SUGGESTED READINGS

Search and Rescue (SAR) in the Canadian Arctic

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The internet is filled with perspectives and opinions. These lists, compiled by academic subject matter experts, are intended to help direct policy makers, practitioners, and academics to credible, open-access sources, available online, free of charge, that reflect leading-edge research and thinking. The compilers of each list have been asked to select readings that are accessibly written (i.e. they are not filled with excessive jargon), offer a diversity of viewpoints, and encourage critical thinking and debate.

Over the last two decades, search and rescue (SAR) requirements have increased dramatically across the Canadian Arctic. At the community level, rapidly changing and increasingly unpredictable environmental conditions have increased the dangers of personal travel, affecting safe access to harvesting grounds, disrupting travel between communities, and causing high SAR incident rates, injury, and deaths. Marine traffic, including bulk carriers, fishing vessels, pleasure craft, and cruise ships, has grown significantly in Canada's Arctic waters as ice coverage decreases and summer accessibility increases in the maritime domain. At the same, the rapid growth in polar air routes has amplified the possibility of major air disasters in the region.

Air, marine, and ground SAR operations on the water, land, and ice of the Canadian Arctic – from the search for a lone missing hunter to a mass rescue – are challenging and complex. The region's vast size (over 3 million square kilometres) and cold climate combine to make time the enemy of all responders. Rapid responses are crucial, but the challenges emerging from the austere environment, the limited local resources and infrastructure, and the close cooperation and coordination required between a wide array of actors can all create significant difficulties. Further, the substantial distances involved in responding with Canadian Coast Guard (CCG) icebreakers deployed in the vast region, or Royal Canadian Air Force aircraft based in the South, mean that the arrival of federal resources on scene can take significant time. These aerial responses often pose their own unique challenges – flying a CH-149 Cormorant helicopter from Gander, Newfoundland, or Greenwood, Nova Scotia, to the High Arctic requires an impressive amount of planning and logistics.

It is not only the vast space and distances involved that define search and rescue in Inuit Nunangat, but also its intimacy. The SAR burden in the region largely falls on the shoulders of community responders who usually know the people for whom they are searching. Almost all have found loved ones deceased – from the cold, from accidents,

or from self-harm. The toll of this trauma and tragedy on the mental health of community responders is extreme.

Given the number of partners involved in search and rescue in the Arctic, strong relationships are a critical component of the system. Through the National SAR Program, federal, provincial/territorial, and municipal organizations share responsibility for search and rescue, with the support and assistance of volunteer organizations and private sector partners. The National Search and Rescue Secretariat (NSS), which is housed in Public Safety Canada, is responsible for coordinating the National SAR Program, provides policy advice to support SAR efforts, oversees SAR prevention activities, and manages Canada's contributions to the International Cospas-Sarsat Programme. The Canadian Armed Forces (CAF) bears overall responsibility for the effective operation of the federal coordinated maritime and aeronautical SAR system. The CAF provides aeronautical SAR services (e.g., responses to aircraft incidents and searches for downed aircraft) and can assist the CCG, which is responsible for the maritime SAR program component, which includes incidents involving a vessel or person(s) from a vessel. Humanitarian SAR and ground SAR cases, such as searches for missing hunters or boaters on inland waters, are a provincial/territorial responsibility, although authority for operational response is often delegated to police organizations. Nunavut is unique in that the territorial emergency management organization has been given authority for SAR operations in the territory. Parks Canada is responsible for SAR in national parks. Several other territorial and federal agencies are also occasionally called upon to provide support to SAR operations in Canada, such as Natural Resources Canada through the Polar Continental Shelf Program.

This reading list is focused explicitly on the conduct of SAR operations in the Arctic. It should be noted that there has been considerable scholarship on the various factors increasing the number of SAR cases at the local level in the Canadian Arctic, as well as on Indigenous land safety practices.[1]

Liane Benoit, *Perspectives on Emergency Response in the Canadian Arctic: Sinking of the MS Arctic Sun in Cumberland Sound, Nunavut. Parts A, B, C*. Munk-Gordon Arctic Security Program, 2014.

This is a three-part series examining the hypothetical sinking of the MS Arctic Sun in Cumberland Sound, Nunavut, Canada. The author explores current emergency management preparedness capacity in the Arctic, including methods of communication, collaboration, resource-sharing, authority, and jurisdiction. She tries to answer the question "are we ready?" for emergencies ranging in scope from the local to the international.

Dylan Clark, James Ford, and Taha Tabish, "What role can unmanned aerial vehicles play in emergency response in the Arctic: a case study from Canada," *PLoS One* (2018).

This paper examines SAR and backcountry medical response constraints in the Canadian Arctic and potential for unmanned aerial vehicles (UAV) to aid in response and preparedness. It is based on semi-structured interviews with SAR responders, Elders, and emergency management officials, as well as UAV test flights undertaken

with community members. The authors analyzed five years of weather data to examine UAV flight suitability, as well as changing social and environmental conditions. Responders desired additional first aid and emergency training. UAVs were demonstrated to have potential benefits for hazard monitoring but not for SAR or medical response due to legal restrictions, weather margins, and local capacity. Accordingly, the authors conclude that prevention of backcountry medical emergencies, building resilience to disasters, and first responder training should be prioritized over introducing UAVs to the response system.

Peter Kikkert and P. Whitney Lackenbauer, "A Great Investment in Our Communities: Strengthening Nunavut's Whole-of-Society Search and Rescue Capabilities," *Arctic* (2021).

Community-based organizations along with territorial, provincial, and federal agencies are responsible for SAR in the Canadian Arctic. In delivering response capabilities at all hours of the day and for 365 days a year, the community-based organizations face a wide array of challenges. Using the data collected through the Kitikmeot Search and Rescue Project and the Kitikmeot Roundtable on SAR, coupled with academic and non-government organization literature, this article explores the major challenges facing community SAR organizations in Nunavut and builds a case for how targeted investment can best bolster community-based capabilities. The authors suggest novel, practical, and holistic solutions that have been proposed by or co-devised with community partners, are rooted in the unique context of Nunavut's communities, and are reflective of a community resilience-building approach. One set of recommendations involves strengthening current programming, including the expansion of Nunavut Emergency Management's inReach program, continued support for the enlargement of the CCGA, streamlining the process to activate Canadian Ranger patrols, and encouraging greater cooperation in the provision of training by federal and territorial agencies. The authors also propose new approaches, including a whole-of-society preventative SAR program centred on educational and youth programming, the adoption of a SAR equipment usage rate model, and the launch of a Community Public Safety Officer program in Nunavut. Finally, to justify greater investment at the community level, they argue that policymakers must change how they conceptualize community-based SAR capabilities in Nunavut. An effective SAR system is about more than the ability to respond to emergency events – it is a critical enabler to broader objectives and goals prioritized in the Arctic and Northern Policy Framework and other federal, territorial, and Inuit strategies.

Peter Kikkert and P. Whitney Lackenbauer, "Search and Rescue, Climate Change, and the Expansion of the Coast Guard Auxiliary in Inuit Nunangat / the Canadian Arctic," *Canadian Journal of Emergency Management* (June 2021).

In Canada's maritime spaces, members of the all-volunteer Canadian Coast Guard Auxiliary (CCGA) provide essential marine SAR services and promote boating safety. By 2015, however, only nine communities North of 55 possessed Auxiliary

units and three of these struggled to remain operational. In 2020, the CCGA counted 20 units in the Coast Guard's new Arctic Region, with 333 members and 31 vessels—the majority of which are located in Inuit Nunangat (the Inuit homeland in Canada) and comprised of Inuit members—and plans for future expansion. Based on stakeholder engagement, government documents, and media analysis, this article assesses the Coast Guard's Arctic Search and Rescue Project and the concomitant programming under the Oceans Protection Plan that has facilitated the Auxiliary's expansion in the Arctic. Our analysis asks two overarching questions: Why has this program been able to expand the Auxiliary after previous efforts failed? How has this expansion improved the SAR system and marine safety in Canada's Arctic, and are there areas for improvement? The article makes four primary arguments: 1) The success of the project has been fueled by strong community engagement and relationship-building efforts, effective data collection that has fostered a better understanding of the marine risks facing Arctic communities, and consistent access to the training and equipment required to safely conduct marine SAR operations 2) Members of Arctic Auxiliary units strengthen SAR operations by improving response times, serving as SAR detectives, contributing to marine safety, and, most importantly, by integrating their local and traditional knowledge and skills into the broader search and rescue system. 3) Training and organizational gaps exist that should be addressed as the Coast Guard continues to bolster existing units and establish new ones. The Arctic SAR Project has provided several best practices and lessons that should guide the implementation of additional resilience-building measures in the North and in other Indigenous communities.

Peter Kikkert, Calvin Pedersen, and P. Whitney Lackenbauer, "Mitigating the Tyranny of Time and Distance: Community-Based Organizations and Marine Mass Rescue Operations in Inuit Nunangat," in *Shipping in Inuit Nunangat* (2023).

In Inuit Nunangat, increased vessel traffic, uncharted seabed, the presence of ice hazards, extreme weather, and inexperienced operators increase the risk of marine transportation accidents and concomitant mass rescue operations (MRO). Marine MROs are low-probability, high-consequence scenarios that are complex and challenging wherever they occur. In Inuit Nunangat, challenges are exacerbated by austere environmental conditions, limited support infrastructure, inadequate local medical capacity, and fewer vessels of opportunity that can be called upon for assistance. Perhaps the most serious challenges are those posed by the tyranny of time and distance. Given the vast distances involved and the position of Canada's primary search and rescue assets in the southern parts of the country, the arrival of SAR resources on-scene can take significant time. In this chapter, we argue that community-based organizations (CBOs) would act as valuable force multipliers both at sea and shoreside during a marine MRO. We use the results of a mass rescue tabletop exercise involving community responders from Nunavut, follow-up interviews, and additional scenario-based discussions to develop the functions that CBOs could perform. We also provide a roadmap for

how to best prepare community responders to take on these roles and to ensure that their capabilities are reflected in relevant mass rescue and emergency plans.

Peter Kikkert, Calvin Pedersen, P. Whitney Lackenbauer, Ian Belton, John Quigley, and Ronald Pelot, *The State of Search and Rescue in Nunavut (Draft)*, January 2024.

In Nunavut, the SAR services delivered by community, territorial, and federal responders provide a safety net that allows Nunavummiut to live, travel, harvest, and work on the land, contributing to individual and community health and well-being. As in the rest of Inuit Nunangat, the burden of search and rescue in the territory largely falls on the shoulders of community responders who usually know the people for whom they are searching. Examining the state of search and rescue in Nunavut, this report shares the results of four Nunavut Roundtables on Search and Rescue (one in 2020 and three in 2022), interviews with community and government responders, and an extensive review of government documents, media stories, and scholarly literature. It provides an overview of the SAR system in the territory; assesses the core strengths supporting and the challenges and problems hampering effective SAR operations, with a particular focus on the perspectives of community responders; and articulates improvements recommended by community and government practitioners. This expands upon ideas framed in Peter Kikkert and P. Whitney Lackenbauer, Strengthening Search and Rescue in Nunavut: Approaches and Options (NAADSN *Policy Primer*, January 2021).

Peter Kikkert and P. Whitney Lackenbauer,*The State of Search and Rescue in Nunavik: A Report for the Kativik Civil Security Department*, May 2023.

The Nunavik Roundtable on Search and Rescue, co-organized by the authors and Kativik Civil Security, was held in December 2022. It brought together community leadership and first responders, representatives from Inuit organizations, and regional, provincial, and federal officials to strengthen relationships and discuss SAR preparedness, prevention, and response. Answering repeated calls from Nunavimmiut for a review and discussion of the status of the SAR system in Nunavik, te roundtable provided the space required to develop mutual understandings of respective response capacities and gaps, examine the SAR risks facing communities, work through challenges, and brainstorm potential solutions in an inclusive and participatory environment. It provided an opportunity for community responders to learn from one another and develop a community of practice, while asking their government partners for clarity on policy, procedural, and operational issues.

Jean J.R. Leroux, "The Arctic Search and Rescue Region: Frozen in Time," *Canadian Military Journal* (Fall 2022)

For the purposes of conducting aerial and marine SAR operations, the federal government has divided the Canadian territory into three Search and Rescue

Regions (SRRs): Victoria, Trenton, and Halifax. Each of these regions is controlled by dedicated rescue centres called Joint Rescue Coordination Centers (JRCC). The largest of these regions is the Trenton SRR, which includes most of the Arctic and covers more than 10 million km^2, stretching from Toronto up to Alert, the last piece of Canadian land before the Arctic Ocean. In thids article, Leroux proposes that Trenton SRR be divided in two. This division would produce a fourth region that would cover the Arctic. The author argues that the government should equip this new region with a dedicated JRCC as the federal government's current SAR regional divisions do not reflect current policies. The author argues that reorganizing the regions and creating an Arctic SAR Region (Arctic SRR) would increase the quality of the coordination, leverage Northern communities' expertise and thus ultimately increase the potential for saving more lives in the Northern region.

Danny Poitras, "Search and Rescue in the Arctic," in *Canadian Arctic Operations, 1941-2015 Lessons Learned, Lost, and Relearned* (2017)

The author explores Canada's capability to respond to various SAR incidents in the Arctic. He engages with critics who have argued that Canada lags behind, even suggesting that Arctic SAR in Canada is more myth than reality, and examines their common solution: the establishment of permanent SAR units in the North. The author challenges if that is really the answer in the current circumstances? The successful completion of the vast majority of the northern SAR missions is a testimony of Canada's ability to conduct Arctic SAR. That being said, the author notes, the current system offers little flexibility or residual capacity and needs improvements to expedite casualty extraction time in the North. Given the low demand, the challenging time and space environment, and the cost associated with SAR operations, any practical solution must involve a holistic approach to enhancing the current program. The author argues that lessons learned from the history of Arctic SAR suggest that the way ahead must capitalize on one of the major strengths of the current SAR program: its integrated and multi-agency dimension. In so doing, Canada can bolster its Arctic SAR capabilities and deliver a better service to those in distress.

Derek Rogers, Michael King, and Heather Carnahan, "Arctic search and rescue: A case study for understanding issues related to training and human factors when working in the north," in *Arctic Marine Sustainability* (2020).

With increased development in Arctic regions (e.g., oil and gas, tourism, fisheries, shipping) the risk to people in case of emergency must be mitigated. The authors of this chapter review how the harsh Arctic environmental conditions affect the ability of rescue technicians to perform the technical skills required for SAR. Built around a 2013 investigative report on the death of a Canadian Forces Search and Rescue Technician on a mission in Nunavut, it reviews the main points in the investigative report and extrapolates lessons learned about human factors issues that apply to all human activities in the region. It addresses the need for

emergency procedures designed for Arctic operations, as well as training and equipment.

Jinho Yoo, Floris Goerlandt, and Aldo Chircop, "Unmanned remotely operated search and rescue ships in the Canadian Arctic: Exploring the opportunities, risk dimensions and governance implications," in *Governance of Arctic Shipping: Rethinking Risk, Human Impacts and Regulation* (2020)

The authors undertake a proactive risk exploration of hypothetical remotely operated SAR ships in the Canadian Arctic. The harsh and remote environment in the region, combined with complicated coastlines and many uncharted or poorly charted traffic routes, makes it a particularly challenging SAR area. The characteristics of Canadian SAR response in the Arctic rest with its high dependency on heavy equipment such as aircraft, helicopters and icebreakers, entailing prolonged hours of response time. As recent climate change impacts and maritime traffic increase in the northern waters disclose safety gaps, the authors anticipate innovation in SAR assets, with state-of-the-art remote control technology filling safety gaps. This chapter discusses remotely operated unmanned ships for SAR response, exploring their opportunities, risk dimensions and governance implications.

Further Reading

Natalie Carter, lead researcher, *Arctic Corridors and Northern Voices: Governing marine transportation in the Canadian Arctic*, various community reports (Ottawa: University of Ottawa, 2017) at http://www.arcticcorridors.ca/reports/.

D.G. Clark and J.D. Ford, "Emergency response in a rapidly changing Arctic," *Canadian Medical Association Journal* 189 (2017): 135-136.

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Peter Kikkert, P. Whitney Lackenbauer, and Angulalik Pedersen, *Kitikmeot Roundtable on Search and Rescue: Summary Report / Qitiqmiuni Katimatjutauyuq Qinighiayinit Annaktinillu – Naunaitkutat*, Report from a workshop hosted at the Canadian High Arctic Research Station (CHARS) in Cambridge Bay, Nunavut, 31 January – 1 February 2020.

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A. Østhagen, *Utilising Local Capacities Maritime Emergency Response across the Arctic* (University of Copenhagen: Centre for Military Studies, 2017)

Senate Standing Committee on Fisheries and Oceans, *When Every Minute Counts: Maritime Search and Rescue* (2018)

Rebecca Sheehan, Dimitrios Dalaklis, Anastasia Christodoulou, Megan Drewniak, Peter Raneri, and Angelos Dalaklis. "The Northwest Passage in the Arctic: A brief assessment of the relevant marine transportation system and current availability of search and rescue services." *Logistics* 5, no. 2 (2021): 23.

Notes

[1] See, for instance, T. Pearce, B. Smit, F. Duerden, J. Ford, A. Goose, and F. Kataoyak, "Inuit vulnerability and adaptive capacity to climate change in Ulukhaktok, Northwest Territories, Canada," *Polar Record*, 46 (2) (2010): 157-177, DOI: http://dx.doi.org/10.1017/S0032247409008602; T. Pearce, H. Wright, R. Notaina, A. Kudlak, B. Smit, J.D. Ford, and C. Furgal, "Transmission of environmental knowledge and land skills among Inuit men in Ulukhaktok, Northwest Territories, Canada," *Human Ecology*, 39 (3) (2011): 271-288, DOI: http://dx.doi.org/10.1007/s10745-011-9403-1; T. Pearce, J. Ford, A. Cunsolo Willox, B. Smit, "Inuit Traditional Ecological Knowledge (TEK): Subsistence Hunting and Adaptation to Climate Change in the Canadian Arctic," *Arctic* 68 (2) (2015): 233-245, DOI: https://doi.org/10.14430/arctic4475; A. Durkalec, C. Furgal, M. Skinner, and T. Sheldon, "Climate change influences on environment as a determinant of Indigenous health: relationships to place, sea ice, and health in an Inuit community," *Soc. Sci. Med.* 136 (2015): 17–26; A. Durkalec, C. Furgal, M. Skinner, and T. Sheldon, "Investigating environmental determinants of injury and trauma in the Canadian North," *Int. J. Environ. Res. Public Health* (2014), DOI: http://dx.doi.org/10.3390/ijerph110201536; D. Clark, J.D. Ford, T. Pearce, and L. Berrang-Ford, "Vulnerability to unintentional injuries associated with land-use activities

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