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by Andrea Charron and James Fergusson
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POLICY PERSPECTIVE

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North American Aerospace Defense Command (NORAD) modernization is in the news these days, but it is often synonymous with an upgrade to the current North Warning System (NWS) only. NORAD modernization goes beyond technological upgrades and is part of a rethink of what it means to defend North America writ large. This article traces past efforts at modernization, the impetus for today's focus on continental defence and the need to shift from dependence on deterrence by punishment to deterrence by detection and denial.

The Cold War to 9/11

North American continental defence has been a tertiary priority for both Canada and the United States, exhibiting extended periods of relative neglect interspersed by brief flurries of investment usually prompted by equipment life cycles. Both governments, or more accurately defence departments, have long prioritized overseas commitments as the key to the defence of North America. This has been reinforced, at least since the early 1960s to the end of the Cold War, by reliance upon the U.S. strategic nuclear deterrent to protect North America. Any potential attack against North America was assumed to be a strategic nuclear one, and until just recently, there was no means to defend against it. Instead, this attack was deterred by the U.S. threat of strategic nuclear retaliation under the condition of Mutual Assured Destruction (MAD) (i.e., deterrence by punishment). In this context, NORAD played a key role as a function of its ballistic missile early warning mission. Accessing information from the U.S. Ballistic Missile Early Warning System (BMEWS), NORAD's mission was to assess whether North America was under attack, and if so, characterize the nature of the attack and inform the National Command Authorities (NCA), a mission labelled Integrated Tactical Warning/Attack Assessment (ITW/AA). Although both countries' NCA would be notified, the key decision-maker was the U.S. president, who has the authority to order a retaliatory strike. In effect, the U.S.'s strategic nuclear retaliatory deterrent made North America a sanctuary.

The Soviet Union's long-range bomber threat took a technological leap forward with the development and deployment of air-launched cruise missiles (ALCMs) in the 1970s and 1980s, and it became the fundamental defence rationale for the modernization of NORAD's distant (air) early warning system (DEW line) with the deployment of NWS, not fully operational until 1993. The 1950s early warning system of three radar lines across Canada (the DEW, Mid-Canada and Pinetree lines) had reached their end of life and were technologically obsolete. Arguably, modernization would have been required even without the emergence of the ALCM threat; this threat simply made it militarily and politically expedient to authorize.

The end of the Cold War eliminated the Soviet threat, and with the modernized NWS, a new era of continental defence neglect emerged, altered only slightly in the wake of 9/11 with the integration of internal Canadian and U.S. civil radar feeds into NORAD to have a more "complete" operational picture, the addition of a maritime warning mission (in 2006) and in the case of the U.S., persistent missions called NOBEL EAGLE or ONE. ONE is an aerospace control and air



defence mission to guard against potential adversaries in or around military installations, airports and other critical infrastructure as well as at high-profile events (such as North American-hosted Olympics).

NWS Renewal and Beyond

These patterns of the past, at least on the surface, are now recurring. The NWS is not optimally placed nor technologically able to deal with today's aerospace threats.¹ Its renewal also requires coverage to be extended farther north in the Canadian Arctic archipelago as a function of the 2018 decision to align Canada's Air Defence Identification Zone (CADIZ) to the farthest northern extent of Canada's land territory.² However, what would have been a relatively straightforward, simple modernization process has become much more technically complicated,³ costly and time sensitive in the new threat environment occasioned by the emergence of Russia as a persistent, proximate threat, and China as the pacing adversary of the West. Russia has developed a new generation of very long-range air- and sea-launched cruise missiles, as well as potentially developing a long-range, ground-launched capability with the collapse of the Intermediate Nuclear Forces (INF) Treaty in 2019. In addition, hypersonic weapons have emerged, and potentially, soon, nuclear-powered cruise missiles. China is following suit in missile development.⁴

North America is vulnerable and lacks the detection, denial and defeat capabilities to deal with this new political and strategic threat environment. As a result, a rethink of what continental defence entails, often mistakenly conceptualized as NORAD modernization (and more specifically, only NWS renewal), has emerged as a priority for both Canada and the U.S.⁵ Continental defence has a much wider context that includes all six domains (land, sea, air, space, cyber and information) and includes safety, security and defence considerations.

What is new from the past is the relative disappearance of the strategic nuclear dimension from continental defence considerations. Instead, implicitly, the threat environment is conceptualized as a conventional one, even though the new generation of aerospace threat capabilities are also nuclear capable. Even so, little if any consideration is given to the fear of a potentially disarming first strike against U.S. strategic forces that dominated U.S. strategic thinking in the Cold War. Today, the threat of strategic nuclear retaliation is considered incredible, but must always be considered as a possibility.

¹ An AI program called Pathfinder is helping analysts see more of what the NWS detects but that old algorithms cannot interpret. While helpful, it does not address the age of the radars or the less-than-ideal placement.

² For a terrific summary of events and consequences, see LCol. Jody Edmonstone, "Canada's Expanded ADIZ," Toronto: Canadian Forces College, 2018, <https://www.cfc.forces.gc.ca/259/290/402/305/edmonstone.pdf>.

³ The NWS cannot "see" as far as the new CADIZ and given the Earth's curvature, current ground-based radar cannot cope without connections to and augmentations of space-based and other emerging technologies.

⁴ For an excellent primer on hypersonics, see Kelley M. Saylor, "Hypersonic Weapons: Background and Issues for Congress," Washington D.C.: Congressional Research Services, March 17, 2022, <https://sgp.fas.org/crs/weapons/R45811.pdf>.

⁵ Canada and United States Joint Statement on NORAD modernization, August 18, 2021, <https://www.canada.ca/en/department-national-defence/news/2021/08/joint-statement-on-norad-modernization.html>.



A Vulnerable Continent

A detailed examination of the role of strategic nuclear deterrence in the new threat environment is beyond the scope of this analysis. It is sufficient to recognize that the dominant continental defence narrative conceives of new generations of Russian and Chinese non-ballistic missile capabilities as the conventional threats against North America.⁶ Their objective is to alter the U.S.'s, and to a lesser degree, Canada's decision-making calculus by holding critical North American economic infrastructure at risk, and hold marshalling and embarkation points hostage to deter U.S. intervention overseas. If deterrence fails, this will dramatically slow the ability of the U.S. and Canada to support and move forces overseas. In basic terms, North America is vulnerable and no longer a sanctuary from conventional war.⁷ Canadians still believe the country is "fireproof."⁸ While a full-scale land invasion is still considered unlikely, kinetic effects against military or other critical targets are not. Unless these vulnerabilities are eliminated, Russia and China will be emboldened to act in their respective regions and discount the U.S.-led global deterrent posture.

Deterrence by Detection and Denial

In practical terms, continental defence demands the acquisition of new detection (and thus denial)⁹ and defeat capabilities to deter not only threats to North America, but also for global deterrence purposes. The first requirement is the need to be able to detect and track these new threats from launch through flight. NWS renewal is only one component and requires a new generation of over-the-horizon radars capable of cruise and, if possible, hypersonic vehicle detection.¹⁰ In addition, a single northern radar line may also need to be supplanted by a second line farther south to manage potential "leakers" through the first line of detection and defence. Ground-based radars, because of the complicated nature of the threat environment, will also need to be supplemented by air, maritime and space-based detection capabilities. In addition, these detection capabilities also need to extend around the continent to provide 360° all-domain coverage of North America. While the Arctic is considered the main avenue of approach, we cannot ignore southern threat vectors as well. While NORAD considers only Canada and the continental U.S. and USNORTHCOM adds Mexico and other near Caribbean islands to its area of

⁶ Terrance J. O'Shaughnessy and Peter M. Fesler, "Hardening the Shield: A Credible Deterrent & Capable Defense for North America," Washington D.C.: Canada Institute, September 2020.

⁷ Ibid.

⁸ Canadian Senator Raoul Dandurand (1861-1942), in a statement to the League of Nations on Canada's international responsibilities, stated: "In this association of mutual insurance against fire the risks assumed by the different states are not equal ... We [Canadians] live in a fire-proof house, far from inflammable materials." See W. A. Riddell, ed., *Documents on Canadian Foreign Policy 1917 – 1939*, (Toronto: Oxford University Press, 1962): 462 –465. See also John Hilliker, *Canada's Department of External Affairs: Volume 1. The Early Years, 1909-1946*, (Montreal: McGill Queen's University Press, 1990): 97.

⁹ For more, see Andrea Charron and Jim Fergusson, "How to Strengthen Deterrence by Denial," *Strategic Studies Quarterly*, 2022: 42–58. https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-15_Issue-4/D-Charron.pdf.

¹⁰ David Pugliese, "Canada Plans New \$1-billion Radar to Protect North American Cities," *Ottawa Citizen*, April 25, 2022, <https://ottawacitizen.com/news/local-news/canada-plans-new-1-billion-radar-to-protect-north-american-cities>.



responsibility,¹¹ Canada needs more connections to USSOUTHCOM to ensure the southern approaches to North America do not become the new back door to an attack.

Radars and other detection capabilities need to be integrated together in a system of systems to ensure detection, tracking, target discrimination, the cueing of interception capabilities and provision of battle damage assessment – a chain of systems. This proliferation of sensors will generate an exponential increase in information or data that needs to be processed, analyzed and acted upon. This, in current NORAD strategy, is the linear all-domain awareness, information dominance and decision-making superiority requirement for continental defence, as laid out by the current NORAD and USNORTHCOM commander, Gen. Glen VanHerck.¹²

The interceptor side of the equation resides alongside the challenges of creating the chain. For some time now, and reflecting the Cold War past, the preferred interceptor solution has been to target the launch platforms (the archers), rather than the missiles (arrows). However, this has become problematic on two counts. First, the development of long-range cruise and hypersonic missiles, with the latter launched by ballistic missiles, places the archers well outside the range of fighter interceptors, or at best at a significant distance even with in-flight refuelling, even if new forward-operating locations (FOLs) are built in Canada's Arctic (the notable exception is forward-deployed naval anti-submarine capabilities). Second, targeting the archers implies a pre-emptive strategic posture which is outside NORAD's defensive mandate per se and for political and capability reasons problematic for Canada. In effect, it is a U.S.-only mission, which, nonetheless, provides an additional layer to the North American deterrent and defence posture.

In effect, NORAD's contribution to continental defence is now an anti-cruise missile mission. Despite Minister Anita Anand's announcement that "a full and comprehensive look" at ballistic missile defence (i.e., Canada's participation in the U.S. midcourse ground-based missile defence program) is a possibility for discussion,¹³ there is no guarantee that the U.S. would now seek Canada's participation, having already declined twice. Nor are ground-based interceptor sites necessary in Canada to tackle the North Korean missile threat (what the current system is designed to counter). Participation in a future hypersonic defence mission is an entirely different issue and is years down the road (if ever) as the technology is nascent at best. Regardless, NORAD's intercept capabilities must be optimized for missiles (arrows), rather than launchers (archers). This reality, in part, explains why ground-based radars (think NWS) alone are insufficient. On the positive side, current F-35 fighter interceptors possess a look-down radar capability optimal for tracking cruise missiles in flight and their interception by air-to-air missiles. However, whether they also possess a capacity to "look up" at a distance to track hypersonics at altitudes of roughly 50 kilometres and possess the air-to-space interception capabilities remains an open question, but a fundamental requirement.

¹¹ USNORTHCOM's AOR includes all air, land and sea approaches to North America, encompassing the continental U.S., Alaska, Canada, Mexico and the surrounding water areas out to approximately 500 nautical miles.

¹² NORAD and USNORTHCOM, "Executive Summary," *Strategy*, March 2021, [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).

¹³ Anand's comments at a CGAI event held May 10, 2022. See <https://globalnews.ca/news/8824160/anita-anand-world-growing-darker>.



A Return to the Past

At least since the late 1960s, continental defence and NORAD have relied exclusively on fighter interceptors (notwithstanding the U.S.'s employment of short-range ground-based defences in the wake of 9/11). However, the new missile threat environment also raises a potential requirement for ground-based area or point defences to protect high-value targets in Canada and the U.S. For now, Canada possesses no such defences and a layer stretching across southern Canada would potentially make a significant contribution. In other words, continental defence may require a return to the 1950s-1960s interceptor architecture.

If one considers each of the three components (detect, deter, defeat) and their integration necessary for an effective continental deterrence and defence posture as challenges, NORAD's current structure represents an impediment. First, NORAD's command-and-control (C²) structure, in which the commander per se issues air tasking orders and the three regional commands (Alaska, Canada and continental U.S.) exercise battle management, is a legacy of the past. This has been recognized, whereby NORAD, through a Vigilant Shield exercise, experimented with a Combined Forces Air Component Commander (CFACC) located within continental U.S. command in Florida. It makes more sense for the CFACC or operational commander to move to the NORAD headquarters in Colorado Springs and for the command to consider a rethink of the three NORAD regions.¹⁴ Regardless, NORAD's command-and-control structure and terms of reference will be restructured with significant implications for the regional commands, as well as investment requirements at both the operational and regional levels.

Second, a fully integrated air and missile defence (IAMD) system, to borrow the U.S. army's tactical level concept, also raises potential issues for the current NORAD mission suite relative to Canada-U.S. continental defence co-operation. Although both the Canadian (chief of the defence staff) and U.S. (secretary of defense) national command authorities can assign a range of capabilities to NORAD command, such as on 9/11 when a U.S. aircraft carrier off the coast of New York was assigned to NORAD command, whether this is sufficient is another question in the new all-domain threat environment. Under the current arrangement for continental defence, NORAD as a bi-national command is responsible for aerospace control and maritime warning only. Maritime and land control are national responsibilities and are governed by bilateral arrangements under the responsibility of Canadian Joint Operations Command (CJOC) and U.S. Northern Command (USNORTHCOM), generating with NORAD the tri-command structure of continental defence. The logic of integration at the aerospace level suggests that integration should also be pursued in all other domains to create a single North American defence command with other government departments and private actors included, notwithstanding political and organizational barriers to such a step forward. This is, perhaps, something that the Military

¹⁴ The three NORAD regions are continental NORAD region (CONR), Canadian NORAD region (CANR) and Alaskan NORAD region (ANAR). Until 1983, the NORAD assets assigned to the regions crossed international boundaries. After 1983, the regions were fixed inside the national borders. Each region is expected to command and control the fight inside its boundaries, with NORAD HQ providing information, capabilities and resources as needed and co-ordinating with neighbouring regions. Given the vastness of the Canadian Arctic, the boundary between ANR and CANR needs to be reconsidered.



Cooperation Committee and Permanent Joint Board on Defence could explore, although the latter seems all but defunct.

Finally, it is important to recall, at least from the U.S.'s perspective, that an effective and credible continental deterrence stance is a component of the U.S.'s global deterrence posture. Thus, it also needs to be integrated as part of this posture. This is underway, for example, with NORAD's participation in the U.S. Department of Defense's Global Information Dominance Experiments (GIDE). For now, it is too early to tell what the implications for continental defence will be.

Conclusion

Overall, continental defence in the NORAD context is focused on horizontal integration in some domains, with some services and a few other government departments. Continental defence is joined by two additional vertical levels of integration – the all-domain continental C² (which includes domains not directly within the militaries' purview) and the U.S. global deterrent. Combined with the capability requirements, continental defence modernization is much more complicated and costly than it was in the 1980s when it was limited to the replacement of aged DEW line radars. For now, NORAD is the lead in developing the new architecture for continental defence as the first step in a longer term modernization process. Of course, once developed, it will then enter the complicated world of the respective defence departments and governments for final approval. The outcome will entail a stepwise process of investment, in which the architecture will be amended over time, not least of all because some of the necessary technology remains to be discovered and deployed. Regardless, this will all take time. Unfortunately, time is at a premium.

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