



ARCTIC SECURITY BRIEFING PAPERS

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NORAD Renewal and a Team Canada approach to security

Analysts and pundits now routinely warn that Canada must urgently beef up Arctic defences to protect Canadian sovereignty and territory from the expansionist ambitions of strategic adversaries – Russia and China (and these days, we could add a third). NORAD ‘modernization’ is a primary response, and Ottawa has announced the planned expenditure of an initial \$38 billion over 20 years on the project. But what are the targets to be defended, and against what weapons? NORAD has in fact always been focused on defending the more southerly regions of the continent against threats coming via the North, rather than the Arctic itself. A renewed NORAD, in the face new generations of conventionally armed missiles, promises to largely maintain that core mission. Though the strategic environment is obviously changing, threats of direct attack on the Canadian Arctic are still broadly deemed to remain low. Furthermore, the security of the Canadian North, indeed of all of Canada, depends on a much deeper “whole-of-society”¹ effort.

Despite growing concerns and warnings, military combat in the Arctic, especially in its North American zone, continues to be regarded as unlikely, with Canada’s new Arctic Foreign Policy concluding that “the risk of military attack in the North American Arctic remains low”² – though it is not impossible.

One credible scenario that could draw the High North into direct military combat points to spillover into the European Arctic from a NATO/Russia shooting war in Europe. That also seemed unlikely until February 2022 but is now dangerously feasible. Should such a war erupt on NATO territory, the most predictable outcome would be unconscionable devastation, and the only rational response would be to end it. But Russia could be expected to have its Arctic Northern Fleet forces move to take the fight into the North Atlantic in order to, for example, disrupt shipping lanes and communication cable links between Europe and North America. NATO’s interest would be the inverse of that – to engage Russian naval forces from the Kola Peninsula before they could reach the North Atlantic, with an added interest in preventing Kola-based air and infantry forces from aiding Russia’s fight in Europe. The most immediate way to significantly decrease the odds of such an escalating European Arctic catastrophe is obviously to end Russia’s devastating war on Ukraine and, in the meantime, all must hope that current Russian and NATO forbearance regarding direct attacks on each other continues to hold.

And besides the myriad physical challenges and consequences that should give pause to warfighting in the Arctic, it remains that all Arctic, or “near Arctic,” states still share a basic interest in avoiding regional military hostilities. Russia and China notably have compelling reasons to try to keep military instability away from the Northern Sea Route (NSR). Russia has shown itself quite capable of acting against its own apparent interests, but it is still the case that its Arctic resource extraction depends on being able to routinely ship those products to markets via the NSR – meaning a climate of high tension that threatens even low intensity armed conflict would definitely be bad for business. Conditions that threaten to interrupt Russia’s oil and gas and other operations are a serious threat to Russia’s economic well-being, and China certainly wants the NSR to become a stable, reliable, route that cuts the shipping time between China and Europe by some 10 days.

Climate change obviously also brings with it key changes to the Arctic security climate (see recent, sobering, reporting³). Increased access to and use of northern territory, including for military purposes, demands greater vigilance and situation awareness. The responsible exercise of sovereignty must include ongoing policy and material support for the well-being of people and communities that work and live there, and not the least of that obligation, whatever the strategic environment, is a timely emergency response infrastructure, as well as ongoing military support to civilian authorities with primary responsibility for border control and public safety.

1. Threats to the Arctic

In contemplating threats facing the Canadian Arctic, the historian and Arctic security analyst, Prof. Whitney Lackenbauer of Trent University, has helpfully categorized potential threats and attacks as being to, in, or through the Arctic.⁴

He describes threats to the Canadian Arctic as “those that emanate from outside of the region and affect the region itself.” Such threats could include attacks on Arctic infrastructure, but his examples point to non-military threats. For example, a foreign ship in Canadian waters could run aground and contaminate its environs, or a “non-like-minded state” could gain ownership or control of a company with a strategically located airfield.

Threats in the Arctic are those that “originate within the region and have primary implications for the region.” Here too, the examples are non-military threats to human security – like the failure of a generator in an isolated community, the degradation of permafrost that threatens critical infrastructure, or “longstanding inequalities” endured by indigenous populations related to essentials like “transportation, energy, communications, employment, community infrastructure, health services, and education....”

Canada’s Arctic Foreign Policy also links human security to national security by making the important point that “strong and resilient Arctic and northern communities increase Canada’s defence against threats.” Adversaries are poised to exploit festering inequalities and tensions related to chronic deficits in economic and communications infrastructure, inadequate health care facilities, and similar failures in order to disrupt and erode trust in national and local institutions. Thus current Canadian policy rightly concludes that “Canada must take action to build trust in public institutions....”⁵ In other words, domestic stability, good governance, and trust in public institutions make important, essential, contributions to national security and warding off malicious foreign interventions, including ultimately military threats.⁶ Lackenbauer thus sees a clear need for what he calls “a whole-of-society approach” to Arctic security. All the “opportunities, challenges, increased competition, and risks associated with a more accessible (and unpredictable) Arctic require a greater presence of security organizations, strengthened emergency management, and improved situational awareness.”⁷

Lackenbauer characterizes the through threats as those that “emanate from outside the region and pass through or over it to strike targets also outside the region.”⁸ A prime example would be a nuclear armed intercontinental ballistic missile (ICBM) launched from the Russian heartland and headed for the American heartland over the Arctic. Or it could be Russian nuclear bombers flying the shortest route to the Canadian and American heartlands.

Another prominent Canadian Arctic security analyst, Prof. Rob Huebert of the University of Calgary, offers a clear description of the threats that are animating NORAD modernization.⁹ He argues that the serious Arctic threat is not to “sovereignty” but to “security.” There are, to be sure, sovereignty issues that need attention – like acknowledgement of the waters of Northwest Passage as internal to Canada, the Beaufort Sea boundary dispute with the United States, overlapping claims to extended continental shelves – but these are challenges to be managed to ensure that it is diplomats, lawyers, and scientists who remain the prime responders. The most immediate military challenge, says Huebert, is to convincingly demonstrate to Russia that it could never “launch a surprise missile attack across the Arctic to American targets with a chance of succeeding” – those targets being in the more southerly Canadian and American heartlands.

Both Huebert and Lackenbauer thus see the threats passing through the Arctic to targets in the American and Canadian heartlands as the focus of the military responses, and it is that same category of threats that drives NORAD modernization. Canada's Arctic Foreign Policy essentially agrees that the basic military threats in the Arctic are the threats of attacks passing through the region: the Arctic "region represents a geographic vector for traditional and emerging weapons systems that threaten broader North American and transatlantic security."

There is little prospect that the capacity to defeat threats travelling through or over the Arctic will ever be comprehensive. There is simply no sure defence against Russian or Chinese nuclear-armed intercontinental ballistic missile attacks via the Arctic on North America. Realistically, there is also no comprehensive defence against massed strategic bombers bearing nuclear-armed, air-launched, cruise and hypersonic missile attacks on North America. These systems represent an existential threat, yet there is no reliable defence against them.

US policy relies on nuclear deterrence to prevent such attacks, and durable prevention requires reliable domain awareness and early warning (that being NORAD's role), and ongoing diplomacy aimed at stabilizing relations with adversaries, confidence building measures towards that end, firm limits on weapons through arms control, and concrete steps toward the total nuclear disarmament that nuclear powers have declared to be their ultimate objective – the kind of policies which Canada should promote from its seat at the continental security table.

2. NORAD priorities

NORAD's current defence focus is not on the nuclear threat to the continent – that is understood to be covered by nuclear deterrence (for which NORAD provides early warning). The Canadian Armed Forces (CAF) and NORAD (the joint Canada/US North American Aerospace Defence Command) are thus mandated to provide early warning of nuclear armed missile attacks (but not defence against them), and early warning and control or defence against attacks and unauthorized civilian entries into North American air space, as well as maritime early warning and regional domain awareness.¹⁰ A major preoccupation is the emergence of new generations of conventionally armed hypersonic missiles (able to travel at least five times the speed of sound within the atmosphere).

In 2020, two US Generals, a former Commander of NORAD and a Deputy Director for Operations of NORAD, elaborated on the latter concern in a paper entitled "Hardening the Shield."¹¹ A much improved shield, they argued, is needed to protect the North American homeland, especially from emerging threats of conventional missile attacks by states like Russia and China on military and non-military infrastructure in the American heartland. A key element of the argument is that adversaries seeking to defeat or intimidate American forces in overseas operations could threaten conventional attacks on America at home – to threaten hit-and-run attacks on vital infrastructure, interrupt American military mobilization efforts, and generally to demonstrate to an American population that military interventions abroad could expose their homeland to retaliatory conventional attacks on key military, and civilian, infrastructure:

"If the traditional American way of war is the deployment of overwhelming force to a fight overseas, then the way to defeat the United States military in the next war, in the minds of her adversaries, is to prevent deployment in the first place. Either through the threat of attacks on economic targets designed to constrain options, or direct strikes on mobilizing forces, the deployment of the American military must be stopped before it starts. The economic engine and carefully orchestrated multi-modal logistical movements that enable the world's preeminent military are now a target."

The key worry is that both Russia and China are busy developing, and deploying, long-range cruise and hypersonic missiles, for example, against which the homeland missile defence system (designed to intercept missiles in outer space) is defenceless because cruise and hypersonic missiles do not operate in outer space. And while North America is considered to be protected from nuclear attack by deterrence, that same deterrence is thought not to be effective against conventional attack, notably by those emerging hypersonic missiles. So that is why both Russia and China are developing missiles explicitly to evade space-borne missile defences and that are capable of

delivering conventional warheads. The point is that Russia and China want a non-nuclear option for attacking military or civilian infrastructure in the United States on the assumption that a limited conventional attack would not immediately trigger “devastating retaliation by the nuclear triad of United States Strategic Command.” The calculation is that “using nuclear weapons against targets in North America in an attempt to alter the outcome of a regional conflict [overseas] would be suicidal, and so they [Russia and China] set out on a deliberate path of conventional long-range weapons development.”¹²

And since potential North American targets are obviously far too numerous to be protected by “hardening,” or to have their own localized missile defences, some analysts insist it is necessary to mount a capacity to destroy Russian and Chinese missile platforms before they are in range to fire their missiles at the American heartland – but that kind of pre-emption obviously risks major escalation in a conflict. Dealing with this threat, O’Shaughnessy and Fesler thus argued, needs to become a key mission of NORAD, and since their flight paths would likely (but need not always) be through the Arctic, modernizing NORAD’s northern warning and interception missions is still deemed urgent.

The implication is that NORAD upgrades are not so much a response to Arctic tensions and vulnerabilities as they are a response to the more tense and dangerous global strategic environment. NORAD renewal is also an attempt to maintain and protect the Pentagon’s ability, or freedom, to project force beyond North American shores. In reviewing the “Hardening the Shield” paper, the Canadian scholar and NORAD expert, Prof. Andrea Charron, has noted that the paper is “...a call for a new North American defence architecture that is both an integral cog in the US deterrence machinery [through early warning] and can ‘actively’ – i.e. offensively if necessary – defend the homeland so that the US military can maintain its superiority and freedom of manoeuvre.”¹³

Canada’s *Arctic Foreign Policy* makes essentially the same point about NORAD modernization and Canadian overseas operations, noting that since Russia is “equipped with missile systems capable of striking Europe and North America,” it is capable “of disrupting Canada’s ability to project forces in support of allies and partners,”¹⁴ notably in Europe.

3. Cruise and hypersonic missiles

It is obvious that technological advances are moving at an extraordinarily rapid pace, in AI in particular, as are their adaptation to military uses. So it is realistic to assume that defence technology will come up with the capability to defeat a hypersonic weapon in some circumstances – both glide and cruise types. But the technical *capability* to intercept individual missiles is not at all the same as being able to mount a reliable military *capacity* to defend a continent from a sustained or massed attack.

The continental ballistic missile defence (BMD) system is a prime example of that capability/capacity gap.¹⁵ The capability to intercept an intercontinental ballistic missile (ICBM) warhead (to hit a bullet with a bullet) has not translated into a capacity to protect the continent from ICBM attack. The Pentagon’s mid-course interception BMD system has the demonstrated capability to intercept an incoming ICBM, but it has nevertheless abandoned the effort to mount a comprehensive defence against such missiles – for at least two reasons. First, because it would be enormously difficult and expensive to mount such an effort, with no prospects for ever being comprehensive (when under nuclear attack, any interception rate of less than 100 percent is by definition a devastating, catastrophic failure). Second, because just the effort to build an effective defence motivates both Russia and China to either expand their arsenals of attack missiles or develop other ways of evading defences. Both have happened – China has expanded its nuclear-armed ICBM stocks and China and Russia have both turned increasingly to cruise and hypersonic missiles which the mid-course interception system isn’t designed to, and can’t, touch.

President Trump has just announced another try at continental defences against Russian and Chinese nuclear armed ICBMs,¹⁶ but critics once again give it little chance of developing the technical capability against all threats, and zero chance of developing the military capacity for foolproof protection of the continent. Nor will the mere effort avoid further destroying already slim chances of resuming strategic arms control and disarmament talks and agreements (it's a topic for another time).

The conventionally armed hypersonic missiles, against which defences are now sought, come in two main types – glide and cruise missiles. A US Congressional Research Service report to Congress¹⁷ describes the glide version as being launched by lifting it to the upper atmosphere or beyond at hypersonic speeds by a ballistic missile, where it is then released to glide and maneuver on a variable flight path to hit a target at hypersonic speed. The cruise version is powered by a scramjet engine to hypersonic speed within the atmosphere and then continues its powered flight along a variable flight path to its target. The unpredictable flight paths and high speeds make interception of either type a significant challenge.¹⁸ The speed of these weapons is important, but the Vice Chairman of the US Joint Chiefs of Staff emphasizes their unique maneuvering capabilities more than the speed.¹⁹

The Russian Avangard glide vehicle, launched by an intercontinental ballistic missile, which means its range has been described as effectively unlimited, is currently deployed, reportedly with a nuclear warhead.²⁰ A ship-launched hypersonic cruise missile, the Tsirkon, is under development with a 1,000 km range.²¹ An air-launched ballistic missile, the Kinzhal, has some maneuverability, but it is thought not to have nearly the same capabilities as glide vehicles and is not always included in hypersonic missile discussions (it is deployed and is reported to have been fired against Ukraine).²²

China cites US missile defence capabilities and its interest in circumventing them, as being behind its pursuit of an intercontinental-range hypersonic glide vehicle, and possibly also a regional-range glide vehicle.²³

Besides pursuing defences against Russian and Chinese systems, the US Navy, Army, and Air Force are all pursuing hypersonic systems of their own – the Navy, a ship-launched and an air-launched glide vehicle; the Army, a long-range glide vehicle (range of 1700 miles); and the Air Force, a glide vehicle and cruise missile. None is yet deployed.²⁴

4. Canada's NORAD upgrade plan

There is still much for military planners to learn about the kinds of potential attacks on North America that might credibly be defeated and those against which, like nuclear armed intercontinental ballistic missiles, there is no reliable means of defence. The key take-away from the science is that defences have yet to be invented, and that offensive capabilities do not remain static. The key take-away from the politics of missile defence is that without restraint, arms control, and strategic stability diplomacy, the pursuit of more effective defence can incentivise adversaries to pursue more effective, expanded, offence.

Canada's 20-year NORAD upgrade plan²⁵ (launched in 2022) includes provisions for a Canadian contribution to research and development programs on "integrated air and missile defence" systems." Those efforts are expected, according to the NORAD timeline, to yield outcomes by 2028, in the early part of that two-decade plan, and are focused on emerging conventional threats. In addition to the air and missile defence effort, that \$4.23 billion science and technology research program includes research into emerging threats, the development of "detection, monitoring, targeting and countermeasure technologies," and what is termed a "system-of-systems approach to provide effective, layered, and timely response to all-domain threats to Canada and North America." These efforts are among 12 projects listed in the "science and technology" section of the NORAD renewal program. It is one of six broad fields of research and acquisition:

- surveillance, including over-the-horizon radar, a network of terrestrial sensors, surveillance from space (\$6.96 billion);

- “technology-enabled decision making” involving information systems, a GPS replacement system, and various communications enhancements (\$4.13 billion);
- modernizing air weapons by acquiring short, medium, and long-range air-to-air missiles (\$6.38 billion);
- infrastructure upgrades including additional air-to-air refuelling, upgrades to forward operating locations for F-35 fighters, training infrastructure (\$15.68 billion);
- science and technology (referred to above – \$4.23 billion); and
- internal services which focus on monitoring progress made on “these ambitious plans,” notably monitoring the extent to which Indigenous and Northern governments are engaged, and monitoring technical research results.

Other defence commitments also involve updating domain awareness capacity generally. Examples include:

- The acquisition of early warning aircraft aimed at giving the CAF and NORAD the ability “to detect, track and prioritize airborne threats sooner;”
- Acquiring maritime sensors “to monitor Canada’s maritime approaches, including in the Arctic and North,” to support defences against “underwater threats, including vessel-launched missiles, underwater systems, ships, and submarines;”
- Constructing a new satellite ground station in the Arctic to improve Canada’s ability “to detect, deter and respond to malign activities and to communicate those threats quickly to our most trusted partners;” and
- The acquisition of two Coast Guard Polar icebreakers, the first slated for completion in 2030. The Canadian Coast Guard reports that the CCGS *Arpatuuq* (built in Vancouver) and CCGS *Imnaryuaq* (in Quebec) will be able to operate in the Arctic year-round “to support Indigenous Peoples and Northern communities, Arctic sovereignty, high Arctic science, and emergency response.”²⁶ In November 2023 Canada, Finland, and the United States signed a Memorandum of Understanding for an Icebreaker Collaboration Effort (ICE)²⁷ that is meant to “coordinate and strengthen capabilities” in building polar vessels, including icebreakers. It points to “increased cooperation” – not a hallmark of today’s Washington.

Upgraded situation awareness in the Arctic also contributes to Canada’s capacity to reliably assure Canadians of the presence (or absence) and nature of threats, and to enable informed responses. Reliable awareness of events and developments in or near the Canadian Arctic is also important for meeting another sovereign responsibility – that is, to provide credible assurances to our American neighbour, and others, that Canadian territory is not and will not be allowed to become a blind spot and undefended zone through which an adversary could mount credible but clandestine threats to our neighbours.

5. Team Canada and Arctic security

The prevailing, firmly entrenched, public discourse on Canadian defence portrays this country’s military preparedness as chronically inadequate – said to be a consequence of willful neglect by successive governments. It’s a perception driven especially by the NATO inspired assumption that the way to measure defence preparedness is to calculate military spending as a percentage of GDP. The current, arbitrary, guide make’s two percent the threshold of respectability across the Alliance, with increasingly ardent calls for raising the ante. Besides the irrelevance of GDP to defence needs, it is a framework that consistently understates the actual, i.e. real, level of Canadian military spending compared to other Alliance members. As a percent of GDP, Canada does indeed sit near the bottom end of NATO rankings; but in real or absolute spending it’s the opposite, with Canada sitting just within the top quartile of NATO military powers and, by the way, within the top 10 percent of global military forces. That makes Canada a significant military power (to which the NORAD renewal project and multiple procurement projects²⁸ have been adding). But that’s a reality that rarely penetrates the myth of abject Canadian weakness – a misrepresentation President Trump is all too eager to repeat and portray as scandalous fact.

A further problem is that the military-spending-to-GDP formula ignores the fundamental reality that national security has never been just about military capacity or spending. Security is a whole of government responsibility and endeavour.

Sometimes, but not often enough, contributions to national security are rightly portrayed as involving development, diplomacy, and defence. Those three D's get a lot closer to the real foundations of security, but still miss two essential dimensions – one being good governance and sustained trust in public institutions (in the interests of alliteration it can be labelled democracy), and the other being arms control and disarmament (with the alliteration built in) and recognition of the reality that security is dangerously imperilled by unrestrained arms racing.

One can justifiably point to Canadian deficiencies across all five of those security D's (none is ever acknowledged as reaching sufficiency), but in both national and global terms it is not the defence D that should be singled out for the most urgent attention. All need upgrading, and that is especially apparent for the Arctic:

- Development as economic equity and sustainability requires sustained investment to meet the fundamental human security needs of northern peoples and communities, notably including urgent political, social, and economic measures to advance climate crisis mitigation and reversal of global warming. Not least, active and sustainable human development measures are critical for demonstrating the responsible exercise of sovereignty in the high north.
- Diplomacy across the Arctic's strategic divide is now being dangerously eschewed, just when regional tensions are escalating and military operations are scaling up. With defences against strategic nuclear threats impossible, with defences against emerging non-nuclear threats to North America still very far from certain, and with the danger that the very pursuit of enhanced defences can incentivise adversaries to expand their offensive systems, a key feature of any realistic search for greater security must be to animate a surge in diplomacy to bridge strategic divides. High on the list for immediate attention in the Arctic should be diplomatic efforts to manage crises and avoid dangerous military encounters and misunderstandings that can easily escalate. Engaging adversaries is central to the pursuit of greater strategic stability and to promote greater clarity regarding the conditions that each side deems important for sustainably reducing tensions and building mutual trust and confidence. Last September's the strategic dialogue among Canada and the Nordic countries did not reach out to Arctic adversaries but, given the current mercurial behaviour of their chief Arctic ally, it turns out to be a timely initiative. They affirmed their shared "deep commitment to multilateral cooperation and international law, including UNCLOS," and indicated their intention "to continue the dialogue on shared policy priorities and to further strengthen the transatlantic cooperation between Canada and the Nordic countries."²⁹

Canada's Arctic Foreign Policy also affirms the importance of diplomatic engagement with internal indigenous communities in the context of their respective land claims settlement areas and self-government authorities: "Arctic diplomacy should be informed by and benefit northern Indigenous Peoples and other northerners." And the government promises that

"foreign policy will be guided by the United Nations Declaration on the Rights of Indigenous Peoples; treaties, including land claims agreements; self-government agreements with Arctic and northern Indigenous Peoples; and the Inuit Nunangat Policy.³⁰ Canada's Arctic foreign policy will also be guided by respect for territorial and provincial jurisdiction, including the devolution agreements with the Northwest Territories, Nunavut and the Yukon."

- Democracy as good governance will also benefit from more effective involvement of indigenous communities in decision-making related to their basic human security needs, but also on defence policy and strategic relations affecting their Arctic homelands. Building northern trust in national and regional institutions is supported by ensuring participation in efforts related to economic well-being, health care, emergency response policies and preparations, national defence, and so on. As the Arctic Foreign Policy puts it: "strong and resilient Arctic and northern communities increase Canada's defence against threats."
- Disarmament diplomacy speaks to the need to address strategic trends that emphasize nuclear arsenal "modernization" and expansion, and it challenges the nuclear powers to live up to their promises to

reduce their dependence on nuclear weapons in national defence policies. Disarmament efforts also need to be a prominent part of responding to emerging conventional weapons (like the hypersonic missiles that are destined to further destabilize the planet), and to confront regional trends towards greater militarization in the Arctic – a process that destabilizes relations among Arctic states instead of nurturing a return to the region’s still remembered traditions of cooperation.

- The commitment to NORAD renewal is for some too little too late, but for others the current pace is a measured approach to meeting defined needs, rather than simply pursuing toward arbitrarily defined spending goals. NATO’s defence challenge writ large is to maintain a capacity to assure its members without feeding into the security dilemma that sees tensions rise and security diminish when unrestrained military preparations are part of a competitive strategic dynamic.

Effective action across the full range of security imperatives points to the virtues of the Team Canada model – an integrated five D’s approach that should broadly apply to the pursuit of national security for Canada, as well as to the pursuit of mutual security for the Arctic region and beyond.

End Notes

¹ P. Whitney Lackenbauer, “Threats Through, To, and In the Arctic: A Framework for Analysis, *Policy Brief*, NAADSN (North American and Arctic Defence and Security Network), 23 March 2021. https://www.naadsn.ca/wp-content/uploads/2021/03/Lackenbauer_Threats-Through-To-and-In-the-Arctic.pdf

² *Canada’s Arctic Foreign Policy*, Global Affairs Canada, 06 December 2024. <https://www.international.gc.ca/gac-amc/publications/transparence-transparence/arctic-arctique/arctic-policy-politique-arctique.aspx?lang=eng>

³ “The Arctic tundra, long considered a critical carbon sink, has become a net source of carbon dioxide emissions, according to the National Oceanic and Atmospheric Administration’s (NOAA) 2024 Arctic Report Card.” Elías Thorsson, “Arctic tundra now emitting more carbon than it absorbs, NOAA report reveals,” *Arctic Today*, 11 December 2024. <https://www.arctictoday.com/arctic-tundra-now-emitting-more-carbon-than-it-absorbs-noaa-report-reveals/>

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⁴ Lackenbauer, 23 March 2021.

⁵ *Canada’s Arctic Foreign Policy*, December 2024.

⁶ Ernie Regehr, “Good Governance and Arctic Security,” The Simons Foundation Canada, 10 January 2024. <https://www.thesimonsfoundation.ca/highlights/good-governance-and-arctic-security>

⁷ Lackenbauer, 23 March 2021.

⁸ Lackenbauer, 23 March 2021.

⁹ Rob Huebert, “The greatest threat to the Canadian Arctic is security, not sovereignty,” *The Hill Times*, 30 November 2024. <https://www.hilltimes.com/story/2024/11/30/the-greatest-threat-to-the-canadian-arctic-is-about-security-and-not-sovereignty/443230/>

¹⁰ <https://www.norad.mil/> “The North American Aerospace Defense Command (NORAD) is a United States and Canada bi-national organization charged with the missions of aerospace warning, aerospace control and maritime warning for North America. Aerospace warning includes the detection, validation, and warning of attack against North America whether by aircraft, missiles, or space vehicles, through mutual support arrangements with other commands.”

“Aerospace control includes ensuring air sovereignty and air defense of the airspace of Canada and the United States. The renewal of the NORAD Agreement in May 2006 added a maritime warning mission, which entails a shared awareness and understanding of the activities conducted in U.S. and Canadian maritime approaches, maritime areas and internal waterways.”

¹¹ Terrence J. O’Shaughnessy and Peter M. Fesler, “Hardening the Shield: A Credible Deterrent & Capable Defense for North America,” The Canada Institute at the Wilson Center, Washington, D.C., September 2020. www.wilsoncenter.org/canada

¹² O’Shaughnessy and Fesler, September 2020.

¹³ Andrea Charron, “Responding to ‘Hardening the Shield: A Credible Deterrent and Capable Defense for North America,’” *Quick Impact*, NAADSN – North American and Arctic Defence and Security Network, 11 September 2020. https://www.naadsn.ca/wp-content/uploads/2020/09/20-Sept_Charron_Responding-to-the-Hardening-the-SHIELD_Quick-Impact.pdf

¹⁴ *Canada’s Arctic Foreign Policy*, December 2024.

¹⁵ “The Difference Between Capability and Capacity in the Military: Why Both Matter, Knowledge and Science Bulletin Board System (knbbs-sharer), Jun 14, 2023. <https://www.knbbs.com/the-difference-between-capability-and-capacity-in-the-military-why-both-matter/>

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¹⁷ The following descriptions rely on CRS report number R45811, US Congressional Research Service: “Hypersonic Weapons: Background and Issues for Congress,” Updated December 2, 2024. <https://crsreports.congress.gov>

¹⁸ “Understanding Hypersonic Missile Systems: Technology and Implications,” *Total Military Insight*. <https://totalmilitaryinsight.com>

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²³ Missiles of China, CSIS Missile Defense Project. <https://missilethreat.csis.org/country/china/>

²⁴ CRS report, December 2, 2024.

²⁵ NORAD modernization project timelines, Fact Sheet (June 2022, last modified 22 November 2024). <https://www.canada.ca/en/department-national-defence/services/operations/allies-partners/norad/facesheet-funding-norad-modernization.html>

Fact Sheet: Funding for Continental Defence and NORAD Modernization. <https://www.canada.ca/en/department-national-defence/services/operations/allies-partners/norad/facesheet-funding-norad-modernization.html>

Annex C: Canada’s NORAD Modernization Plan. <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/north-strong-free-2024/annex-c-canada-norad-modernization-plan.html>

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