



C2 at Sea

Embarking Modular, Scalable, and Mobile C2 Centres Aboard the AOPV

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OVERVIEW

In the face of emerging threats, Canada is recapitalizing its military and modernizing the North American and Aerospace Defence Command. One component of this modernization is the creation of new Future Combined Air Operations Centre for the Royal Canadian Airforce. This article argues that these mobile air C2 nodes should be capable of operating aboard the Royal Canadian Navy's Arctic and Offshore Patrol Vessels. By doing so, the Canadian Armed Forces can fully leverage existing assets while enhancing their ability to defend Canada's territory and interests in the Arctic.

Centralized command and control infrastructure presents real risks. This paper examines the possibility of dispersing RFAC C2 aboard the AOPV.

The international security environment has become increasingly uncertain and dangerous, necessitating investment in the Canadian Armed Forces' (CAF) capabilities.¹ Since 2007, the Government of Canada (GoC) has begun identifying and correcting the CAF's capability gaps, especially in terms of its ability to operate and defend Canada's interests in the Arctic.² The GoC has made major investments to recapitalize the CAF, including the procurement of new Arctic and Offshore Patrol Vessels (AOPVs) for the Royal Canadian Navy (RCN), a commitment to modernize the North American Aerospace Defence Command (NORAD), and the creation of the Royal Canadian Air Force's (RCAF) Future Combined Air Operations Centre (FCC) Capability Project as part of NORAD modernization (NORADMOD). Yet, the government has not begun to explore the full potential of these investments. This article argues that the RCN's AOPVs should be employed as bases for modular, scalable, and mobile FCC nodes. Doing so would enhance the capabilities of the CAF and its allies, facilitate joint and/or combined operations, and fully leverage existing CAF assets in the Arctic, addressing Canada's capability gaps and enhancing the ability of the CAF and its allies to respond effectively to a range of threats in the region.

Background

The CAF, along with other Western militaries, has benefitted from a long peace dividend following the end of the Cold War. Instead of spending approximately 2 percent of the country's gross domestic product on defending against Soviet threats, as it had between 1970 and 1990, the GoC was able to reduce its military expenditures dramatically after the collapse of the Soviet Union.³ Since then, the CAF's platforms, weaponry, and supporting infrastructure have been allowed to age and slowly become obsolete, so long as they could still perform the peacetime functions necessary to meet domestic and international obligations.⁴ Twenty years on, this underinvestment has resulted in significant capability gaps, including the CAF's lack of localized aerial air defence, surveillance and detection, and resilient Command and Control (C2) for operations in the Canadian Arctic.⁵ These gaps leave Canada vulnerable to kinetic attacks or exploitation by potential adversaries.

This level of vulnerability has become increasingly unacceptable as the international security environment becomes more dangerous.⁶ Over the last two decades, state and non-state threat actors have proliferated, including authoritarian states such as China, Russia, North Korea, and Iran, as well as violent extremist groups.⁷ Weapons technology has also improved dramatically and become more affordable, amplifying the potential threats posed by such adversaries.⁸ Most importantly, great power competition challenging Western hegemony has emerged between Russia, China, and the United States. Russia and China have become near-peer or peer adversaries to the United States, capable of challenging the interests of the United States and its allies at home and abroad. Most critically, the Canadian homeland has ceased to be a sanctuary, guarded by distance and great oceans. In their 2020 work on continental defence, former NORAD commanders Terrence J. O'Shaughnessy and Peter M. Fesler identified adversary strikes on North American communication and logistical nodes as a real and present danger.⁹ For Canada, a legacy C2 system, based on vulnerable, stationary assets, presents a critical vulnerability.

Context

Unlike its adversaries, Canada has been slow to reinvest in military capabilities, especially those meant to deter and defend against kinetic threats to the homeland. In the late 2000s and 2010s, the GoC acknowledged the need to recapitalize the CAF and began the process.¹⁰ Existing CAF assets have been refitted to extend their useful lives, and new assets are being procured to maintain and improve the CAF's abilities, including the RCN's six new AOPVs entering into service by 2028.¹¹ Along with investing in the AOPV, the GoC has committed to spending \$38.6 billion to modernize NORAD, aiming to improve the binational Canada–US command's ability to detect, identify, track, and defeat potential ballistic missile attacks on North America.¹² Under the umbrella of NORADMOD, the CAF has also begun working on a variety of projects to bolster its ability to withstand and counter adversaries, including the Royal Canadian Air Force's FCC Project to create a resilient, modular air power C2 capability.¹³ Despite the enormous dollar value of the GoC's recent efforts to recapitalize the CAF, more can and should be done to make sure that these investments are optimally employed, delivering the most value possible to the CAF and to Canada's alliances.

The AOPV

The procurement of the RCN's fleet of AOPVs, first announced in 2007, was meant to give the CAF a new, sustained presence in the Arctic.¹⁴ The GoC envisions these large and versatile platforms conducting a variety of operations, including search and rescue, maritime domain awareness, logistical support, and

sovereignty projection missions, as well as aiding law enforcement, civil powers, and other government departments as required.¹⁵ Yet, these tasks also fall under the purview of the Canadian Coast Guard, which has AOPVs and assets of its own.¹⁶ Instead of performing overlapping roles, the RCN's AOPVs should be strategically deployed to enhance CAF-specific capabilities in the Arctic. However, presently, the AOPVs are not designed with the weapons, communications, or sensor systems necessary to fulfill a more military-centric role. Further investments would need to be made for these ships to be refitted in a way that would realize their full potential.¹⁷

NORADMOD

Following its procurement of the RCN's AOPVs, the GoC announced in June 2022 its commitment to spending \$38.6 billion over the next two decades to modernize NORAD. NORADMOD includes investments in surveillance systems, technology-enable decision-making systems, air defence, infrastructure and support capabilities, and research and development programs.¹⁸ These aim to bolster NORAD's threat detection, communication, and defeat systems.¹⁹ The overall goal of NORADMOD is to future-proof the CAF's ability to sustain a strong presence in the Arctic and defend North America against emerging threats.²⁰

One specific area of investment in NORADMOD is the RCAF's FCC Project. The project aims to deliver an advanced C2 system for the RCAF, consisting of personnel, processes, and equipment needed to monitor, plan, direct, coordinate, and control domestic, continental, and global operations.²¹ In the face of adversary capabilities that hold the North American continent at risk through unprecedented range and precision, the FCC must achieve survivability through mechanisms other than traditional infrastructure hardening. To this end, the FCC is conceived as a modular and scalable family of systems comprised of fixed infrastructure, mobile C2 capabilities, and a common tactical network. The FCC will have the ability to subdivide itself into FCC nodes that will disperse and connect to one another and to RCAF platforms, in order to maintain continuity of operations in the face of persistent threats.

The FCC nodes, when operational, will conduct planning and issue guidance to assigned forces, as well as performing data analysis, fusion, targeting, and dissemination for domain awareness. Nodes such as these would constitute C2 forward operating bases, extending the CAF's ability to conduct operations in the Arctic. To deliver this capability in the face of emerging threats, the commander of the RCAF has stated that the FCC nodes must be designed to ensure continuity of operations and be able to withstand and counter adversaries in contested, degraded, and limited operating environments. Practically, this means that the nodes must be modular and scalable, providing connectivity and communications via robust and redundant means.

Mobile and Survivable FCC Nodes

In addition to modularity and scalability, the RCAF's FCC nodes should be mobile to improve their survivability and the CAF's operational flexibility and response times in the Arctic. Kinetically hardening a traditional fixed FCC is unlikely to achieve the level of survivability needed to meet NORAD's mission to protect North America against emerging threats in the evolving security environment. Fixed bases are vulnerable to adversarial targeting and may not be positioned optimally for swift operations in remote regions like the Arctic. By making FCC nodes mobile, the centres could complicate a potential adversary's targeting picture, making it harder to identify FCCs and strike them.²²



To further evade potential detection and targeting by adversaries, mobile FCC nodes could be dispersed across the Arctic region. Mobile and dispersed nodes allow for the quick deployment of forces and resources where they are needed most, enhancing operational agility and facilitating training, exercises, and operations while maintaining a strategic presence in contested areas. However, from both an operational and policy perspective, there are numerous challenges in making FCC nodes mobile within relevant timelines. Another difficulty is connecting geographically dislocated FCC elements to a common network to execute C2 functions. In sum, the FCC nodes' mobility, modularity, and scalability requirements make the project a particularly complex initiative.

To meet these complex requirements, strategically repurpose existing assets, and simplify the FCC Project, the CAF should consider locating FCC nodes on AOPVs. Presently, the RCN's AOPVs are not employed to their full potential, and the GoC has not provided a clear vision for how they will be used for military, rather than constabulary, purposes. In principle, an AOPV could receive, integrate, and operate an FCC node in the form of a transportable and modular sea can-based system, as the AOPV already has the ability to load, unload, and house various mission-specific equipment.²³ Locating a modular FCC on an AOPV would provide the CAF with a mobile FCC node that would be more resilient against kinetic and non-kinetic threats than traditional fixed centres, by virtue of the ship's ability to move. Another benefit of being aboard an AOPV is that the centre would be able to quickly travel throughout the Arctic. The AOPV's existing ability to operate as a standalone platform or as part of a task group also makes the platform inherently scalable, allowing for multiple assets to work together to achieve CAF goals. By establishing mobile FCC nodes, the CAF can bolster its ability to conduct operations to assert control, respond to threats, or deter potential aggressors in the Arctic, thereby reinforcing Canada's national security in an increasingly unpredictable world.

Use Cases

- 1) **Denied/Degraded Communication Environments:** FCC nodes aboard AOPVs could significantly improve the ability of the CAF and its allies to conduct operations in degraded or denied communication environments, which are increasingly likely in modern conflicts.²⁴ In the event that communications are disrupted by natural disasters or damage to infrastructure, or are denied by adversaries through electronic warfare or cyberattacks, having a mobile FCC node would ensure that CAF assets can continue to execute air operations. The embarked FCC nodes could retain connectivity and command of assets by using alternative communications technology, such as tactical data links and radios at various levels of frequency. The mobility of the AOPVs would also allow the FCC nodes to reposition as necessary to avoid detection by adversaries, maintain communications with assets, or establish connections with other forces. This resilience in communication capabilities makes embarked FCC nodes pivotal in contested environments, enhancing operational effectiveness, allowing the CAF to maintain a strategic advantage, and contributing to mission success.
- 2) **Combat Scenarios:** AOPVs equipped with FCC nodes could play a crucial role in facilitating rapid CAF and allied responses to kinetic attacks against North America in the Arctic. Embarked FCC nodes could act, alone or in concert with one another, as mobile coordination hubs, efficiently deploying air assets. The FCC nodes' mobility would provide the CAF and its allies with a strategic advantage, enabling these essential C2 hubs to evade enemy detection and reposition themselves out of range of enemy assets, enhancing their survivability. If multiple AOPVs had embarked FCC nodes, these C2 nodes could disperse across the region, further complicating the enemy's targeting

picture and allowing for the CAF to conduct operations in more than one area. Additionally, by being located aboard armed naval vessels, embarked FCC nodes would be protected by the ship's self-defence capabilities, providing protection that fixed C2 centres lack. Overall, having FCC nodes aboard AOPVs would allow for effective C2 for joint responses in combat scenarios, improving the survivability of the centres and the capabilities of the CAF.

- 3) **Remote Operations:** FCC nodes aboard AOPVs could significantly improve the abilities of the CAF and NORAD to conduct operations in remote regions of the Arctic, far from established bases. The mobile nature of these FCC nodes would allow them to deploy rapidly and provide C2 in areas that are challenging to access or build in.²⁵ This is particularly important in the Arctic, where traditional logistics and supporting infrastructure are limited or nonexistent.²⁶ Having FCC nodes embarked on AOPVs would facilitate real-time coordination among Canadian and allied military air assets during CAF and international training, exercises, and operations in remote areas in the Arctic. This would allow Canada to contribute a unique and powerful capability to its alliances, helping foster stronger partnerships with allies in the strategically critical region.

Key Considerations

- 1) **Lack of Self-Defence Capabilities:** Currently, the AOPVs are not adequately armed for self-defence, rendering them vulnerable to attack by adversaries operating anything beyond lightly armed merchant cruisers. Each vessel is equipped with one 25mm cannon and two .50 calibre machine guns, limiting their coercive capability and effectiveness in combat scenarios, especially against near-peer and peer adversaries with sophisticated weaponry.²⁷ To face evolving threats, it is vital to have and protect CAF FCC nodes in the Arctic. Therefore, the AOPVs should be refitted with heavier armament or be escorted by air or maritime support to improve their survivability in contested environments.²⁸
- 2) **Positioning of AOPVs:** Strategically positioning the AOPVs carrying FCC nodes is crucial to maximize the centres' effectiveness. To optimize the FCC nodes' operational capabilities, the AOPVs must be deployed in locations that allow for rapid response to potential threats or emergencies. When deciding where to position these assets, attention should be paid to staying close to, yet far enough away from, critical chokepoints, assets, and areas of high maritime activity. Adversaries may seek to target these areas, making them particularly dangerous for AOPVs to operate in and around. However, AOPVs should be stationed within range of these locations, so they can provide C2 to localized assets if the areas or assets need to be defended. By strategically positioning AOPVs, the CAF can have a proactive presence in the Arctic, enhancing deterrence and readiness while safeguarding national interests in this increasingly contested region.
- 3) **Infrastructure Requirements:** FCC nodes embarked on AOPVs would require adequate supporting infrastructure in the Arctic to refuel, repair, and restock the AOPVs as well as the FCC systems. In the Arctic, such infrastructure is often inadequate or non-existent. Investment in port facilities and support services will be necessary to enable sustained operations in the region. However, the harsh conditions and remoteness of the Canadian Arctic further complicate the building of new infrastructure and reliable supply chains there. Without a well-coordinated logistics strategy, the operational effectiveness of the FCC nodes could be severely hampered, potentially leaving the CAF unable to respond effectively.

Recommendations

To bolster the capabilities of the CAF and its allies, facilitate operations, and fully leverage existing CAF assets in the Arctic, while meeting the requirements of the RCAF FCC Project, the GoC should consider embarking sea can–based FCC nodes aboard the RCN’s AOPVs. If the GoC was to accept this recommendation, additional investments would have to be made to:

- 1) **Enhance the Defence of the AOPVs:** To safeguard the FCC nodes aboard AOPVs, the vessels must be refit with at least the minimal armament and self-defence systems needed for self-defence against state adversaries or be escorted by air or maritime assets to improve their survivability in contested environments.
- 2) **Strategically Deploy AOPVs:** AOPVs should be strategically deployed in locations that enable rapid responses to emerging threats, allowing for effective C2 over assets and enhanced deterrence against potential adversaries. A concept of operations should be drafted and promulgated detailing how operational planners and commanders can determine which locations to send AOPVs to and permissible mission sets for AOPVs with FCCs aboard.
- 3) **Invest in Infrastructure Development:** To facilitate sustained operations in the Arctic, significant investment in supporting infrastructure is needed. This includes the development of port and support facilities that can accommodate refuelling, repairing, and restocking both the AOPVs and the FCC nodes. The GoC should prioritize establishing partnerships with regional stakeholders to develop resilient supply chains, ensuring that the CAF has the necessary resources to maintain operational effectiveness in this challenging environment.

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In conclusion, by strategically repurposing the RCN’s AOPVs to host FCCs and making the necessary corresponding investments, the CAF can significantly enhance its operational capabilities in the Arctic. Modular, scalable, and mobile FCC nodes aboard AOPVs would be ideal C2 platforms, capable of quickly deploying, evading potential adversaries or enemies, and effectively responding to emerging threats in an increasingly complex security landscape.



Notes

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- ²⁰ DND, “NORAD Modernization.”
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