ B-GA-400-000/FP-001 Royal Canadian Air Force Doctrine, 3rd Edition, November 2016 p14, https://publications.gc.ca/collections/collection_2017/mdn-dnd/D2-368-2016-eng.pdf

⁵⁹ Government of Canada, National Defence / Canadian Armed Forces, The Strategic Tanker Transport Capability Project and NORAD Modernization, July 25, 2023, <https://www.canada.ca/en/department-national-defence/news/2023/07/the-strategic-tanker-transport-capability-project-and-norad-modernization0.html>

⁶⁰ Capt Mike Wolter, 435 Squadron delivers air-to-air refuelling for a quarter century, Skies Magazine, June 13, 2018, <https://skiesmag.com/news/435-squadron-delivers-air-to-air-refuelling-for-a-quarter-century/>

⁶¹ Government of Canada, National Defence / Canadian Armed Forces, The Strategic Tanker Transport Capability Project and NORAD Modernization, July 25, 2023, <https://www.canada.ca/en/department-national-defence/news/2023/07/the-strategic-tanker-transport-capability-project-and-norad-modernization0.html>

⁶² Brian Todd and Jethro Mullen, July Fourth message not the first from Russian bombers, CNN, July 23, 2015, <https://www.cnn.com/2015/07/23/politics/us-russian-bombers-july-4-intercept/index.html>

American mission following the September 2001 attacks, tankers flew 6,175 sorties.⁶³

The implementation of the new tanker fleet comes at a much-needed time, however, analyzing the composition of the CC-330 fleet does leave some concern. The Huskey is categorized as a multiuse aircraft, capable of conducting, air-to-air refueling as well as strategic transport and aeromedical evacuation missions. Accounting for maintenance inspections, serviceability, and servicing two locations, the nine aircraft would be fully tasked with just air-to-air duties. This doesn't account for extended missions which may require more than one tanker to allow fighters to remain on station. In order to ensure that the NORAD mandate has sufficient reaching capability, further expanding the purchase contract for the A330 aircraft should be explored. An additional four aircraft would be sufficient to ensure capacity to conduct the NORAD support missions, as well as additional taskings.

“Persistence. The persistent employment of air power gives a commander influence and presence in an air environment. Even though air power cannot occupy terrain or remain in constant proximity, its inherent characteristics of speed and reach allow the operational environment to be shaped by revisiting targets persistently over time.”⁶⁴

While reach allows air power to be projected over great distances, missions may require the continuous presence of Combat Air Patrols (CAPs) to remain on station for extended periods of time. Without the complement of tanker aircraft, coordinated waves of fighter aircraft are required to rotate on the station to provide the same amount of continuous overwatch. As such the tankers become force multipliers as they allow for an economy of effort in maximizing crew duty day while minimizing resource demand for tasks. On 2 May 2024, fighters stationed in Alaska were involved in an eleven-hour intercept mission of four Russian military aircraft over the Bering Sea.⁶⁵ While fighter bases are more centrally located in Alaska, there are similar challenges to that of Canada's Arctic.⁶⁶ Accomplishing such a mission and maintaining a presence for such a duration would have required several tankers rotating to provide a continuous fuel

⁶³ Rebecca Grant, The Tanker Imperative, April 2009

https://secure.afa.org/Mitchell/reports/MP2_TankerImperative0409.pdf

⁶⁴ B-GA-400-000/FP-001 Royal Canadian Air Force Doctrine, 3rd Edition, November 2016 p17, https://publications.gc.ca/collections/collection_2017/mdn-dnd/D2-368-2016-eng.pdf

⁶⁵ David Cenciotti , F-16 Of The 18th Fighter Interceptor Squadron Escorts Russian Tu-95, Su-35 and Su-30 Off Alaska, The Aviationist, May 3, 2024, <https://theaviationist.com/2024/05/03/f-16-of-the-18th-fis-intercept-russians/>

⁶⁶ <https://militarybases.com/alaska>

supply.⁶⁷ Persistence and reach are not only just for the fighter force. Canada's Intelligence, Surveillance, and Reconnaissance (ISR) fleets apply the same principles to provide information gathering and domain awareness. The CP-140 Aurora has contributed the most when it comes to maritime awareness performing maritime surveillance and ice patrols for over forty years.⁶⁸ The aging fleet even played an important role in overland reconnaissance during the Afghanistan campaign. Reaching the end of their life expectancy, the announcement of procuring sixteen new Boeing P-8A Poseidon aircraft was welcome news in November 2023.⁶⁹ This was further supported by the announcement in December of the same year that the RCAF would acquire a fleet of eleven MQ-9B Sky Guardian remotely piloted aircraft systems (RPAS).⁷⁰ The Sky Guardian has a proven track record and boasts an impressive complement of ISR capabilities for a variety of roles.⁷¹ While the system boasts impressive capabilities and extended flight duration, one of the drawbacks of the system is its speed. Driven by a single propeller system and stationed in CFB Greenwood and CFB Comox, the Arctic is a long flight making the system less useful for Arctic patrol. Regardless of limitations and demands on both fleets, they are welcome additions to the RCAF's inventory.

One area Canada has neglected is fully developing its airborne domain awareness capabilities in the form of an Airborne Warning and Control System (AWACS) platform. The NORAD modernization program has heavily invested in ground-based systems, however only contributed a small portion of the funds to be included in the USAF AWACS replacement program. The RCAF has a long history of cooperation and contribution towards the NATO and the USAF AWACS programs however has not developed its own internal capability.⁷²⁷³ Radar sites have the benefit of permanence, however are limited to their range and field of vision. The employment of airborne surveillance allows for mobility, extended range, and customization for specific missions. More importantly, these are systems which can be employed in the near future, as opposed to the expected development of the NASS infrastructure. With so many new fleets being

⁶⁷ The author served at the 611th Air and Space Operations Centre in Alaska from 2012-2016 and was a member of the operations crew which monitored and coordinated many Russian Military Aviation (RMA) interceptions.

⁶⁸ Canada.ca, National Defence, Canada purchasing up to 16 P-8A Poseidon Multi Mission Aircraft for the Royal Canadian Air Force, November 30, 2023, <https://www.canada.ca/en/department-national-defence/news/2023/11/canada-purchasing-up-to-16-p-8a-poseidon-multi-mission-aircraft-for-the-royal-canadian-air-force.html>

⁶⁹ Ibid

⁷⁰ Ken Pole, Canada to acquire fleet of MQ-9B Sky Guardian drones, *Skies Magazine*, December 19, 2023, <https://skiesmag.com/news/canada-to-acquire-fleet-of-mq-9b-skyguardian-drones/>

⁷¹ <https://www.ga-asi.com/teamskyguardiancanada/>

⁷² Chris Thatcher, Welcome back, Canada: flying the NATO E-3A AWACS aircraft, *Skies Magazine*, March 4, 2022, <https://skiesmag.com/features/welcome-back-canada-flying-nato-e-3a-awacs-aircraft/>

⁷³ Emily Lindahl, New aircrew badge announcement made at 22 Wing North Bay, Government of Canada, October 23, 2020, <https://www.canada.ca/en/department-national-defence/maple-leaf/rcaf/2020/10/new-aircrew-badge-announcement-made-at-22-wing-north-bay.html>

introduced, it would most likely be unrealistic that the RCAF could absorb the introduction of a new ISR AWACS fleet. However, due to our long history of cooperation, there is a relatively robust cadre of qualified members on existing systems. The development of a lend-lease program from either Australia or the United States could allow for an initial fleet to be implemented in short order. This fleet would provide a valuable bridge and further enhance air domain awareness inside the Canadian Air Defence Identification Zone (CADIZ).

“Speed. The speed of air vehicles provides a rapid response capability that can be projected over great distances. Speed can also be used to achieve surprise and allows for a reduced time of exposure to hostile action, thus increasing survivability.”⁷⁴

When covering such great distances in the Arctic, speed becomes an important concept. First is the ability to quickly deploy to the Arctic DOBs to prepare for the various missions which may be required. Where fighter aircraft have evolved to reach supersonic speeds, the CC-130 Tanker is left in the rearview mirror. While the addition of a tanker is normally beneficial, having such a slow airframe can disrupt the flow of operations. The addition and modification of the CC-150T Polaris was beneficial as it could keep pace with the fighters adding efficiency. Looking forward, the CC-330 Husky is a modern purpose-built refuelling aircraft capable of keeping pace with any Canadian aircraft as well as partner nations.⁷⁵ This becomes even more relevant as time will be an asset. Russian tactics are evolving and where bombers once flew unescorted, they are now often seen with supporting fighter aircraft.⁷⁶ Capabilities which allow the fighters to operate at their optimal manoeuvring envelope and provide efficient transfer enhancing intercept missions.

Speed also plays a role when countering new technology. With the fielding of hypersonic weapons, the battlefield becomes a smaller arena. With weapons capable of speeds greater than Mach five, this decreases decision-making time and relies on speed to close the gap and counter the threat.⁷⁷ Having been tested in Syria and believed to be employed in the Ukraine, hypersonic

⁷⁴ B-GA-400-000/FP-001 Royal Canadian Air Force Doctrine, 3rd Edition, November 2016 p14, https://publications.gc.ca/collections/collection_2017/mdn-dnd/D2-368-2016-eng.pdf

⁷⁵ Chris Thatcher, With Airbus MRTT, Canada contracts for larger and more flexible refueling fleet, Skies Magazine, 26 July, 2023, <https://skiesmag.com/news/airbus-mrmt-aircraft-canada-contracts-larger-more-flexible-refueling-fleet/>

⁷⁶ David Cenciotti , F-16 Of The 18th Fighter Interceptor Squadron Escorts Russian Tu-95, Su-35 and Su-30 Off Alaska, The Aviationist, May 3, 2024, <https://theaviationist.com/2024/05/03/f-16-of-the-18th-fis-intercept-russians/>

⁷⁷ Williamson, J., & Wirtz, J. J. (2021). Hypersonic or just hype? Assessing the Russian hypersonic weapons program. *Comparative Strategy*, 40(5), 468–481. <https://doi-org.cfc.idm.oclc.org/10.1080/01495933.2021.1962198>

missiles bring speed to the battlefield like never before.⁷⁸ As the Western world determines the best countermeasure for this system, the early answer is to answer with speed.

“Elevation. The capacity to employ air power above surface of the Earth offers the ability to observe and influence activities on the surface and below the sea.”⁷⁹

The Arctic has limited radar coverage, and communications can be challenging resulting in many blind spots. A final important piece towards establishing control and domain awareness is holding the high ground. Exploiting the tenet of elevation through space-based assets allows for a more fulsome understanding than relying solely on conventional radars and aircraft. Canada’s agencies require the most comprehensive understanding of who is transiting the north, and exactly where they are. The development of the RADSAT 2 and the Polar Epsilon (PE) project has provided enhanced synthetic aperture imaging and maritime traffic awareness.⁸⁰ These systems can be used to monitor ice flows as well as track shipping through the Automatic Identification System (AIS).^{81,82} Modernization of land-based system such as the High Frequency/Low Frequency Communications (HFLF) array as well as space-based communications such as the Enhanced Satellite Communication – Polar (ESCP-P) also aids in enhancing Command and Control in the Arctic.⁸³ Perhaps one of the largest advances in the space domain is the dedication of its own Division. 3 Canadian Space Division was formed on 22 July 2022, with a mandate to provide space domain awareness and support of military operations at home and abroad.⁸⁴ This commitment demonstrates that Canada is forward-thinking when it comes to the importance of Space Power and the importance it can play in the Arctic.

⁷⁸ Mirosław Banasik, “Global Challenges and Threats of Hypersonic Weapons: The Russian Context”. Safety & Defense, Vol. 7, no. 2, Oct. 2021, pp. 40-50, <https://doi.org/10.37105/sd.119>

⁷⁹ B-GA-400-000/FP-001 Royal Canadian Air Force Doctrine, 3rd Edition, November 2016 p14, https://publications.gc.ca/collections/collection_2017/mdn-dnd/D2-368-2016-eng.pdf

⁸⁰ P. W. Vachon, C. Kabatoff and R. Quinn, "Operational ship detection in Canada using RADARSAT," IEEE Geoscience and Remote Sensing Symposium, 2014, <https://ieeexplore.ieee.org/document/6946595>

⁸¹ P. W. Vachon, C. Kabatoff and R. Quinn, "Operational ship detection in Canada using RADARSAT," IEEE Geoscience and Remote Sensing Symposium, 2014, <https://ieeexplore.ieee.org/document/6946595>

⁸² Denbina, M., Collins, M. J., Iceberg Detection Using Simulated Dual-Polarized Radarsat Constellation Data. Canadian Journal of Remote Sensing, 2014 40(3), 165–178. <https://doi.org/10.1080/07038992.2014.945517>

⁸³ Gov of Canada, NORAD modernization project timelines, 24 Mar, 2023, <https://www.canada.ca/en/department-national-defence/services/operations/allies-partners/norad/norad-modernization-project-timelines.html>

⁸⁴ Government of Canada, Royal Canadian Air Force, Canadian Space Division celebrates its first birthday, July 21, 2023, <https://www.canada.ca/en/department-national-defence/maple-leaf/rcaf/2023/07/3-canadian-space-division-celebrates-its-first-birthday.html>

Conclusion

Canada has made bold commitments toward global security and partnerships in the past years. The Indo-Pacific strategy was released in 2022 and places a heavy burden on the Royal Canadian Navy to fulfill commitments in that theatre.⁸⁵ This is coupled with critical staffing shortages leaving the Navy struggling to meet its taskings and only able to sail a single newly acquired Arctic Offshore Patrol Vessel (AOPV) at any one time.⁸⁶ In 2023, the Minister of National Defence announced that Canada would deploy a Brigade-size force to Latvia by 2026. This will focus a large portion of the Canadian Army's resources into the European theatre. With these services focused on these regions, the Air Force is left to ensure North American security through its commitment to NORAD. Canada's announcements of NORAD modernization and the Defence Policy Update demonstrate that Canadian decision-makers are at least aware of the looming threats in the Arctic, however for the time being that commitment is only a paper commitment. Financial commitments will have to survive political cycles and economic realities as these projects move forward. Understanding the complexities of Arctic construction, and using past experience as a measure of success, it is very likely that some of these projects will not be completed until the early 2040s. All the while, competitive nations continue to expand their foothold and capabilities in the Arctic. Leaving these challenges unchecked weakens Canadian sovereignty and its claim on the Arctic. Until NORAD modernization projects can break ground and reach initial operating capability the RCAF is the clear answer to challenge these foreign claims in the north. By bolstering the RCAF's posture and employing air power in developing stronger Arctic domain awareness, Canada can rapidly deploy air power to provide presence and clearly assert Canadian sovereignty over the region. Through coordinated efforts, various platforms can deploy and fulfill obligations to Arctic partners and uphold mandates. It must be understood that air power does have limitations and is not a panacea for all the future challenges which may be experienced in the decades to come. It does however offer a viable current solution to sense, support and act within the Arctic region and can ensure the north remains true, strong, and free.

⁸⁵ <https://www.international.gc.ca/transparency-transparence/indo-pacific-indo-pacifique/index.aspx?lang=eng>

⁸⁶ Admiral Topshee, The State of the Royal Canadian Navy, youtube.com, Nov 27, 2023, <https://www.youtube.com/watch?v=FuD6Q1HXskw&t=6s>

BIBLIOGRAPHY

- Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic, 12 May 2011, <https://oaarchive.arctic-council.org/server/api/core/bitstreams/ba22a423-2d69-4ae0-8a54-0241a7539a6c/content>
- Arctic Council, About the Arctic Council, <https://arctic-council.org/about/>
- Austen, Ian, “Canada and Denmark End Their Arctic Whisky War”, New York Times, 14 June, 2022, <https://www.nytimes.com/2022/06/14/world/canada/hans-island-ownership-canada-denmark.html>
- Banasik, Mirosław, “Global Challenges and Threats of Hypersonic Weapons: The Russian Context”. Safety & Defense, Vol. 7, no. 2, Oct. 2021, pp. 40-50, <https://doi.org/10.37105/sd.119>
- Barsh, Russel Lawrence, “High Arctic Relocation: International Norms and Standards”, <https://data2.archives.ca/rcap/pdf/rcap-11.pdf>
- Blake, Emily, “To what extent does Russia present a real threat to Canada’s Arctic?”, Cabin Radio, April 27, 2022, <https://cabinradio.ca/90997/news/politics/to-what-extent-does-russia-present-a-real-threat-to-canadas-arctic/>
- Brewster, Murray, “NATO chief warns Canada that Russia, China have designs on the Arctic”, CBC News Aug 26, 2022, <https://www.cbc.ca/news/politics/nato-stoltenberg-trudeau-russia-china-1.6563825>
- Brewster, Murray, “Canadian military buying armed drones for \$2.49B”, CBC News, 19 Dec 2023, <https://www.cbc.ca/news/politics/armed-drone-canadian-armed-forces-1.7063989>
- Brown, Beth, “Nunavut mine says it's not allowed to harm Inuit harvesting” CBC News, 17 Feb, 2021, <https://www.cbc.ca/news/canada/north/nunavut-mine-says-it-s-not-allowed-to-harm-inuit-harvesting-1.5916186>
- Carroll, Luke, “Canada showcases ability to defend Arctic amid global tensions”, CBC News, Mar 13, 2024, <https://www.cbc.ca/news/canada/north/canada-showcases-ability-to-defend-arctic-amid-global-tensions-1.7141865>

- CBC News, “Arctic naval refuelling station set to open in 2024”, CBC News, Jan 19, 2023, <https://www.cbc.ca/news/canada/north/nanisivik-naval-base-nunavut-2023-update-1.6717971>
- CBC News, *RCMP looks at building Arctic intelligence network*, CBC News, 22 Jul, 2009, <https://www.cbc.ca/news/canada/north/rcmp-looks-at-building-arctic-intelligence-network-1.792292>
- Cowan, Christopher & Davis, Andrew, “Buying Vintage: Examining the RCAF’s Acquisition of F/A-18 A/B Fighters from Australia”, 14 December 2017, CDA Institute, <https://cdainstitute.ca/buying-vintage-examining-the-rcafs-acquisition-of-f-a-18-a-b-fighters-from-australia/>
- Cavell Janice, “Consolidation and Control of All Eskimo Income”: *The Motive for the 1953 High Arctic Relocation*”, University of Toronto Press, Vol 55 Issue 1, Winter 2021, pp. 118-151, <https://utpjournals-press.cfc.idm.oclc.org/doi/10.3138/jcs.2020-0018>
- Cenciotti, David, “F-16 of the 18th Fighter Interceptor Squadron Escorts Russian Tu-95, Su-35 and Su-30 Off Alaska”, *The Aviationist*, May 3, 2024, <https://theaviationist.com/2024/05/03/f-16-of-the-18th-fis-intercept-russians/>
- Charron, Andrea. “Canada, the Arctic, and NORAD: Status Quo Or New Ball Game?” *International Journal* 70, no. 2 (06, 2015): 215-231.
- Collins, Jeff, “On the Arctic Watch: Why we need to protect Canada’s sovereignty and security in the Far North: Jeff Collins for Inside Policy”, Macdonald-Laurier Institute, 17 January 2022, <https://macdonaldlaurier.ca/what-we-need-vs-what-we-have-assessing-canadas-defence-capabilities-in-the-arctic-jeff-collins-for-inside-policy/>
- Conley, Heather A., Melino, Matthew, and Alterman, Jon B., *The Iron Curtain Russia’s Arctic Military Presence*, CSIS, 26 March 2020 <https://www.csis.org/analysis/ice-curtain-russias-arctic-military-presence>
- Denbina, M., Collins, M. J., Iceberg Detection Using Simulated Dual-Polarized Radarsat Constellation Data. *Canadian Journal of Remote Sensing*, 2014 40(3), 165–178. <https://doi.org/10.1080/07038992.2014.945517>
- Fedy-MacDonald, Dayna, “Initial operational capability of Canada’s CC-295 FWSAR aircraft delayed to 2025-26”, *Skies Magazine*, 4 May 2022, <https://skiesmag.com/news/initial-operational-capability-canadas-cc-295-fwsar-aircraft-delayed-2025/>

Freeze Frame Logo - Historic Polar Images, *British Arctic Expedition 1875-6*, <https://www.freezeframe.ac.uk/resources/expeditions/arctic/british-arctic-expedition-1875-6/british-arctic-expedition-1875-6>

General Atomics Aeronautical, “Government of Canada Orders the MQ-9B Sky Guardian RPAS from GA-ASI”, 19 Dec 2023, <https://www.ga-asi.com/government-of-canada-orders-the-mq-9b-skyguardian-rpas-from-ga-asith>

Grant, Rebecca, *The Tanker Imperative*, April 2009
https://secure.afa.org/Mitchell/reports/MP2_TankerImperative0409.pdf

Gray, David, “Alert Beyond the Inuit Lands: The Story of Canadian Forces Station Alert”, Borealis Press, Ottawa, 1997 p 13

Goette, Richard. *Sovereignty and Command in Canada – US Continental Air Defence*, UBC Press, Vancouver BC 1940-57 p192

Government of Canada, “Canada-Denmark Relations”, 9 June, 2023
<https://www.international.gc.ca/country-pays/denmark-danemark/relations.aspx?lang=eng>

Government of Canada, “Canadian High Arctic Research Station now fully managed and operated in the North”, 7 June 2023,
<https://www.canada.ca/en/polar-knowledge/news/2023/06/canadian-high-arctic-research-station-now-fully-managed-and-operated-in-the-north.html>

Government of Canada, “NORAD modernization project timelines”, 24 Mar, 2023, <https://www.canada.ca/en/department-national-defence/services/operations/allies-partners/norad/norad-modernization-project-timelines.html>

Government of Canada, “Canada and the Circumpolar Regions”, 22 January 2024, <https://www.international.gc.ca/world-monde/international-relations-relations-internationales/arctic-arctique/index.aspx?lang=eng>

Government of Canada, Royal Canadian Air Force, Canadian Space Division celebrates its first birthday, July 21, 2023,
<https://www.canada.ca/en/department-national-defence/maple-leaf/rcaf/2023/07/3-canadian-space-division-celebrates-its-first-birthday.html>

Government of Canada, National Defence / Canadian Armed Forces, *The*

Strategic Tanker Transport Capability Project and NORAD Modernization, 25 July 2023, <https://www.canada.ca/en/departement-national-defence/news/2023/07/the-strategic-tanker-transport-capability-project-and-norad-modernization0.html>

Hage, Robert, “*Rights of Passage: It’s Time the U.S. Recognizes Canada’s Arctic Claim*”, Canadian Global Affairs Institute, September 2018, https://www.cgai.ca/rights_of_passage_its_time_the_us_recognizes_canada_as_arctic_claim

Hoare, Callum, “*North Pole: How Russian submarine planted flag below Arctic waters in territory claim*”, Express, 11 Jul 2019, <https://www.express.co.uk/news/world/1152287/north-pole-russia-submarine-flag-arctic-ocean-territory-claim-vladimir-putin-fire-spt>

Hopper, Tristin, “*Declaring itself a 'near-Arctic state,' China to build a 'Polar Silk Road' off Canada's north*”, National Post, 30 Jan 2018, <https://nationalpost.com/news/canada/declaring-itself-a-near-arctic-state-china-to-drive-a-polar-silk-road-off-canadas-north>

Jacobs, Frank, “*Most Canadians live south of Seattle and other mental map surprises*”, Big Think, 7 June 2023, <https://bigthink.com/strange-maps/canadians-south-seattle-mental-map-surprise/>

Jones, Seth G., Topshee, Angus, *Center for Strategic & International Studies*, Interview between Dr. Seth G. Jones, CSIS Sr VP and Commander of the Royal Canadian Navy, Vice-Admiral Angus Topshee, 3 Nov 2023, <https://www.youtube.com/watch?v=H8yr6xma7Kg&t=957s>

Jordan, Jonathan, “*Russia’s Coercive Diplomacy in the Arctic*”, July 6, 2021, <https://www.thearcticinstitute.org/russia-coercive-diplomacy-arctic/>

Hanaček, Ksenija Markus Kröger, Arnim Scheidel, Facundo Rojas, Joan Martinez-Alier, “*On thin ice – The Arctic commodity extraction frontier and environmental conflicts*”, Ecological Economics, Volume 191, January 2022, <https://www.sciencedirect.com/science/article/pii/S0921800921003062>

Kikkert, Peter. “*Arctic Mass Rescue is Daunting, but Doable.*” The Daily Sentinel Review, Jul 07, 2023. <https://login.cfc.idm.oclc.org/login?url=https://www.proquest.com/newspapers/arctic-mass-rescue-is-daunting-doable/docview/2834367877/se-2>.

Kikkert, Peter and Lackenbauer P. Whitney, “*Handshakes or Arm Wrestling?, The United States, Canada and Icebreakers in the Arctic*”, Canadian Global Affairs Institute, August 2020,

<https://canadacommons.ca/artifacts/1419509/handshakes-or-arm-wrestling/2033557/>

King, Byron, Alaska: “*The Most Important Strategic Place in the World,*” Part III”, Daily Reckoning, 22 Feb, 2008, <https://dailyreckoning.com/the-importance-of-alaska-part-ii/>

Lackenbauer, P. Whitney & Nicol, Heather, “*Whole of Government through an Arctic Lens*”, Mulroney Institute of Government, 2017, <https://canadacommons.ca/artifacts/1188641/whole-of-government-through-an-arctic-lens/1741765/>

Lackenbauer, P. Whitney., Lajeunesse, Adam, “*China's Arctic ambitions and what they mean for Canada*”, Calgary, Alberta, University of Calgary Press, 2018.

Landriault, Mathieu, “*Public Opinion on Canadian Arctic Sovereignty and Security*”, Arctic, Vol. 69, No. 2 24 August 2015, P. 160-168. <https://journalhosting.ucalgary.ca/index.php/arctic/article/view/67604>

Landrum, Laura & Holland, Marika M., “*Extremes become routine in an emerging new Arctic*” Nature Climate Change, Vol 10, pg 1108–1115, 14 September 2020, <https://doi.org/10.1038/s41558-020-0892-z>

Legasseé, Philippe, Massie Justin, “*Don't Count on Us: Canas's Military Unreadiness, War on the Rocks*”, 11 April 2024, <https://warontherocks.com/2024/04/dont-count-on-us-canadas-military-unreadiness/>

Lindahl, Emily, *New aircrew badge announcement made at 22 Wing North Bay*, Government of Canada, October 23, 2020, <https://www.canada.ca/en/department-national-defence/maple-leaf/rcaf/2020/10/new-aircrew-badge-announcement-made-at-22-wing-north-bay.html>

Live & Learn, “*11 basic facts about Canada*”, 8 June 2015. <https://livelearn.ca/article/about-canada/10-basic-things-to-know-about-canada/>

Loh, Chris, “*The Canadian Air Force's Incoming A330 MRTTs: What We Know So Far, Simply Flying*”, Mar 17, 2024, <https://simpleflying.com/rcaf-airbus-a330-mrta-husky-update-march-2024/>

Marcus, Alan Rudolph. *Relocating Eden : The Image and Politics of Inuit Exile in the Canadian Arctic*, University Press of New England, 1995.

Mason Lee, Robert. “*Death and Deliverance*”. Macfarlane Walter & Ross, 1992

(77)

- MilitaryBases.com, “*Alaska Military Bases*” <https://militarybases.com/alaska>
- National Defence, “*Our North, Strong and Free: A Renewed Vision for Canada’s Defence*”, Minister of National Defence, 2024, <https://www.canada.ca/en/department-national-defence/news/2024/04/our-north-strong-and-free-a-renewed-vision-for-canadas-defence.html>
- Pinto, Sam, “*Canada’s Final Frontier: Understanding Arctic Sovereignty*”, The Tribune, February 25, 2014, <https://www.thetribune.ca/features/canadas-final-frontier/>
- Pole, Ken, “*Canada to acquire fleet of MQ-9B Sky Guardian drones*”, Skies Magazine, December 19, 2023, <https://skiesmag.com/news/canada-to-acquire-fleet-of-mq-9b-skyguardian-drones/>
- Royal Canadian Air Force Doctrine, B-GA-400-000/FP-001, 3rd Edition, November 2016, https://publications.gc.ca/collections/collection_2017/mdn-dnd/D2-368-2016-eng.pdf
- RCAF Strategy for Space Mission Assurance, B-GJ-120-000/FP-001, 1st Edition, March 2022, <https://www.canada.ca/content/dam/rcaf-arc/documents/reports-publications/space/b-gj-120-000-fp-001.pdf>
- Roots, Fred, “*Why the North Pole matters: An important history of challenges and global fascination*”, Canadian Geographic, March 14, 2017, <https://canadiangeographic.ca/articles/why-the-north-pole-matters-an-important-history-of-challenges-and-global-fascination/>
- Rosen, Yereth, “*Russian objection to U.S. territorial claims off Alaska complicates maritime relationship*”, Alaska Beacon, 6 April 2024, <https://www.yahoo.com/news/russian-objection-u-territorial-claims-120045774.html>
- Rumer, Eugene, Sokolsky, Richard, Stronski, Paul, “*Russia in the Arctic: A Critical Examination*”, Carnegie Endowment for International Peace, March 29, 2021, <https://carnegieendowment.org/2021/03/29/russia-in-arctic-critical-examination-pub-84181>
- Schlosberg, Jon, Brooksbank, Tommy, Whitworth, Kayna, and Alvim, Leda, “*Navy launches training exercise in Arctic Circle as global tensions rise*”, ABC News, March 15, 2022, <https://abcnews.go.com/US/navy-launches-training-exercise-arctic-circle-global-tensions/story?id=83439828>

- Sinclare Robert, Arctic Council: Canada,
<https://arctic-council.org/about/states/canada/>
- Sponagle, Jane, *'We called it 'Prison Island': Inuk man remembers forced relocation to Grise Fiord'*, CBC News, 30 Jun 2017,
<https://www.cbc.ca/news/canada/north/forced-relocation-high-arctic-inuit-1.4182600>
- Spring, Rebecca, *"Inuit Speak out Against Expansion of the Arctic Iron Mine, Community Concerned over Wildlife Impacts"*, World Wildlife Fund Canada, 2 February, 2021, <https://wwf.ca/stories/inuit-speak-out-against-expansion-of-arctic-iron-mine/>
- Stewart, Will, Truelove, Sam, *"Russian nuclear bombers come face to face with US fighter jets as Vladimir Putin deployed two warplanes near the coast of Alaska"*, Mirror, 3 May 2024, <https://www.mirror.co.uk/news/us-news/russian-warplanes-come-face-face-32728964.amp>
- Têtu, P. L., Lasserre, F., Pelletier, S., & Dawson, J. (2019). 'Sovereignty' over submerged cultural heritage in the Canadian Arctic waters: case study from the Franklin expedition wrecks (1845-48)". *Polar Geography*, 42(2), 71–88. <https://doi-org.cfc.idm.oclc.org/10.1080/1088937X.2019.1578288>
- Thatcher Chris, *"With Airbus MRTT, Canada contracts for larger and more flexible refueling fleet"*, Skies Magazine, 26 July, 2023,
<https://skiesmag.com/news/airbus-mrvt-aircraft-canada-contracts-larger-more-flexible-refueling-fleet/>
- Thatcher, Chris, *"Welcome back, Canada: flying the NATO E-3A AWACS aircraft"*, Skies Magazine, March 4, 2022,
<https://skiesmag.com/features/welcome-back-canada-flying-nato-e-3a-awacs-aircraft/>
- Todd, Brian, Mullen, Jethro, *"July Fourth message not the first from Russian bombers"*, CNN, July 23, 2015,
<https://www.cnn.com/2015/07/23/politics/us-russian-bombers-july-4-intercept/index.html>
- Toth, Katie, *"Investigators, experts ask questions after ship grounded in Arctic"*, CBC, 28 Aug 2018, <https://www.cbc.ca/news/canada/north/investgiators-kugaaruk-nunavut-ship-run-aground-1.4801273>
- Tranter, Emma, *"You cannot claim any more:' Russia seeks bigger piece of*

Arctic”, CBC News, 11 April 2021,
<https://www.cbc.ca/news/canada/north/russia-arctic-ocean-canada-united-nations-continental-shelf-1.5983289>

Tranter, Emma, “*It's high time': Nunavut officially takes over land, resource responsibilities from feds*”, CBC News, Jan 18, 2024,
<https://www.cbc.ca/news/canada/north/nunavut-trudeau-sign-devolution-agreement-1.7086272>

Tukker, Paul, “*The DEW Line at 65: Future unclear for the North's aging radar sites*”, CBC News, May 10, 2022,
<https://www.cbc.ca/news/canada/north/dew-line-65-years-norad-1.6446875>

Turnbull, Sarah, “*Threat of Russian invasion in Canada's North 'very low' but that could change: Defence chief*”, CTV News, 10 March 2022,
<https://www.ctvnews.ca/politics/threat-of-russian-invasion-in-canada-s-north-very-low-but-that-could-change-defence-chief-1.5814612>.

United States Coast Guard, “*Major Icebreakers of the World*”, 1 May 2017
<https://www.dco.uscg.mil/Portals/9/DCO%20Documents/Office%20of%20Waterways%20and%20Ocean%20Policy/20170501%20major%20icebreaker%20chart.pdf?ver=2017-06-08-091723-907>

Vachon, P. W., Kabatoff C. and Quinn, R, “*Operational ship detection in Canada using RADARSAT,*” *IEEE Geoscience and Remote Sensing Symposium*, 2014, <https://ieeexplore.ieee.org/document/6946595>

Williamson, Justin & Wirtz, James J., “*Hypersonic or just hype? Assessing the Russian hypersonic weapons program*”. *Comparative Strategy*, 20 Sep 2021, 40(5), 468–481. <https://doi.org/cfc.idm.oclc.org/10.1080/01495933.2021.1962198>

Wikipedia, *First Air Flight 6560*, 24 February 2024,
https://en.wikipedia.org/wiki/First_Air_Flight_6560

Wikipedia, *Tupolev Tu-95*, 8 May 2024,
https://en.wikipedia.org/wiki/Tupolev_Tu-95#cite_note-Monino-2

Wolter, Mike, “*435 Squadron delivers air-to-air refuelling for a quarter century*”, *Skies Magazine*, June 13, 2018, <https://skiesmag.com/news/435-squadron-delivers-air-to-air-refuelling-for-a-quarter-century/>

Woolf, Marie, “*Canada’s defence chief warns Russia has reoccupied Arctic*

bases”, Global News, March 10, 2022,
<https://globalnews.ca/news/8674752/canada-defence-minister-russia-cold-war-bases/>