Defence | White Paper

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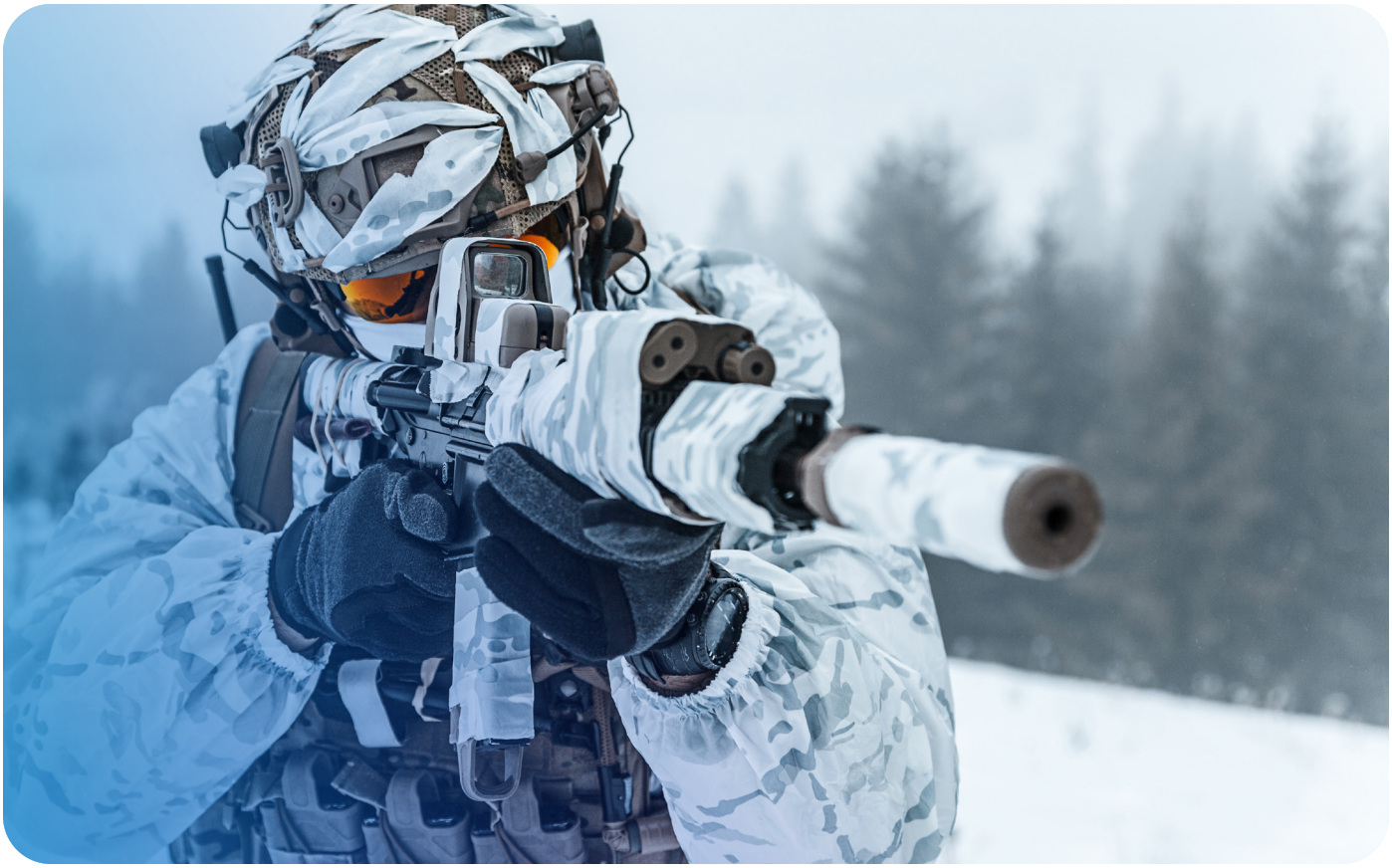


Protecting Canada's Arctic Sovereignty

Multi-Domain Awareness Solutions

Summary

Canada will be investing billions of dollars into protecting our Arctic sovereignty. Some threats, like aircraft and missiles, are well established. New threats, including uninhabited platforms, are less well established. The pace of technology development is accelerating for many key enablers, including space systems, AI and quantum. Rapid integration of new technology will pose challenges for sensing and decision-making. To make timely, informed decisions about threats to our sovereignty, multi-domain awareness is essential. To understand all the threats—air, land, sea and subsurface—all sensor data needs to be integrated into a common environment to give commanders and leaders multi-domain awareness.

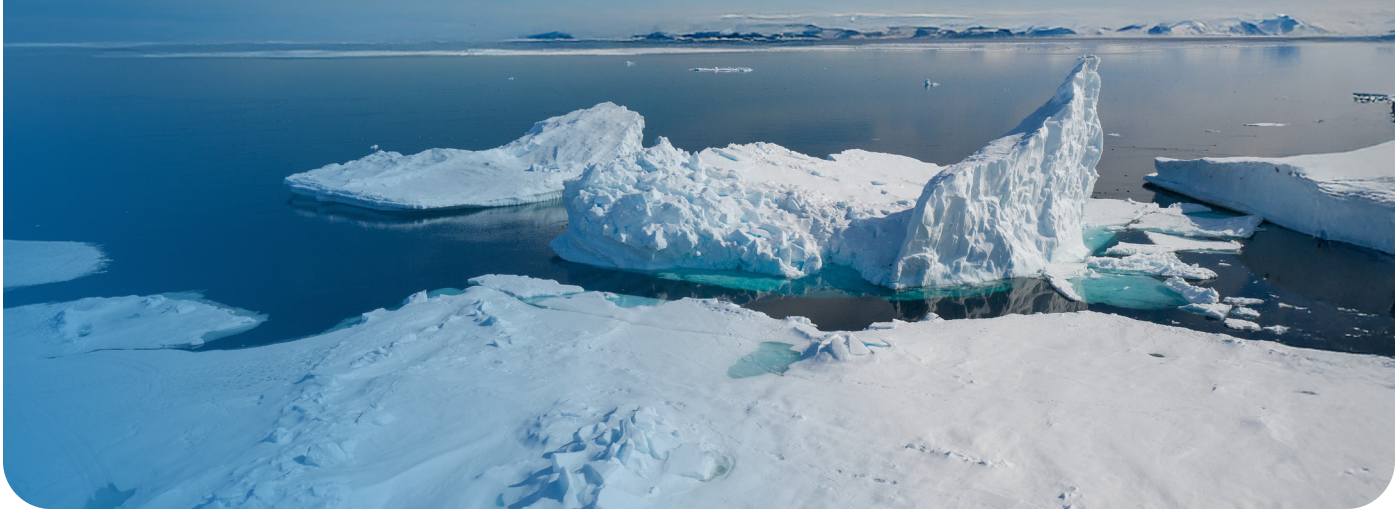
Our Duty to Defend the Arctic

Canada's Northern and Arctic region is a huge space that makes up 40 per cent of Canada's territory and more than 70 per cent of the total coastline, and has low population density, spread across many, mostly small, remote communities.[1]

This vast space is increasingly under threat. The effects of climate change are causing multi-year ice to melt, enabling greater shipping traffic through Canada's Arctic waters and increasing the likelihood of disputes over access and usage of the Arctic.[2]

Maintaining sovereignty over the Arctic is a clear priority for Canada. Increasing activity from Arctic nations and self-declared "near-Arctic" nations requires defending against known and emerging territorial threats. With clear responsibilities as part of NORAD for defending the maritime and aerospace approaches to North America, and shared responsibility with NATO partners for the northern boundaries of the alliance, Canada has a duty to contribute to Arctic peace and security.[3]

To build Canada's capabilities for the Arctic, the Canadian government announced the continental defence modernization suite of programs in 2022. These include infrastructure development, communications capabilities, sensing capabilities—from space and of space—and command-and-control capabilities. These programs are all essential to support Canada's military activities across a wide spectrum of needs: the ability to sense the environment through collection, inform command decision, and act and interdict with air, land and sea-based platforms.



Multi-Domain Awareness is Essential

The emphasis for command and control in Canada's Arctic is on aerospace operations,[4] not on multi-domain awareness. Situational awareness for Canada's aerospace is essential. We know that balloons operated by states have been intercepted over North America, and there have been other unidentified objects in the airspace.[5] For space and low-Earth orbit, we know there are currently 10,000 satellites operating with forecasts ranging from 20,000 to 58,000 low-Earth orbit satellites by the year 2030.[6] Maintaining awareness of those objects and the threats they pose is essential. But it's not enough.

With the opening of more northern shipping routes, Canada needs to maintain awareness of surface vessels moving through Canadian waters. With more activity in Northern waters in general, it is likely that more submarines, uncrewed surface vehicles (USV), and uncrewed underwater vehicles (UUV) will enter Canadian waters. There is also potential for land incursions from ships, USVs and UUVs because of sparse population and vast tracts of open space.

Multi-domain awareness solutions are essential to providing awareness of all the threats to Canada's sovereignty, not only the aerospace threats.

Our Solutions

Calian is a highly diversified Canadian company that provides products, services and solutions for any defence program—including for multi-domain awareness needs. Our solutions for multi-domain awareness enable data fusion into a common synthetic environment to show all the threats, and visualize the operating environment to support decision-making, and command-and-control activities.

Our solutions also enable the secure transmission of data—including using space systems and security for data storage and for facilities. Calian delivers solutions to connect the right data feeds into a common operating picture and support the safe and secure transmission of data from sensor to decision-maker.

Data Fusion

Modern command posts and headquarters take in data feeds from multiple sensors from land, air, space and sea. To integrate data into a common synthetic environment, Calian takes a systems-agnostic approach, connecting any system—no matter where it comes from. Using our virtual command and control interface (VCCI), we seamlessly integrate data streams into a single C5–ISRT environment. This approach is used operationally for joint, multi-agency and multinational operations, where there are many organizations working together. VCCI is currently in service with the Canadian Armed Forces and the British military.

Calian's audio distribution service (ADS) connects voice radios for dismounts, vehicles, ships and aircraft into a single system-agnostic communications network. This approach allows commanders and leaders full visibility of their communications networks, including all the nodes. With ADS, commanders and leaders can see their network and contact any callsign on the network, as required. Additionally, with voice-to-text technology, radio calls from callsigns on the network can be shown as text in the headquarters, keeping down noise and providing an immediate record of radio transmissions.

For multi-domain awareness in the Arctic, VCCI and ADS enable the connection of any sensor and callsign into a common environment. Information from a Canadian Ranger patrol, a Canadian Coast Guard ship, patrolling aircraft, navy vessels, an uncrewed system in the air, in the water, or below the surface can all have their sensor data and communications integrated into a single environment. This puts all the necessary information together to deliver true multi-domain awareness, enabling commanders and leaders to make informed decisions.

To help reduce the cognitive loads in headquarters, AI is providing help in pattern recognition and recommending actions based on processes and protocols. Calian developed a human-autonomous teaming prototype to support aerospace controllers by automating pattern detection for aircraft approaching airfields. The technology provided suggestions to human operators, based on aircraft manoeuvring in a simulated environment. This technology showed the value of AI-enabled decision support for aircraft in a NORAD context, and could be extended to support decision-making for other applications in a multi-domain environment.

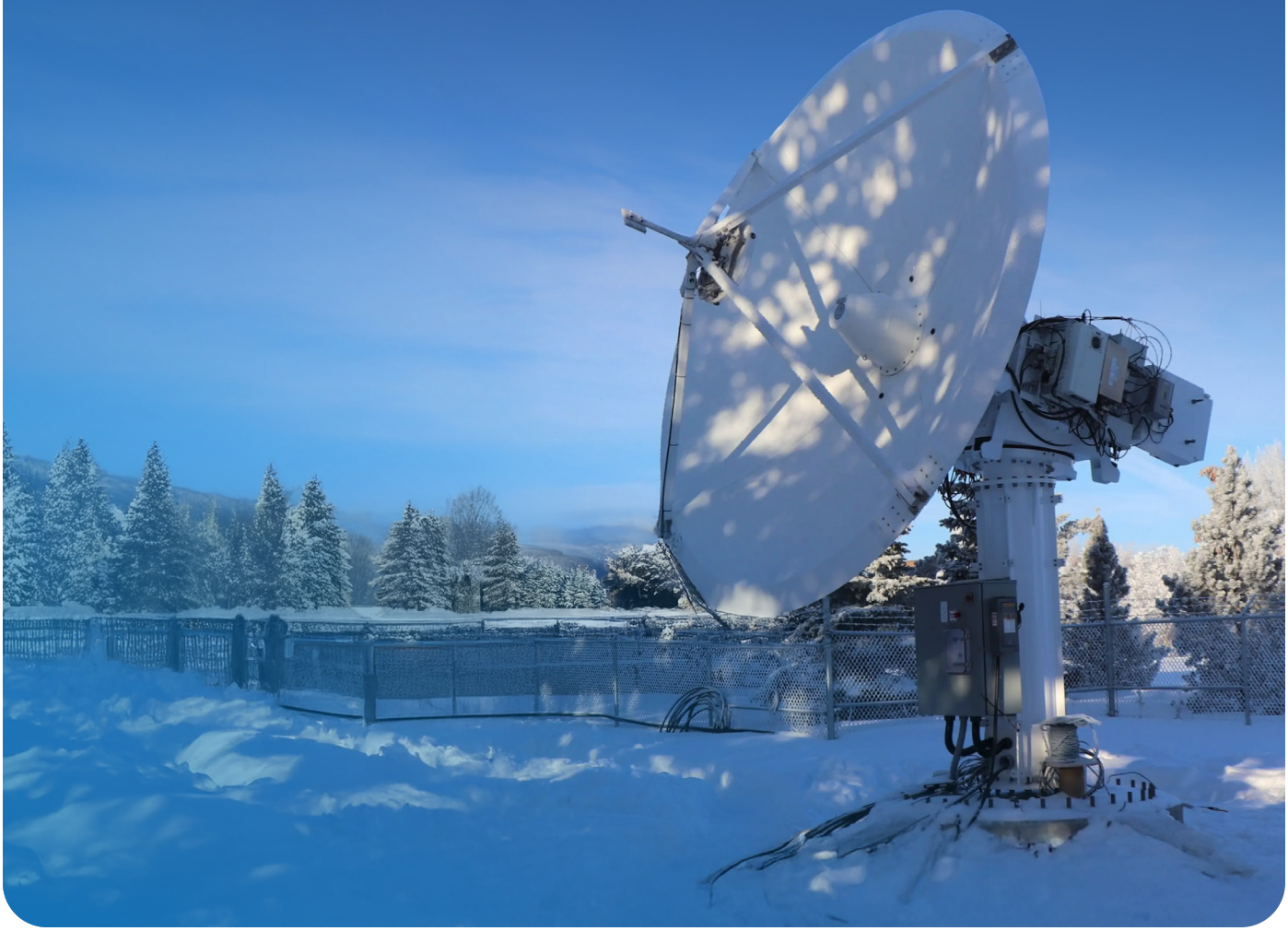
The AI-enabled application does not replace human decision-making; it provides suggestions to human operators based on recognizing known patterns—and deviations from them. This technology has the potential to support detection and identification of threats in a multi-domain Arctic environment.

Data Transmission

Sharing information is harder in the Arctic than in most regions. Low population density means less communications infrastructure than in most cities and towns. This means relying on a mix of space-based communications infrastructure to supplement land-based communication through conventional radios.

Calian is a global leader in delivering ground-based space infrastructure to connect satellites to the Earth. With over 40 years of experience, we have delivered ground-based infrastructure in all climates—including desert, littoral, jungle and temperate forest, and tundra. We have delivered ground stations in the Caribbean, the Australian outback, and in Canada's Arctic. Our antennas and ground stations are world-class, ranging from 1m to 35m for applications in low-Earth orbit, medium-Earth orbit, geostationary orbit and deep space communications. We also deliver satellite communications gateways to connect platforms and vehicles with services on-orbit for reliable global communications.

To manage constellations of satellites, we provide resource orchestration solutions that visualize satellite operations and requirements. With visualization, planners and leaders can see the distribution of satellites across orbits, and develop plans that make sure all satellites are on-time and on-target, no matter the mission. Calian's resource orchestration solutions give you greater confidence in planning and operational management for any constellation operation.



Data Storage

Operating in the Arctic means less digital connectivity, but without reduced data needs. With less connectivity, more local storage of data provides on-platform or on-premises access and analysis. Local cloud solutions enable connectivity for units, formations and headquarters to manage more data locally. Using local, sovereign data solutions also reduces dependency on other countries. Calian knows that sovereign data solutions are essential to ensuring that foreign governments or actors do not access cloud-based data without the owner's knowledge.

Calian also delivers local data storage solutions that can store everything from unclassified to top secret data using one solution. For multi-agency operations in Canada's North, this means that unclassified data from non-defence and security sources can be part of the same solution as classified data from defence and security sources using the same solution, all while complying with information security protocols and regulations.

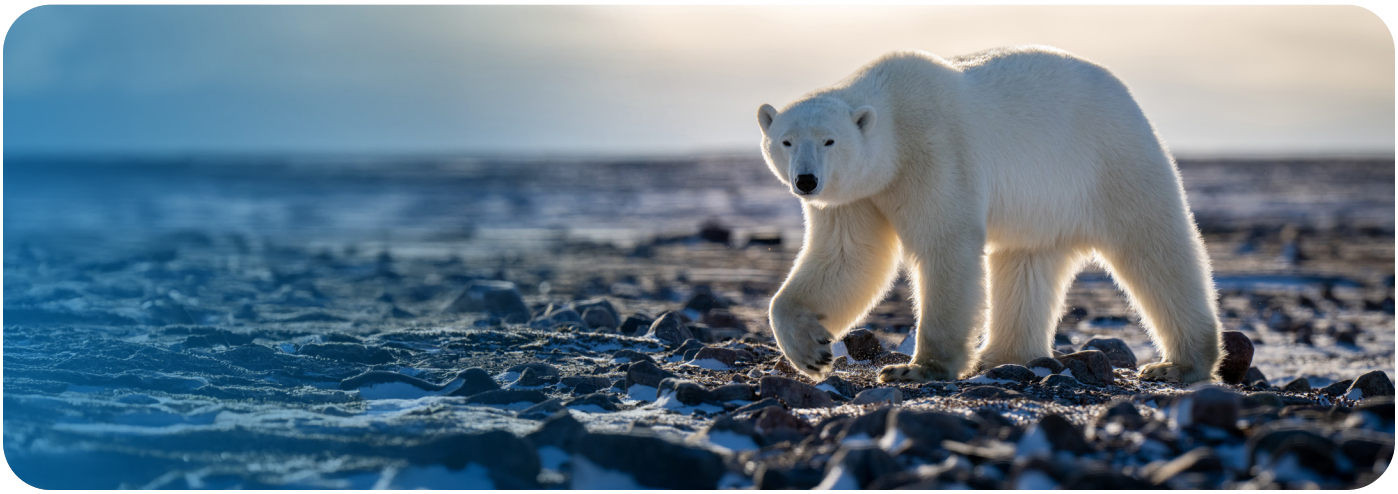
Data Security

Security of data for large organizations involves more than just devices. Security of facilities and installations, infrastructure and networks, and other endpoints are all required to ensure enterprise-level security of your information. Calian is a Canadian leader in emissions security, threat assessments, pen testing, security operations centres/network operations centres, and incident response for cybersecurity. Using TEMPEST-certified devices, we secure your data by taking a systems-level approach to ensure your data and the facilities where they are used are secured from unauthorized access. Government customers with high-security needs trust us to secure their facilities and infrastructure.

Conclusions

With growing threats to Canada's Arctic sovereignty, awareness of who and what is transiting our air, land and water is essential. Maintaining awareness over aerospace threats is no longer enough. The rising threat of shipping, submarines, land incursions and a whole range of remotely operated and uninhabited systems means that multi-domain awareness is essential.

Calian has a proven record of connecting multiple sources of data into a common operating picture, providing space and software systems for communications connectivity, and ensuring security of data and networks. We provide multi-domain awareness solutions to enable informed decision-making. The future of Canada's Arctic will be more complex than those we faced before, and multi-domain awareness is essential to protect our sovereignty from threats.



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Confidence. Engineered.

Calian® helps people communicate, innovate, learn and lead safe and healthy lives. Every day, our team embodies our core principles of unwavering customer commitment, integrity, innovation, respect and teamwork, to engineer reliable solutions that solve complex challenges. That's Confidence. Engineered.

We are a growing company headquartered in Ottawa with offices and projects spanning North American, European and international markets with a focus on innovative healthcare, communications, learning and cybersecurity solutions.

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