National Defence Défense nationale

Canadian Forces College

Collège des Forces Canadiennes

INCREASING THE RCN'S SITUATIONAL AWARENESS IN THE ARCTIC

Lieutenant-Commander Scott Rudderham

JCSP 47

Service Paper

Disclaimer

Opinions expressed remain those of the author and do not represent Department of National Defence or Canadian Forces policy. This paper may not be used without written permission.

PCEMI 47

Étude militaire

Avertissement

Les opinons exprimées n'engagent que leurs auteurs et ne reflètent aucunement des politiques du Ministère de la Défense nationale ou des Forces canadiennes. Ce papier ne peut être reproduit sans autorisation écrite.

Canada

CANADIAN FORCES COLLEGE - COLLÈGE DES FORCES CANADIENNES

JCSP 47 - PCEMI 47
2020 – 2021

SERVICE PAPER – ÉTUDE MILITAIRE

INCREASING THE RCN'S SITUATIONAL AWARENESS IN THE ARCTIC

By Lieutenant-Commander Scott Rudderham

Word Count: 2,298

Nombre de mots : 2.298

INCREASING THE RCN'S SITUATIONAL AWARENESS IN THE ARCTIC

AIM

1. Increased access means that the Canadian Armed Forces (CAF) must be ready to respond to domestic emergencies and international threats to Canada's Arctic sovereignty. This paper will discuss and recommend which capabilities the CAF – specifically the Royal Canadian Navy (RCN) – requires to increase its situational awareness in the Arctic and how best those capabilities may be employed.

INTRODUCTION

2. In such a vast and mostly barren landscape, cutting-edge technologies that can withstand the harsh climate and challenging environmental conditions will enable the RCN to fulfill the Government of Canada's (GoC) objectives and protect Canadian interests in the north. Intelligence, surveillance, and reconnaissance (ISR) are essential capabilities that the RCN requires in greater concentration to survey and assess threats to Canada's sovereignty properly.

3. This paper aims to articulate some of the potential capabilities the RCN can obtain and employ while increasing its situational awareness and its footprint in the Arctic. The discussion will centre around the Arctic Offshore Patrol Vessels (AOPS), mobility, and integrated or additional (module) ISR options and suites.

DISCUSSION

4. The Arctic is aptly described as quickly becoming a hotly contested space. Internationally, there is a growing interest in the region from both state and non-state actors who have expressed interest in accessing the vast and untapped natural resources and the circumpolar trade routes of the North. Currently, the GoC maintains the Arctic and Northern Policy Framework, which explicitly outlines its objectives and goals for Arctic sovereignty until 2030.[1] With increased access to the North, the Arctic's strategic advantages are becoming apparent to both Arctic and near-Arctic states, including increased economic prosperity through resource extraction and trade, ice-free areas for joint foreign military exercises and patrols, and additional tourist and research traffic opportunities. While the GoC does not see an immediate threat to the Arctic or the North, it is aware of growing economic and military interests in the region.[2]

5. Although the Arctic may not see a buildup of conventional military forces in the near term, Canada is a three-ocean nation and must insist upon its Northern sovereignty. Canada must maintain its claim over the North and ensure that the safety and security challenges that come from increased access are considered in full. Through partnerships with local governments and residents, other government departments, and NATO partners, Canada is positioned well to protect its sovereign territory. As glacial melt opens new waterways and maritime routes from

---

[1] Canada's Arctic and Northern Policy Framework: Safety, security, and defence chapter. Accessed 7 December 2021.

[2] *Ibid…50.*

Asia to Europe, the RCN must ensure increased situational awareness domestically. Increased presence in the North will require additional critical infrastructure and emergency preparedness, including robust search and rescue capacity, which also requires increased sensing capabilities in an unforgiving environment. The RCN is receiving a fleet of six AOPS that will be instrumental in ensuring it is prepared to act against any threat to Canada's national interests. The RCN has taken delivery of the first two AOPS, with the final ships beginning construction in 2022.[3] All AOPS will be outfitted with an embarked CH-148 Cyclone Maritime Helicopter capability, an integrated bridge navigation system, and a multi-purpose operating space to coordinate operations and mission execution.[4]

6. The AOPS project provides the RCN with a valuable platform to patrol Canada's North and defend its sovereign rights. However, as well designed as the AOPS are, they do not contain all of the requisite capabilities required for complete situational awareness in the North. While a single ship cannot be designed to do it all (nor should it), the AOPS must incorporate new and additional technological suites into its current and future arsenal if it is to be effective at increasing its situational awareness while protecting a fragile and delicate ecosystem.

Mobility

7. As global temperatures rise year-over-year, new circumpolar trade routes offer economic advantages and increased trade between China to Europe. Canada requires a naval capability that will allow it to navigate ice in Arctic waters and sail through its Northern Archipelago. The Northwest Passage, in particular, contains seven potential shipping routes spread through 73 large islands, and 18, 114 smaller islands.[5] Additionally, the United Nations Convention on the Law of the Sea (UNCLOS), specifically states "The right of innocent passage allows ships to travel in other countries' territorial seas if it is not prejudicial to the peace, good order or security of the coastal state… the passage must be continuous and expeditious transit of the strait. With archipelagic sea lanes, passage archipelagic states may provide sea-lanes and air-routes passage through their waters where ships can enjoy freedom of navigation."[6] In response to increased access, Canada must ensure it can engage foreign vessels in all seven sea lanes.

8. For the first time since the 1950s, when HMCS *Labrador* was commissioned as a Naval Ice Breaker, the RCN will once again operate in Canada's Arctic.[7] The AOPS allows the RCN to navigate Arctic waters; however, the devil is in the details as this ability is limited. In its current construct, the AOPS project has been defined by limitations such that its hull is only able to withstand young, first-year ice. This will constrain the RCN's ability to navigate through Arctic waters. While generally free from ice through warmer summer months, smaller pieces of multi-year ice can and do flow into open waterways and have been known to strand ships and their

---

[3] Public Services and Procurement Canada, Arctic and offshore patrol ships: Royal Canadian Navy. Accessed 7 December 2021.

[4] *Ibid…*

[5] Ostreng, Willy, Karl Magnus Eger, Brit Fløistad, Arnfinn Jørgensen-Dahl, Lars Lothe, Morten Mejlænder-Larsen, Tor Wergeland. "Shipping in Arctic Waters: A comparison of the Northeast, Northwest and Trans-Polar Passages." *SpringerHeidelberg New York*. (2013), 23. Accessed 7 December 2021.

[6] United Nations Convention on the Law of the Sea. Secretary-General of the United Nations (1982). Accessed 7 December 2021.

[7] Canadian Naval Review, The case for a more combat capable Arctic Offshore Patrol Ship, Rob Hueburt, 4.

crews. Further, collisions with multi-year ice under the surface could damage the AOPS' hull, leaving it damaged, out of service altogether, or limiting its service to warmer coastal waters. Without the ability to intercept and interdict mariners in the Arctic Archipelago, the AOPS will be limited to operating in one of the warmer, more southernly lanes of the Northwest Passage.

9. To solve limited mobility through Arctic waters, the design of the AOPS (under construction) should be reviewed to determine if the hull can be redesigned or retro-fitted with increased density and strength. While the top speed of 17 nautical miles is relatively slow, the real issue for the AOPS is its inability to patrol a large portion of navigable Northern laneways due to thickened sea ice. To increase situational awareness in the most basic sense, a ship must be able to sail freely in all waters; therefore, a more rigid hull design capable of handling multi-year ice is necessary. Additionally, there is a direct correlation on the RCN's ability to sail through the Arctic such that a more capable and mobile ship can also respond to remote emergencies ashore and environmental disasters at sea. AOPS must be fully mobile to augment advanced ISR suites, embarked helicopters, and unmanned aircraft to increase its sensing function in the North.

Intelligence, Surveillance, Reconnaissance

10. The sparsely populated and isolated communities of the Arctic are spread across tundra and ice for thousands of kilometers. Space, time, and distance combine with other factors to necessitate that AOPS maintain a robust and independent sensing suite capable of providing a complete operating picture.

> "Navigation in the Arctic has always been a tricky proposition, given the unreliability of the magnetic compass and poor accuracy of many hydrographic charts. Radio and satellite communication have, likewise, been unreliable – hindered by the eastern Arctic's high mountains, ionospheric interference and the geostationary orbits of most satellites."[8]

In their current construct, AOPS' ISR suite is limited to navigational radars, GPS, and an embarked helicopter capability. However, when embarked, a Sikorsky CH-148 Cyclone is the only asset that can currently provide anti-submarine surveillance or over the horizon line of sight. An important point to consider is that although AOPS can embark an aircraft, the RCN more frequently sails without an attached helicopter and air department (HELAIRDET), subsequently limiting ISR when operating independently. Moreover, ice, present around a ship in any form, severely limits a helicopter's ability to detect sub-surface traffic, making anti-submarine warfare exceptionally difficult in the Arctic. To compensate for this vulnerability, the RCN should investigate the use of sub-surface sensors to detect and transmit an in-depth real-time sub-surface operating picture.

11. One promising advancement in this field is the Arctic Mobile Observation System (AMOS). The AMOS consists of a network of sensors – made up of unmanned undersea vehicles

[8] Naval Affairs Program Briefing Note # 15. "The RCN in the Arctic." *Naval Association of Canada.* Accessed December 7, 2021.

(UUV), surface and sub-surface buoys, and data sharing nodes, networked through infrastructure ashore on embedded into the ice. A prototype is currently being developed for the United States Navy for use in the Beaufort Sea as a persistent underwater surveillance system, able to scan a range of up to 100 square kilometers from the 'center' node.[9] Fully and semi-autonomous underwater vehicles, data sharing nodes, and buoys are all parts of a larger 'net,' which can sense vessels deep underwater and shifting ice conditions (a risk for the AOPS with its current hull design and construction*).

12. The further north the RCN operates, the more difficult it is to conceptualize the operating space in real-time since the Global Positioning System (GPS) becomes less reliable due to decreased satellite coverage and magnetic interference. This can and does affect maritime navigational instruments, so ships often resort to charts when unsure of GPS data accuracy. Sub-surface navigation is even more of an issue as sea ice hinders communication to the surface, creating a unique problem for UUVs. This is a unique challenge, but one that is capable of being overcome using the AMOS. Buoys anchored in ice act as transmitters and receivers, working together in a GPS-net, communicating with each other and collecting data on currents, wind speed, and temperature.[10] This information is then communicated to the UUVs, which provides them with enough data to be able to navigate seamlessly under Arctic ice. Similarly, a series of sensors scours the ocean to detect anomalies (submarines) and communicate that information through secure channels.[11]

13. In addition to sensing what is lurking beneath the ocean, the AMOS (through the use of semi-submersed buoys) will be able to shore-up GPS tracking data for the AOPS and provide the RCN with sub-surface surveillance. Ultimately, the real benefit to the AMOS capability is providing the RCN with a digital picture of a three-dimensional Arctic space in real-time. This could be scalable, if required, to monitor more extensive areas of the ice-covered ocean or networked with similar systems currently in development. There are many benefits to using a meshed network of undersea sensors, including increased sub-surface visibility, redundancy in the case of damage to one or more sensors, and cost of maintenance. An AMOS capability will significantly increase the RCN's situational awareness in the North and should be considered as a tool for Canada to shore up its sovereign claim.

14. In contrast to sub-surface sensing capabilities, the RCN must reconsider its above water (or ariel) sensing capabilities. As previously mentioned, AOPS will not always operate with an embarked HELAIRDET, which creates a large gap in situational awareness. Enter the MQ-4C Triton Broad Area Maritime Surveillance (BAMS) – a long-range Unmanned Ariel Vehicle (UAV) specifically designed for maritime surveillance. This UAV was created for use in a maritime environment and is suitable for "conducting sustained operations over an area of interest at long ranges. It relays maritime intelligence, surveillance, and reconnaissance

*Advanced notification of shifting ice patterns or open water will enable AOPS to plan and understand the operating space when unable to rely on GPS or line of sight navigation.

[9] Trevithick, Joeseph. "The Navy Is Building A Network Of Drone Submarines And Sensor Buoys In The Arctic." *The Warzone.* 1 October, 2020. Accessed December 7, 2021.

[10] *Ibid…*

[11] *Ibid…*

information directly to maritime commander."[12] A drone specifically made to withstand the harsh climate of the Arctic provides many benefits for the RCN. In open water, such UAVs can operate as part of anti-submarine warfare, whereas in areas of restricted visibility, they can provide over the line of sight sensing abilities. Further, the MQ-4C Triton may be flown remotely from the ship by a qualified technician, thus alleviating the need for crew rest and increasing situational awareness over a longer time span. With such a UAV, situational awareness is increased significantly in an area that is otherwise hard-pressed to support aerospace operations due to lack of critical infrastructure.

CONCLUSION

15. The future role of the RCN in the Arctic is continually evolving and shaped mostly by climate change, economic development, and national strategic policy. As global trade routes open due to ice melt, Canada and the RCN are well-positioned to take advantage of new technologies to increase their sensing capabilities. The Navy must have the requisite equipment to operate effectively in the North while defending Canada's interests here, at home. Mobility, AMOS, UUVs, and the MQ-4C Triton Drone are potential capabilities identified as only some of the possibilities available to aid in protecting such a delicate and precarious ecosystem most vital resources – people. Regardless of the uncertainty about the role of Canada's Navy in the Arctic, one thing is sure; the GoC continues to make significant investments in the RCN and its Arctic capabilities, pointing to the importance of the Arctic over the next 20 years.

[12] Dunlop, David. "Canadian Arctic Surveillance: Is the MQ-4C Triton HALE UAV the Answer?" *Canadian Naval Review.* February 20, 2020. Accessed December 7, 2021.

BIBLIOGRAPHY

Crown-Indigenous Relations and Northern Affairs Canada. "Arctic and Northern Policy Framework: Safety, Security and Defence Chapter." *Government of Canada.* Last accessed 7 December 2021. https://www.rcaanc-cirnac.gc.ca/eng/1562939617400/1562939658000

Dunlop, David. "Canadian Arctic Surveillance: Is the MQ-4C Triton HALE UAV the Answer?" *Canadian Naval Review.* 20 February 2020. Last accessed 7 December, 2021. https://www.navalreview.ca/2020/02/canadian-arctic-surveillance-is-the-mq-4c-triton-hale-uav-the-answer/

Huebert, Rob. "The Case for a More Combat Capable Arctic Offshore Patrol Vesseel." *Canadian Naval Review*. Volume 10, Number 3 (2015). Last accessed 7 December 2021. https://www.navalreview.ca/wp-content/uploads/CNR_pdf_full/cnr_vol10_3.pdf

Lanteigne, Marc and Mingming Shi. "China Stakes Its Claim to the Arctic." *The Diplomat.* 29 January, 2018. Last accessed 7 December 2021. https://thediplomat.com/2018/01/china-stakes-its-claim-to-the-arctic/

Larter, David. "The Arctic is a strategic hot spot, but Western allies lack good intel." *Defence News.* 21 September, 2020. Last accessed 4 December, 2021.

National Defence. "Strong, Secure, & Engaged: Canada's Defence Policy." *Government of Canada.* Last accessed 7 December 2021. http://dgpaapp.forces.gc.ca/en/canada-defence-policy/docs/canada-defence-policy-report.pdf

Naval Affairs Program Briefing Note # 15. "The RCN in the Arctic." *Naval Association of Canada.* Last accessed 7 December 2021. https://www.navalassoc.ca/wp-content/uploads/2020/06/BN15-RCN-and-Arctic.pdf

Ostreng, Willy, Karl Magnus Eger, Brit Fløistad, Arnfinn Jørgensen-Dahl, Lars Lothe, Morten Mejlænder-Larsen, Tor Wergeland. "Shipping in Arctic Waters: A comparison of the Northeast, Northwest and Trans-Polar Passages." *SpringerHeidelberg New York*. (2013). Last accessed 7 December 2021. https://books.google.ca/books?id=beU_AAAAQBAJ&pg=PP1&redir_esc=y#v=onepage&q&f=false

Public Services and Procurement Canada. "Arctic and offshore patrol ships: Royal Canadian Navy." *Government of Canada.* Last accessed 7 December 2021. https://www.tpsgc-pwgsc.gc.ca/app-acq/amd-dp/mer-sea/sncn-nss/npea-aops-eng.html#a3

Royal Canadian Navy. "Advanced Unmanned Aircraft to Provide an Eye in the Sky for Kingston Class Ships." *Government of Canada.* Last accessed 7 December 2021. http://www.navy-marine.forces.gc.ca/en/innovation/innovation-view.page?doc=advanced-unmanned-aircraft-to-provide-eye-in-the-sky-for-kingston-class-ships/jsagj4mt

Royal Canadian Navy. “Arctic and Offshore Patrol Ship Project.” *Government of Canada.* Last accessed 7 December 2021. http://www.navy-marine.forces.gc.ca/en/fleet-units/aops-home.page

Trevithick, Joeseph. “The Navy Is Building A Network Of Drone Submarines And Sensor Buoys In The Arctic.” *The Warzone.* 1 October 2020. Last accessed 7 December 2021. https://www.thedrive.com/the-war-zone/36821/the-navy-is-building-a-network-of-drone-submarines-and-sensor-buoys-in-the-arctic

United Nations Convention on the Law of the Sea. Secretary-General of the United Nations (1982). Last accessed 7 December 2021. https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf