West of the Greenland-Iceland-UK gap, the Alaska NORAD Region and the Canadian NORAD Region feed their tactical pictures to NORAD Headquarters. East of it, the Combined Air Operations Centre at Bodø is the primary tactical air command and control node for a northern flank assigned in its entirety to Joint Force Command Norfolk.

Mind the Gap

Integrating NATO and NORAD C2 Across the Arctic

By Colonel Kevin 'Tread' Anderson,
US Air Force, Deputy Commander, 354th Fighter Wing, Alaska

On 12 February 2026, Swedish Air Force JAS-39 Gripens departed Iceland for Greenland to join Royal Danish Air Force F-35s and German Typhoons in Operation Arctic Sentry, NATO's first Enhanced Vigilance Activity (eVA) dedicated to the High North. Yet as the formation crossed the Greenland-Iceland-United Kingdom (GIUK) gap, it also crossed an invisible boundary dividing the Arctic battlespace between NATO and North American Aerospace Defense Command (NORAD), a seam increasingly vulnerable to the speed and complexity of modern threats.[1]

For decades this seam has been both practical and convenient, a result of distinct operational requirements and intentional political choices. On one side of the gap, NORAD provides a centralised aerospace architecture

A Russian Su-35 flying inside the Alaskan Air Defense Identification Zone (ADIZ) passes dangerously close to a US Air Force F-16 from Eielson AFB, Alaska. While rare, such incidents reflect increasing tensions in the Arctic.

to secure a vast 8,000-kilometre approach. On the other side, NATO relies on a federated air defence structure to defend the European High North stretching from the GIUK gap to the Barents Sea. Over time, this boundary did not merely separate two areas of responsibility (AORs); it created parallel command and control (C2) ecosystems operating on separate networks and under distinct legal authorities.[2] Although strategic warning data is exchanged across the Atlantic, the pathways connecting the two systems are still optimised for an era of subsonic aircraft and ballistic trajectories. This leaves underlying tactical networks legacy-bound: slow, dependent on manual handoffs, and oriented vertically rather than horizontally.[3]

The operational environment has evolved. Hypersonic, highly manoeuvrable, and low-observable platforms can exploit any friction between the two organisations, compressing decision timelines and demanding rapid coordination across a battlespace whose two separate command ecosystems were never designed to operate together seamlessly. This article argues that NATO and NORAD must bridge this C2 seam not by erasing its political foundations, but by building the unified deterrence architecture the current threat demands. Achieving this requires progress across three pillars: the technical infrastructure to share data at machine speed, the institutional frameworks to align command culture and legal authorities, and the training opportunities that allow operators to work proficiently across the boundary. To make that case, the article maps the current Arctic C2 architecture, examines the barriers driving divergence between the commands, and offers recommendations to achieve seamless deterrence across the Arctic.

NORAD: The North American Shield

Established in 1957, NORAD is a bilateral organisation charged with safeguarding the North American continent through three primary missions: aerospace warning, aerospace control, and maritime warning. Operationally, NORAD divides the northern theatre into two regional command sectors split along the Alaska-Canada border. The Alaska NORAD Region (ANR) is directed by the 611th Air Operations Center (AOC) at Joint Base Elmendorf-Richardson, Alaska, where it is co-located with Alaskan Command and the 11th Air Force. The 1 Canadian Air Division (1 CAD) manages the Canadian NORAD Region (CNR) from Canadian Forces Base (CFB) Winnipeg, Canada. Sector-level tactical operations are executed by 22 Wing, Canadian Air Defence Sector (CADS) at CFB North Bay, Ontario. Both feed their tactical pictures back to NORAD Headquarters at Peterson Space Force Base (SFB) in Colorado Springs. Peterson SFB is also home to US Northern Command (USNORTHCOM), the overarching combatant command responsible for wider coalition coordination with Allies and partners.[4]

On its far western boundary, NORAD-NORTHCOM interfaces directly with US Pacific Command (USPACOM) across the Bering Strait. While this western boundary divides two geographic combatant commands, their close interoperability is anchored by shared national authorities, procurement lines, and synchronised doctrinal C2 goals, permitting seamless, automated, machine-to-machine connectivity.

NATO's Arctic Overhaul

Across the GIUK gap, the command structure transitions from a binational homeland defence mandate to a multilateral collective defence framework. NATO's model differs fundamentally from NORAD's centralised architecture. Rather than a single unified command, NATO's northern flank leverages a federated design that navigates sovereign national architectures, differentiated networks, and complex legal authorities. This framework balances multinational unity of effort with national sovereignty over sensors and weapons systems in the High North.

In 2025, NATO executed an extensive restructuring of its northern flank, reassigning the entire Arctic AOR to Joint Force Command (JFC) Norfolk and bringing the security interests of the seven Arctic Allies under a coordinated joint headquarters. In tandem with this geographic consolidation, NATO recently opened a dedicated Combined Air Operations Centre (CAOC) at Bodø Armed Forces Base in Norway. As the primary tactical air C2 node for the northern sector, CAOC Bodø orchestrates regional air policing, maritime surveillance, and large-scale exercises such as those under the Arctic Sentry umbrella.[5]

Between these two architectures lies Greenland. As both a North American island and a self-governing territory of Denmark, Greenland sits within NATO's political footprint, but its radar arrays at Pituffik Space Base send data directly into NORAD's early warning architecture. While Denmark has not formally incorporated Greenland into the NORAD framework, its unique trilateral arrangement extends NORAD's air defence perimeter to the edge of the Euro-Atlantic, marking the practical location where two parallel command structures meet.[6]

The Space Between

While NORAD and NATO monitor their respective geographic flanks, a complex space infrastructure orbits above. Buckley SFB, Colorado, home to Space Delta 4, serves as the primary global hub for processing and sharing overhead persistent infrared (OPIR) and other tracking data with both organisations. NORAD consumes this missile warning data in near-real-time through the Integrated Tactical Warning/Attack Assessment (ITW/AA) architecture. NATO then receives a filtered feed via the Shared Early Warning System

(SEWS II), which sanitises, geographically filters, and sends data into the Control and Reporting Centre System Interface (CSI) over secure network, via the Joint Range Extension Application Protocol (JREAP).[7]

The data flow is not entirely unidirectional. European Allies contribute national space-based ISR through multilateral pooling arrangements such as the Allied Persistent Surveillance from Space (APSS) initiative and France's Multinational Space-based Imaging System (MUSIS) programme. In addition, nascent independent warning capabilities such as the EU-funded Odin's Eye initiative are maturing. As European space capacity grows, NORAD will gain coverage and redundancy that US and Canadian architecture alone cannot provide. Today, NORAD's integrated, automated warning architecture is more mature than NATO's federated equivalent, but that gap is closing. Enhancing integration across the seam is therefore beneficial to both organisations.

While this data-sharing arrangement functions reliably under permissive, steady-state conditions, the cross-seam pipeline remains optimised for strategic early warning rather than dynamic tactical control. It lacks the horizontal, machine-speed pathways required to

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pass high-fidelity tracking data directly between the 611th AOC, the CADS, and CAOC Bodø; it is precisely this gap that the converging threat environment is beginning to expose.[8]

Converging Threats, Diverging Seams

The Arctic is no longer a frozen buffer zone. Climate change is opening transit corridors that were once impassable; Sino-Russian cooperation is deepening across the region; and the accession of Sweden and Finland has pushed NATO's frontier further north than at any point in the Alliance's history. The polar region has become an arena of active competition, and the weapons that define it do not respect organisational boundaries. Hypersonic systems, low-observable cruise missiles, and containerised strike weapons compress decision timelines and demand coordination at machine speed. Consider a hypersonic glide vehicle detected west of Greenland with the potential to strike either North America or Europe. The threat will traverse both NORAD and NATO monitoring zones within minutes, yet delays from manual data translation, geographic filters, or gateway mediation consume decision time that cannot be recovered.[9]

Denmark and Sweden perform a training mission over the Faroe Islands as part of eVA Arctic Sentry.

As the threat environment rapidly converges, Allied C2 across the NATO-NORAD seam is at risk of technical and structural divergence. The United States and Canada are rapidly modernising toward Combined Joint All-Domain Command and Control (CJADC2), which links sensors, decision-makers, and shooters into a common automated ecosystem at machine speed.[10] Meanwhile, much of Euro-NATO remains anchored to legacy infrastructure, such as older network gateways and unmodernised Link 16 terminals that cannot support the bandwidth and multi-netting requirements of modern combat. NATO's Federated Mission Networking (FMN) framework is designed to bridge this gap by linking national systems through common standards. However, FMN is not a network itself, and its effectiveness depends on consistent implementation across dozens of sovereign nations.[11] Uneven adoption of the ten-year FMN spiral roadmap will delay theatre-wide integration. Compounding this, CJADC2 and FMN are not inherently compatible; gateway-mediated exchanges between them introduce latency into the tactical kill web. If these gaps are not closed, software deployment on the North American side risks outpacing Allied procurement cycles, creating a multi-tiered Alliance in which some partners are effectively isolated from the common ecosystem.

This technical divergence is worsened by an institutional expertise gap. NATO has historically under-resourced the human and organisational component required to manage advanced tactical networks. NATO currently lacks a centralised datalink integration office, a body responsible for managing network configurations, synchronising cryptographic updates, and ensuring Allied systems can talk to one another during a crisis. Without it, network coordination defaults to fragmented national solutions, producing C2 delays early in recent exercises and operations.[12] This shortcoming extends to the operator level as well, where the Alliance has no advanced Level 4 training pipelines within Europe for Joint Interface Control Officers (JICOs), leaving the European theatre reliant on a single training source in the United States.

Finally, both commands lack realistic training in denied, disrupted, intermittent, and limited environments. Scenarios tend to be stovepiped within NORAD or NATO, rarely involving cross-boundary target tracking and handoff. Rather than forcing networks to fail realistically, planners rely on administrative 'white cards' to simulate away friction.[13] This precludes primary, alternate, contingency, and emergency (PACE) plan validation and masks operational limitations across the transatlantic seam.

Closing the Gap: A Three-Part Strategy

To reconcile the diverging seam between NORAD and NATO, both organisations must execute a coordinated strategy that synchronises technical solutions, institutional structures, and operational exercises.

Pillar 1: Technical Solutions

Before the Alliance can achieve cross-seam interoperability, it must address hardware shortcomings, disparate data architectures, and the Arctic's harsh environmental constraints. Modernisation requires a pragmatic hardware baseline that connects existing systems into automated, machine-to-machine pathways, without requiring a costly fleetwide replacement.

The first priority is a tiered datalink upgrade. Aircraft and ground systems already equipped with older Link 16 terminals should keep them, provided they are upgraded to meet current cryptographic and aeronautical standards. Assets requiring higher bandwidth, such as advanced fighters, airborne early warning platforms, and key C2 nodes, should receive a full upgrade to modern systems like Multifunctional Information Distribution System Joint Tactical Radio System (MIDS JTRS). This upgrade would support faster, more flexible network configurations, including Tactical Targeting Network Technology for rapid sensor-to-shooter connections.[14] While a fully modernised NATO fleet will assure optimised efficiency, this tiered approach meets the requirement for effective cross-seam C2.

The second priority is a permanent NORAD-NATO data bridge: a shared mission partner environment (MPE) where both organisations' systems can automatically

The Northern Lights over the North Atlantic, as seen from HDMS Esbern Snare, Standing NATO Maritime Group One flagship.

pass data rather than relying on manual, point-to-point transfers. Instead of a unidirectional, US-managed pipeline, this architecture should be co-developed, drawing on existing US programmes such as the Secret and Below Releasable Environment (SABRE) while integrating natively into NATO's own network standards.[15] In practice, tracking data from Canada's new Arctic and Polar Over-the-Horizon radars, expected to be online by 2029, would flow into NORAD's cloud-based command system before automated gateways convert and push that data at machine speed directly to CAOC Bodø.[16]

Finally, the Arctic's atmospheric and ionospheric conditions are among the most disruptive on Earth, frequently degrading satellite communications at high latitudes. Both commands are responding by spreading their communications across multiple orbital bands, offering resilience when one altitude is degraded. The next step is consolidating these diverse assets into a single architecture that switches automatically between backup pathways without human intervention.[17]

Pillar 2: Institutional Collaboration

Software and hardware upgrades are inherently limited without the organisational frameworks and legal agreements required for implementation. The recommendations below are not calls to dissolve existing policy boundaries or override national sovereignty. They are proposals to work deliberately within those boundaries to manage the risk and friction those boundaries generate at the operational level. Taken together, they address the cultural, relational, and governance dimensions of cross-seam integration.

The first recommendation is to establish a classified information-sharing compact among the Arctic Seven NATO nations. The primary intent of such a compact is cultural: shifting institutional mindsets from a need-to-protect to a need-to-share philosophy. Such an arrangement should begin by developing a shared threat assessment among the Arctic Seven nations. This compact could progress these allies toward a political and legal framework that expands data releasability to build a comprehensive recognised operating picture of the entire Arctic. Aligning legal authorities across sovereign nations is admittedly the hardest dimension of this effort, but it is also the most important, as technical solutions will continue to stall at policy boundaries.

Second, while JFC Norfolk's Arctic Sentry framework has improved theatre-wide synchronisation, the Alliance still lacks a dedicated operational-level exchange between the ANR, CADS, and CAOC Bodø. A rotating annual forum among the three AOCs would give senior leaders and operational staff a dedicated venue to discuss cross-seam procedures, align future requirements, and build the institutional relationships that no amount of technical connectivity can substitute for.

Finally, as part of NATO's broader modernisation imperative under Allied Command Transformation (ACT), NATO and NORAD should establish an Advanced Tactical Data Link Integration Office. This office would manage cross-seam network configurations, synchronise cryptographic updates, and ensure technical alignment between CJADC2 and FMN on future software development. This would provide the permanent integration authority between technical modernisation and institutional governance that currently exists nowhere in the Alliance structure.

Pillar 3: Operational Training and Exercises

Where Pillar 2 focuses on organisational alignment and relationship building, Pillar 3 addresses the practical proficiency of the operators who must execute cross-seam missions. Technical architecture and institutional frameworks are only as effective as the people trained to use them under pressure.

The most immediate gap is Europe's absence of advanced datalink training infrastructure. NATO should establish a JICO training facility accredited to teach the Level 4 'Multi-Tactical Data Link Management' curriculum, replicating the standards of the US Joint Staff J6 Joint Interoperability Division Training Centre (JID-TC). Without this capability in theatre, the European flank will remain dependent on a single training source in the United States.[18]

Equally important is the quality of training operators receive once certified. Multinational exercise planners should abandon the administrative 'white cards' that simulate away network failures and atmospheric anomalies. When a cross-seam datalink drops or an ionospheric event severs a connection, forces should troubleshoot in real time. These degradations are the most valuable stress tests available for diagnosing interoperability issues before a real crisis occurs.[19]

NORAD and NATO should also increase the frequency and ambition of cross-seam tactical training: deploying fighters to opposite AORs to cross-train in homeland defence and air policing missions, executing Agile Combat Employment (ACE) concepts during Arctic-focused iterations of Red Flag-Alaska, and flying profiles that force live, cross-boundary targeting handoffs between controllers on both sides of the seam. The objective is shared procedural fluency that survives the friction of a real contingency.[20]

Finally, the Alliance should invest in a transatlantic Distributed Mission Operations (DMO) network dedicated to live, virtual, constructive (LVC) training between AOCs. Interconnecting existing North American and European virtual environments would allow battle managers in Alaska, Canada, and Norway to routinely practise cross-seam intercepts without the cost of cross-Atlantic aircraft deployments.[21]

Conclusion: Deterrence at Machine Speed

While the ice in the Arctic thaws, geopolitical tensions in the High North will continue to harden. For decades, the NATO-NORAD seam served as the mechanism by which the Alliance balanced operational deterrence with political sovereignty. The emergence of peer threats now demands a new approach that speeds integration by embedding interoperability, while guarding sovereignty. Hypersonic and low-observable systems demand a reassessment of how organisations share data, build institutions, and develop operators capable of managing the Arctic battlespace. The aircraft participating in Arctic Sentry may cross the GIUK gap in minutes, but their command architectures still do not. Until NATO and NORAD can exchange information and coordinate decisions with equal speed, the seam running through the Arctic will remain an operational vulnerability that adversaries can exploit. ●

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ABOUT THE AUTHOR

Colonel Kevin 'Tread' Anderson

US Air Force, Deputy Commander, 354th Fighter Wing, Alaska

Colonel Kevin 'Tread' Anderson is the Deputy Commander of the 354th Fighter Wing at Eielson Air Force Base, Alaska. A graduate of the United States Air Force Academy and the USAF Weapons School, he is an F-16 command pilot with over 3,600 flight hours, including 1,000 combat hours. His career spans multiple operational assignments, and most recently, he served as Chief of Staff of the NATO Joint Air Power Competence Centre (JAPCC). As Deputy Commander of the 354th Fighter Wing, he leads a combat wing that specialises in fifth-generation power projection and Arctic homeland defence, and hosts Red Flag-Alaska.