# Advancing Solutions to the Arctic Maritime Domain: The Canadian Rangers

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## Abstract

The Arctic is becoming more consequential to the United States as reflected in national security documents. The *2022 National Security Strategy, 2022 National Defense Strategy, and 2022 National Strategy for the Arctic Region*, among others, all point to the strategic significance of the Arctic and the US commitment to safeguarding its national interests in the region. This Special Report focuses on maritime domain awareness (MDA) as one crucial aspect of Arctic security. The need for Arctic MDA is pressing, given increased shipping, tourism, and fishing in the region, as well as increased security threats – specifically from China and Russia. This Special Report suggests that while MDA tools such as satellites, AI, and other technologies are important, local and traditional knowledge can complement these tools to achieve more effective domain awareness and hence more informed decision making.

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## What is MDA?

Domain awareness is an intelligence-related concept (Ryder, 2021). It entails a comprehensive understanding of the factors and dynamics that influence military operations, such as the terrain, weather conditions, enemy capabilities, and friendly force positions. Domain awareness is crucial for effective decision-making, mission planning, execution of operations, and enabling military personal to assess threats, identify vulnerabilities, and exploit opportunities within their operational environment. Domain awareness can be best summed up by the following statement: "If we cannot see the threat, we cannot defend against it" (NORAD/USNORTHCOM, 2021).

MDA, a subset of domain awareness, is the "effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment of the United States" (National Maritime Intelligence-Integration Office, 2022). It focuses on monitoring military and non-military events and activities in a maritime environment to detect threats and ensure security (Freire et al., 2022). Monitored activities include ice (Eicken, et al., 2017); the environment (to better understand climate change impacts) (Bjerke, et al., 2014); safety and surveillance of maritime traffic (Ulmke et al., 2017); and anomalous vessel behavior (Sidibé & Shu, 2017). MDA also plays a crucial role in search and rescue operations, i.e., monitoring and analyzing distress signals, tracking missing vessels or individuals, and coordinating rescue efforts.

MDA requires gathering, synthesizing, and sharing information from a broad range of data categories, such as vessels (e.g., flag, type, track history), cargo (e.g., origin, destination, hazard class), people and organizations (e.g., vessel owners, crew, passengers, insurers), infrastructure (e.g., geospatial information regarding ports, waterways, facilities, bridges, tunnels), and the environment (e.g., weather, hydrographic and bathymetric data, sea temperature, ice flows) (National Maritime Intelligence-Integration Office, 2022, A1-A2). It relies on tools such as satellite imagery, AI, surveillance aircraft, radar, sensor technology, and web-centric enterprise services (e.g., clouds, databases). For example, the US Naval Research Laboratory launched "Proteus" in 2022 to address security threats such as illegal, unreported, and unregulated fishing. This program identifies, queries, and filters maritime vessels based on user-defined criteria and the Defense Innovation Unit's international competition (xView3) to create machine learning models to locate and distinguish maritime vessels with synthetic aperture radar (Indo Pacific Defense Forum, 2022). Canadian Marine Security Operation Centers (MSOCs) are an example of an organizational MDA tool. The MSOCs comprise federal government departments and agencies that work together to share intelligence, surveillance, and reconnaissance information and data.

These tools, while sophisticated, have limitations. First, there are challenges related to data itself, such as quality, timeliness, filters, classification, protection, and compression. Second, there is an implicit assumption that whoever collects the data creates the operational picture and has a monopoly on future decision making about how to deal with a particular threat – an assumption that may not be accurate. Third and relatedly, coordination among government agencies at the federal level is important, however, actors at the sub federal scale and those in other sectors who have critical information and understanding can be left out of the picture. Fourth – and particularly related to the Arctic – there are challenges to using these tools due to extreme climate and geography. Thus, although sophisticated technology and tools are necessary for Arctic MDA, these are not sufficient. Effective Arctic MDA may require other tools.

## The Canadian Rangers

The Canadian Rangers serve as an example of MDA utilizing local and traditional knowledge and expertise. The Canadian Rangers are part-time, non-commissioned members of the Canadian Armed Forces (CAF) Reserves who serve as the eyes, ears, and voice of the CAF in the Arctic (Lackenbauer, 2022). Their role is

to provide a military presence in sparsely settled Canadian northern, coastal, and isolated areas that cannot conveniently or economically be provided for by other components of the CAF (DAOD, 2015).

There are five Canadian Ranger Patrol Groups across Canada, each encompassing a distinct geographic area. The largest – and perhaps most well-studied – is the 1st Canadian Ranger Patrol Group (1 CRPG), which comprises more than 1850 members mostly drawn from Indigenous communities in Yukon, the Northwest Territories (NWT), Nunavut, and northern British Columbia (Lackenbauer & Kikkert, 2020, 1). These members are organized into 61 patrols based in 65 communities across Canada's High North (Lackenbauer & Kikkert, 2020, 1). The 1 CRPG is responsible for an astounding 40 percent of Canada's territory, approximating four million square miles, including almost 5,000 miles of coastline (Lackenbauer & Kikkert, 2020, 1).

The Canadian Rangers play a significant role in enhancing Arctic domain awareness generally and contributing to the security of the region. The Canadian Rangers serve at least four purposes (Lackenbauer & Kikkert, 2020). First, the Canadian Rangers possess extensive traditional knowledge of the Arctic environment and serve as a valuable resource for conducting surveillance and presence patrols. They monitor activities and report any suspicious or unusual sightings to the appropriate authorities. Second, the Canadian Rangers serve as Northern guides to help people operate in the terrain and climate of the Canadian Arctic. Their deep knowledge of the Arctic environment enables them to effectively navigate and survive in challenging conditions, providing valuable situational awareness. Third, the Canadian Rangers serve as liaisons for the Northern communities to maintain positive interactions with the CAF, particularly those coming up from regions outside the Canadian Arctic. Fourth, the Canadian Rangers buttress cultural and community resilience. For example, youth are recruited to participate in the Junior Canadian Ranger Program, which teaches them not only how to function on the land, but how to function in the community.

The Canadian Rangers have long played a role in the Arctic maritime domain (Lackenbauer & Kikkert, 2020). Responsibilities include coastal and inland water surveillance; tracking vessels; reporting unidentified vessels, unusual activities or sightings; and collecting local data for the CAF. For example, from August-September 2018, 1 CRPG deployed Rangers from patrols across Nunavut and the NWT to monitor the Northwest Passage and report suspicious vessels (Lackenbauer & Kikkert, 2020, 46).

The Canadian Rangers also engage in other MDA activities. They conduct scientific monitoring and act as guides for scientific researchers. One case in point is the Kugluktuk patrol, whose members acted as guides and collected samples for Fisheries and Oceans Canada (DFO) researchers carrying out oceanographic research in the region under the auspices of the Canadian Ranger Ocean Watch Program (Lackenbauer & Kikkert, 2020, 46). Additionally, the Canadian Rangers participate in pollution prevention and preparedness. Several Rangers from the Kugluktuk patrol participated in oil spill and environmental response training over the last decade during Operation NANOOK or through annual training patrols conducted in communities (Lackenbauer & Kikkert, 2020, 47). Finally, the Canadian Rangers are expected to conduct and provide assistance to CAF Domestic Operations with regard to local knowledge of the environment and survival training. As Lackenbauer and Kikkert (2020) explain regarding Operation Nunakput 2017:

"Throughout the 4100-km operation along the waterways of the NWT, Rangers connected the naval component from one community to the next, meeting jet boats on the river and arranging overnight camps at each stop. A *News/North* story described the Rangers as 'the glue that holds the operation together – the 'eyes and ears' of the North who not only provide fuel, the occasional meal and places for the operation's personnel to set up camp, but knowledge of the local surroundings that is integral to navigating the North.' Tulita Ranger Benny Doctor and his grandson, 24-year-old Ranger Sergeant Archie Erigaktuk, shared their survival knowledge with soldiers from 2nd Battalion, Royal 22nd Regiment,

including how to build a fire and how to read the river. Erigatuk emphasized the importance of the Ranger-military relationship, explaining how the Army 'give us the resources to be trained for certain situations,' whether search and rescue, a wildfire, or other 'potential hazards'" (Lackenbauer & Kikkert, 2020, 41).

The Canadian Rangers also play a crucial role in Arctic search and rescue operations, assisting in locating and rescuing individuals or vessels in distress (Kikkert & Lackenbauer, 2021). The Rangers view themselves as valuable force multipliers in a potential maritime mass rescue operation (MRO), using their training, equipment, and expertise in this kind of emergency (Lackenbauer & Kikkert, 2020, 68). If an MRO occurred, Canadian Rangers could, for example, provide updates to the Joint Rescue Coordination Centre; act as the on-scene coordinator; provide intelligence on where passengers could be evacuated to on the land; conduct shoreline searches if any passengers are missing; search for missing passengers; provide first aid; and serve as points of contact between evacuees and the community (Lackenbauer & Kikkert, 2020, 68).

There is current focus in the Canadian government on enhancing surveillance and control of maritime approaches to North America, as well as Canadian sovereignty, territory, waters, and airspace in its Arctic, through an integrated, layered system-of-systems model (Lackenbauer & Kikkert, 2020, 19). The Canadian Rangers represent one of several elements that contribute to this integrated model, working with Arctic and Offshore Patrol Vessels, the Nanisivik refueling facility, the Canadian Coast Guard, and fixed- and rotary-wing overflights (Lackenbauer & Kikkert, 2020, 19).

## Insights

Lackenbauer and Kikkert (2020) proposed detailed metrics to more rigorously measure the effectiveness of the Canadian Rangers. Yet academic research and anecdotal evidence demonstrate that the Canadian Rangers have contributed in very practical ways to Arctic MDA. Arctic exercises have demonstrated the value of having access to Indigenous peoples with extensive experience operating in harsh conditions and who are willing to share their local and traditional knowledge (Lackenbauer & Kikkert, 2020, xii). Lessons learned or post-exercise reports from CAF Arctic activities regularly highlight the benefits of the partnership between Canadian Rangers and the CAF (Lackenbauer & Kikkert, 2020, xii). Some have suggested that, given their importance to domain awareness generally and MDA specifically, more should be done to ensure that Canadian Rangers receive the same level of support as other areas of the CAF (Stevens, 2021). This aligns with broader discussions on reconciliation and creating better opportunities for Indigenous peoples in the Arctic (Stevens, 2021; Vullierme, 2021).

Satellites, AI, and other technologies are important to MDA. Receiving information "at the speed of relevancy" is imperative in many situations to make better decisions (Charron, 2020, 4). Yet, we should be realistic about the limits of technology, particularly in a region like the Arctic (Johnson, 2021). As Charron (2020) points out, disasters have been obverted on occasion because a soldier or analyst doubted what a computer screen suggested (Charron, 2020, 4). Decision makers, therefore, may want to consider local and traditional knowledge as an integrative tool to round out MDA in appropriate circumstances. The Canadian Rangers could serve as a model for this proposition in both Greenland and Alaska (Kikkert & Lackenbauer, 2021). In the right circumstances, local and traditional knowledge can complement more advanced tools to achieve more effective domain awareness and hence more informed decision making.

## References

Bjerke, J. W., Karlsen, S. R., Høgda, K. A., Malnes, E., Jepsen, J. U., Lovibond, S., Vikhamer-Schuler, D, & Tømmervik, H. (2014). Record-low primary productivity and high plant damage in the Nordic Arctic region in 2012 caused by multiple weather events and pest outbreaks. *Environmental Research Letters*, 9(8), 084006. https://doi.org/10.1088/1748-9326/9/8/084006

Charron, A. (2020, September 11). *Responding to Hardening the SHIELD: A credible deterrent & capable defense for North America*. NAADSN Quick Impact. https:// www.naadsn.ca/wp-content/uploads/2020/09/20-Sept_Charron_Responding-to-the-Hardening-the-SHIELD_Quick-Impact.pdf

Defence Administration Order and Directive (DAOD). (2015). 2020-2, *Canadian Rangers*. Retrieved September 26, 2023, from https://www.canada.ca/en/department-national-defence/corporate/policies-standards/defence-administrative-orders-directives/2000-series/2020/2020-2-canadian-rangers.html

Eicken, H., Mahoney, A., Jones, J., Ravens, T., Ivey, M. & Merten, A. (2017). Sustained, integrated observations for Arctic maritime domain awareness in a hybrid research-operational setting in Northern Alaska. *OCEANS 2017*. https:// ieeexplore-ieee-org.gate.lib.buffalo.edu/document/8232236

Freire, W. P., Melo, Jr., W. S., do Nascimento, V.D., do Nascimento, P. R., & de Sá, A. O. (2022). Towards a secure and scalable maritime monitoring system using blockchain and low-cost iot technology. *Sensors*, 22(13), 4895. https://doi.org/10.3390/s22134895

Indo Pacific Defense Forum. (2022, February 13). US forges maritime technology collaborations to improve domain awareness. *Indo Pacific Defense Forum*. https://ipdefenseforum.com/2022/02/u-s-forges-maritime-technology-collaborations-to-improve-domain-awareness/

Johnson, B. (2021). Sensing the Arctic: Situational awareness and the future of Northern security. *International Journal: Canada's Journal of Global Policy Analysis*, 76(3), 404-426. https://doi.org/10.1177/00207020211048424

Kikkert, P. & Lackenbauer, P. W. (2021). The Canadian rangers: Cornerstone for community disaster resilience in Canada's remote and isolated communities. *The Northern Review*, (51). https://doi.org/10.22584/nr51.2021.003

Lackenbauer, P.W. & Kikkert, P. (2020). *Measuring the success of the Canadian rangers*. NAADSN Special Report. https://www.naadsn.ca/wp-content/uploads/2020/10/Rangers-Success-Metrics-Lackenbauer-Kikkert-upload.pdf

Lackenbauer, P.W. (2022, March). *The Canadian armed forces' eyes, ears, and voice in remote regions: Select writings on the Canadian rangers*. NAADSN Engage Series no. 9. https://www.naadsn.ca/wp-content/uploads/2022/01/Lackenbauer-Cdn-Rgrs-selected-writings-NAADSN-jan22.pdf

National Maritime Intelligence-Integration Office. (2022). *National strategy for maritime security: National maritime domain awareness plan.* U.S. Department of Defense. Retrieved September 17, 2023, from https:// nmio.ise.gov/Portals/16/National%20MDA%20Plan%202023%20%28U%29.pdf

NORAD/USNORTHCOM. (2021, September). *The North Star*. (1). Department of Defense.

Ryder, R.M. (2021). Domain awareness superiority is the future of military intelligence. *Military Review*, 67-74. https:// www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/November-December-2021/Ryder-Domain-Awareness/#Defining%20Domain%20Awareness

Sidibé, A. & Shu, G. (2017). Study of automatic anomalous behaviour detection techniques for maritime vessels. *The Journal of Navigation*, 70(4), 847-858. https://doi.org/10.1017/s0373463317000066

Stevens, S. (2021). Canadian rangers: community, autonomy, and sovereignty. *Journal of Australian, Canadian, and Aotearoa New Zealand Studies*. 1(2), 8-40. https://doi.org/10.52230/lmiu1341

Ulmke, M., Battistello, G., Biermann, J., Mohrdieck, C., Pelot, R., & Koch, W. (2017). Persistent maritime traffic monitoring for the Canadian Arctic. *Proc. SPIE 10190, Ground/Air Multisensor*

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*Interoperability, Integration, and Networking for Persistent ISR VIII*, 101900Q. https://doi:10.1117/12.2267323

Vullierme, M. (2021). Cultural understanding and dialogue within the Canadian armed forces: insights from Canadian ranger patrols. *The Northern Review*, (52), 127-144. https://doi.org/10.22584/nr52.2021.005