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## SITUATIONAL AWARENESS IN THE ARCTIC: RCN PRIORITIES

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## **SITUATIONAL AWARENESS IN THE ARCTIC: ROYAL CANADIAN NAVY PRIORITIES**

### **AIM**

1. The aim of this service paper is to discuss the Situational Awareness (SA) capability required in the Canadian Arctic region, and to specifically recommend investment in those capabilities that need to be put in place and maintained by the Royal Canadian Navy (RCN).

### **INTRODUCTION**

2. Canada is a vast country with the world's longest coastline (approximately 260,000 km<sup>1</sup>) and the 7<sup>th</sup> largest Exclusive Economic Zone (EEZ)<sup>2</sup> (approximately 5.6 million km<sup>2</sup>). A significant portion of this coastline and EEZ is in the Arctic region, and has historically been sparsely populated, with very restrictive navigation windows. With the onset of climate change however, the Arctic is becoming more navigable. The Northwest Passage (NWP), which extends approximately 1400 km from the Beaufort Sea in the west to the Baffin Bay, the Davis Strait, and the Labrador Sea in the East, has seen other nations challenge Canada's sovereignty in the North. Such challenges include the intentions of certain nations to exploit the NWP (such as China's declaration that it is a Near-Arctic State<sup>3</sup>), or to exploit the Arctic (such as Russia planting a flag on the North

<sup>1</sup> "List of Countries by Length of Coastline," Wikipedia, last modified 15 Oct 2019, accessed 10/18, 2019, [https://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_length\\_of\\_coastline](https://en.wikipedia.org/wiki/List_of_countries_by_length_of_coastline).

<sup>2</sup> "Countries with the Largest Exclusive Economic Zones," World Atlas, last modified 29 Jun 2018, accessed 10/18, 2019, <https://www.worldatlas.com/articles/countries-with-the-largest-exclusive-economic-zones.html>.

<sup>3</sup> China, *White Paper: China's Arctic Policy* (Beijing: The State Council Information Office of the People's Republic of China, [2018]).

Pole seabed<sup>4</sup>). As identified in *Leadmark 2050*, Canada must therefore “safeguard our northern sovereignty and security”.<sup>5</sup> A key component to maintaining sovereignty and security is the ability to maintain Situational Awareness.

3. The SA requirements in the Arctic are inherently joint, and fall under the jurisdiction of the whole of the Canadian Armed Forces and Government of Canada, however there is a component which must inherently fall under the RCN. This service paper will identify the needs for SA in the Arctic along the Air, Land and Sea lines of approach, and will then discuss those items which should be prioritized within the RCN.

The primary areas of discussion are:

- a. Air and Space domain, looking specifically at satellite, radar and UAV coverage in the Arctic;
- b. Land domain, looking at the need for forward operating bases in the Arctic; and
- c. Sea domain, looking at the needs of a surface and subsurface capable fleet, as well as the need for passive monitoring of NWP traffic.

## **DISCUSSION**

4. The first aspects of SA in the Arctic to be discussed will be those which fall in the Air and Space domain. Due to the sheer size and limited accessibility, one of the most economical methods for gaining a comprehensive operating picture is through the use of

<sup>4</sup> "Russia Plants Flag on North Pole Seabed," *The Guardian*, last modified 2 Aug 2007, accessed 10/18, 2019, <https://www.theguardian.com/world/2007/aug/02/russia.arctic>.

<sup>5</sup> Royal Canadian Navy Canada, *Leadmark 2050: Canada in a New Maritime World* (Ottawa, ON: National Defence, [2017]).

satellite imagery. In 2019, RADARSAT Constellation<sup>6</sup> deployed three satellites, and together with the RADARSAT-2<sup>7</sup> satellite already in orbit, makes up the Canadian space surveillance capability. While these satellites are able to provide excellent maritime surveillance to Canada, that is not their only role, since they are also employed for scientific reasons. The limiting factor in providing Arctic SA becomes the rate at which the information is updated. Canada Space Agency states that satellite imagery in the Arctic is updated daily.<sup>8</sup> By contrast, in a single day, a ship travelling at 20 knots could make it almost half way through the Northwest Passage. Therefore, satellite imagery in the Arctic must be refreshed at a much faster rate in order to be effective as a maritime SA tool. Two approaches which would increase Arctic monitoring are to either increase the size of the RADARSAT constellation, or to launch a dedicated satellite constellation with the sole purpose of monitoring maritime traffic.

5. Another source of SA in the Arctic comes from radar systems, such as the North Warning System which is currently in operation<sup>9</sup>. The purpose of the NWS is to protect Canada and the US against air threats from over the pole, such as Russian-launched ICBMs. Canada and the US have begun negotiations to update the NWS as the system is approaching its end of life.<sup>10</sup> While the system is predominantly employed for air detection, it does provide an excellent physical site for expanding additional capability,

<sup>6</sup> "What is the RCM?" Government of Canada, last modified 13 Jun 2019, accessed 10/18, 2019, <http://www.asc-csa.gc.ca/eng/satellites/radarsat/what-is-rcm.asp>.

<sup>7</sup> "Radarsat-2," Government of Canada, last modified 14 Dec 2017, accessed 10/18, 2019, <http://www.asc-csa.gc.ca/eng/satellites/radarsat2/default.asp>.

<sup>8</sup> "What is the RCM?"

<sup>9</sup> Canada. Dept. of National Defence and Canada. Ministère de la Défense nationale, *Strong, Secure, Engaged: Canada's Defence Policy* (Ottawa, ON: National Defence, [2017]).

<sup>10</sup> Canada. Dept. of National Defence and Canada. Ministère de la Défense nationale, *Strong, Secure, Engaged: Canada's Defence Policy* (Ottawa, ON: National Defence, [2017]).

such as low altitude and horizon surveillance along the approaches to the Northwest Passage. It would be highly impractical to expect the installation of surface radar technology for the entire Arctic, since surface radars have a radar horizon generally not exceeding the visual horizon, or 25 nautical miles. In this case, the use of satellites for the monitoring of the Arctic would be more practical.

6. Another approach to apply air surveillance in the Arctic would be through the use of UAVs or manned aircraft, with UAVs being the preferred method for economical reasons. UAVs today have endurances in excess of 30 hours and ranges well in excess of 10,000 km.<sup>11</sup> With the harshness of the Arctic environment however, the usefulness of unmanned systems has yet to be proven. Were it feasible, this capability would enable the monitoring of the entire NWP, and indeed the entire Canadian Arctic territory, from a single forward operating base in the vicinity of the NWP.

7. When discussing SA in the Arctic, it is important to consider the establishment of forward operating bases so as to respond to sovereignty challenges in a timely manner. This is especially true for the RCN, since the transit from Halifax to the entrance of the NWP is approximately 4500 km, or 5 days' sail time. Having a forward operating base would not only reduce transit times when a ship is on station, but also provide replenishment and logistical support for that asset. Such a site could also be used as a forward operating base for aerial surveillance (satellite or otherwise), lending to a synergetic development of such a site between the RCN and the RCAF. Currently,

<sup>11</sup> "The 10 Longest Range Unmanned Aerial Vehicles (AVs)," Airforce Technology, last modified 19 June 2019, accessed 10/18, 2019, <https://www.airforce-technology.com/features/featurethe-top-10-longest-range-unmanned-aerial-vehicles-uavs/#targetText=RQ%2D4%20Global%20Hawk%20HALE%20UAS&targetText=It%20has%20a%20maximum%20endurance,altitudes%20up%20to%2060%2C000ft>.

Canada is building a naval facility at Nanisivik, on Baffin Island, conveniently located near the eastern end of the NWP.<sup>12</sup> It is expected to be operational by 2020. On the western side, Tuktoyaktuk, NWT, is a natural harbour, and is the northernmost point on the Arctic Ocean that is connected to the rest of Canada by road, making it an appealing likely site for further development by the RCN. With two sites in the Arctic from where to sustain northern operations, Canada would be well positioned to assert its sovereignty. It is important to stress at this point that, just as SA in the Arctic is an inherently joint operation, so too must the development of current and future forward operating bases be joint.

8. As we have discussed the air and land requirements for SA in the Arctic, the maritime component will now be discussed. In the words of VAdm Maddison, “The Arctic’s physical and social geography make it undisputedly a maritime theatre.”<sup>13</sup> Canada’s policy of sovereignty in the Arctic has been made very clear through the procurement of Arctic Offshore Patrol Vessels (AOPS), the first of which, *HMCS Harry DeWolf*, will be accepted by the RCN in late 2019.<sup>14</sup> AOPS will give Canada a long range, ice-capable platform with the primary purpose of enforcing Canada’s laws over the entire northern Canadian region. This capability will also grant us the ability to patrol

<sup>12</sup> "Operation NANOOK 2018: Canadian Armed Forces Strengthen Joint Arctic Capabilities," Royal Canadian Navy, last modified 7 Sep 2018, accessed 10/18, 2019, <http://www.navy-marine.forces.gc.ca/en/news-operations/news-view.page?doc=operation-nanook-2018-canadian-armed-forces-strengthen-joint-arctic-capabilities/jl8edjzj>.

<sup>13</sup> Paul Maddison, "Strategic Trust and Cooperation in the Maritime Century," *Canadian Military Journal* 13, no. 1 (Winter, 2012), 7.

<sup>14</sup> "Delivery of First Arctic Patrol Ship Delayed again, but Still Expected Sometime in 2019," National Post, last modified 20 Aug 2019, accessed 10/18, 2019, <https://nationalpost.com/news/delivery-of-first-new-arctic-patrol-ship-delayed-again-but-still-expected-sometime-in-2019>.



our coastal waters, including the NWP. Canada's ability to bring sailors to the area of operation will greatly increase our SA in the area.

9. Having discussed surface vessel capabilities, Canada also needs submarines which are capable of operating in the Arctic. While some may believe that Canada does not need a submarine force in this day and age,<sup>15</sup> those views are disputed by other authors such as Mitchell.<sup>16</sup> Their existence provides Canada with a monitoring capability for surface as well as subsurface ships (clandestinely, if required), and a strategic deterrent in the event that it is required. They also give Canada access to intelligence from other submarine-operating allies.<sup>17</sup> Moreover, recent activities by two nations highlight the absolute importance of a submarine force. For one, China has stated it is a Near-Arctic force, demonstrating its desire to either increase its presence in the Arctic, or begin to exploit it. China has also increased the size of its navy drastically in recent years, and its submarine fleet is among the largest in the world.<sup>18</sup> China has also demonstrated readiness to annex territory to increase its global reach. Meanwhile, Russia has continued to demonstrate a fairly adversarial role on the world stage. Both these countries are or intend to be active in the Arctic, and Canada cannot rely solely on allies to defend Canada's sovereignty.

<sup>15</sup> Michael Byers, "Does Canada Need Submarines?" *Canadian Military Journal* 14, no. 3 (Summer 2014), 7.

<sup>16</sup> Paul T. Mitchell, "The Contribution of Submarines to Canada's Freedom of Action on the World Stage," *Canadian Military Journal* 14, no. 3 (Summer, 2014), 15.

<sup>17</sup> Paul T. Mitchell, "The Contribution of Submarines to Canada's Freedom of Action on the World Stage," *Canadian Military Journal* 14, no. 3 (Summer, 2014), 15.

<sup>18</sup> "Total Submarine Strength by Country," Global Firepower, accessed 10/18, 2019, <https://www.globalfirepower.com/navy-submarines.asp>.

10. Lastly, just as satellites are used to provide an aerial surveillance system, so too can hydrophones be used to provide an acoustic surveillance system. An example of such a system is the aptly named SOSUS (Sonar Surveillance System), which was in operation in the Atlantic and Pacific oceans during the Cold War.<sup>19</sup> These hydrophone arrays could be deployed in strategic locations near the entrances of the NWP to detect ships and submarines that traverse our territorial waters. New developments in this type of system are progressing, and in fact a similar system is being deployed by China in the South China Sea.<sup>20</sup> It must also be noted that, while satellite surveillance provides an excellent maritime SA picture, it is limited in the detection of submarines.

## **CONCLUSION**

11. As discussed above, the need to gain SA in the Arctic is an inherently joint endeavour. Proper SA would require contributions and development by both the RCN and the RCAF, and would range from satellite systems to underwater hydrophone arrays. From an RCN perspective, the four main areas of development are:

- a. Continued delivery of AOPS;
- b. Completion of the Nanisivik Naval Facility, an expansion to northern presence to include a Naval Facility to the West, and an expansion of capability to include joint interoperability with the RCAF;

<sup>19</sup> "Sound Surveillance System (SOSUS)," Global Security, last modified 28 Jul 2011, accessed 10/18, 2019, <https://www.globalsecurity.org/intell/systems/sosus.htm>.

<sup>20</sup> "China's Undersea Great Wall," Washington Post, last modified 30 Aug 2016, accessed 10/18, 2019, <https://www.washingtontimes.com/news/2016/aug/30/chinas-underwater-great-wall/>.

- c. Research and deployment of an underwater monitoring capability similar to SOSUS; and
- d. Initiation of a Submarine Replacement Program.

12. The most difficult, complex and important portion of this plan will be the replacement of the submarine fleet. However, by 2035, the *Victoria*-class submarines will be 45 years old. By comparison, at 45 years of age, both the AOR and *Iroquois*-class ships were decommissioned. The AORs were built in 1969-1970, decommissioned in 2015. *Iroquois*-class ships were built in 1970-1971, and decommissioned in 2015-2017. Canada's previous class of submarines, the *Oberon*-class, was approximately 35 years old when they were retired (1965-2000). All this to say that it stands to reason that the *Victoria*-class submarine will need to be replaced by 2035.

13. Another concern which must be factored is the issue of loss of skill. During the short period of time between when the *Oberon*-class was decommissioned and the *Victoria*-class entered service, the degradation of skill within the submarine community was extensive. The RCN took a great deal of time and effort to recover, as can be attested to by Rear-Admiral Cassivi. For this reason, it is apparent that Canada would be ill-advised to delay new submarine procurement past 2035.

14. A final factor impacting the urgency to initiate a submarine replacement program is the timeline required to acquire or build ships in Canada. The timelines for ship acquisition of all four latest ship procurements, from initial project start until the first ship is accepted, has ranged from twelve years for AOPS (assuming acceptance of first ship in 2019) to twenty years for the CSC (assuming current project timelines are maintained).

Needless to say, the complexity of the shipbuilding activity only lengthens the timeline. With respect to submarine acquisition, historically Canada has not built submarines but rather procured them. Even then, the timeline between initial intention to acquire and when the first submarine was deemed fully operational was eighteen years (White paper in 1994, *HMCS Victoria* full operational capability attained 2012). Prior to this, the submarines saw limited service with non-Canadianized systems.

15. Lastly, the inclusion of Arctic sovereignty into the overall equation leads to the inevitable question of how many submarines are required to maintain this important strategic capability. For all the reasons stated above relating to geography and the changing climate of the Arctic, Canada must determine an appropriate number of platforms to meet the demand.

## **RECOMMENDATION**

16. Given the strategic importance of a submarine service, and the increased importance of the Arctic to Canada and its sovereignty, it is highly recommended that the RCN initiate a submarine replacement program as soon as possible so as to replace the *Victoria*-class submarines before they reach end of life.

17. It is also recommended that the RCN explore the possibility of using passive sound detection systems to more closely monitor surface and subsurface activity in Canada's national waters, particularly in the Northwest Passage.

## BIBLIOGRAPHY

- "The 10 Longest Range Unmanned Aerial Vehicles (AVs)." Airforce Technology. Accessed 10/18, 2019. <https://www.airforce-technology.com/features/featurethe-top-10-longest-range-unmanned-aerial-vehicles-uavs/#targetText=RQ%2D4%20Global%20Hawk%20HALE%20UAS&targetText=I%20has%20a%20maximum%20endurance,altitudes%20up%20to%2060%2C000ft.>
- "List of Countries by Length of Coastline." Wikipedia. Accessed 10/18, 2019. [https://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_length\\_of\\_coastline](https://en.wikipedia.org/wiki/List_of_countries_by_length_of_coastline).
- "Sound Surveillance System (SOSUS)." Global Security. Accessed 10/18, 2019. <https://www.globalsecurity.org/intell/systems/sosus.htm>.
- "Total Submarine Strength by Country." Global Firepower. Accessed 10/18, 2019. <https://www.globalfirepower.com/navy-submarines.asp>.
- Bana, Sarosh. "China's Undersea Great Wall." Washington Post. Accessed 10/18, 2019. <https://www.washingtontimes.com/news/2016/aug/30/chinas-underwater-great-wall/>.
- Byers, Michael. "Does Canada Need Submarines?" *Canadian Military Journal* 14, no. 3 (Summer 2014, 2014): 7.
- Canada, Royal Canadian Navy. *Leadmark 2050: Canada in a New Maritime World*. Ottawa, ON: National Defence, 2017.
- Canada. Dept. of National Defence and Canada. Ministère de la défense nationale. *Strong, Secure, Engaged: Canada's Defence Policy*. Ottawa, ON: National Defence, 2017.
- Canadian Space Agency. "Radarsat-2." Government of Canada. Accessed 10/18, 2019. <http://www.asc-csa.gc.ca/eng/satellites/radarsat2/default.asp>.
- Canadian Space Agency. "What is the RCM?" Government of Canada. Accessed 10/18, 2019. <http://www.asc-csa.gc.ca/eng/satellites/radarsat/what-is-rcm.asp>.
- China. *White Paper: China's Arctic Policy*. Beijing: The State Council Information Office of the People's Republic of China, 2018.
- Coleman, Linda. "Operation NANOOK 2018: Canadian Armed Forces Strengthen Joint Arctic Capabilities." Royal Canadian Navy. Accessed 10/18, 2019. <http://www.navy-marine.forces.gc.ca/en/news-operations/news-view.page?doc=operation-nanook-2018-canadian-armed-forces-strengthen-joint-arctic-capabilities/jl8edjzi>.

Maddison, Paul. "Strategic Trust and Cooperation in the Maritime Century." *Canadian Military Journal* 13, no. 1 (Winter, 2012): 7.

Migiro, Geoffrey. "Countries with the Largest Exclusive Economic Zones." World Atlas. Accessed 10/18, 2019. <https://www.worldatlas.com/articles/countries-with-the-largest-exclusive-economic-zones.html>.

Mitchell, Paul T. "The Contribution of Submarines to Canada's Freedom of Action on the World Stage ." *Canadian Military Journal* 14, no. 3 (Summer, 2014): 15.

Parfitt, Tom. "Russia Plants Flag on North Pole Seabed." The Guardian. Accessed 10/18, 2019. <https://www.theguardian.com/world/2007/aug/02/russia.arctic>.

Pugliese, David. "Delivery of First Arctic Patrol Ship Delayed again, but Still Expected Sometime in 2019." National Post. Accessed 10/18, 2019. <https://nationalpost.com/news/delivery-of-first-new-arctic-patrol-ship-delayed-again-but-still-expected-sometime-in-2019>.