



Network for Strategic Analysis (NSA)

NORAD Modernization Closed Door Workshop (via Zoom)

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The following report was prepared by:

Nicholas Glesby, MA Candidate and Student Fellow, Centre for Defence Security Studies

Daniel Kiesman, BAH Student, University of Manitoba

Jill Barclay, Policy and Research Coordinator, North American and Arctic Defence and Security Network

Dr. Andrea Charron, Director, Centre for Defence and Security Studies

Executive Summary

This workshop wrestled with three challenges for NORAD that are often overlooked when discussing modernization and future CANUS operations.

- 1) Role, responsibilities, and concepts for dealing with Unmanned Aerial Systems (UAS) – American terminology/Remotely Piloted Aerial System (RPAS) – Canadian terminology.
- 2) All domain awareness.
- 3) Sustainment of operations in the Arctic.

Central to the issue of NORAD modernization is the understanding that NORAD is not just an aerospace or maritime monitoring institution, but that it is a binational defense command with a defense mission to protect North America. All-domain awareness is one solution to this wicked problem, as accurate information, picked out by artificial intelligence, can be presented to decision-makers in real time during a time of crisis. Competitors, such as Russia and China, continue to pose an increasing threat to North American security and are not deterred by North America's current homeland defence efforts. Threats today are multi-domain and asymmetric and therefore must be met with flexible responses. To meet these challenges, the "stove piping" of important information among the various North American defense agencies must be stopped, so that critical data can be shared likely via a future artificial intelligence dominated cloud system of information.

The US and Canada must understand the nature and lethality of the threats they face jointly. In order to best utilize NORAD, Canada and the US must agree that North America is vulnerable. If the US views NORAD modernization as a priority and invests in it, Canada will follow along and invest funds as well; Ottawa only has political capital to spend on modernization if Washington does as well.

NORAD tends to be reactive and not proactive. This is the inherent problem with a defensively oriented command. In order to avoid another inflection point, like 9/11, the United States needs to raise the profile of the North Warning System as critical to domain awareness. In turn, Canada must dedicate further research and development funds but is likely to be more favourably received in Canada if pitched as all domain awareness beyond purely military threats. The Post-World War era of American and Canadian governments are not structured to deal with the Arctic as a distinct region with unique issues. Sustained operations in the Arctic will continue to be massive exercises in logistics to pre-deploy assets and temporary lodgings and facilities. Most importantly, stovepipes need be removed in order to provide decision-makers the most accurate information in real time to defend North America including sharing an air picture with all security and defence actors in North America.

Recommendations

RPAS

- Transport Canada and NAVCanada need the ability to track RPAS in flight and share with defence officials. Furthermore, A North American UAS/RPAS traffic management

system is needed that highlights, especially, malign/unusual UAS activity so that the picture does not become too saturated.

- Canada needs statutory regulation in detection and response to RPAS entering restricted spaces or threatening critical infrastructure other than airports.
- Permanent no-fly zones around critical infrastructure may create better awareness about restricted spaces and may make it easier to track malicious actors by creating a discriminatory effect.
- Committees on both sides of the border are considering this issue and it is recommended that this issue be raised and studied by the Permanent Joint Board on Defence at a future meeting including future counter-UAS capabilities and protocols for North America.

All Domain Awareness

- Canada's decision not to participate in the US ground-based midcourse ballistic missile defence system is strangling any coherent debate about participation in future systems because of a lack of understanding and knowledge about the systems. The recommendation is that new language be adopted.
- The elimination of information stove pipes and greater access to cross-departmental information and intelligence are key recommendations which includes a shared, common air picture for all air agencies.
- An information campaign informing the Canadian public about repurposing the North Warning System as a cost-efficient preferred alternative would be beneficial,
- Any future modernization projects must anticipate future demographic migration expected farther north in the provinces and territories, especially BC and Yukon.

Operations in the Arctic

- The Arctic is a homeland to many Indigenous peoples. Given duties and responsibilities outlined in UN Declaration on the Rights of Indigenous Peoples (UNDRIP), it is paramount that militaries and security and safety agencies form formal liaisons with ITK, ICC, Gwich'in and Athabaskan councils¹ to ensure meaningful and significant pre-decision consultations. Rather than each department seeking their own liaisons, it is recommended that Canada's Arctic Security Working Group be used more effectively (as it brings together all Canadian departments and agencies) and that the PJBD also seek guidance from these indigenous councils.
- It is time for a serious rethink of the tricommand relationship and a refresh of the classified Tricommand Arctic Strategy. One of the key questions is does Canada need a new mechanism for fuel contracts?

¹ The ICC, Gwich'in and Athabaskan peoples have formal representation as Permanent Participants on the Arctic Council representing Canadian and US (and Russian) indigenous peoples. The ITK has representation via the ICC on international issues. See <https://arctic-council.org/en/about/permanent-participants/>

- Militaries must be prepared for extreme temperatures at both ends of thermometer. Operations will continue to be herculean logistics exercises in pre-deploying assets and temporary facilities for the foreseeable future.
- There is no political advantage for Canada to push NORAD modernization in Washington as NORAD has long been advertised as a defensive command, and USNORTHCOM is unlikely to win in a battle of resources US Congress given focus on China and the Asia Pacific region.

1) **Role, responsibilities, and concepts for dealing with RPAS/UAS.**

The use of remotely piloted aircraft systems (RPAS – the Canadian terminology), also known as unmanned aerial systems (UAS – the American terminology), by state and nonstate actors has increased in recent years. RPAS of various sizes and capabilities, frequently fly around/near key/critical infrastructure and other sensitive areas. A report by the CNA notes that Russia’s use of autonomous systems, especially in swarms using artificial intelligence (AI), is now working on integrating and coordinating crewed and uncrewed vehicles in operations. A sampling of this advanced use of UAS was seen in Syria and in Nagorno Karabakh.² Russia’s way of war is to deny culpability which UAS facilitate. And while Russia is quick to note the intent is to use UAS defensively, this potentially changes the calculus of the US military and allies for future operations.

Whether benign or malign, RPAS are difficult to detect using existing radar as they are not easily distinguishable from animals and/or they are flying at a speed and/or range not conducive to detection by radar. When suspicious RPAS activity does occur, it is often difficult to determine if the operator has malicious intentions and poses a security risk, or if the operator is just careless/ignorant of the relevant rules and regulations. Additionally, the nature of RPAS is such that they can take off and land nearly anywhere. As a result, RPAS can approach and enter restricted spaces with little warning. This, coupled with the difficulty of RPAS detection, as well as the challenges discerning intent, can significantly limit the critical decision time of the relevant defence, security, and regulatory agencies.

Transport Canada Responsibilities

Transport Canada has focused on regulating and educating hobby and amateur operators in order to address safety concerns surrounding the use of RPAS. To legally fly in Canada, RPAS must be marked and registered. Transport Canada has a RPAS pilot certification that any operator

² Jeffrey Edmonds, Samuel Bendett, Anya Fink, Mary Chesnut, Dmitry Gorenburg, Michael Kofman, Kasey Stricklin, and Julian Waller, “Artificial Intelligence and Autonomy in Russia”, CNA (May 2021): 115. https://www.cna.org/CNA_files/centers/CNA/sppp/rsp/russia-ai/Russia-Artificial-Intelligence-Autonomy-Putin-Military.pdf

flying a RPAS over 250 grams must obtain.³ There are also a number of rules operators must obey when flying RPAS, which include requiring all operators to be in view of the RPAS at all times, fly below 400 feet in the air, and stay outside of controlled airspace. Violators of these rules can face fines ranging from \$1,000 - \$15, 000.⁴ These regulations are designed to make all RPAS operators aware of their responsibilities and operate their RPAS safely. **Transport Canada, however, has no ability to track RPAS in flight. I.e., they have no sensors and no watch floor dedicated to RPAS.** Civilian RPAS *may* be detected by NAVCANADA systems and NAVCANADA has a web and mobile app to aid RPAS users plan a safe flight within Canadian airspace, especially controlled airspace.⁵ The onus, however, is on operators to behave safely and lawfully.

Transport Canada is focused on security issues relating to RPAS. With the increasing popularity of RPAS, Transport Canada has prioritized the safety and security of airports and aircraft. The disruptive potential of RPAS was illustrated at Gatwick Airport in the United Kingdom, when a RPAS forced the airport to shut down for 33 hours interrupted the travel of roughly 100,000 passengers, causing delays and economic impacts.⁶ Transport Canada works closely with large airports on strategies for RPAS detection and responses in order to prevent a similar incident from occurring at a Canadian airport. In Canada, RPAS operators⁷ must stay at least 5.6 km away from airports and cannot fly anywhere near aircraft.⁸ Additionally, Transport Canada is also working on a proof of concept for RPAS surveillance system from Iqaluit to aid with improved marine awareness, mapping and infrastructure inspections and emergency response but a country-wide rollout of such projects is years in the making.

Transport Canada is working with industry on an RPAS tracking system. Even with such a capability, malfeasants, who want to cause harm, will find ways to avoid/jam/defeat such systems. Furthermore, **Canada lacks statutory regulation in detection and response to RPAS entering restricted spaces or threatening critical infrastructure other than airports.** The use of force against RPAS in these situations is not specifically addressed in Canadian law. Presumably, should the NORAD Commander deem a RPAS a critical threat, he/she would seek permission to engage via National Command Authorities. However, given difficulties detecting such threats, the time for permission and clarification of rules of engagement may be insufficient

³ Transport Canada. “Flying Your Drone Safely and Legally.” Government of Canada. 1 September 2020. <https://tc.canada.ca/en/aviation/drone-safety/flying-your-drone-safely-legally> and Aeronautical Information Manual – Remotely Piloted Aircraft found at https://tc.canada.ca/sites/default/files/2021-03/AIM-2021-1_RPA-E.pdf

⁴ Ibid.

⁵ <https://www.navcanada.ca/en/flight-planning/drone-flight-planning.aspx>

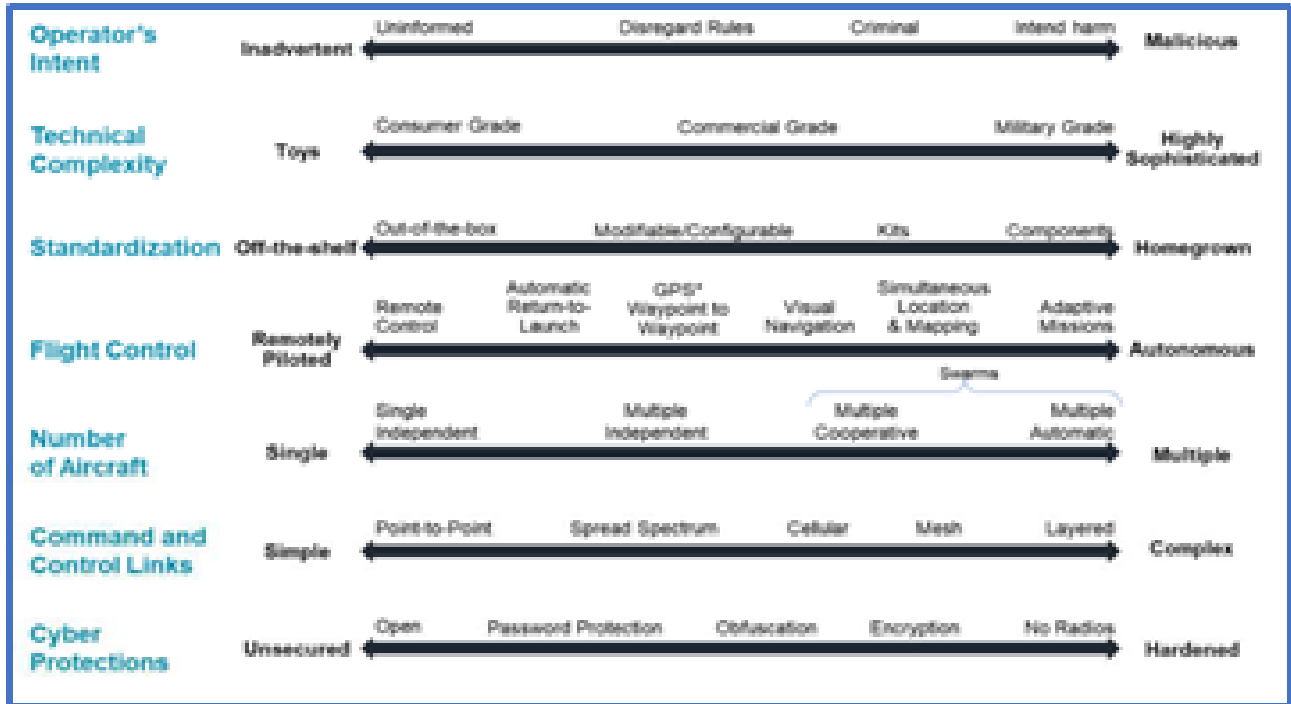
⁶ Benjamin Mueller and Amie Tsang, « Gatwick Airport Shutdown by Deliberate Drone Incursion », NY Times (20 December 2018). <https://www.nytimes.com/2018/12/20/world/europe/gatwick-airport-drones.html>

⁷ Rowlatt, Justin. “Gatwick Drone Attack Possible Inside Job, Say Police.” BBC News. 14 April 2019. <https://www.bbc.com/news/uk-47919680>.

⁸ Transport Canada, “Flying Your Drone Safely and Legally.”

to defeat the threat. Figure 1 below shows the continuum of malign activity. Militaries are typically engaged with the far-right end of the spectrum; Transport Canada with the far left of the continuum and the RCMP and Transport Canada with activity in the middle, especially criminal.

Figure 1 – Continuum of Malicious UAS activity⁹



No Fly Zones

Permanent no-fly zones are routinely established to protect critical areas within the continental United States but not so in Canada. There are no permanent no fly zones, for example, above nuclear facilities. Transport Canada establishes temporary no-fly zones often tailored to a specific, international event such as the G20 or Olympics or around important sites, such as legislatures. These restrictions are communicated through a notice to airmen (NOTAM). Hobby RPAS operators may not be aware of or know where to find NOTAMs. Additionally, RPAS operators with malicious intent will not follow such restrictions and given that RPAS can take off and land within these restricted spaces, critical decision time by authorities is reduced significantly. NAVCanada and Transport Canada are working on an app to allow authorization for RPAS in controlled zones (NAVdrone), but it is still a work in process.

⁹ Lacher et al, *Small Unmanned Aircraft*, p.3.

Permanent no-fly zones around critical infrastructure may create better awareness about restricted spaces and may make it easier to track malicious actors by creating a discriminatory effect. Reliance on AIS/transponders for drones is insufficient as they can be turned off and current remedies to render RPAS incapacitated are now easily defeated.

An Air Picture for all Agencies?

Unlike Canada's maritime agencies which operate as part of a multi-agency Marine Security Operations Centre (MSOC) to share information about vessels of interest,¹⁰ the Canadian air agencies do not co-create one air picture. Rather, NAVCANADA shares air feeds with the RCAF and with NORAD regarding civilian aircraft, and the military adds their information, but there is no equivalent Marine Security Operations Centres (MSOCs)¹¹ that include all of the relevant actors to share information and create a common air picture. **Currently, no agency is charged with actively tracking RPAS; they may or may not be captured by NORAD radars or NAVCANADA radar. A North American UAS traffic management system is needed that highlights, especially, malign/unusual UAS activity so that the picture does not become too saturated.**

Domain awareness is a key requirement for NORAD to detect, deter and defeat air threats. This includes RPAS with aggressive, malicious intent (activity that falls to the right side of Fig. 1). While NORAD is more focused on malign state-based RPAS that could cause considerable damage, NORAD is painfully aware of what happens when a civilian, who simply wishes to cause mischief, is able to enter restricted air zone calling its ability to defend the North American airspace into question.¹² Counter-RPAS use by both the Canadian and US militaries is a new area of study and concern. **Committees on both sides of the border are considering this issue and it is recommended that this issue be raised and studied by the Permanent Joint Board on Defence at a future meeting.**

¹⁰ MSOCs are more rightly called maritime intelligence analytical fusion centres. The impetus for their creation was to facilitate the sharing of intelligence among the six federal government agencies concerned with marine-based threats that could negatively affect safety or security. The Canadian Armed Forces, Canadian Coast Guard (CCG), Transport Canada (TC), Canada Border Services Agency (CBSA), RCMP, the Conservation and Protection (C&P) arm of Fisheries and Oceans Canada are represented at the three MSOCs – one on the East and West coast and one for the Great Lakes. For more on the MSOCs see <https://www.navalreview.ca/2020/02/ode-to-canadas-maritime-security-operation-centres/>

¹¹ See <https://www.navalreview.ca/2020/02/ode-to-canadas-maritime-security-operation-centres/> and <https://tc.canada.ca/en/marine-transportation/marine-security/marine-security-operation-centres>

¹² FLYING UNDER THE RADAR: SECURING WASHINGTON, D.C., AIRSPACE, HEARING BEFORE COMMITTEE ON OVERSIGHT AND GOVERNMENT REFORM HOUSE OF REPRESENTATIVES, ONE HUNDRED FOURTEENTH CONGRESS (29 April 2015)

<https://www.govinfo.gov/content/pkg/CHRG-114hrg95250/html/CHRG-114hrg95250.htm>

Given the global environment, it is critical that NORAD be ready for war – it is not simply a defensive command. Therefore, it is important to consider UAS not only as a regulatory and security problem, but also as tools used in war and conflict. NORAD then must consider how the North Warning System (NWS) and/or new radar systems can be configured to detect malicious UAS.

Small UAS used by hobbyists, and the problems they can cause, are best handled by law enforcement and regulations, such as altitude restrictions and mandatory distances from airports. Given NORAD’s resources these smaller devices are not likely something NORAD can handle appropriately. NORAD must use its resources most efficiently and many of NORAD’s weapons are ill suited to countering small UAS. In the past NORAD has tried to tackle the “low and slow” problem, where radar cannot distinguish small aircraft from animals, with little success. However, technological advancement in machine learning, as demonstrated by the Pathfinder¹³ project, may allow for better UAS detection. **As UAS becomes more prevalent, counter-UAS capabilities will be needed.** The US Department of the Air Force will award a \$500 million counter-UAS contract by the end of the year. Counter-UAS measures that could be developed and implemented include, swarming, netting, and the use of lasers.

The threat posed by UAS is not going away and is only likely to increase with time. There is an opportunity for NORAD to collaborate with Transport Canada on countering UAS. Addressing the UAS phenomenon will likely require innovative countermeasures, technological advancement in UAS detection and tracking systems and the further development of statutory regulation and policy to guide the counter-UAS actions of the relevant agencies and organizations.

2) All domain awareness

A) Existing Sensors

All-Domain awareness (US parlance) or pan-domain (Canadian parlance) is the goal of militaries and governments. Due to complex, 360⁰ threats, that are both asymmetric and symmetric threats. NORAD’s current strategy is outlined below.

The four strategic principles used to achieve [NORAD and USNORTHCOM] priorities are building blocks under an umbrella of Global Integration (GI). All Domain Awareness (DA) is the first step in pursuit of Information Dominance (ID), which is used to reach Decision Superiority (DS) in competition and crisis. Applying these strategic principles

¹³ Leveraging commercial technology, the Pathfinder ecosystem ingests air domain sensor data, utilises software automation and applies machine learning models all within a cloud-based architecture to support real-time domain awareness and warfighter decision-making.

positions the commands further “left of launch” not just in crisis, but also during competition in order to get inside the adversaries Observe-Orient-Decide-Act (OODA) loop and complicate their calculus.¹⁴

NORAD is fundamental to the Canada-United States (CANUS) defence relationship. Due to the binational structure of the command, information that an artificial intelligence-based all-domain awareness system would possess is contained in stovepipes of numerous government departments and agencies on both sides of the border. This poses a problem for decision-makers who only have seconds to make a choice during times of crisis. Because defence and security information places NORAD at the end of the chain of information, these mandates and structures created in a post-World War II world have an impact on the binational relationship. With near-peer competition resulting in technological advancements of adversaries (i.e., cruise missiles and hypersonic weapons), NORAD must be given more importance on the continuum of North American safety, security, and defence. **The elimination of information stove pipes and greater access to cross-departmental information and intelligence are key recommendations which includes a shared, common air picture for all air agencies.**

There needs to be a discussion by the PJBD on future sensor needs.

B) Enhanced Systems

North Warning System (NWS) renewal includes multiple considerations, beyond those located in the political or financial realms. Necessary upgrades to NWS are a byproduct of technological advancement by adversaries. The current radar system, designed for the last war, is no longer sufficient for constantly evolving continental defence. NORAD’s new concern are hypersonic weapons, their detection and defeat. The US MDA has outlined a potential future system that involves multiple platforms in multiple domains including the Aegis system.¹⁵ **Canada’s decision not to participate in the US ground-based midcourse ballistic missile defence system is strangling any coherent debate about participation in future systems because of a lack of understanding and knowledge about the systems. The recommendation is that new language be adopted.** Rather than BMD and hypersonic systems, use detection and denial language to reset the conversation in Canada. The military would be wise to invest in public affairs officers to actively counter and correct poorly worded/misleading media and op ed pieces on new systems.

¹⁴ NORAD and USNORTHCOM Strategy: Executive Summary (March 2021): 6.
[https://www.northcom.mil/Portals/28/\(U\)%20NORAD-USNORTHCOM%20Strategy%20EXSUM%20-%20Signed.pdf](https://www.northcom.mil/Portals/28/(U)%20NORAD-USNORTHCOM%20Strategy%20EXSUM%20-%20Signed.pdf)

¹⁵ MDA Hypersonic Concept System (16 June 2021). <https://www.dvidshub.net/video/801628/mda-hypersonic-concept>

C) New Systems

Investment in new systems, primarily located in the Canadian Arctic, creates an intrinsic political dilemma for Ottawa. Investment in these systems will help defend Canada through the Arctic as an avenue of approach, contrary to public sentiment that what happens in the Arctic stays in the Arctic. This is bound to be a problem for NORAD, as funding is approved via the federal government. **An information campaign informing the public about repurposing the North Warning System as a cost-efficient preferred alternative would be beneficial**, with emphasis on how the radar installations serve as navigation tools for Indigenous hunters and gatherers. The conversation in Canada, however, needs to widen to one about continental defence writ large, rather than confined to Arctic-only issues.

In terms of cost-efficiency, R&D institutions like Defence Research and Development Canada (DRDC) and the Defense Advanced Research Projects Agency (DARPA) need to find shrunk-down, cost-effective solutions (perhaps containing quantum radar that can detect stealth air assets) that can fit into existing NWS radar installations. The benefit of this would be that the Department of National Defence (DND) will maintain the NWS (which is too expensive to demolish and clean up), rather than the NWS *and* new modernized radar installations. This is akin to the repurposing of several Distant Early Warning (DEW) Line sites to suit the NWS. However, any sort of large upgrades originating in DARPA or DRDC realms is unlikely to have political impetus until the Department of the US Air Force (as NORAD's funding guarantor) deems necessary. For example, Pathfinder is a crucial to interpreting data the NWS receives, and is driven by the US military, with Canada providing minimal support.

Given the enormous advancement in technology since the NWS was installed in the late 1980s, the equation of defending the continent has also changed. **With the alignment of the Canadian Air Defence Identification Zone (Canada ADIZ) reaching from the Labrador Sea to the very northern part of the Arctic archipelago as of 24 May 2018, the NWS has been pushed even further in terms of its capabilities.** (See Figure 2) Noticeably, the Canadian NORAD Region, and NORAD writ large, does not have any radar coverage in a sizeable portion of Canada. If an adversary was to hypothetically penetrate the western-most existing United States Air Defense Identification Zone (US ADIZ) and Canadian ADIZ, there would be zero radar coverage (that is not stove piped inside government agencies) that NORAD could have access to. This creates both a seam and capability gap that adversaries may seek to exploit. **More than a NWS overhaul is needed but it is unclear what a "system of systems" would entail and if Canada could afford such a system.**

Figure 2¹⁶

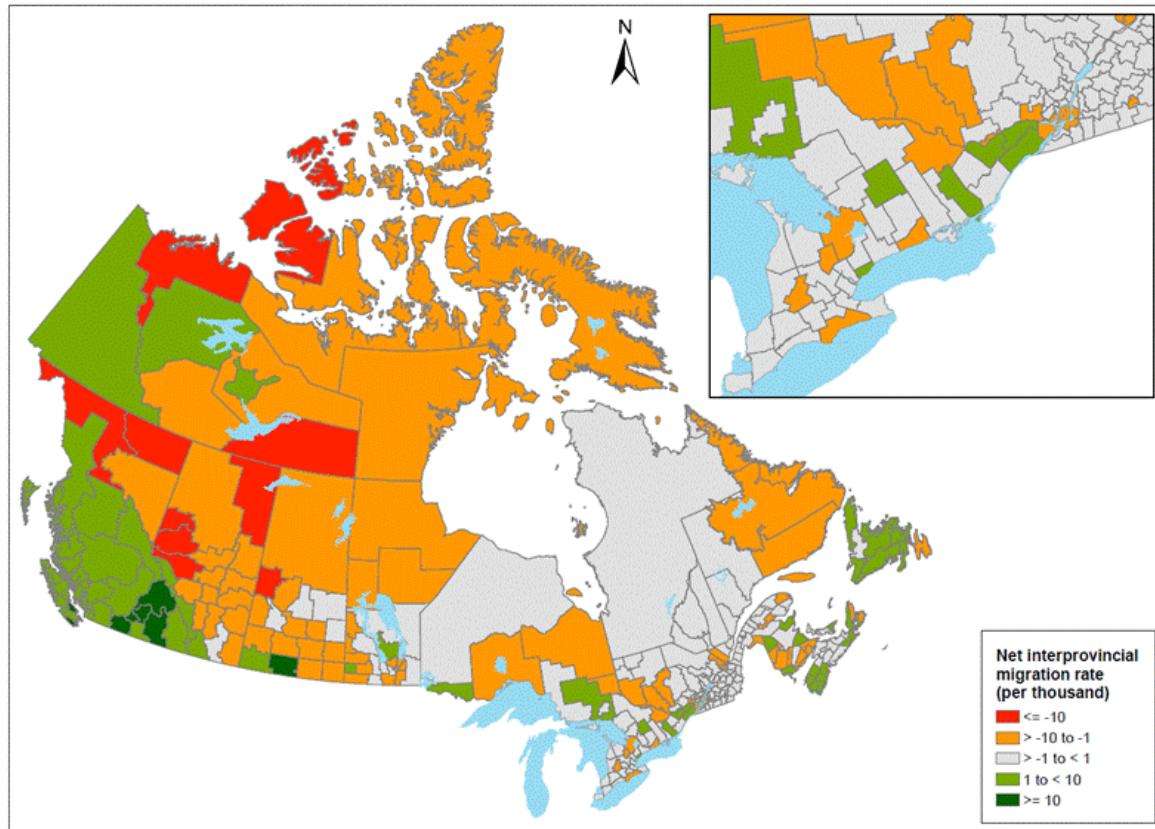
¹⁶ Provided by NORAD.



While there are currently no major population centres in the Canadian radar gap, **any future modernization projects must anticipate future demographic migration expected farther north in the provinces and territories, especially BC and Yukon.**¹⁷

¹⁷ Map and report from Statistics Canada on internal migration see <https://www150.statcan.gc.ca/n1/pub/91-209-x/2018001/article/54958-eng.htm>

Map 3
Net interprovincial migration rate (per thousand), by census division, 2015/2016



Source: Statistics Canada, Demography Division.

While the old adage: “if you defend everywhere, you defend nowhere” is particularly true for Canada, decision-makers must prioritize essentials to be defended and plan for how to best defend them while ensuring Canadian territorial sovereignty remains intact. **For example, cyber warfare, economic intrusion, and cruise missiles are the new threats with a nexus to NORAD. These three threats could leave a hole in the continental defence lines should a military installation or NWS radar station be targeted by an adversary.**

Figure 3: NWS location ¹⁸

¹⁸ CBC News (courtesy of Nasittuq Corporation). “Raytheon wins 5-year North Warning System contract. 1 April 2014. <https://www.cbc.ca/news/canada/north/raytheon-wins-5-year-north-warning-system-contract-1.2594075>.



All-Domain Awareness, and Joint All-Domain Command and Control (JADC2) (in Canada pan domain integrated operations) are the US military's goal and NORAD's solution to ensure deterrence by denial i.e., raising the cost to adversaries should they consider an attack on North America. **Modernized radar (perhaps quantum in the future?) may be needed to address the new threat of cruise missiles and hypersonic weapons, but this will be far in the future.** In the short-term, by repurposing the NWS to deter and detect adversarial threats, NORAD will demonstrate fiscal and environmental responsibility to those living in the Canadian Arctic. **Eliminating stovepipes amongst Canadian and American government agencies and departments will feed information into a singular, central approach which (using Artificial Intelligence) can feed relevant information to relevant actors in real-time to make decision-making more accurate and responsive across the two governments.** By utilizing all forms of intelligence assets in air, land, space (i.e., RADARSAT Constellation), sea, and cyber domains, NORAD and defence actors can address concerns in real time. Modernization writ large needs to place emphasis on how adversaries are seeking to attack the continent and how they may use our capability gaps and seams to do so. In short, NORAD modernization is more than CF-18 replacement; **modernization is a binational whole-of-government approach in gathering real-time multi-domain intelligence that provides decision-makers with the best available information to make a decision in a time of crisis.** Until the impetus inside the United States drives this change, it is unlikely that Canada will use the political or financial capital to change capability gaps that exist in the NWS and continental defence writ large.

The NORAD relationship vis-a-vis NATO is not new. For Canada, this juxtaposition may mean a reignited national debate on hypersonic missile defence, something that is akin to the ballistic

missile defence debate of 2004. It is also unlikely that Canada would want to expand the NORAD arrangement to include European partners, as it would create further complexity regarding “plug-and-play” capabilities of military equipment and would erode the special CANUS relationship that Ottawa cherishes.

In 1959, Prime Minister Diefenbaker cancelled the Avro Arrow project, a plane designed by a Canadian company. Instead, operating under the guise of the newly formed NORAD arrangement in 1957, Diefenbaker announced the purchase of 56 anti-aircraft Boeing Michigan Aeronautical Research Center (Bomarc) missiles that could intercept Soviet Union missiles before they reached Canadian valuable targets. However, the government never disclosed to the public that the Bomarcs were to carry nuclear warheads, causing mass outrage. Furthermore, the NATO demands included the purchase of CF-104 fighters, which were required to be nuclear tipped. When the planes eventually deployed in Europe, Canada refused to carry nuclear weapons.¹⁹ **The Avro Arrow scandal, which prompted the 1963 election, and the 2005 BMD debate, shows the political volatility that both cruise and hypersonic weapons may pose for decision-makers in the short-term and next generation.**

3) Sustainment of operations in the Arctic.

The Arctic is a homeland to many Indigenous peoples. Given duties and responsibilities outlined in UN Declaration on the Rights of Indigenous Peoples (UNDRIP), it is paramount that militaries and security and safety agencies form formal liaisons with ITK, ICC, Gwich'in and Athabaskan councils²⁰ to ensure meaningful and significant pre-decision consultations. Rather than each department seeking their own liaisons, it is recommended that Canada's Arctic Security Working Group be used more effectively (as it brings together all Canadian departments and agencies) and that the PJBD also seek guidance from these indigenous councils.

Overall cooperation and coordination for operations in the Arctic is located in the tri-command arrangement consisting of NORAD, USNORTHCOM and Canadian Joint Operations Command (CJOC) – or N²+C - established roughly a decade ago.²¹ It is, at best, an informal command

¹⁹ “The Bomarc Missile Controversy.” *Valour Canada*. Accessed 25 June 2021. <https://valourcanada.ca/military-history-library/the-bomarc-missile-controversy/>.

²⁰ The ICC, Gwich'in and Athabaskan peoples have formal representation as Permanent Participants on the Arctic Council representing Canadian and US (and Russian) indigenous peoples. The ITK has representation via the ICC on international issues. See <https://arctic-council.org/en/about/permanent-participants/>

²¹ To a lesser degree, the Permanent Joint Board on Defence (PJBD) and the Military Cooperation Committee (MCC) also provide input on cooperation requirements. The PJBD was established by the 1940 Ogdensburg Agreement (a one-page press release) and makes recommendations on defence cooperation to both national

arrangement, and whether or not it will evolve to become a more formal, centralized North American command is dependent on political will. Moreover, the N² legs of the arrangement (NORAD and USNORTHCOM) are devoted strictly to North America, while CJOC is responsible for all Canadian military operations, whether home or abroad, that do not involve NORAD or special forces. Whereas before, CJOC devoted most of its attention and limited resources to overseas operations,²² today, due to climate change, COVID 19 and the need to provide assistance to Canadian civilian agencies, the split in terms of resources and attention is 50% at home, 50% overseas.²³ **It is time for a serious rethink of the tricommand relationship and a refresh of the classified Tricommand Arctic Strategy. One of the key questions is does Canada need a new mechanism for fuel contracts that is a pan-Arctic approach rather than commanders with individual contracts.**

NORAD is going to be focused on the Arctic region in the future. Between a post-COVID-19 world, Russian and Chinese aggression, and climate change, a renewed and intense focus in the Arctic is underway in Canada and the United States. As this demand increases, the military needs more cold-weather infrastructure. This includes airfield runways, joint agile basing and forward operating locations, and the ability to refuel. Due to the cold-temperature and high building costs, there are few runways that are not gravel — which limits the platforms that can land safely. **Equipment** such as new radar sensors, refueling planes, and transportation **must be built with the extreme weather in mind – increasingly at both ends of the thermometer.** If NORAD, and separately, the USAF and RCAF are to create more hard points in the Arctic, the research and development of this equipment must be emphasized so that this new infrastructure is reliable at all times. This is with particular reference to over-the-horizon radar systems which will solve the problem of the high latitude of the region, relative to the curvature of the earth, and the technological inability to access certain communications equipment at this latitude.

As the post-COVID-19 world begins in earnest with high uptake of vaccinations in western nations, the pent-up demand for travel will place a new emphasis on search and rescue for

commands. authorities. The MCC in many ways is simply the technical arm of the PJBD. See Andrea Charron. “The Permanent Joint Board on Defence; How Permanent and How Joint? Workshop Report. (Winnipeg: Centre for Defence and Security Studies, 25 February 2020). Found at https://umanitoba.ca/centres/cdss/media/The-Permanent-Joint-Board-on-Defence-final-workshop-report_2020.pdf

²² For a brief period of time following the establishment of USNORTHCOM, Canada established a separate Canada Command, along with Canada Expeditionary Command, Canada Special Operations Forces Command (CSOFC), and Canada Canadian Operational Support Command (CANOSCOM). Primarily for cost reasons, and with the exception of CSOFC, these commands were merged into CJOC.

²³ As of June 2021, Canada had 2000 personnel deployed overseas under NATO, UN and US-led initiatives (which does not include the number of support personnel required) vs the myriad Operations at home including Ops LENTUS (natural disaster support), LASER (COVID), VECTOR (vaccine distribution), LIMPID (surveillance, especially maritime), NANOOK (4 different Arctic operations and resupply to bases like ALERT), SAR, and of course NORAD. See Canadian Armed Forces, “Current CAF Operations List” (2021) found at <https://www.canada.ca/en/department-national-defence/services/operations/military-operations/current-operations/list.html>,

NORAD and USNORTHCOM. With the melting of more sea ice and a longer transit season, more cruise ships are estimated to transit the Northwest Passage in the coming years. This will place a greater demand on legal authorities to be prepared for Arctic maritime search and rescue. **Canada cannot provide Arctic combat search and rescue**, as there is no capacity or justification to do so. **Most of Canada's SAR in the Arctic is volunteer-led and executed.** This is not sustainable in the long run and is discordant with US expectations about SAR.²⁴

With modernization efforts this large, partner dialogue is required. Military-to-military discussions and exercises (such as AMALGAM DART or Canada's Operation NANOOK exercises) need to be supplemented with technocrat-to-technocrat (via the Military Cooperation Committee) and government-to-government via the Permanent Joint Board on Defense (PJBD). The PJBD met after this workshop and issued the following statement:

The PJBD reviewed a framework to guide NORAD modernization efforts to improve capabilities necessary for NORAD to conduct its aerospace and maritime warning and aerospace control missions. The co-chairs re-affirmed the importance of the U.S.-Canada defense relationship and the need to deepen collaboration on areas of mutual defense and security interest.²⁵

Given that modernization is costly and covers multiple generations, it is important that military leaders agree on the threats North America faces. This is in addition to the necessity that political decision-makers in Ottawa and Washington agree on proactive measures through budgets, policy, and mutual cooperation. However, it is unlikely that true cooperation will be reached. This is due to a number of competing factors, including, but not limited to: Competing time horizons between Canada and the United States on when NWS renewal should occur, and in Canada's procurement reality, "new" means two decades away. Simply put, Canada moves much slower than the US and tends to follow its lead. It must be recognized that **there is no political advantage for Canada to push NORAD modernization in Washington as NORAD has long been advertised as a defensive command, and USNORTHCOM is unlikely to win in a battle of resources US Congress given focus on China and the Asia Pacific region.**

²⁴ See for SAR recommendations.

https://umanitoba.ca/centres/cdss/media/JABAS_18_Feb_2021_SAR_Arctic_Part_2.pdf One of the immediate and pressing needs is for several Arctic Community Public Safety Officer (CPSO) positions that can function as SAR coordinator while carrying out other public safety and emergency management.

²⁵ "US-Canada Permanent Joint Board on Defense Discusses Defense Priorities, NORAD Modernization." *U.S. Department of Defense*. 25 June 2021. <https://www.defense.gov/Newsroom/Releases/Release/Article/2671975/us-canada-permanent-joint-board-on-defense-discusses-defense-priorities-norad-m/>.

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