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North Atlantic Arctic Crisis Workshop (NAACW)

Coastal Response Research Center/Center for Spills & Environmental Hazards (CRRC/CSE)

UNH Department of Security Studies and the New England Arctic Network (NEAN)

Ted Stevens Center for Arctic Security Studies

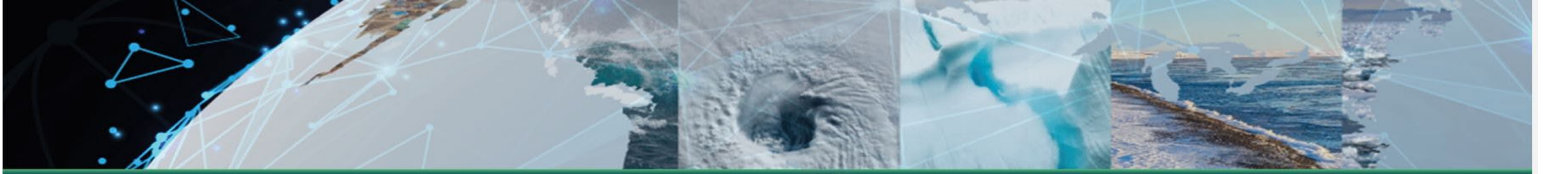
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North Atlantic Arctic Crisis Workshop, 12-13 December 2023

North Atlantic Arctic Crisis Response Workshop

Sponsored by: Ted Stevens Center for Arctic Security Studies (AK), U.S. DOD

Conducted by: Coastal Response Research Center/Center for Spills and Environmental Hazards at the University of New Hampshire

With support from the UNH Department of Security Studies and the New England Arctic Network (NEAN)

December 12 & 13, 2023

University of New Hampshire, Durham NH





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II. Abbreviations

AECO	Association of Arctic Expedition Cruise Operators
ACGF	Arctic Coast Guard Forum
CASP	USCG Center for Arctic Studies and Policy
CCG	Canadian Coast Guard
CME	Coronal Mass Ejections
CRRC/CSE	Coastal Response Research Center /Center for Spills and Environmental Hazards
EPPR	Arctic Council Emergency Prevention, Preparedness and Response Working Group
GSARCC	Ground Search and Rescue Council of Canada
ICAS	Inupiat Community of the Arctic Slope
ICE-PPR	International Cooperative Engagement Program for the Polar Research
ISR	Intelligence, Surveillance, and Reconnaissance
JRCC	Danish Defense Joint Arctic Command
MER	U.S. Coast Guard, Marine Environmental Response Policy
MOSPA	Marine Oil Pollution Preparedness and Response Agreement
NATO	North Atlantic Treaty Organization
NORTHCOMM	U.S. DOD Northern Command
NAACW	North Atlantic Arctic Crises Workshop
NGO	Non-Governmental Organization
RAD	TSC Research and Analysis Division
SAR	Search and Rescue
STS	Ship-to-Ship
TSC	Ted Stevens Center for Arctic Security Studies
TTX	Tabletop Exercise
UNH	University of New Hampshire
USAID	U.S. Agency for International Development
USDOD	U.S. Department of Defense
VEI	Volcanic Explosivity Index

III. Acknowledgements

This workshop and report were supported by the Ted Stevens Center for Arctic Security Studies (TSC) and the University of New Hampshire's (UNH) Coastal Response Research Center (CRRC)/Center for Spills and Environmental Hazards (CSE). The content for the workshop was developed in cooperation with the TSC and the following Organizing Committee members:

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Katharine Duderstadt, *University of New Hampshire, New England Arctic Network*

Steven Jensen, *Senior Advisor, American Red Cross; Lecturer and Advisor, California State University Long Beach*

Anthony Schilling, *University of New Hampshire, Homeland Security Studies*

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Shane Sadoway, *Regional Director, Navigational Programs & Operations, Canadian Coast Guard Arctic Region*

Haliehana Stepetin, *School of Arctic & Climate Security Studies, Ted Stevens Center for Arctic Security Studies*

Kelsey Frazier, *Ted Stevens Center for Arctic Security Studies*

Gary Mann, *U.S. DOD Northern Command (NORTHCOMM)*

Dana Tulis, *U.S. Coast Guard HQ, Marine Environmental Response Policy (MER)*

The workshop was facilitated by Nancy Kinner (www.crrc.unh.edu). CRRC/CSE is known globally as an independent intermediary that brings all stakeholders to the table to develop and implement viable and trusted solutions to complex problems related to environmental disasters. CRRC/CSE has conducted 90+ workshops that bring together practitioners, researchers, and scientists of diverse backgrounds (e.g., industry, academia, government, NGOs) to discuss and develop solutions to marine pollution and crisis/disaster problems, including several in the Arctic. Along with Nancy Kinner and "Church" Kee, we would like to thank each of the speakers for their participation in the workshop:

RADM John Mauger, *U.S. Coast Guard District 1 Commander*

Youssef Mani, *Assistant Commissioner, Canadian Coast Guard*

Peter Garapick, *Quark Expeditions*

Haliehana Stepetin, *Ted Stevens Center for Arctic Studies*

Morrie Lemen, Jr, *Executive Director, Inupiat Community of the Arctic Slope*

Stephanie Nelson, *Director of Emergency Management, Inupiat Community of the Arctic Slope*

Terrence O'Sullivan, *Program Director, UNH Homeland Security Studies*

A special thank you (1) Katharine Duderstadt, Anthony Schilling, Steven Jensen, Sam Zarakovich (UNH, Homeland Security Studies) for in-depth research and development of the realistic crisis scenarios; (2) Kathy Mandsager and Wesley Lambert (CRRC/CSE) for their efforts in coordinating this workshop; (3) James Wood, Kara Wittmann, Tori Sweet, Alex Magin, Madeline Dubosque, Sam Zarakovich (UNH) for their logistical support and notetaking during the event.

IV. Executive Summary

On December 12-13, 2023, the U.S. Department of Defense (USDOD) Ted Stevens Center for Arctic Security Studies (TSC) held a workshop at the University of New Hampshire (UNH) entitled the North Atlantic Arctic Crisis Workshop (NAACW). The workshop was facilitated by the UNH Center for Spills and Environmental Hazards (CSE) which is co-located with NOAA's Coastal Response Research Center (CRRC). Many workshops have been held to address security issues in the Bering, Beaufort, and Chukchi Seas, but few have focused on the North Atlantic Arctic (NAA), though there are many potential climate change, infrastructure and environment-related challenges that could arise (e.g., severe storms, vessel accidents, security breaches) and trigger cascading issues (e.g., public health crisis, community isolation, natural resource damage).

The TSC hosted the NAACW as a first step to: enable dialogue to advance the understanding of crisis response in the NAA as an element of security in strategic competition; strengthen networks for mutually supportive research and collaboration across the U.S. agencies, Allies, and Indigenous Peoples; identify policy gaps in U.S. authorities and international agreements to respond to a crisis in the NAA; identify the knowledge gaps, capability gaps, and capacity shortfalls to respond to a crisis in the NAA; and identify questions for future TSC research. This report details the structure of the workshop, plenary overview, and crisis scenarios discussed in the Tabletop Exercise (TTX) and summarizes the findings including the gaps identified for future TSC efforts/research. The appendices contain the agenda, participant lists, presentations, maps and summary notes from the breakout groups and plenary sessions. Other information and documents available include the NAACW 2023 Exercise Design Summary, the Legal/Policy Guidance and discussions based TTX materials.

Four breakout groups were formed and the workshop participants in each one answered several questions regarding their assigned scenario (i.e., Baffin Island Missing Expedition and Flooding/Infrastructure/Public Health Issues; Cruise Ship Rescue; Svalbard Undersea Cable Threat; West Coast Greenland Disaster). The participants agreed on 18 key points and 12 overarching themes regarding potential response to crises in the North Atlantic Arctic. Future efforts need to focus on: (1) better integration of Western science and Indigenous knowledge as part of the planning process so that these perspectives can be incorporated as seamlessly as possible into crisis response, resilience, and recovery; (2) multinational approaches, especially those that blend culture, and Indigenous and military activity to insure a unified front and careful management and pre-planning; (3) exercises that emphasize planning and preparedness for a variety of possible climate change related crises that go “deeper” into challenges and levels of security needed; (4) greater appreciation of the strategic competition and looming potential for a conflict with Russia and China in the Arctic; and (5) incorporation of other players in these discussions (e.g., Greenlandic Indigenous Peoples, Icelandic representatives).

V. Introduction

On December 12-13, 2023, the U.S. Department of Defense (USDOD) Ted Stevens Center for Arctic Security Studies held a workshop at the University of New Hampshire (UNH) entitled the North Atlantic Arctic Crisis Workshop (NAACW). The workshop was facilitated by the UNH Center for Spills and Environmental Hazards (CSE) which is co-located with NOAA's Coastal Response Research Center (CRRRC). The NAACW was followed by a one-day meeting on communications hosted by the International Cooperative Engagement Program for Polar Research (ICE-PPR), a collaboration among the defense agencies of the U.S., Canada, Denmark, Finland, New Zealand, Norway, and Sweden. [N.B., A report on the ICE-PPR workshop is forthcoming and available upon request.]

The TSC, the sixth USDOD regional center was established in 2021 and is located at Joint Base Elmendorf-Richardson in Anchorage, AK. The center addresses Arctic security through executive education, strategic engagement, and research and analysis in keeping with the nation's National Security Strategy. Key to the TSC's mission are the principles of innovation and experimentation, and thoughtful exchange of ideas to promote a peaceful, prosperous, and secure Arctic region. The TSC works with military and civilian security practitioners, leaders, and decision-makers from the U.S. and its allies and partners across the Arctic region and is inclusive of Arctic indigenous peoples and perspectives. While located in Alaska, the TSC has a pan-Arctic approach to regional security, recognizing that security in the North Atlantic Arctic is crucial and that there are many potential crises that could develop there. Many workshops have been held to address security issues in the Bering, Beaufort, and Chukchi Seas, but few have focused on the North Atlantic Arctic, though there are many potential climate change, infrastructure and environment-related challenges that could arise (e.g., severe storms, vessel accidents, security breaches) and trigger cascading issues (e.g., public health crisis, community isolation, natural resource damage).

The TSC hosted the NAACW as a first step to:

- Enable dialogue to advance the understanding of crisis response in the North Atlantic Arctic as an element of security in strategic competition.
- Strengthen networks for mutually supportive research and collaboration across the U.S. interagency, Allies, and Indigenous Peoples.
- Identify policy gaps in U.S. authorities and international agreements to respond to a crisis in the North Atlantic Arctic.
- Identify the knowledge gaps, capability gaps, and capacity shortfalls to respond to a crisis in the North Atlantic Arctic.
- Identify questions for future (TSC/USDOD) research.

It is important to note that the Center's Research and Analysis Division (RAD) conducts research and analysis studies that support awareness and understanding of the Arctic region focusing on climate issues, policy, and strategy and operations (e.g., domain risk, integrated solutions). The TSC does not fund or conduct detailed scientific or engineering studies involving field or laboratory-based research (e.g., agencies with that mission include the U.S. National Science Foundation, U.S. Army Corps of Engineers, Department of Energy). TSC's RAD projects typically result in knowledge products, many of which are designed for decision-makers and suitable for publication in the TSC's Journal for Arctic and Climate Security Studies.

VI. Contents of the NAACW Report

This report will: 1) detail the structure of the workshop, plenary overview, and crisis scenarios discussed in the Tabletop Exercise (TTX); and 2) summarize the findings including the gaps identified and questions for future TSC research. The appendices contain the agenda, participant lists, presentations, maps and summary notes from the breakout groups and plenary sessions. Other information and documents available include the NAACW 2023 Exercise Design Summary, the Legal/Policy Guidance and discussions based TTX materials.

VII. Structure of the Workshop

Participants for the NAACW were asked to enroll in an online pre-meeting preparation “course” that provided an overview of the goals of the workshop and developed the TTX scenarios with weekly modules starting a month prior to the on-site event. Relevant documents, videos and slides helped the participants appreciate the scope of the various crises presented. Each scenario was formulated from events that have previously occurred in the Arctic (with live links to the actual event coverage). Background information was provided on various topics with which the participants may not have been familiar (e.g., Greenland disaster response).

The primary drivers of the impending crises were a heat dome over Greenland and Baffin Island, increased solar activity, an atmospheric river, and a high-pressure blocking weather pattern all leading to a major ice sheet melting and catastrophic flooding. In addition, there was suspicious Russian and Chinese ship movements near sensitive undersea cables. The flooding in Greenland and Baffin Island led to infrastructure failure (e.g., wastewater treatment plant failures triggering water contamination and widespread GI disorders among the population; Pituffik Space Force Base infrastructure failures). Concurrently, 20 individuals (e.g., students, professors, a local guide) who were kayaking and camping on northern Baffin Island were out of communication for three days and feared to be in trouble. The fourth crisis involved a small adventure cruise ship in a harbor on the eastern side of Greenland, damaged by a thawing-related landslide-generated tsunami. The nearby village was heavily damaged, the solar activity was disrupting communications and oil was leaking from the hull.

Day 1 of the workshop began with welcoming remarks from UNH’s Senior Vice Provost for Research and Engagement, Dr. Marian McCord who outlined the university’s large portfolio of Arctic research and education and its leadership of the New England Arctic Network (NEAN), a regional collaboration of researchers, stakeholders and external partners who anticipate and respond to regional climate change and its impacts on the eastern coast of North America.

TSC Executive Director Kee summarized the challenges facing the Arctic and how the new USDOD center is structured to explore security issues, identify research gaps, and enhance networking among Allies, partners, and stakeholders. He also noted the interest in addressing the issues of the North Atlantic Arctic as it becomes more susceptible to climate change and security threats.

These introductory presentations were followed by four talks giving the perspectives of the U.S. Coast Guard (USCG), Canadian/International Representatives, the cruise ship industry, and Indigenous communities on North Atlantic Arctic security-related issues.

The rest of the workshop (1.5 days) was devoted to breakout group and plenary discussion of the TTX scenarios. Questions that were addressed by each scenario's breakout group included:

Group Breakout Session 1:

- What are the priorities of the response to these crises?
- What will the response be?
- What are the limitations for the response?
- What resources will be available for the response?

Group Breakout Session 2:

- What will be the multi-incident response considering the simultaneous occurrence of all the scenarios? Coordination, command, and control?
- How will the different responses be prioritized?
- How will the ethical and political implications of the priorities be addressed?

After each breakout session, representatives of each group reported on their group's answers to these questions.

A final plenary session was held to discuss the 10 major themes the workshop Organizing Committee drafted from the discussions:

- 1) Strategic Communication (information flow, social media, diplomatic and political pressures)
- 2) Cultural Sensitivity and Incorporation of Indigenous Knowledge
- 3) Gap in Public Health
- 4) Timeline and Phasing
- 5) Coordination (daily calls, multi-agency coordination center (MAC))
- 6) Handling of Mass Human Casualties in the Arctic
- 7) Sovereignty
- 8) Cascading Effects
- 9) Theory of Constraints
- 10) Allowing a Network to Form (multi – agency communication)

Participants reframed the themes during the final plenary, prioritized them and discussed the path forward. Subsequent to the workshop, the CRRC/CSE consolidated the breakout groups' lists of policy, knowledge, and capability gaps and research needs. These gaps and needs were vetted by the TSC staff and are shown in the final section of this report.

Perspectives of Key Stakeholders (Plenary Session 1)

John Mauger, *RADM, U.S. Coast Guard (USCG) District 1 Commander* recognized that no operational commander has all of the maritime awareness or resources needed to address the challenges of responding in remote locations (e.g., the Arctic). Therefore, multi-disciplinary planning is essential

for the USCG to operate, protect, defend, and rescue within its jurisdiction. The challenges are clear when considering missions in the Arctic because of the rapidly changing environment. USCG must work with others in the region including USDOD, indigenous communities, and international partners. He reminded the participants of the four pillars of the U.S. Arctic Strategies and Implementation Plans: security, climate change, sustainable development, and international cooperation and governance. It is important for the USCG to strengthen relationships to ensure that rules-based order and transparency exists across operating environments. There must be an operational focus on the goals of protecting life, property, and the environment in the Arctic. This can be achieved through planning and preparedness. He noted the close relationship and cooperation between the U.S. and Canadian Coast Guards. RADM Mauger cited the example of the emergency search and rescue response for the underwater submersible Titan in June 2023 where 14 organizations participated within 96 hours to find the imploded vessel on the seafloor. The actions required in the Arctic will be just as, if not more, complex. He concluded that the discussions and recommendations of this workshop will be an important component of planning and preparing for Arctic operations.

Yousef Mani, *Assistant Commissioner, Canadian Coast Guard (CCG)* oversees the Arctic region which comprises 40% of the Canada's territory and is central to its sovereignty and security. The CCG's motto for the Arctic region is that "everything needs to be done by the north for the north"; with direct involvement of Inuit, First Nations, and others. These needs include: search and rescue, maritime communities traffic services, icebreaking for remote communities, hazard response due to increased vessel activity (most of it being cruise or adventure ships), with an emphasis on incident management. He stressed that natural disasters, such as flooding and wildfires, will occur more frequently, spreading people and resources thin. Mani noted the absolute necessity of incorporating Inuit knowledge to ensure success of the response and hence, the importance of developing relationships with indigenous communities. Because operating in the complex Arctic environment is so difficult, interoperability and working together is essential.

Peter Garapick, *Director of External Relations, Quark Expeditions* (small, <200 passengers adventure cruise ship operator) discussed the ways that the cruise industry addresses the risks of operating in the Arctic. He noted that, in the Arctic, there are lots of authorities with whom companies must interact. Most companies are members of the Association of Arctic Expedition Cruise Operators (AECO), an organization that represents the concerns and view of their members. AECO has specific standards and guidelines for operating expedition cruises in the Arctic (e.g., guidelines for visitors, marine plastic pollution, visiting communities, wildlife). AECO is committed to safety and operates mostly Polar Code (PC) ships of Category 6 designed to operate in at least thin first year ice. Quark meets all IMO standards for cruise ships operating in the Arctic and has plans for emergencies (e.g., spills) and permits for landing. They perform exercises annually with the CCG. [N.B., Quark Expedition is a Canadian company.]. They operate with other ships nearby (but out of line-of-sight), for evacuation support. Because charts in the Arctic are limited and mostly outdated, the cruise ships use sonar. The ships avoid ice and do not go into communities without permission.

Dr. Haliehana Stepetin, TSC Associate Professor of Arctic Security Studies; Morrie Lemen, Jr., Executive Director Inupiat Community of the Arctic Slope; and Stephanie Nelson, Director of Emergency Management, Inupiat Community of the Arctic Slope; presented the perspectives of the

Indigenous Peoples of the Arctic. Dr. Stepetin noted there are many distinct indigenous groups in Alaska with 21 languages spoken and hundreds of dialects. The Indigenous Peoples know how to sustain their economy and ways of life in the harsh conditions of Arctic. Colonization wreaked havoc on Indigenous communities (e.g., diseases). The climate is rapidly changing causing problems such as erosion, flooding, invasive species, relocations, and changes in wildlife migration. The opening of Arctic Sea routes threatens the sustainable fishing and hunting Indigenous communities have done for millennia. Emergency response in the Arctic is difficult, especially with the severe storms the region is experiencing because of climate change.

Morrie Lemon, Jr. is the Executive Director of the Inupiat Community for the Arctic Slope (ICAS), a regional Alaska Native tribal government. He described the impact of a severe storm (80 mph winds) on an Alaska Native community that lost power except at one municipal building. Emergency management by outside agencies was flawed. As a result of this kind of problem, in the event of a disaster, there must be a tribal lead because of the limited access of other entities to geographically isolated communities.

Stephanie Nelson, Director of Emergency Management for ICAS, discussed the importance of the government's emergency management programs. ICAS established an emergency management department in 2020. It operates a FEMA-approved Emergency Alert System (EAS) to send out crucial notifications to communities. ICAS is drafting comprehensive emergency management plans for a range of situations and has a draft for hazard mitigation. One of the big challenges is the multiple layers of government within the boundaries of the North Slope and understanding their roles in response.

The overall conclusion of the Indigenous Community presentation is that Indigenous Peoples adapt and come together with all entities and organizations. Through adaptation, education, and advocacy, they find solutions to security threats and move forward.

VIII. NAACW TTX Crises Scenarios

1) Situation in North Atlantic Arctic 28 days prior to TTX.

[N.B., All of the crisis scenarios were designed to occur in a future summer during the months of June and July.]

Since April, there has been a persistent "Omega" atmospheric blocking pattern bringing a series of increasingly strong high-pressure ridges, or heat domes, to Eastern Nunavut's Baffin Island and to the entire Greenland ice sheet. This pattern is consistent with a more wavy Jet Stream than normal and a negative phase of the North Atlantic Oscillation (NAO) climate mode, both associated with a changing climate.

Snow melting starting at lower, and even some higher, elevations of Greenland.

The sun currently has multiple active regions that produce occasional eruptions. The largest active region is currently rotating away from Earth with a risk of producing extremely large flares or coronal mass ejections (CMEs) in approximately three weeks when it rounds the sun's east limb to

once again face Earth. An unusually dry winter has led to late spring wildfires increasing from western and central Canadian fires. Wildfire smoke is not an issue yet.

2) Situation 23 days prior to TTX.

- A record-breaking heat dome effect over Baffin Island and the entire Greenland ice sheet begins to move off and dissipate by the end of the week.
- Meanwhile, forecasters predict the region may experience significant rainfall in the weeks ahead, as a series of atmospheric rivers develop and move into the area.
- 80% of the ice sheet surface has already begun melting. The region experiences significant ice melt flooding with some damage to infrastructure, but no major casualties.
- Russian Federation oil tanker SN Braco docks in Murmansk, Russia, SN Braco is fully loaded with oil and is a single hull tanker. Destination likely to be West Africa, primarily Lagos, Nigeria or Lomé, Togo's capital – both countries emerging as a fast-growing hub for Russian ship-to-ship (STS) oil shipments. This would be an EU Ukraine-related sanctions violation.
- Four Chinese People's Liberation Army (PLA) Navy ships identified as brand-new Type 055 destroyers (Renhai Class Cruisers) have rounded Cape Agulhas off Africa and are proceeding into the Atlantic. The U.S. Navy (USN) is tracking their movements. No information is available on their destination or plans.

3) Situation 15 Days Prior to TTX.

- A low-pressure system and atmospheric river move into the region, bringing large amounts of warm, moisture-laden air poleward from the warmer lower latitudes.
- >97% of the surface of the Greenland ice sheet shows evidence of melting and glacial melt. Flooding is becoming an increasing threat to coastal villages (similar to summer 2012).
- Ice melt and permafrost thaw have caused roads to sink and become increasingly dangerous to traverse.
- Pituffik Space Force Base is temporarily closed due to flooding, with roads collapsing, and the runway inoperable. Expected time to return of operations is to be determined. Pituffik Space Force Base weekly resupply flights are postponed until further notice.
- Wastewater pumping station at Nuuk in Southern Greenland has shut down due to flooding and may overflow into the water and ocean.
- Chinese PLA Navy Task Force is now well into the Atlantic and moving north at fast speed. It is being shadowed by USN Destroyers and aircraft. Destination not currently known.
- A group of 20 U.S. college students and tribal nation students and five professors arrive on Baffin Island for a 3-week study abroad program involving coastal erosion and other climate-related subjects.
- Eyjafjallajökull Volcano on Iceland (last eruption 2010) showing signs of becoming active again. This volcano seriously disrupted air travel in 2010. Harmonic tremors are the type of seismicity that is associated with an impending or ongoing volcanic eruption. The tremors might precede an eruption by days or hours, or they might not lead to an eruption at all. Eyjafjallajökull Volcano previously erupted as a Volcanic Explosivity Index (VEI) Four level volcano. The volcano is at alert level one, "Advisory" indicating it is exhibiting signs of elevated unrest above known background levels.

4) Situation 8 Days Prior to TTX.

- A second atmospheric river is bringing large amounts of warm, moisture-laden air poleward from the warmer lower latitudes, fueled in part by additional moisture from an early season hurricane.
- There is extreme precipitation on the upslope of the mountains of Western Greenland, extending far north to Pituffik Space Force Base.
- Multiple Inuit-majority villages and towns on eastern Baffin Island and on the western and southern coast of Greenland report being cut off from land resupply due to impassable roads. There is damage to water supply systems from permafrost slump and flooding.
- Waste dumps in three villages are now overflowing contaminating the area and, in some cases, flowing into the ocean.
- A bridge in Qaanaaq (South of Pituffik) has washed away by flooding from the Qaanaaq Glacier, disconnecting the town from the airport.
- Kangerlussuaq is experiencing heavy flooding and thaw. The newly rebuilt bridge is still holding. However, the airport runways are showing large cracks and deformations and have been temporarily closed to assess damage.
- Exacerbated by the preceding heat dome, the atmospheric river situation in Greenland is now a crisis.
- Tourist cruises have stopped in Disko Bay as a result of the density of ice bergs from the Jakobshavn glacier.
- The Russian Federation tanker, SN Braco left Murmansk and is being shadowed by the Norwegian Navy and Air Force moving south into the Atlantic towards Svalbard Island area. The tanker is “riding low” indicating it is fully loaded. It is expected to make an illegal oil transfer somewhere off Africa, but intel is incomplete. Intel reports SN Braco has been modified to refuel warships at sea. The tanker is escorted by a single Russian destroyer out of Kaliningrad, RF Nastoychivyy (Sovremenny-class destroyer).
- Eyjafjallajökull Volcano sensors are still detecting harmonic tremors. Eyjafjallajökull Volcano is moved to Alert Level “Advisory” to “Watch”. The London Volcanic Ash Advisory Center issues Aviation Color coded “Yellow” for Eyjafjallajökull. They indicate this could change quickly.

5) Situation at Start of TTX.

- SS Reindeer with 86 personnel on board has stopped at Ittoqqortoormitt, Greenland. There are 30 crew and passengers. This is the first cruise for this state-of-the-art super luxury cruise ship (rooms start at \$30,000 per room) with many well-known celebrities on board as well as U.S. congress persons and their families. Ittoqqortoormitt is a new stop on this new cruise company’s agenda.
- Hours later, the major media report – via satellite phone – that a ship carrying a U.S. Congressman or well-known celebrity has been catastrophically damaged, partially sunk by a large landslide-generated tsunami between Ittoqqortoormilt (Scoresbysund) and Daneborg, Greenland.
- The ship appears to be leaking fuel oil.
- Permafrost melt and weather-related flooding events in northeastern Nunavut and Greenland are a deepening crisis. Towns are being cut off from fresh water and food due to

impassable roads, waste dumps are overflowing, contaminating the area and, in some cases, flowing into the ocean.

- First deaths reported due to the flooding.
- There is a massive iceberg from the Jakobshavn glacier that is stalled next to Innaarsuit causing great concern if it calves, sending destructive waves to the shore.
- Media from CNN, CBC, BBC, and FOX are now involved and asking what assistance can be rendered by the U.S., Denmark and Canada. This situation makes the daily President's news media briefing.
- Pituffik Space Force Base is now out of service due to ice melting and sewage issues, flooding, cracked roads and possible runway damage. There is no estimate on when it can return to service. The Space Force Commander is requesting assistance as soon as possible.
- RF Tanker SN Bravo stopped 30 kilometers north of Svalbard. No movement detected. Queries to the RF are unanswered. Requesting U.S. State Department assistance with this matter. There are at least two other tankers in the area, however, they are not transmitting their location.
- Incomplete reports come in from eastern Greenland about a damaged adventure cruise liner carrying 500 passengers.
- The Russian Federation destroyers are located north of the UK and moving towards the Iceland and Greenland direction, towards Svalbard Island to protect a possible illegal ship to ship oil transfer with tankers from an unknown entity.

IX. Workshop Findings

Scenario Response

Four breakout groups were formed and the workshop participants in each one answered several questions regarding their assigned scenario (i.e., Baffin Island Missing Expedition and Flooding/Infrastructure/Public Health Issues; Cruise Ship Rescue; Svalbard Undersea Cable Threat; West Coast Greenland Disaster). For each scenario, the breakout groups discussed response plans, limitations of the response, and resources available. In a subsequent set of breakout groups, with members representing each scenario, multi-incident coordination/command/control, prioritization of responses, and ethical/political implications of priorities were discussed. The breakout groups' notes are shown in Appendix E. A summary of the overall findings for each scenario and the overall responses' coordination follows.

Baffin Island

The participants concluded that the Baffin Island crises would be under the response structure of Canadian government agencies in coordination with the Indigenous leaders. The participants stressed that other countries would not likely be asked for support. In Canada, governmental agencies work closely with Indigenous People in planning and preparedness for disasters. There are consultations among the partners as to the options for response. The Indigenous leaders make the decision about the option(s) actually used. Response support would likely come from the CCG, as well as commercial and personal vessels (e.g., fishing, cruise ships, cruising sailboats) in the area. Communications with the communities would be essential and via VHF and if internet/Starlink were operating, then via Facebook. Normally, a community reaches out to initiate search and rescue (SAR) using the Ground Search and Rescue Council of Canada (GSARCC) Agreements in place for SAR. Inuit knowledge would be essential to locate the missing kayakers. Fuel for the flooding impacted communities would be brought in by tanker. There would be longer term cleanup issues (e.g., garbage/dump). The water supply issues would be critical; water will need to be used sparingly and initially flown or shipped in until the supply can be protected (longer term). Portable water treatment units (e.g., reverse osmosis) could be brought in for temporary use. Medical needs could exceed on the ground capacity until the disease issues are under control (i.e., clean water, less crowded housing). Medical evacuation would likely be necessary in some cases. The Canadian Red Cross could be activated. Translators would be used to overcome language barriers between responders and the local inhabitants.

Cruise Ship

The first efforts for this response would be to save lives with cleanup of the oil spill addressed once human safety was under control. Greenland/Denmark would likely ask for assistance immediately. Due to its proximity, Iceland would likely send a response vessel, equipment, and personnel, and provide air support. Iceland has a bilateral agreement for support in Greenland. The cruise ship industry usually has a policy that ships are close enough to provide support if a vessel gets into trouble. Therefore, the cruise ship in proximity would likely respond, unless it was also in distress. Commercial vessels in the area would also respond. Existing agreements on SAR and oil spills (MOSPA) created by the Emergency Prevention, Preparedness and Response Working Group (EPPR) of the Arctic Council that are exercised routinely by Arctic member states, would provide a structure

for the response. While this cruise ship disaster would be a tragedy, the participants concluded that this response would be one where the roles, responsibilities and actions taken would be more familiar because of exercises done annually by AECO, ACGF (resuming in 2024 after break due to COVID and Russian Aggression in Ukraine) and EPPR. The presence of “high profile” passengers could make this situation more prominent via social media and other news coverage and that could present ethical and political issues and mean more transparent communications would be needed. There could also be the potential for misinformation. It would be important to pre-empt this coverage to lower its impacts. Tracking the passengers is crucial and this could be difficult because shipboard this is either done with written checklists or “bracelets”. During an incident in Norway, responders had difficulty “reading” the bracelets because they did not have a scanner. The flow of information would also be challenging because the site of the crisis is far from major support centers, and maintaining an up-to-date common operating picture would be doubtful. The oil spill would not be massive (limited to the ship’s capacity). However, deploying shipboard spill kit equipment could present problems because non-recovered oiled response gear (e.g., booms) is often a worse problem than the spill itself. Getting sufficient response equipment to the site in a timely manner would be difficult due to its remoteness.

Svalbard Undersea Cable

The failure of the undersea cable presents many problems physically and geopolitically. The type of critical information being passed through the cable must be identified and other means of obtaining it must be pursued. It would also be important to “protect” information in the event the cable is being “monitored” by the Russians or Chinese. Any information or targets that are compromised must be identified and confirmed. Starlink could possibly be used to transmit some information but will not likely be able to cover the entire capacity. Assessment must be made immediately of what data is a priority.

The issue of diversity of data communication systems and redundancy was a main focus of the breakout group. The direct response to the failure would be to determine its cause (e.g., malicious action, equipment failure). This would involve troubleshooting the infrastructure. The cable owner would conduct the assessment and help plan the response in conjunction with the Norwegian government. Attribution is a very important part of conducting the response. If the cause was a nefarious act by Chinese/Russian actors, then deterrence will need to be handled carefully to avoid escalation of a geopolitically sensitive situation. Likely Norway, its Nordic allies and NATO (including the U.S.) would be in communication and jointly planning for the response. Messaging would need to be conveyed quickly to prevent the spread of fake information. The focus of the Allies would be on intelligence, surveillance, and reconnaissance (ISR) to disseminate accurate, relevant, and timely information. This crisis would likely be present in the news and on social media at a much lower level due to the other crises ongoing.

Greenland West Coast Disaster

The heat dome-generated melting ice and atmospheric river caused massive flooding and infrastructure failure along Greenland’s West Coast. The failure of sewage treatment systems; lack of treated drinking water; and failure of docks, roads, runways, and bridges in communities and at the Pituffik Space Force Facility created a massive crisis for the inhabitants and triggered widespread GI disease outbreaks. The priorities would be for human life and safety, including the

need for adequate food, water, shelter, and medical care. Transportation and possibly communication would be impaired. There may also be some limited cases of SAR needed. The participants acknowledged that while the scenario was challenging the Danish Defense Joint Arctic Command (JRCC) would work with Greenland authorities to lead the command and control the response. Unless it was too compromised, Nuuk would be the likely incident response center because it has established operations facilities. Support could be requested from Canada, but that nation may be less able to help because of the Baffin Island crises. NATO would likely be contacted for support along with U.S.. USAID would be the lead partner agency because of the type of crises. Vessels of opportunity (e.g., commercial deep-sea and bulk ore carriers) could be asked for help in bringing in response equipment/supplies. Iceland would likely be too involved in the crises on the Greenlandic east coast to help on the west coast. The more isolated communities could be self-sustaining for a longer time than these larger ones. The key challenge would be getting supplies to the region from the outside. Other factors would be limited consulate staff and the difficulty in tracking people. Supplies would come by ship. Some of the materials and response personnel could come by air, but damage to runways and related infrastructure could be a problem. The weather and the proximity of icebergs could hinder supplies getting to the scene. All logistical support for those responding would need to be brought into the region. The command would have to carefully stage the arrival of critical support and supplies because the limited infrastructure would be overwhelmed otherwise. The overall conclusion of the participants was that this crisis would be stressful, but manageable with a phased response overseen by the JRCC and supported by NATO Allies from Europe and the U.S. with controlled timing of support the major factor for insuring success.

Multi-Incident Coordination, Command and Control

The second breakout groups were formed of representatives from each of the scenario's groups. The second breakout session was tasked with discussing the requirements and challenges of having multiple incidents occurring simultaneously. The groups were asked to prioritize the needs for the responses and address the ethical and geopolitical implications of those priorities. There was a consensus that a joint multinational command would not be established to oversee and coordinate the responses. Rather the participants emphasized the likelihood of sovereign decision-making and priority of response resources in all cases (e.g., Baffin Island = Canada; Cruise Ship = Greenland/Denmark with Icelandic support; Cable Failure = Norway; West Coast Greenland = Danish Defense Forces with NATO Allies' support). Coordination would occur with respect to logistics (e.g., bringing in supplies from outside a country's borders as needed for the cruise ship and west coast of Greenland). There might also be a need for some type of communications coordination among liaisons from the responding countries. These liaison officials would be charged with coordination of resources to avoid conflicting demands. There are existing mechanisms among these nations to share information (i.e., intelligence). While the Arctic Council may be too slow to provide oversight, it is nimble and has protocols that would be useful for some of these events. Multinational coordination would likely be accomplished through a daily call among the countries' lead responders.

Key points that were noted by multiple breakout groups included:

- Respectful interaction of the international and national response teams with the Indigenous Peoples is paramount. The integration of Indigenous knowledge into the crises in Canada

would be the most well-coordinated because there are existing protocols between First Nations and the Canadian government. This would be more likely to be problematic in the west coast of Greenland crisis. There may be different reactions to the desire to stay or evacuate. Response options and decisions may be conflicting between Indigenous Peoples and military and civilian responders. The Circumpolar Inuit Protocols for Equitable and Ethical Engagement (<https://www.inuitcircumpolar.com/project/circumpolar-inuit-protocols-for-equitable-and-ethical-engagement/>) has specific recommendations for coordination of equitable approaches. Cultural sensitivity training, while not the standard in Greenland now, should be considered. Overall, the role and leadership of the Indigenous Peoples in the responses must be respected and clearly acknowledged by all partners. This coordination must occur as part of the preparedness, not as afterthought during a crisis (i.e., a designated protocol on incorporation of Indigenous knowledge). [N.B., The role of Indigenous Peoples on the Svalbard Cable incident and the cruise ship was considered to be less relevant to these responses. The potential impact of the oil pollution on natural/subsistence resources and food security could be a factor in the Cruise Ship scenario, depending on the extent of the release and the availability of response equipment.]

- The vulnerability at times of crisis to the negative interference of foreign actors (e.g., Russia, China).
- The importance of establishing a seamless means of financial support for the logistical needs of multiple, concurrent responses.
- The potential impact of social media on global awareness of some of the crises (e.g., cruise ship “celebrities”, missing Baffin Island kayakers). This visibility could place ethical and geopolitical pressures on the response, but could also be helpful in “tracking” crises and response as in hurricanes in the U.S.. This may be another reason for close coordination of multi-incident communications and information flow.
- In all cases, the “tyranny of distance” in the Arctic was noted. For example, supplies from the U.S. would take at least 6-7 days to transit to the west coast of Greenland.
- The importance of preparedness, especially response agency personnel “knowing” each other was stressed repeatedly by the participants. Relationships among the parties should be developed prior to people interacting during crises. This is one of the main advantages of doing exercises of various scenarios. However, there can be negative repercussions (e.g., exercise “burnout”) if too many of these events are scheduled.
- There should be more emphasis placed on managing data from crises especially when multiple nations will be involved in concurrent crises where the need for command and control are high. This includes protocols for data collection, delivery, sharing, security, and visualization (display). Arctic ERMA is the EPPR-designated common operating picture, but it must be maintained and there are limited financial resources to do that. Data sovereignty is also very important and must be respected, especially with respect to Indigenous knowledge.
- Poor charting in the Arctic, especially in coastal waters will be a hindrance to any response where vessels must go inshore (e.g., cruise ship). The lack of safe anchorages may also hinder distribution of supplies and response equipment.
- Language barriers may inject uncertainty into the response, especially when outside responders come into local communities. This may also hinder the transfer of Indigenous knowledge across participating response entities,

- The scenarios focused on climate change impacts. The U.S. may have less “climate literacy” with respect to the Arctic than their Polar allies. Climate literacy should be stressed more fully in training of U.S. agencies and forces (e.g., U.S. Coast Guard) who may be deployed in Arctic crises, especially in the North Atlantic Arctic. The need for incorporating this literacy could be written into Arctic international agreements.
- Recovery in the short and especially the long-term is often not stressed in response. This must change as effective recovery can best be accomplished when response planning accommodates the needs for recovery early in the crises. This lesson has been learned in numerous U.S. disaster responses (e.g., hurricanes).
- Long and short-term resilience to climate change must be incorporated into preparedness in the Arctic.
- Communications north of 65° are very limited and must be improved to handle crises in the North Atlantic and other Arctic areas. Special emphasis needs to be on local communications, which is currently reliant on radios and internet (i.e., Facebook).
- Arctic planning/response kits are under development and should be deployed strategically throughout the region.
- Tracking people and resources is very challenging in the Arctic and the TTX crises made that clear. Methods of tracking should be further developed and codified in protocols and agreements among Arctic partners.
- A workforce must be developed that understands the challenges of Arctic responses including: sensitivities to and respect for Indigenous Peoples and their culture and knowledge, and the difficulties posed by weather, vast distances, and limited resources (e.g., equipment, infrastructure).
- Currently, there are no international agreements with respect to public health crises in the Arctic. Discussions are starting under Norway’s Arctic Council leadership, of an ‘All Hazardous Framework’ including international mass casualties and public health. The NAACW workshop highlighted the importance of these efforts.
- The participants acknowledged that the challenges of responding to simultaneous (multiple) crises in the North Atlantic Arctic could be more problematic than this workshop considered. The Arctic nations and Indigenous Peoples should explore the ramification and likelihood of climate-driven incidents. The role of national, international and Indigenous sovereignty in multiple responses should be considered to avoid misunderstandings and conflict during response.

X. Overarching Themes

The participants agree that 12 themes apply to crises in the North Atlantic Arctic.

1. Equitable collaboration with Indigenous People and Indigenous knowledge holders. Including respect for data sovereignty.
2. Strategic communications/perceptions (e.g., information visualization, social media, phone apps).
3. Data Collection, management, security, classification/de-classification, visualization, sharing, and delivery with consultations as appropriate.

4. Coordination to determine sharing or additional resources requests and unified messaging (e.g., daily calls, a multi-national communication/logistics coordination effort).
5. Diplomatic and political pressures and effects on the incident priorities.
6. Gaps in Public Health Response and Recovery (prioritizing water).
7. U.S. should address overwhelming Arctic logistic challenges, timeline and phasing. Tyranny of distance. Logistically supporting responders and response. Localized and expeditionary.
8. Framework, similar to SAR, for managing maritime evacuation response (e.g., human casualties, evacuation, dislocation, accountability) in the Arctic.
9. Respect for the sovereignty of individual nations. Respecting the rights of Indigenous Peoples and places when responding to events.
10. When addressing complex, concurrent events in the Arctic, the potential for cascading effects exists which makes the challenge greater and the response more difficult.
11. Sufficient and resilient maritime and terrestrial infrastructure (e.g. water, sanitation, charts, maritime access). Respond and adapt to both shocks and stressors.
12. Resourcing the preparation and education of U.S. personnel for emergency response working with, by, and for Indigenous Communities in the North. Building a workforce (through the Ted Stevens Center for Arctic Security (TSC) and the U.S. Coast Guard Center for Arctic Security and Policy (CASP)) that understands the unique issues and conditions in the North.

The Steering Committee, in its post-workshop meeting noted that:

- The looming potential for a conflict with Russia and China in the Arctic and strategic competition was not fully appreciated. These adversaries could exploit the tendency of the U.S. and its allies to de-escalate in these kinds of situations.
- Multinational approaches, especially those that blend culture, and Indigenous and military activity require a unified front and careful management and pre-planning.
- Exercises are needed that emphasize planning and preparedness for a variety of possible climate change related crises that go “deeper” into challenges and levels of security needed.
- There needs to be better integration of Western science and Indigenous knowledge as part of the planning process so that these perspectives can be incorporated as seamlessly as possible into crisis response, resilience, and recovery.
- Other players should be brought into these discussions (e.g., Greenlandic Indigenous Peoples, Icelandic representatives).

XI. Path Forward

The following conclusions were drawn and actions recommended:

- Continue to build and foster strategic partnerships regarding crisis response among all entities (including local communities) and promote information sharing.
- This workshop is a “beginning”. Future activities should focus on sharing expertise and lessons learned. There is a need to think ahead in small steps to tackle these large challenges.
- A primer is needed (e.g., extension of the Inuit Circumpolar Handbook) on each nation’s protocols and policies with respect to interactions with Indigenous Peoples.
- Collaboration among Arctic entities and understanding for, and respect of, all parties’ perspectives is essential for successful cooperation in response, resilience, and recovery.
- While financial limitations are often the first challenge highlighted in these scenarios, this must not be allowed to stymie the discussion. There will always be a struggle for resources, and gaps and turnover in personnel. These challenges must be recognized as “Arctic realities” and addressed in planning and preparedness.

In all actions to address North Atlantic Arctic Crises, the guideposts are:

- No one nation can tackle this level of crises alone.
- Indigenous Peoples must be a part of all planning, preparedness, response, resilience, and recovery solutions.
- Trust among all parties is the first step in success, followed by sharing knowledge with an emphasis on transparency.

XII. Appendix

- A. Agenda
- B. Participants
- C. Presentations
- D. Maps for TTX
- E. Notes from Breakout Groups & Plenary
- F. TTX Design Materials
- G. Legal-Policy Guidelines



**North Atlantic Arctic Crisis Workshop,
12-13 December 2023**

Appendix A: Agenda





North Atlantic Arctic Crisis Workshop, 12-13 December 2023

Strafford Room, Memorial Union Building, University of New Hampshire

Agenda

Day 1 (Tuesday):

0800 Doors open & Registration

0900 Introductions/Administrative Remarks – *Nancy Kinner, CRRC/CSE, Facilitator*

0930 Welcome Address - *Randy “Church” Kee, Ted Stevens Center for Arctic Studies*

1000 “The Coast Guard’s Practical Problem North of 66 degrees”, *RADM John Mauger, U.S. Coast Guard*

1020 *Break*

1040 Canadian/International Perspective - *Youssef Mani, Assistant Commissioner, Canadian Coast Guard*

1100 Industry Perspective - *Peter Garapick, Quark Expeditions (virtual)*

1120 “The Community’s Practical Problem”

Haliehana Stepetin, Ted Stevens Center for Arctic Studies

Morrie Lemen, Jr., Executive Director, Inupiat Community of the Arctic Slope (virtual)

Stephanie Nelson, Director of Emergency Management, Inupiat Community of the Arctic Slope (virtual)

1150 Introduction to Exercise I - *Terrence O’Sullivan, Program Director, UNH Homeland Security Studies*

1215 *Lunch*

1300 Introduction to Exercise II - *Terrence O’Sullivan*

1315 Breakout Group Discussion

1700 Participant Written Evaluation on Exercise

1730 Closing Remarks

1745 *Adjourn*

Day 2 (Wednesday):

0830 Doors open

0845 Administrative remarks

0900 Review of Exercise - *Terrence O'Sullivan*

1015 *Break*

1030 Breakout Group Discussion of Policy, Knowledge, Capability Gaps and Research Needs

1200 *Lunch*

1300 Breakout Reports

1400 Determination of (5) Priorities for Policy, Knowledge, Capability Gaps and Research Needs

1615 Path Forward

1645 Closing Remarks

1700 *Adjourn*

Objectives:

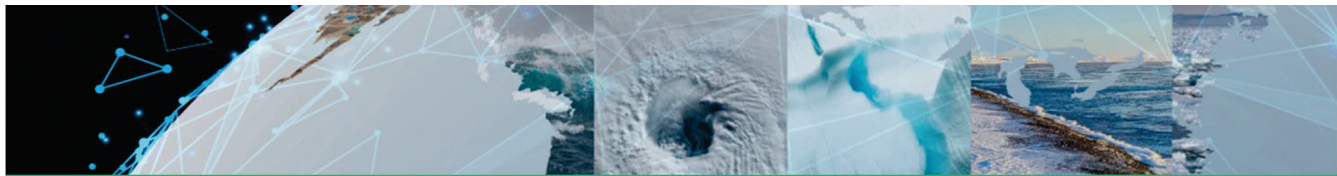
- Enable dialogue to advance the understanding of crisis response in the North Atlantic Arctic as an element of security in strategic competition.
- Strengthen networks for mutually supportive research and collaboration across the U.S. interagency, Allies, and Indigenous Peoples.
- Identify policy gaps in U.S. authorities and international agreements to respond to a crisis in the North Atlantic Arctic
- Identify the knowledge gaps, capability gaps, and capacity shortfalls to respond to a crisis in the North Atlantic Arctic
- Identify questions for future (TSC/U.S. DOD) research



**North Atlantic Arctic Crisis Workshop,
12-13 December 2023**

Appendix B: Participants





North Atlantic Arctic Crisis Workshop, 12-13 December 2023

Strafford Room, Memorial Union Building, University of New Hampshire

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**North Atlantic Arctic Crisis Workshop,
12-13 December 2023**

Appendix C: Presentations



North Atlantic Arctic Crisis Workshop

12-13 December 2023

ICE-PPR Communications Workshop

14-15 December 2023

Welcome



Safety and Logistics

- Exits
- Gathering Area
- Restrooms
- Food
- Questions: see Kathy Mandsager

Notebooks

- 1st Tab: Agenda and Bio
- 2nd Tab: Participants
- 3rd Tab: Scenario and Maps
- 4th Tab: Legal and Policy Guidance

Agenda: Tuesday Morning

Day 1 (Tuesday):

- 0800 Doors open & Registration
- 0900 Introductions/Administrative Remarks – *Nancy Kinner, CRRRC/CSE, Facilitator*
- 0930 Welcome Address - *Randy “Church” Kee, Ted Stevens Center for Arctic Studies*
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- 1020 *Break*
- 1040 Canadian/International Perspective - *Youssef Mani, Assistant Commissioner, Canadian Coast Guard*
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- 1120 “The Community’s Practical Problem”
Haliehana Stepetin, Ted Stevens Center for Arctic Studies
Morrie Lemen, Jr., Executive Director, Inupiat Community of the Arctic Slope (virtual)
Stephanie Nelson, Director of Emergency Management, Inupiat Community of the Arctic Slope (virtual)
- 1150 Introduction to Exercise I - *Terrence O’Sullivan, Program Director, UNH Homeland Security Studies*
- 1215 *Lunch*

Agenda: Tuesday Afternoon

1300 Introduction to Exercise II - *Terrence O'Sullivan*

1315 Breakout Group Discussion

1700 Participant Written Evaluation on Exercise

1730 Closing Remarks

1745 *Adjourn*

Day 2 (Wednesday):

Agenda: Wednesday

0830 Doors open

0845 Administrative remarks

0900 Review of Exercise - *Terrence O'Sullivan*

1015 *Break*

1030 Breakout Group Discussion of Policy, Knowledge, Capability Gaps and Research Needs

1200 *Lunch*

1300 Breakout Reports

1400 Determination of (5) Priorities for Policy, Knowledge, Capability Gaps and Research Needs

1615 Path Forward

1645 Closing Remarks

1700 *Adjourn*

Objectives

- Enable dialogue to advance the understanding of crisis response in the North Atlantic Arctic as an element of security in strategic competition.
- Strengthen networks for mutually supportive research and collaboration across the U.S. interagency, Allies, and Indigenous Peoples.
- Identify policy gaps in U.S. authorities and international agreements to respond to a crisis in the North Atlantic Arctic
- Identify the knowledge gaps, capability gaps, and capacity shortfalls to respond to a crisis in the North Atlantic Arctic
- Identify questions for future (TSC/U.S. DOD) research

Participant Introductions

- Name
- Affiliation
- Arctic Focus

Maritime Incident Response: Arctic Region – Canadian Coast Guard

Youssef Mani, Assistant Commissioner, Arctic Region

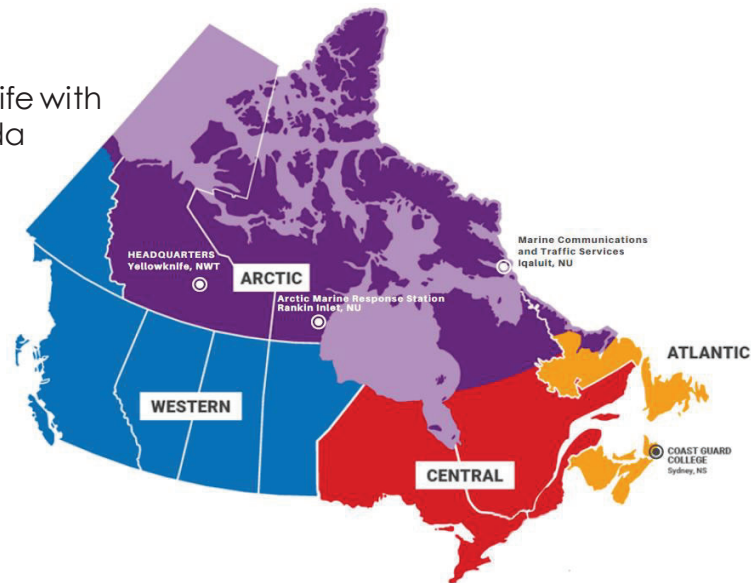
North Atlantic Crisis Workshop, ICE-PPR Communications Workshop,
Ted Stevens Center

December 12 - 15, 2023



Canadian Coast Guard (CCG)

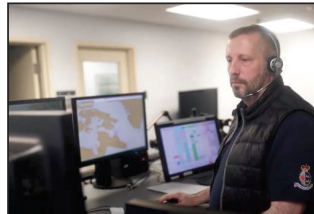
- As Canada's civilian fleet operator, CCG has been providing key maritime programs & services to Canadians & mariners for over 60 years
- CCG Arctic Region is headquartered in Yellowknife with offices in Hay River & Iqaluit, & staff across Canada
- Arctic Region was announced in 2018
- Extensive internal & external engagement:
 - Inuit, First Nations, & Métis governments & organizations;
 - Provincial & territorial governments;
 - Industry, & other stakeholders
- Completion of responsibilities transfer in April 2021



Our Programs & Services



Maritime Search & Rescue (SAR)



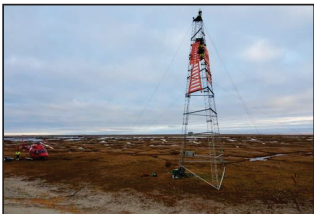
Marine Communications & Traffic Services



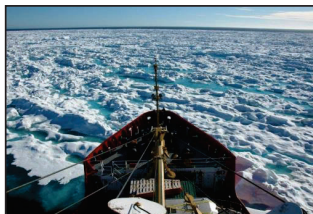
Marine Environmental & Hazards Response (MEHR)



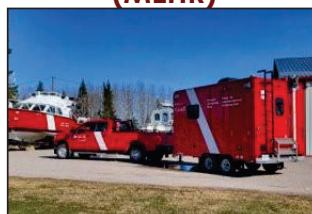
Compliance & Enforcement (C&E)



Aids to Navigation & Waterways Management



Maritime Security



Incident Management (IM)



Icebreaking Operations & Escort

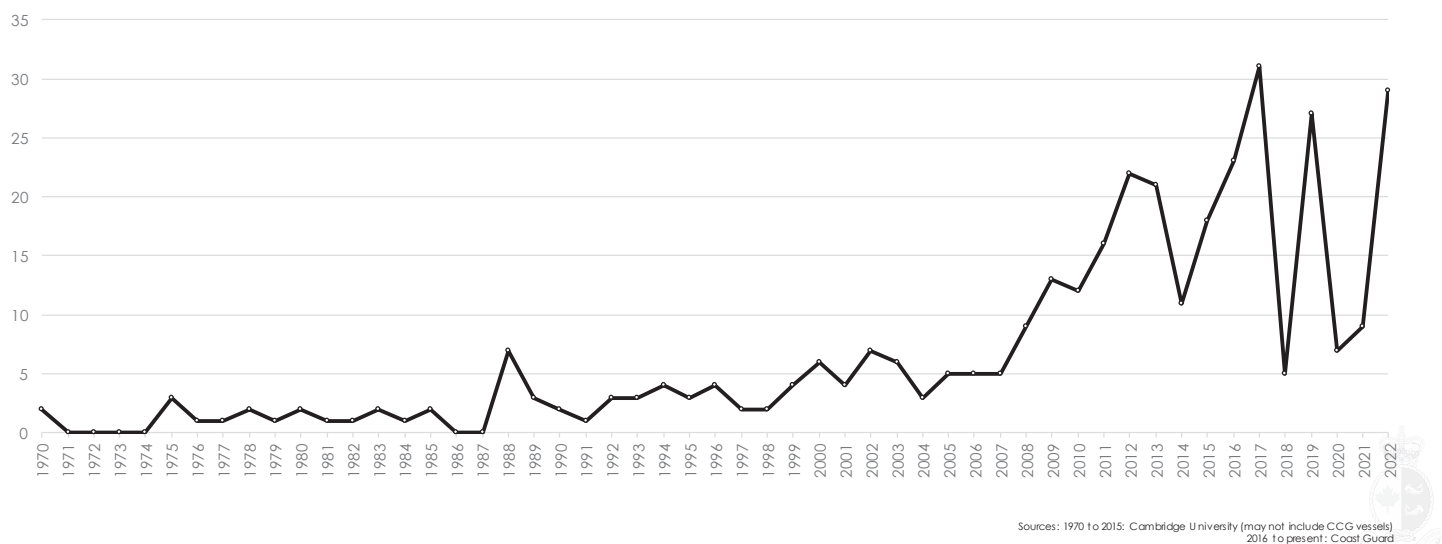
Arctic Region's Operating Context

- Disproportionate impact of climate change on Arctic – increased extreme weather events
- Reduction & thinning of sea-ice – increased unpredictability of sea-ice thickness & movement
- Increased access to Arctic – remote, ecologically & culturally sensitive areas
- Increased vessel traffic & new users – particularly from tourism & natural resource projects
- Changing risk landscape for navigation
- Lack of local response capacity, charting, connectivity, & infrastructure



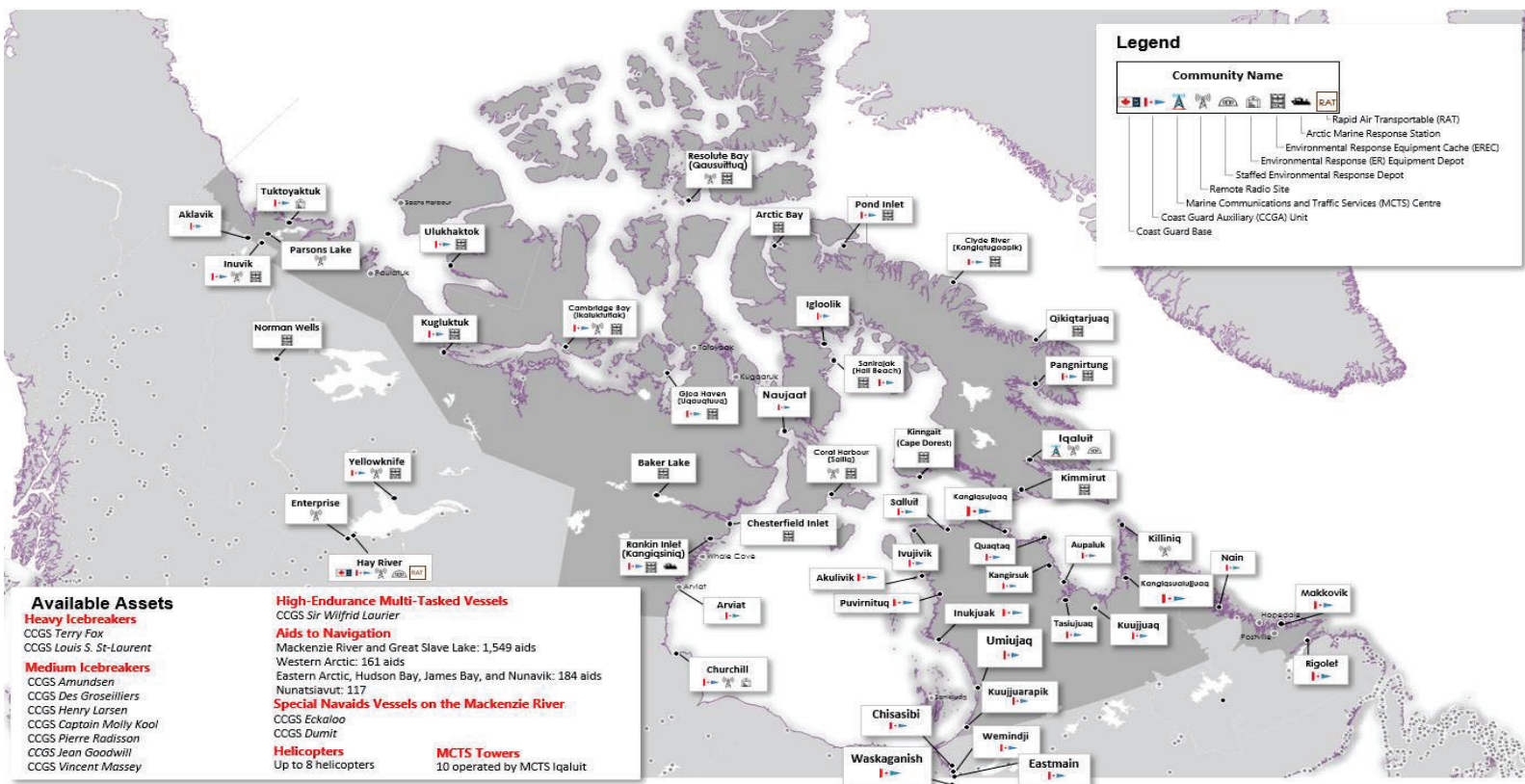
Shipping Trends – Northwest Passage Transits

Number of Northwest Passage Transits



Sources: 1970 to 2015: Cambridge University (may not include CCG vessels)
2016 to present: Coast Guard

CCG Arctic Region Available Assets Map 2023



Incident Response – Collaboration & Cooperation

- Undertake joint exercising with key partners to enhance interoperability – both domestic & international
- Collaborate with international partners & allies – implement international agreements (e.g., Arctic SAR Agreement, *Joint Marine Spills Contingency Plan*)
- Enhance local incident response capacity
- Engage with Inuit, First Nations, & Métis governments, organizations, & communities
- Increase size of CCG's Northern workforce & implement Oceans Protection Plan Renewal programs



Oceans Protection Plan Renewal

- 2016: OPP announced \$1.5 billion to invest in protection of Canadian coastlines & waterways
 - 2022: **\$2.0 billion over 9 years announced** to renew & expand upon first phase
 - Arctic Region capability & program enhancements:
 - 29 new Arctic Community Equipment Caches (MEHR)
 - Establishment of Coastal Marine Response Teams (MEHR)
 - Integrated Marine Response Planning (MEHR)
 - Hazardous & Noxious Substance program (MEHR)
 - Vessels of Concern (MEHR)
 - Expansion of Arctic Marine Response Station (SAR)
 - Canadian Coast Guard Auxiliary Renewal (SAR)
 - Indigenous Community Boat Volunteer Program (SAR)
 - Indigenous Search & Rescue (SAR)
 - Risk-Based Analysis of Maritime SAR (SAR)
 - Communication Portal for Integrated Incident Response (IM)
 - Marine Training Program – Indigenous Participation & Training
-



Thank you (English) | Merci (French)

Mársı (Denesuline) | Nakurmiik (Inuktitut) | Meegwetch (Cree)

Mársı (Dëne Sųłıné Yatıé) | Hąı' (Dinjii Zhu' Ginjik)

Máhsi (Sahtúot'ıne Yatı) | Máhsi (Dene Zhatıé) | Máhsi (Tıçhı Yatı)

Quanaq (Inuinnaqtun) | Quyanainni (Inuvialuktun)

Kinanāskomitin (Nēhiyawēwin) | Nakummek (Inuttitut)

Quanaq (Inuktitut) | Matna (Inuktitut) | Qujjanamiik (Inuktitut)



**SAFETY
FIRST,
SERVICE
ALWAYS.**

Indigenous Peoples Contribution to Arctic Security

Dr. Haliehana Stepetin

UNCLASSIFIED

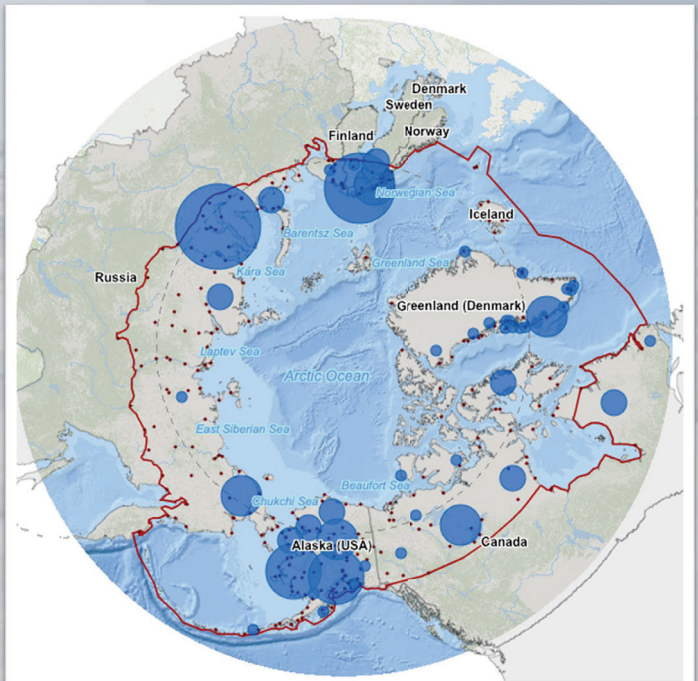


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Indigenous Peoples of The Arctic

- The lands and waters of the Arctic are home to many Indigenous Peoples, as recorded by the Arctic Monitoring and Assessment Programme (AMAP).
- Indigenous homelands provide everything needed to survive and thrive in the Arctic.
- Map showing the Indigenous Arctic population distribution:
 - Arctic areas by region
 - (blue circles)
 - Arctic boundary
 - (red borders)
 - Sources: [AMAP](#), [Natural Earth](#).

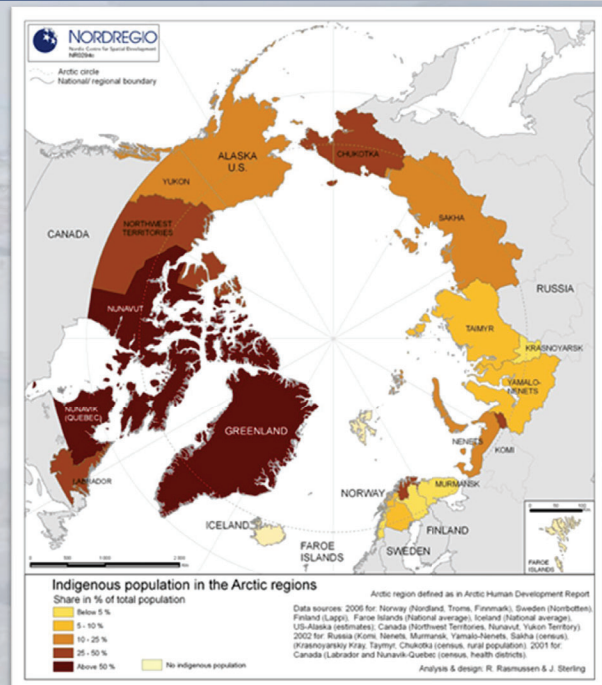


Arctic Indigenous Peoples

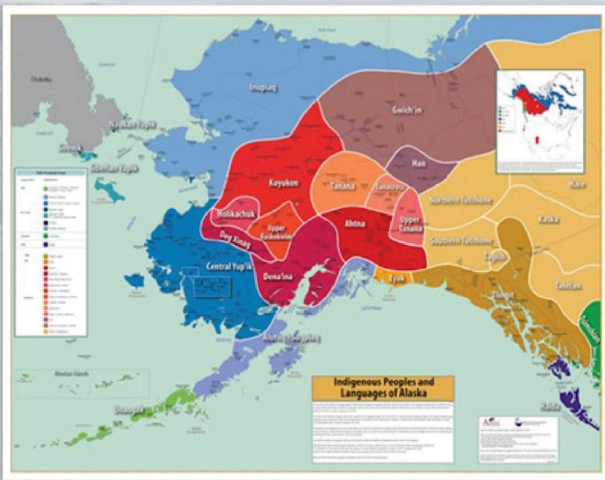
• Indigenous Peoples

- In and of the Arctic for thousands of years
- 40 different ethnic groups, hundreds of languages
- Diverse environments, diverse cultures
- Estimated to be about 10% of population living in the Arctic or 500,000 People
- Tribal territories and country borders might not align

Source: <https://archive.nordregio.se/en/Maps/01-Population-and-demography/Indigenous-population-in-the-Arctic-regions/index.html>



Indigenous Peoples – North America



Alaska



Canada

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Expansive Language Families

- North American Arctic:
Circumpolar Arctic Indigenous
Language Family
- Inuit, Yup'ik, Unangaĕ
- Shared Cultural Values
- Shared security interests/threats



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Inuit Nunaat (Inuit Circumpolar Council map)



The Ted Stevens Center for Arctic Security Studies...meeting the challenge through networks and solutions

Kalaallit Nunaat, Inuit (Greenland)

- 88% of 56,000 residents are Inuit, under Danish Kingdom (do not have sovereignty like North American Indigenous nations)
- Greenland self-government since 1979
- 3 major groups of Kalaallit
- Inuit is official language, Danish is also spoken
- Economy: subsistence hunting, commercial fishing, tourism, energy development



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Security Threats

- Food security
- Housing security
- Infrastructure
- Communications
- Climate security:
 - erosion, flooding, increased frequency in extreme weather events, relocation, invasive species, changes in returns/migrations of animals, unpredictable ice flows (affects walrus, whales, hunting), international risks
- Water security
- Numerous human security threats

The Ted Stevens Center for Arctic Security Studies...meeting the challenge through networks and solutions

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Unique Challenges faced by Arctic Indigenous Peoples

- Loss of sea ice and rapid warming in the Arctic and implications for Indigenous communities
- Disruptions to usual and accustomed returns and migrations of animals and plants: food insecurity and food sovereignty
- Threats to Indigenous homelands due to rising sea levels, changes in foodways, and security challenges from melting sea ice
- Impact of larger and more frequent weather events on Indigenous places, coasts, waterways, infrastructure, connectivity

The Ted Stevens Center for Arctic Security Studies...meeting the challenge through networks and solutions

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Questions and Discussion

The Ted Stevens Center for Arctic Security Studies...meeting the challenge through networks and solutions

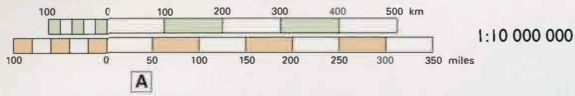




**North Atlantic Arctic Crisis Workshop,
12-13 December 2023**

Appendix D: Maps





Projection: Conic with two standard parallels

West from Greenwich

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ARCTIC REGION







**North Atlantic Arctic Crisis Workshop,
12-13 December 2023**

Appendix E: Breakout Group Discussion Notes



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Baffin Island Disaster - Group A

What are the priorities?	How will we respond?	What are the limitations for the response?	What resources will be available?	Additional Notes
<p>Two bins: short term crisis (missing people) and long term issues (infrastructure). Human security. Water supply (trucks delivering water). Less capacity to deal with health issues and higher risk for disease, with possibility to attract predators. Ability to locate students (FEAR to get approved and proper documentation, maritime incident the Maritime Emergency Response Protocol), gather partners at the table to determine leaders and resources. Leverage canadian rangers located in the communities (option but first search and rescue from the Coast Guard will go first). Bring supplies from barricades. Challenging to get fuel, are the fuel tankers okay or not? They are going to run out of water, the dump will impact drinking water supply. Someone will be going after the kayak teams (rescuers know where to go through). Electricity (internet will be down, phone signals are weak, IT capabilities are limited). Impact on the community will be medical support. They have a heated location for the 20 kayakers, but do they have the capacity to handle the emergency from a medical standpoint? In this case medivac will need to be considered (where can the chopper land?). They are not supposed to have an EAS, you are going through the north, we cannot oblige you to have an EAS. If they have something like a GPS or satellite connection to locate them. Locals know the currents and how the ice will move for a rescue (know how to access the beach thee). A lot of locals have VHF radio, or an in-range (newer technologies). Inuit knowledge is critical be they are observing the situation. Assume the path was charted out by the professor. VHF towers cover 40 nautical miles which covers more than what we need here, therefore we should be able to locate them. Notify community to not drink water (use Facebook). Ensure proper services and basic needs are being met long term. Translator is imperative.</p>	<p>Community will reach out to auxiliary to initiate a search and rescue mission and call GSRCC (all countries have access to this data base). Whoever is closest will respond to increase chance of saving life (should not infringe on sovereignty). Pull on agreements already in place for response. Cleanup efforts in the short term, need to be mindful of longterm recovery. Long term need to relocate dumps or provide disposal infrastructure. Longterm: Barges to cleanup trash, bigger picture infrastructure problems. If air help can't land, then maritime resources will help. Primetime for cruise industry, personal yachts or sailboats may be in the area (prime location). Be careful with request for assistance, Greenland will have to prioritize their own turf. Triage. Use coast gaurd ice breaker for emergency fuel and then bring a tanker to refill supplies. Prioritize the fuel resupply (incorporated city through federal funding). Emergency central setup, there is a connection with the people in Iqaluit (there is no way they can handle the medical crisis alone - necessary to call for support). Different departments involved in remediation and post recovery. There will be a connection to the federal government through a request for assistance.</p>	<p>Weather limitations. 36 hours to get an icebreaker to the kayakers. 1-2 Community boats that can only take 4-5 students each (meaing 10 students cannot board). Kayakers are going to be in a shallower area in less they get pulled out by currents. Immediate water crisis, need to get resources to communities. Exceeding medical facility capacities. Small community which rationalizes not funding. Expensive to do infrastrucutre updates. Overcrowded housing encourages the spread of viruses. Longterm resolution of water crisis (can't keep shipping water). Based on the season there may be fuel shortages (if we are in the summer time there may be a fuel shortage when the tanker has not come through). Adventurers may stop by and borrow fuel and deplete supplies. Being reactive rather than proactive. Possibility for boiling water, but not realistic for 1,000 people or community size distribution.</p>	<p>Who is in the area at that time? Local inuit for locational and resource information. Kayakers having an inreach or spot to be located with. Air assets to bring water resources from Ottawa (quick turnover). There is a limited air strip, which would then require helicopter or barge to deliver resources. Possibility to have filtration units (reverse osmosis? - saline brine must be dealt with). There is a health center there, but medivac will be important. Gut problems from the dumps may overwhelm the medical centers. Iqaluit is not the preferred location. The canadian military will be able to dispatch professionals to support the gastrointestinal outbreaks and provide medical attention. Redcross would be activated. What do we need: longterm solution for the water (short term - portable filtrations and delivering water supplies), new water treatment plant (human right, protected under the UN). Icelandic coast guard have medical services but also hook up and support the town for power needs. Norway has a similar setup. Medical facilities and runways at Iqaluit.</p>	<p>Assume smoke does not get delivered to Baffin Island (interference of tree line). Concern for no further action beyond an immediate response (need for a full recovery). Impactful relationship between Inuit people and federal government due to previous relocation efforts (tough part of the history that needs to be addressed). 1,500-2,000 people population in Pond Inlet (daily flights, some fishing, mining, federal government and territorial government, grocery stores). Pang years ago had a power plant go down so flew a powerplant from Iqaluit to Pang. Iqaluit 8,000-9,000 population with bigger hospitals (based on scenario it may be at capacity). Water comes from the river or under the ice and add chlorine at Pond Inlet and trucks distribute the water (one for clean and one for sewage).</p>

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Cruise Ship Rescue - Group B

What are the priorities?	How will we respond?	What are the limitations for the response?	What resources will be available?	Additional Notes
<p>Save as many lives as possible. Moving people to Iceland. Establishing who could monitor a spill response to localize the impact and monitor the situation (onsite situational awareness).</p>	<p>Follow the IAMSAR.</p>	<p>Information flow. You can only have situational awareness if people are on scene and safe. Inter-operability between a company who wants to make money from tourism and the government who is supposed to represent the people. Maintaining and updating the common operational picture. Everything requires a body or two on shift work. The systems required to maintain a common operating picture requires humans which are a finite resource. Time zone challenges.</p>	<p>Vessel of opportunity (fishing vessel, cruise ship). MOSPA.</p>	<p>The ship is minor in size. The landing strip closest to this can take 37 aircraft. Can use assets from Iceland. Similar situation this year in August with the National Park. It took 4 days for the assets to arrive. Reacted more calmly as it was merely a ship stuck on the ground. No leaks or health hazards. USCG lens of an emergency sometimes differs from the lens of others. Difference in how we approach things.</p>
	<p>Establishing incident on scene command. On scene environmental response. Organizing on scene medical response as second priority. Chances are 50/50 for having Danish ship in the area. The minute you put out gear, you are collecting oil. Need a place to store it. Would rather go on scene and monitor to figure out what we would need to do once we are ready. Do not want to oil gear we cannot recover. Source control is principle. What is the government's response and company's response. Understand level of stability of the slopes. Health concerns with uninhabitable shorelines. Assuming the celebrity aspect would not impact the response because they are just another human we are trying to rescue. The congress people on the ship would be an administrative burden. A lot more briefings. The US would have more information requests and there would be more media interest. We could help with that as the US government connecting with the Danish government. Minimize the constant need for information. The operator can shut the wifi off on the ship. The law says that environmental response that cannot be handled locally will be handled by the kingdom. Likely a kingdom level incident. Resources would be provided by Denmark, Iceland, cruise operators. Not sure if the kingdom would call upon NOAA/the US for scientific support. NOAA, USCG, and the Navy often get called into large international spills. Not sure this is large enough. If there were particular needs, there would be a process for a request for assistance. It depends on the scale. The salvage to get the oil off the ship would be a key priority. Even if the hull failed, it would be unlikely that it would be a massive spill.</p>	<p>Sustaining safely the responders and managing them. Trying to minimize the amount of administration burden. The largest limitation is the flow of information either in the command center and external players. Will try to push a lason but they will have to travel a long ways to get there. All that will do is fuel the information tsunami. When the oil spill in Russia happened, the US offered support but Russia said they did not want the help. It was a domestic issue. In this case, we are close to Iceland so it is international. If there were no congress people on, we would still call an offer. Sending out responders on site to ensure situational awareness and a common operational picture that benefits everyone, would need to send out vessels. Salvaging the vessel would be a limitation but the company would respond to that. Ability to get everyone off the vessel and to safety. Situational awareness of where the survivors/rescued bodies are. Most cruise ship operators use paper and pencil to track you. Some use bracelets that can be used to do a recall. Off the coast of Norway, they did not have a way to read the bands. How do we account for where the people are located. You can only have situational awareness if people are on scene and safe. Inter-operability between a company who wants to make money from tourism and the government who is supposed to represent the people. Maintaining and updating the common operational picture. Everything requires a body or two on shift work. The systems required to maintain a common operating picture requires humans which are a finite resource. Time zone challenges. The water is so cold, dealing with the fuel will be challenging. There has been research on using dispersants in cold water. There are certain scenarios where that would work, but that close to the shoreline you would not use dispersants. In situ burning requires more equipment and fire control. Concerns with shoreline impacts. In situ burns require a certain thickness and no emulsifications. Would have to do it quickly which would collide with the lives first priority.</p>	<p>Might be a Danish vessel in the area. Within 72 hours, a vessel of opportunity (fishing vessel, several cruise ships). In June the seas are okay to traverse. Bi-lateral agreement with Iceland. When there are no issues at hand there is very free movement. During a previous incident Iceland moved one of their cutters to be ready in case they needed it. Would the kingdom ask for assistance from allies for spill response? Yes, either having Icelandic equipment or international equipment flown to Iceland would be ideal. The Arctic also has the MOSPA. Proximity is a big thing especially with equipment. It is hard to bring equipment from far distances. Does the US have a bi-lateral agreement on environmental response with Denmark? This falls in the MOSPA. The bi-lateral agreements with Canada and Mexico have only been used a couple of times. I do not know that the Arctic agreement has actually been used in practice. On the spill side, they require a request for assistance and funding. If help with funding is needed, another country can step in. We typically bring expertise and knowledge. Looking at the RP in the pollutor pays system. The decision to offer is a gut call. There needs to be a go/no go on when to activate these international agreements. The power of the personal relationship to serve as a catalyst is important. If this happened in AK and there were Danish celebrities, would this also be the case? Unlikely that JCO would be a part of it.</p>	
<p>Save as many lives as possible. Then look at material loss and environmental loss. Long term impacts might be there but first priority is to save as many lives as possible. Take assets drawn from continental Denmark. There are 2 populated places on the east side of Greenland. Infrastructure/healthcare will not match these needs. No major surgery will take place there. Tasiilaq has 2,500 inhabitants. Iceland has several major settlements. Get people across to Iceland where there is better healthcare and it is closer. JCO response force and applying additional assets. In some cases it is better to stick to what we have up and running rather than setting up a new incident command location. It is second nature to assign an on scene commander from a SAR response standpoint. You can have a vessel out there that is self sustaining to focus on the spill. With larger cruise operators the company would have a level of involvement. Not sure about the small companies. A project through EPRR was completed where small cruise operators are now carrying spill response kits. They are supposed to have a SAR plan of cooperation in place. It should be pretty seamless. The smaller operators are likely an AECO member who are responsible. Well connected to where the ships are every day and in touch with ships nearby hours away. Need a cruise ship to rescue a cruise ship. They would have a ship of reasonable size with medical crew.</p>				<p>US asking to declare emergency in Greenland. You would call the people who generated this and asking leadership to hold back. Then doing damage control. In practicality this does not mean a lot. It does not change the fact that we will continue to offer assistance. Continue to follow the agreements. First thing, call JCO counterparts and apologize. Explain that you need quicker updates. It adds a layer of complexity and you will need to assign a few people on this. More people would need to be briefed. Briefing on what is actually happening and the agreements in place. What if the US tells Denmark that we really think this should happen. How would the kingdom respond? Cannot recall any declarations of emergency in Denmark. It is unusual. Cannot recall and times a foreign power declared an emergency in Denmark. Would still have to get clearance. Would have to rapidly deploy a fix-it team. If you declared an emergency everytime these conditions occurred, there would be a constant emergency. Would not do anything different in terms of handling response but would have differences in the administration part. When a crisis happens, sometimes inexperienced leadership makes people make decisions like this because they feel compelled to do something. It would complicate matters tremendously in Denmark. Domestically it would be an even bigger problem than for the US. The chance of us doing something like this would be small but it could happen if someone young is making the decision.</p>

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Svalbard Undersea Cable Threat - Group C

What are the priorities?	How will we respond?	What are the limitations for the response?	What resources will be available?	Additional Notes
<p>Generally maintain the communications that the cable is providing via the integrity of the cable, alternative means, etc. Identify the critical information that is being passed through the cable that would need to be protected in the event that the cable is being monitored. What resources and capabilities do we have to identify the protection of the asset and manage/mitigate any damage. Identify the extend of impacts of the compromise (targets) and use that to guide operations. Attribution is key. With the complexity of an event (overlap) there will be competition and operations. Need to have multiple communication plans in place that do not rely on a cables (utilizing technologies like StarLink). Using other assets for transmitting data in a timely, secure manner. Current ships utilize Star Link/Star Sheild so that could be used to keep transmission open. Will alternatives (StarLink) satisfy the data volumes that the cable currently uses. May not recover entire capacity but will provide a buffer. Data in question needs to be prioritized to determine which will get reduncency and which is not as essential. Diversity of coms/redundancy. Prioritize data for what will get transported through an alternative means. This area is sensitive for operations, how will shadowing/collections maintain without escalating the situation? Need to have a measured response to what is actually taking place. UCON will be the first responder-maintaining close relationship with naval allies. After inject-Attention to leadership at many levels down will be focused on human and environmental concerns.</p>	<p>Need to first identify why the cable is not responding. Classification of information will dictate the response. Coms/social media will be the first to reviece word. Have a message out to prevent the spread of false information, etc. OSD and strategic communicators coordinate messaging (don't place blame or directed response but coordinate message from top down). Assess the damage to the cable and what the malfunction is (knock out of power supply, integrity of the cable). Start an investigation for finding the cause (troubleshooting infrastructure). Assess the impacts of the hardware being down for whatelse needs to be communicated. Assess the cause of the com failure and then the options for recovery. Start primary and secondary alternative communication. Identifying these in parallel to. Assess what is wrong with the cable, how did it occur. Activate the contingency plans that have been established prior (possibly a gap). Assess what is wrong with the cable, how did it occur. Activate the contingency plans that have been established prior. Have plan for de-escalation and deter and future bad actions. If we have ISR to make presence known it could act as a deterance. Could utilize other assets for monitoring/increase deterance. Have additional resources (go from covert to overt). Deterance without escalation (top down response).</p>	<p>Time and resources. The political limitations and ramafications that drive response. Are there contingency response readily available to execute. Are those relationships established and ready to be used. If they have not been done before/are in reserve, this could be a limitation. Use of alternative coms (StarLink) could be limited in access in area. Weather and environmental contrans (we don't know when it will turn bad). Weather is unpredictable, there will be considerations for how response will be adapted to the area. Communications with first responders. Distance and Arctic capability of Navy fleet. Competition for resources for maretime response having to be divided. Attention of leadership and public will focus on human and environmental (good and bad, gives time to organize response but pulls resources elsewhere). Limited critical assets/resources (fuel). Need coordination of resources/limitations. Is there an existing security/policy protocol for US in non-US waters for info sharing. Planned and contracted redundacies capatibiles. Events in Greenland will take priority over this issue (good/bad).</p>	<p>Resources will extend beyond what is available by US (we don't have all the resources to throw into the Arctic). NATO countries assets, Nortic allies. Patrol capabilities. Other rescue assets: fishing vessels (go out in sister pairs), commercial assets (utilize with a way to mass communicate). The owner of the cable is an interested party to help plan response and conduct assessment of the cable (equipment failure, security, and plan for alterantives). Information sharing agreement between Norway and the US.</p>	

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West Coast of Greenland Disaster - Group D

What are the priorities?	How will we respond?	What are the limitations for the response?	What resources will be available?
<p>Priorities list (non linear)</p> <p>1.Safety of life</p> <p>oFood, Water, Shelter, Medical Care</p> <p>2.Transportation Communication o(Possible) (Redundancy)</p> <p>3.Environmental o(Sewage)</p> <p>4.Sustainable logistics (Communities and Responders)</p> <p>5.Infrastructure (Evacuation and Communications)</p> <p>oBridges, Roads, docks, And Water treatment</p> <p>6.Possible search and Rescue</p> <p>7.OP national security (priority for US military)</p>	<ul style="list-style-type: none"> •Command and Control oArctic response will take control (defense forces) oNuuk will be center / established operations oSisimut oOr Pitufik (worst case) • Limitations •Very limited Consulate staff •USAID would be activated •Landing infrastructure (both sea and air) •Logistical support for responders (ie, bring your own) •Origin and time of delivery for supplies •Tracking of persons very difficult •Would have to be phased •Heavily scheduled •Is it pre sorted?(for villages) Is a logistical center necessary? •Iceland will be too little •Day, time, weather, TIMING oAffects what's available for shipping oIn relation to resupply •Icebergs 	<p>Limitations</p> <ul style="list-style-type: none"> •Very limited Consulate staff •USAID would be activated •Landing infrastructure (both sea and air) •Logistical support for responders (ie, bring your own) •Origin and time of delivery for supplies •Tracking of persons very difficult •Would have to be phased •Heavily scheduled •Is it pre sorted?(for villages) Is a logistical center necessary? •Iceland will be too little •Day, time, weather, TIMING Affects what's available for shipping In relation to resupply •Icebergs 	<p>International agreement Types:</p> <ul style="list-style-type: none"> •Mutual Aid between Canada and Denmark? •JRCC •USAID <p>From Iqaluit</p> <ul style="list-style-type: none"> •NATO would be first to ask •Danish could act as Command vessels •Availabilities Canada •4 or 5 of different sizes •Adventure yachts •Sailboat yahoos •Commercial deep sea •Can generate water •Five to 10 bulkers (taking out iron ore from the mine) <p>Iceland</p> <ul style="list-style-type: none"> •Too little (better off going to Svalbard) <p>Greenland</p> <ul style="list-style-type: none"> •More isolated communities can be self sustaining <p>Denmark</p> <ul style="list-style-type: none"> •Supplies would be sent by ship •Food, water, medical, warm clothes, tents •Denmark doesn't have as much resources

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Breakout Session 2 Group A

What will be the multi-incident coordination, command, and control?

How will you prioritize the needs for the different responses?

How are you going to address the ethical and political implications of the priorities?

<p>Central node for informational flow (multiple layers of planning and control). Greenland cruise ship and Baffin island can happen independently. Resource conflict and overlap through liaison officers. What can we give away and what do we need for our situation? Pulling from the same pool resources. Misinformation requires good PAOs. Multinational communication fusion center? NCC with liaison officers from each of these countries that is a communication path that exists. Work with allies and partners. Is there an arctic security council? Leave decisions to sovereign governments and feeding those needs into one interagency structure so that logistics group is looking at the demand rather than supply (not conducting operations just facilitating to logistical elements). Arctic early bird email - every monday. Arctic sar agreement (sar and security), what would be managing both these things at once? ucom (not a military event, what would be the civil authorities equivalent). Defense support for civil authorities - Arctic coast guard agreement is more about boundaries (denmark takes care of the cruise ship, etc). Kayak incident MERP responds (assigning roles and responsibilities). Unity of effort vs command and control (prevent chaos through decisions making). There is no arctic command and control center. Starts at sovereign level, then bilateral, then regional - within that framework what are the gaps?</p>	<p>Manage multiple incidents at once. Incidences possibly managed independently. Information gathering and awareness from a tactical level. SAR and security awareness allows for proper resource allocation. Create a decision making point that isn't currently governing a response like this (a signed document to come up with a decision for international decision making). Often is attributed to relationships (informal but under guides of Arctic Sars - but 75% personal relationship). Risk of not providing adequate service for their own people. If canadian ship is closer than US coast guard ship, it is irrelevant, most important to save lives. Prioritization may be based on who is closest and able to help? Who deals with the cut cable when lives are not at risk? Typically not US vessels in that area, probably talk to Norwegian allies. No real structure - hopes to codify further. Who will supply support and how? Are there protocols in place to help figure that out? Typically militaries are best equipped to respond. Resources exist but making sure we get access to them and get them in time (consider things like the duration of resource allocation). All scenarios are different enough that they are drawing on separate resources (overwhelmed due to limitations of planning staff).</p>	<p>Conversations between the Kingdom of Denmark and Greenland (addressing sensitivities). Reliance on systems and structures. An incident like that might overwhelm our allies and partners, important to reach out and make the offer to provide support. Kayakers are 20 US nationals which may apply pressure. A matter of the tripwires for the international SARs agreement. Shared information at the UNclass level -> a pathway to share information with Denmark is key. Arctic intelligence coordination group with the US, Norway, and Denmark.</p>
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<p>Key Points: Is this a solution looking for a problem? Not a matter of capability it is a matter of capacity. We tend to forget about the communities and focus on organizations rather than the reality of the locations. There is no panarctic C2 structure. Response can happen independently (some type of multinational communication - liaison officers from each country to act as a starting point for information). Strong emphasis on building relationships. Perception of need for areas like the Arctic when it may not be necessary.</p>	<p>Question from Church about how Denmark asks for help: Question Addressed by Johan: We frequently host exercises to gain arctic experiences. To train ourselves and cooperate with canadian or US forces. We would be willing to ask for resources. We would want to benefit from laying ground to those exercises. Our coordination with iceland is so good that if the grounding of the ship was a threat to life, iceland would reply much quick (1-2 days rather than 4 days). We are very willing to ask for assistance in those circumstances. Iceland infrastructure is so much better than Greenland. We frequently call in Iceland which is all based on good cooperation.</p>
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Discussion Portion

<p>Question from Steven Jensen: Need for a unified command or coordinating method? Imagine we had gone on for a couple more day and imagine we have 10 different instances and 10 more things in Greenland. Life safety is really an issue and resources are stretch. As you suggested earlier the Cruise ship is probably a very minor one because it engages a lot of ethical issues. High social media coverage but lower magnitude. Do resources go to Cruise ship bc it has a lot of attention? or to the people getting very sick? Who gets the resources and what sort of coordinating mechanism do we need?</p>	<p>Question from Philip: There is a big US effort to bolster the norwegians but I believe arctic council moves a little slow for this type of active response. I don't think the Arctic council will give you a lot of help.</p>	<p>Comment from Patrick: National sovereignty: In japan in 2011, takeaway is that there is a big open willingness to bring support in those early days bc it is so traumatic but after a few weeks when it was under control and then back off.</p>
<p>Response from Ben: That cruise ship is a small case even with media coverage. This becomes a public information endeavor and you have to get good timely information out. Recognize that you can't bring people back to life and you have to focus resources on where you can do the most good and just push out information.</p>	<p>Response from Bryan: Knowing people in the room is important. We need to understand their frameworks and structures. Canada is going to take care of Canadian aspects first and then allocate spare resources. Overseeing body to prioritize resources is not a reality.</p>	<p>Comment from Paul: Once a country goes to the US for help, there is a huge amount of resources. Earthquake relief in countless places. Once they energize US capabilities there is a huge amount of resources. Medical resources and teams to handle situations. Everything was greatly appreciated -> a matter of if you have those communications that someone can ask for help.</p>
<p>Response from Anthony : Timescale of these responses is important. The first 72 hours is what a sovereign nation can provide a short term response. How good are we at coming together for the what ifs? Months of repairs for the water treatment plants. The conversations of the sovereign nations need to be asking where can we get these longterm resources. In those first seventy two hours, Arctic is unique. You need to find, source, and move these supplies earlier. How well wired is our relationships on a personal level and organizational level? Strapcom is overlooked. Professional communication is key (need to be prioritized). 12 PAOs in the entire coast guard. Not a lot of expertise going towards that specialty.</p>	<p>Response from Ben: Arctic council is not fast but we are nimble. The Arctic SAR agreement is managed by Arctic council but now owned by the council. Scenarios today when beyond the Arctic SAR agreement. We don't need a justice league super level coordination center because it works pretty well right now. A lot is based on relationships. Encounters for forming relationships and building.</p>	<p>Comment from Youseff: There is a component there that has no answer right away. If we look at the inuit map it is the same people impacted by those scenarios that would happen in real life, we discussed what the government can do but not how the limits will reset and support. Like it or not they have a role to play. If these scenarios happen simultaneously what is the impact on the economy on the financial markets that will trigger different discussions? If the push comes from the market the government may react differently? I think we need to keep that in mind.</p>

Breakout Session 2 Group B

What will be the multi-incident coordination, command, and control?	How will you prioritize the needs for the different responses?	How are you going to address the ethical and political implications of the priorities?
<p>First Greenland goes to JCO for west coast scenarios. Canada takes care of Baffin Islands. Set up a military centralized unified command of experts in Nuuk, sometimes requested by municipalities. US and Denmark collaboration. Support from JBER. Getting the 20 kayakers rescued. Do we want one center that runs everything? You can have central coordination through unified command run by Denmark but separate groups for each incident. Who coordinates the local needs and what resources go to each place? Is it Greenland? U.S.? Combination of Greenland and US? It can be joint. Need to integrate tribal relations. The cruise ship is clearly outlined how to respond. Are we leaving Norway to fend for themselves to figure out the cable issue? Search and rescue for kayakers would be Canada. The cable would be separated but coordinated through centralized command. Greenland asks JCO. Canada wouldn't give all their resources to one incident. US would send resources. Lean on Iceland for the cruise ship incident. The centralized command would be more for coordination than decision making. Greenland is Europe command so there would be competing priorities in England. Coordinating call on a daily basis with each country involved. Has there been similar incidents in the past that required international help? How was it handled? There was an exercise for Arctic Light to get US support. Multi agency coordination daily call.</p>	<p>Canada and Denmark will fight over resources provided by US (such as ships). Some incidents are handled without US resources. Multi agency coordination call to help prioritize. The US will likely prioritize the space force base by getting resources there. Emergency procedures from the UK to help with this as well. Call on partners to supply the backup we need. All hands on deck, especially when life is at risk. How would you prioritize between Canada and Denmark? The leaders from those countries would say they need help on the calls and that is how we figure out who needs what support. The western part of Greenland had the most happen so they would need the most support. What if the US has 4 airplanes to provide and Canada and Denmark each want 4 airplanes? Saving lives would be the first criteria. It is basically who has the money stream. The US calling a national emergency for Greenland gets them the money. The kayakers are also lives at stake so that might not always be the case. It would be a bigger picture. Does it depend on who has the authority to release the resources? In 3 days resources can be sent. Whoever sets up this financial flow. If Denmark declines the US state of emergency request, would that impact the access to resources? It would slow down the access to resources. You would have to go a different route to get those resources. The whole world could respond to the emergency if it is declared a national emergency. Need to decide what you want. The US likes to be the superhero so Denmark could later say they need the support. At times of crisis we can be vulnerable to threats in the area like the Russian ships. We are incredibly vulnerable in times of crisis.</p>	<p>Going to struggle with social media. It will drive political pressure and criticism of actions taken. Even if local, regional, tribal parties do not have resources to provide, it is important to still keep them informed. Maybe we do this daily call but how are we going to handle the media, because we can't keep up anymore. It is also a language a lot of people do not understand. Speak frankly, directly, honestly. Social media is a gap. No structure to deal with that but you could set up a messaging structure. That is where we might bring in other organizations to make sure we are meeting with the right outlets. Having sub groups handling the messaging, politicians, etc. The Arctic nature of this means critical resources need to be managed. Does it make sense to have all the issues addressed in one thing or have the lead country address the issue they are dealing with. You could be slowing things down with that much coordination and overhead. Communication will be hard. How do you do that timely? Maybe it is someone at the offices running this coordination. Instead of a central command for communication you have each country dealing with their events communicating with the public. The cable is strictly military and some are health care issues so there will be different priorities. With hurricanes in the US, social media is used as a rescue platform. Could it be used like that for incidents like these? In Boston, they found the bomber from the community using social media. In a lot of these communities, internet connection is limited and they might be inundated as well. Wifi is provided by satellite so it can be limited. Starlink is changing that. Starlink does not work for all of Greenland yet but is going to in 2024. It is not ready for mass groups. We should follow the ethical handbook (Inuit Circumpolar Handbook) on how to coordinate with Indigenous Peoples in an equitable way, not a top down approach. Would not want to shut off wifi for the cruise ship. Can use wifi in a positive way for communication to assess the situation. There are some extensions of those concepts where there is limited bandwidth. Things where you bring more bandwidth to an area to allow for communication among responders and the community. Do you think Indigenous people would want to evacuate or survive on their own? You would need to talk to each community separately. It will depend on the community. A lot of villages are built in locations that are not susceptible to a tsunami unless land falls into the ocean. Sometimes communities are evacuated and it is always good to lend a hand. Sometimes people will not want to evacuate. It depends on the event too. Letting Indigenous people make the decisions for themselves.</p>

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Breakout Session 2 Group C

What will be the multi-incident coordination, command, and control?	How will you prioritize the needs for the different responses?	How are you going to address the ethical and political implications of the priorities?
<p>Has to be individually nationalistic approach. Responses will not be overarching over multiple efforts. There will be a joint effort between Greenland and Iceland, this is dictated based on the ability/availability to get response. Having something with the best suited people from both sides mixed together for best suited result. Need a liaison across involved groups to allocate resources, etc. There will have to be three focal points on unified command. Would there be any request for assistance outside of Canada, Norway, Greenland response. Who makes the decision for how resources are divided. In US there is the national response team which is used to determine where to send resources. There is not that agreement internationally (MOSBA is somewhat used for international response). There is no clear maritime/marine response. Set up outside of unified command. Determine if existing strategies still work with increasingly complex situations (limits in international cooperation, complex issues, etc.). USAID would set up and determine what resources can be sent for chronic needs (called in time of extreme emergencies). For Canada, first response would be what is sitting in Baffin Bay (Coast Guard, cruise ships, sailboats, etc.) have resources sitting there that could be used to move people out or supply resources. Utilize independent items/resources and see what can be used to reduce time for loading in/out of the country. There would be limit strain on resources as most ships come prepared for marine use, resupply own ships and Coast Guard ships (could become a prolonged issue but not short term). From the US side there is the speed/time/distance concern with most ships being research or relocation oriented (use in long term support (6-7 days to arrive)). Need a robust system of liaison.</p>	<p>Look down and in, across Baffin Bay limits availability of help to Greenland. Depending on the time of the year, there will be various ships in place that can be used for response. For dividing resources, using local communities/local coast guards for knowledge of location and response. Setting up an army field hospital/office. Providing water (fly in, use water treatment (RO) for immediate response, shipping in water if arial transportation infrastructure is down). For sovren vessels that come from a country and try the best to follow polar code. For cable cutting/line cutting of natural gas, is there initiation for planning/coordination for more than just restoring the cable? Priority concerns are drinking water. Human life/health/safety (immediate search and rescue) and environmental life/health/safety. Immediate search and rescue will take many assets, rely on local assets for support/knowledge/key resource to help in first responding efforts. This would help keep other assets available in the case of multi/complex issues. Security of communications is not a priority, assessets should be given to other priorities. Depending on the time of the year, response efforts change based on constraints (stressors based on number of available efforts). Depending on environmental conditions will change the timing of asking for assistance, availability of response. The ability to restore utilities/normal functions would be an immediate need and then maintain for longer-term restoration (transition back to "normal"). Recovery of a vessel (cruise ship scenario) would be included in the restoration. Identify what assets (manufacturer, technologies (acoustic sensors) etc.) to determine which resources will be used for each type of response.</p>	<p>First priority is to make sure each sovereign nation is respected. Respect the Inuit's ability in Greenland. What could go wrong/how to encroach on sovereignty? There may need to be cultural sensitivity training for beyond-initial response to respond in respectful way (not needed for initial response). Set priority of life and safety, then set respect for sovereignty and cultural. Follow the national response system of the sovereign nation.</p>
<p>Who sits at the table to represent national response plan?</p>		
<p>Church: It would be interesting to see for the educational benefit, how would that country (Canada and Denmark) present for assistance/international support?</p>	<p>Steve Jensen: Escalate to the necessity for a unified command, life/safety is an issue, stretch of resources, etc. As suggested earlier there is a high visibility issue but not that big of a deal. How do we make ethical decisions for resource allocation? What kind of coordinating mechanisms do we need (are they in place) to timely and orderly fix these things?</p>	<p>Need to understand frameworks and how countries respond to control assets in the event of an international response.</p>
<p>Ussaf: For Canada, it will be the process of current command, Coast Guard, RCMP. If need to call for assistance, there is the ability/protocols set on a personal level. It will be more of the public safety taking the call and leading the discussions for response. Will use diplomatic way forward. At operational level, if there is a need, there is a network/protocol in place to get various support. Different interms of publicity/sharing with citizens. The political peice- it depends on too many variables (depending on the day).</p>	<p>Ben: From EMT perspective not in resurrection buisness. Even in the event of a small challenge, need to focus resources on where can be the first good response. Time scale is important for determining the resource response.</p>	<p>Shane: To answer long term question, not seen as what is being done here today. First make sure human security is good, once it is stable, then there is a handover from the incidence response group. Beware of exercise fatigue - can build relationships but need a clear and concise plan for the future and how partners will be used throughout the exercises. People/groups/organizations get fatigued, which a strong plan would help this not happen.</p>
<p>For Denmark, The are frequently cooperation with international forces for training (Greenland, etc.) that Denmark would be very willing to call on for support. If there was a threat to Iceland environment/grounding, they would be able to respond faster and complete (Icelandic capabilities are more advanced than the infrastructure on the adjacent Greenland).</p>	<p>How good are we at having close coordination for long term resources? Who is initiating these conversations that need to happen within the first 72 hours? These conversations need to start earlier, relationships on a professional/interagency need to be utilized.</p>	
	<p>Why does it fall on the federal agencies to provide agencies (could members of industry, investigators, etc.)? Why can't we leverage the community to help aid in response?</p>	

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Breakout Session 2 Group D

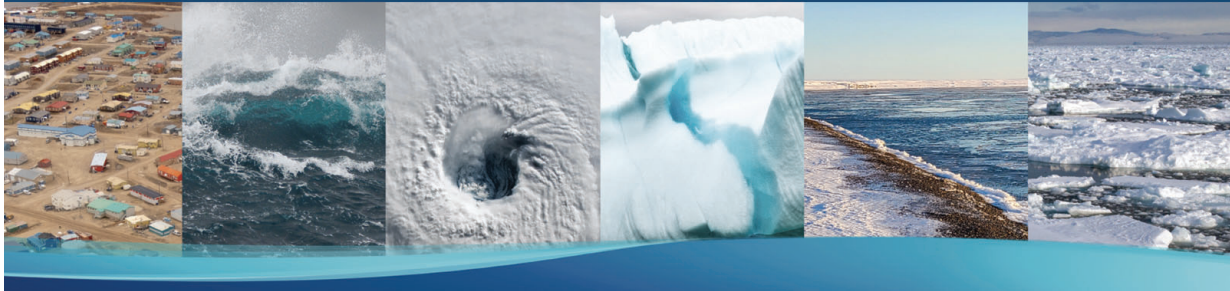
What will be the multi-incident coordination, command, and control?	How will you prioritize the needs for the different responses?	How are you going to address the ethical and political implications of the priorities?
<p>•Canada would have primary leadership, within Canada itself.</p> <p>•Gastro intestinal issue, things higher than S&R but still within Canadian response capabilities. Start long term Canadian Infrastructure improvements. Started about going elsewhere, immediate problem for Greenland (west side) was logistics. Transportation routes and their limitations, they will go through JACO. Other resources Arctic countries.</p> <p>• And separate routes for civilian and military. The scale would be too large to handle on their own, and the first partner would be Canada, but due to scale, US would be second to ask. Station Nord would be the primary place to refuel and Resupply to keep recon/surveillance capabilities up. Also discussed capability of using other ships in the region.</p> <p>•Would need to rely on public/cruise ships. Assuming event is happening in the summer, at which point ice clears up in Baffin Bay area. Thus vessels would be available. Ships could double as floating hospitals. The Baffin situation could certainly still leave resources available, but cruise ships could still be used as water generation. Main issue for Danish would be time. ex, time could be a few weeks minimum. Coast Guard could certainly bring resources, but due to airfields being damaged it could still be an issue. Any of these cargo planes can land on 3000 feet of something. You could establish a temporary airfield in ice and use it to move heli's. Amphibian could be used, but fuel usage is high. East Greenland would be primarily isolated to that side. Nuuk was the planned site. Iceland could be used as a response partner. Shannon Island could be used for Sirius patrol, which is a division under Joint Arctic Command. They patrol entire northeast, Greenlands national park. they do not patrol during Summertime, but are available as potential command posts. Sirius Patrol would be in primary control due to complete knowledge of the coastline. high likelihood that a research vessel could be first to respond. would give time to do immediate life rescue, while giving time to get additional resources in.</p> <p>•Health and Safety, environmental, through the company. Could be handled locally if Nuuk is down. Sirius is Command and control, but not an asset. Daily flights from Iceland to Serosby's fjord.</p> <p>• 72 hours is the most rational time for mass rescue. Iceland has not many, but good response capabilities. Oil skimming, hospitals. One would remain on the coast and be available in the nearby seas. Impact to satellite control Agencies. EUCOM and NATO would be involved due to the severing of the cable, so those agencies will need the data. NATO will be the primary response force. A submarine would be immediately deployed to the area as a deterrent. Like the Nord Stream incident, the closest country would be the first in control. Norway would be in this case.</p> <p>•The commercial cable would also be there at the same time to assess. Who is going to contain that message? The legal consequences would also be there due to potential criminal damage and viability. A ship would be activated by the company in reserve (part of insurance plan). Company that owns the cable would go first. Cable is also not mostly under ICE, so that would not be an issue. Aspects such as downtime, are adversaries exfiltrating, etc. Meteorological data is the concern due to its necessity for NATO Countries. Norwegian forces would control all press releases, i.e., Norway is first amongst equals. Most likely, the entity there is American. Recently an Agreement was made, and immediately Americans flew planes to Finland and Norway. There are agreements already on Information sharing. As long as continuity of communications is ensured that's the priority. Norwegian Air force base on Jan Mayen Island could function as a location or stopover point. There is a US Air force unit in Reyjavik.</p> <p>•Denmark doesn't have as much resources</p>	<p>You treat it as a sovereign entity, you setup an EOC, is it a long term, acute, short term, or other type of incident. Then Awareness, is the staff office surge staffed. You can only staff a location if it is possible and practical. And that cannot be done without the involvement of the host nation. They'll be taking in logistics requests. MAC is there only when you need it. That choice should be made by the most impacted country. EY:</p> <p>This situation should not be under one total ICS. It should be split (potentially) into separate ICS. One for West Greenland/Baffin, and East Greenland, finally Svalbard. Canada and Denmark for Greenland, Denmark and Norway for East Coast, and Svalbard could be Iceland, Norway, Finland, Sweden (stuck in Baltic).</p> <p>Having someone dedicated to de-cluttering/de-conflicting the situation awareness between partners is critical. This would be primarily under a MAC. Denmark would say they are still busy. Cruise ship is clear, due it being under the Arctic council. Setting a JC would be helpful as well. All messaging has to go through DC, potentially leading to delays in comms. Data and info would have to be shut down and filtered as soon as possible.</p> <p>ADDITIONAL COMMENTS: Languages are going to be a high priority and problem. Translation, and effective translations, may not be immediately available, but the languages may not be parallel to whats needed. Going to the consulate would be the primary pathway</p>	<p>There would not be a general distinct priority of one incident over the other</p>



**North Atlantic Arctic Crisis Workshop,
12-13 December 2023**

Appendix F: TTX Scenario Materials





North Atlantic Arctic Crisis Workshop (NAACW) 2023 Exercise Design Summary

(Prepared by Terry O’Sullivan, Tony Schilling, Steven Jensen,
Kathy Duderstadt and Sam Zarakovich)

Summary

The North Atlantic Arctic Crisis Workshop (NAACW) engages US Inter-agency, Canadian, and European participants to respond to a simulated set of *regional* maritime and coastal community crisis scenarios. It examines treaties & agreements, coordination mechanisms, as well as response capability and capacity in the context of strategic competition and the rapidly changing Arctic climate.

NAACW Objectives

Among the goals and objectives for this Workshop are to analyze and assess:

- *Situational awareness* – When something goes wrong, how will we know what happened in the region? How can we maintain a common operating picture of a crisis?
- *Crisis response authorities in US Code* – Do statutory authorities leave gaps or seems in crisis response? Are these gaps or seems that our adversaries could exploit?
- *International agreements* – Are the existing treaties and agreements, created in a period of Arctic exceptionalism, sufficient to meet emerging events in an era of strategic competition?
- *Competitor influence* – Does our crisis response framework leave us vulnerable to malign influence, interference, or information operations?
- *Community Vulnerability* – Would investments in community resilience reduce the consequences of a crisis in the region?

- *Communications technology/coverage/redundancy* – Are existing communications capabilities adequate to address a crisis in the region?
- *Spill remediation capability in sea ice* – Do we know how to mitigate contamination in regions that freeze? Is this capability on hand in sufficient capacity?
- *SAR capabilities suitable for the environment* – Do the US and her Allies have adequate Search and Rescue equipment and systems to respond in a maritime crisis in the region?
- *Vessel capabilities* – Do US and Allied forces have adequate vessel technology to respond to crisis in the region?
- *Maritime Infrastructure* – Would improvements to port facilities in the region significantly improve our ability to respond to crisis in the region?
- *Position/Navigation/Timing technology* – Does adequate PNT exist to conduct security operations in the region? Are there vulnerabilities that are unique to the region?
- *Aircraft capabilities* – Do the US and Allied forces have adequate aircraft technology to respond to crisis in the region?
- *Aviation Infrastructure* – Would aviation infrastructure improvements such as instrumented runways significantly improve our ability to respond to a crisis in the region?
- *Capacity* – If technology is adequate, is the number of aircraft, vessels, SAR assets, or spill kits an issue?

NAACW Tabletop Structure

The exercise and workshop consists of **three phases**, designed to compensate for a shorter in-person format by having an interactive lead-up to the “acute” phase, followed by a day of policy and research implications:

1. **Pre-TTX (Nov 15th – Dec 11th)**: collaborative online work for approximately four (4) weeks preceding the scenario presented during the Face-to-Face TTX.
 - Participants have an opportunity to view the scenarios with weekly summaries of ongoing situational developments and responses and interact on a discussion board, detailing specific responses, capabilities, and collaborations.
 - Each week introduces policy and response questions and challenges and provides links to videos, documents, other resources relevant to the developing situation.
 - This pre-workshop activity helps to identify strengths and gaps in response capabilities, while preparing participants for the TTX
2. **Face-to-Face TTX (Dec 12th)**. Address the evolving pre-workshop scenarios and policy questions at higher levels in breakout groups and plenary discussions. Inject additional natural events, conflicts, and constraints as needed.
3. **Post-exercise evaluation (Dec 13th)**. Develop policy and research objectives from the findings of the Pre-TTX and TTX.

Assumptions

1. Rapid change is occurring in the Arctic across the natural, built and social environments, thereby exacerbating potential for disaster.
2. Deep collaboration is required across civil, military and commercial sectors, as well as between the Arctic nations.
3. Information flow and sense-making capabilities will be critical for managing the unusual situations which are likely to characterize the Arctic.

Policy Development

Asking relevant questions to capture policy considerations will be an important part of both the Pre-TTX online exercise and Face-to-Face TTX Workshop. Ideas that are gathered are then organized around themes. The resulting policy considerations are continually integrated into the Workshop playbook and used after the exercise to identify options and policy research questions.

Pre-TTX Scenarios

(Assuming compound events throughout the North Atlantic Arctic region during a near-future summer from mid-June through mid-July)

Pre-Week FOUR – Scenario in Mid-June

(28 days prior to the face-to-face TTX scenario - released online Nov 15)

Focus: Introduction to Online phase of Tabletop

- ⇒ Familiarization with exercise format and intent
- ⇒ Introductions
- ⇒ Week 1 scenario

Situation

- For much of the summer, there has been a persistent “Omega” atmospheric blocking pattern bringing a series of increasingly strong high-pressure ridges, or heat domes, to Eastern Nunavut’s Baffin Island and to the entire Greenland ice sheet. This pattern is consistent with a wavier Jet Stream than normal and a negative phase of the North Atlantic Oscillation (NAO) climate mode, both associated with a changing climate.
- An unusually dry winter has led to late spring and summer wildfires across Canada, including in Quebec and the Maritime Provinces. By mid-June wildfire smoke is reaching as far north as Baffin Island and southern Greenland.
- Surface melt is pervasive throughout the lower elevations and a growing portion of even higher elevations of Greenland, leading to flooding.
- NOAA’s Space Weather Prediction Center is monitoring multiple regions on the Sun that are producing occasional eruptions. The largest active region is currently rotating away from Earth with a risk of producing extremely large flares or CMEs (coronal mass ejections) in approximately three weeks when it rounds the Sun’s east limb to once again face Earth. *(Similar to conditions in July 2012 when a CME narrowly missed Earth.)*

Prompts

1. Self-Introductions: Organization, Role and Short Bio
2. What is of concern in the scenario, and why?
3. What should we be watching?

Resources

- Maj Gen Kee’s introduction video
- Greenland Smart Book - North Atlantic Arctic Crisis Workshop
- Short briefing on how to use Canvas
- Videos, PowerPoint slides, and other informational links
- Articles and maps of the North Atlantic, Greenland and Baffin Island

Pre-Week THREE – Scenario in Late June

(21 days prior to the face-to-face TTX scenario - *released online Nov 20*)

Focus: Early Structure and Communications

- ⇒ What is important at this point?
- ⇒ Implications of what is developing
- ⇒ Working together

Situation

- A record-breaking heat dome settled over parts of Baffin Island and the entire Greenland ice sheet. Meanwhile, forecasters predict that Greenland may experience additional significant ice melt and rainfall in the days ahead. A major mid-latitude storm has the potential to produce an atmospheric river as it travels from the continental US over the North Atlantic, bringing heat and moisture poleward.
- Over 80 percent of the ice sheet surface has already begun melting.
- Both Greenland and eastern Nunavut (Canada) are experiencing significant ice melt and flooding with some damage to infrastructure, but as-yet no reports of major casualties.
- Russian Federation oil tanker SN Bravo docks at Murmansk, RF, SN Bravo is fully loaded with oil and is a single hull tanker. Destination likely to be West Africa, primarily Lagos, Nigeria or Tome, Togo's capital – both countries emerging as a fast-growing hub for Russian ship-to-ship (STS) oil shipments. This would be an EU Ukraine-related sanctions violation.
<https://www.balticshipping.com/vessel/imo/9412359>
- Four Chinese People's Liberation Army (PLA) Navy ships identified as brand-new Type 055 Renhai Class Cruisers have rounded Cape Agulhas off Africa and are proceeding into the Atlantic. The US Navy is tracking their movements. [Type 055 Renhai.pdf](#)

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Prompts

1. Implications? As this is an exercise, we can assume more will be happening.
2. What are the best ways to keep track of these situations, and what if any planning or response should occur?
3. Who needs to know?
4. How do we work together?

Resources

- Background on Pitufik Space Force Base
- Background on Russian Federation Tanker NS Bravo
- Background on PLA Navy Renhai Class Cruiser
- Videos, PowerPoint slides, and other informational links

Pre-Week TWO – Scenario in Early July

(15 days prior to the face-to-face TTX scenario - *released online Nov 27*)

Focus: Working across domains

- ⇒ Assessing the situation
- ⇒ International considerations
- ⇒ Incident Management System requirements

Situation

- A low-pressure system and atmospheric river travel over Greenland, bringing large amounts of warm, moisture-laden air from the warmer lower latitudes.
- Over 98% of the surface of the Greenland ice sheet shows evidence of melt, breaking the summer 2012 record. Glacial melt flooding is becoming an increasing threat to villages and towns in glacial runoff basins (breaking the summer 2012 record).
- Ice melt and heavy rainfall have caused permafrost thaw has caused roads to sink and flood, becoming increasingly dangerous to travel on.
- Pitufik Space Force Base is temporarily closed to incoming aircraft due to flooding. While the runway is still operable, buildings and roadways on the base are flooded and some utilities have been disrupted. Currently assessing the condition of pipes and other critical infrastructure with expected return to operations is to be determined. Pitufik Space Force Base resupply flights are postponed until further notice.
- The sewage pumping station at Nuuk in Southern Greenland has shut down due to flooding and may overflow into the water and ocean.
- Chinese PLA Navy Task Force is now well into the mid-Atlantic and moving north at fast speed. It is being shadowed by a USN Destroyer and aircraft. Destination not currently known.
- A group of twenty USA college students, tribal nation students, and professors arrive on Baffin Island for a 3-week study abroad program involving coastal erosion and other climate related subjects. While based in Pond Inlet, the team will kayak and camp to study the coastline. The group is striving to follow Inuit Circumpolar Council ethical engagement guidelines and is accompanied by a local Inuit guide.
- Eyjafjallajökull Volcano on Iceland (last eruption 2010 as a VEI Four level volcano) showing signs of becoming active again. The 2010 eruption seriously disrupted air travel in the North Atlantic and Europe. The tremors might precede an eruption by days or hours, or they might not lead to an eruption at all.

Prompts

1. Processes for international assistance
2. Systems in place for the Arctic
3. Considering how the whole system works, how would you characterize managing emergencies in the Arctic
4. Future system requirements.

Resources

- Legal/Policy Guidance document
- Evaluation of the Department of Defense's Efforts to Address the Climate Resilience of U.S. Military Installations in the Arctic and Sub-Arctic
- Threats to Pitufik From a Changing Climate and Extreme Weather
- Background on Sovremenny Class (Type 956) RF Destroyer

Pre-Week ONE – Scenario in Mid-July

(8 days prior to the face-to-face TTX scenario - *released online Dec 4*)

Focus: Incident Management

- ⇒ Put together a system
- ⇒ Types of resources likely to be required.

Situation

- A second atmospheric river is bringing large amounts of warm, moisture-laden air poleward from the warmer lower latitudes, fueled in part by additional moisture from an early season hurricane.
- There is extreme precipitation on the upslope of the mountains of Western Greenland, extending far north to Pitufik Space Force Base.
- Warming and ice melt continues throughout the region, with multiple Inuit majority villages and towns on Eastern Baffin Island (especially in Pangnirtung and Clyde Rive) and on the Western and Southern coast of Greenland report damage to ports, water systems, and/or runways from permafrost thaw and flooding, disrupting the schedule of re-supply services.
- Waste dumps and sewage lagoons in three villages are now overflowing contaminating the area and, in some cases, flowing into the ocean.
- Flooding from the Qaanaaq Glacier has washed out two river crossings in Qaanaaq (North of Pitufik), disconnecting much of the town from the airport.
- Kangerlussuaq is experiencing heavy flooding and thaw. The newly rebuilt bridge is still holding. However, the airport runways are showing large cracks and deformations and have been temporarily closed to assess damage.
- There is widespread record flooding.
- There are reports of significant iceberg calving from the both the Jakobshavn Isbrae Glacier and Petermann Glacier
- Russian Federation tanker left Murmansk and is being shadowed by the Norwegian Navy and Air force moving south into the Atlantic towards Svalbard Island area. Tanker is “riding low” indicating it is fully loaded. It is expected to make an illegal oil transfer somewhere off Africa, but intel is incomplete. Intel reports SN Bravo has been modified to refuel warships at sea. The tanker is escorted by a two Russian destroyers out of Kaliningrad, both Sovremenny-class destroyers.
- The Four Chinese People’s Liberation Army (PLA) Navy Renhai Class Cruisers have passed within 25 miles of Norfolk Naval Base and are heading north east, destination not clear. Four US Navy Aegis Class destroyers and a Coast Guard Cutter are shadowing their movements, along with aircraft. This deployment so close to the largest naval facility in the world elicited a reaction from the State Department and was a major topic at the White Press Corps Daily Briefing.
- Grindavik Volcano sensors are detecting harmonic tremors and seismicity associated with magma movement and an impending or ongoing volcanic eruption. The tremor might precede an eruption by days or hours, or they might not lead to an eruption at all. Eyjafjallajökull Volcano is moved to Alert Level “Advisory” to Watch.”

<https://www.usgs.gov/programs/VHP/volcanic-alert-levels-characterize-conditions-us-volcanoes>

- The London Volcanic Ash Advisory Center issues aviation Color coded “Yellow” for Grindavik They indicate this could change quickly.

<https://www.usgs.gov/programs/VHP/alert-level-icons#:~:text=Volcano%20updates%20include%20both%20a,Orange%3B%20Warning%20and%20Red>).

Prompts

1. “You go to war with the Army you have...” Cobble something together that works virtually and in person at the TTX
2. Full briefing at beginning of TTX as if escalating.

Resources

- Briefing Book sent to all participants
- Legal-Policy Guidance on ARCTIC NAACW
- The Threat To Undersea Cables in the Eastern Arctic
- Chinese PLAN Cruisers and Russian Destroyers Escorting SN Bravo
- Video- NATO- Ice Ice Navy – Patrolling Greenland on Denmark’s HDMS Triton

TTX Face-to-Face

(Scenario occurs in a near-future summer in late July)

Scenario: Late-July

December 12th

“Day 0”- Review scenarios from the four weeks of Pre-TTX

- Review slides in Briefing Book

“Day 1” TTX new updates:

- Incomplete reports come in from eastern Greenland about a damaged adventure cruise liner carrying 500 passengers
- Hours later, major media reports – via satellite phone – that a ship carrying a [two U.S. Congressman and their families and several well-known celebrity] has been catastrophically damaged, partially sunk by a large landslide generated tsunami between Ittoqqortoormitt (Scoresbysund) and Daneborg Greenland
- Distress messages indicate the ship appears to be leaking fuel oil.
- Permafrost melt and weather-related flooding events in northeastern Nunavut and Greenland are a deepening crisis. Towns are being cut off from supplies due to impassable roads, damaged ports, and cracking runways. Sewage lagoons and wastewater treatment plants are overflowing in three more villages, contaminating the area and, in some cases, flowing into the ocean.
- First deaths reported due to the flooding
- Media from CNN, CBC, BBC, and FOX are now asking what assistance can be rendered by the USA, Denmark and Canada. This situation makes the daily presidential news media briefing.
- The Space Weather Prediction Center confirms that the unusually large active region of Sun has grown and is rotating to face Earth. *[Note that solar flares reach Earth in tens of minutes and can cause ionospheric disruptions and radio blackouts. CMEs reach Earth in as short as ~15 hours and can disrupt radio waves, GPS coordinates, satellite navigation systems as well as damage electrical grids and undersea cables.]*
- Pitufik Space Force Base airport continues to be out of service due to ice melting and sewage issues, flooding, cracked roads and possible runway damage. No estimate on when it can return to service. While critical defense operations continue, the Space Force Commander is requesting assistance to ensure the station has the required support and communications remain open.
- RF Tanker SN Bravo, along with her two destroyer escort, has slowed down 30 kilometers northwest of Svalbard. Queries to the RF about what is occurring are unanswered. Requesting US State Department assistance with this matter. There are at least two other tankers in the area, however they are not transmitting their location, locator beacons appear off.
- SS Reindeer with 86 personnel on board has stopped at Ittoqqortoormitt, Greenland. This is the first cruise for this state-of-the-art super luxury cruise ship (rooms start at \$30,000 per room) with many well-known celebrities on board as well as 6 congress

persons and their families. Ittoqqortoormitt is a new stop on this new cruise company's agenda.

- The two Russian Federation destroyers are located north of the UK and moving towards the Iceland and Greenland direction, towards Svalbard(??) to protect a possible illegal ship to ship oil transfer with tankers from an unknown entity.
- The Chinese Task Force is near Bermuda and moving north towards what appears to be a possible rendezvous with the Russians.
- [potential **inject**: “There are indications that another, smaller adventure cruise boat in the same area is missing”]

TTX Injects – Breakout Groups

- ⇒ Situation at Pitufik Space Force Base: Record temperatures and rains cause the North River to overflow its banks, breaching the embankments. Facilities near the airfield are flooded and temporarily out of service. Flooding has reached the runway. Melting permafrost has weakened sections of the runway causing closures. There are new concerns that contaminants have entered the water supply.
- ⇒ Greenland and Baffin Island Waste Dump Situation: Many of the waste dumps are located near populated areas and close to fjords and other water sources.
- ⇒ Pond Inlet Study Abroad Program: 20 US college students, Tribal nations students, professors and a local Inuit guide have been out of communication for three days.
- ⇒ Greenland - Baffin Island Gastrointestinal Disorders: Greenlandic Government maintains four major hospitals along the coast, and these have a total of about 350 beds. The approximately 130 beds in Nuuk are full and have reached capacity.
- ⇒ PLAN-RF Status Day Zero- Svalbard: The 4 Chinese Cruisers were refueled by the modified SN Bravo Tanker south of Svalbard over the last 24 hours. The PLAN Task Force with the two Russian Destroyers are moving very slowly between Svalbard and Norway towards the east at 10 knots. They are closely followed by P-8's and other NATO forces as they move. The Automated Identification Systems on all the ships are OFF, no longer transmitting.
- ⇒ Svalbard Cable: Reports from Svalbard Island and from Norway are indicating that the Svalbard Cable system, both cables, are not transmitting. Communications between SvalSat on Svalbard Island and mainland Norway are not functional.
- ⇒ State Department- US Consulate Greenland: After discussions with the local representatives from Greenland and Denmark, the US Consular General is requesting through US Embassy Denmark that an emergency be declared in Greenland and it's surrounding waters.
- ⇒ Svalbard Inject Two: After several hours, the Task Force has split into two sections: One RF Destroyer and Tanker are moving east. The second destroyer and four PLAN Cruisers appear to move south. The 7 ships now have their AIS turned online and are being tracked. Directions and intentions are currently unknown.

Optional Additional Injects

- ⇒ Geomagnetic Storm: An extremely large solar flare and Coronal Mass Ejection (CME) occurred today at 11:07 a.m. ET and the Space Weather Prediction Center has issued a level G5 Geomagnetic Storm Watch. Particles from solar flares arrive at Earth within 10s of minutes. The Coronal Mass Ejection is forecast to arrive as early as late tomorrow with effects continuing into the next day.
- ⇒ Saattut Island, known for its sled dogs is running very short of dog food and Vet supplies. The “helistop” is unserviceable to land helicopters due to flooding and permafrost issues from the storms.
- ⇒ Closure of Greenland Airports: Nuuk airport has just been closed due to strong and dangerous crosswinds. This airport closure adds to the runway damage in Pituffik and Kangerlussuaq and the flooding at Qanaaq. Many passengers are stranded at airports waiting to be re-routed.
- ⇒ Emergency Comms- STARLINK Coverage Area: Concerns over communications as STARLINK satellites affected by solar storm.
- ⇒ Public Affairs-Media Situation Inject: All major media sources are requesting (print/cable/social) a briefing on damaged ship and casualties off the East Coast of Greenland. Social media has erupted in the last 24 hours with concerns for the missing students. Media is demanding an update on all the issues occurring “Up There.”
- ⇒ Thawing toxins from former military sites such as Camp Century.

“Day 2” Scenario: Continuation

December 13th

TTX Update:

- ⇒ Reindeer Concordia Princess CRUISE SHIP INJECT: Cruise Ship off the coast of Eastern Greenland half sunk on its side after “massive” tsunami in Keiser Franz Joseph Fjord. Distress messages also indicate the Reindeer Concordia Princess is leaking fuel oil into the Fjord. Channel blocked by glacial ice debris, preventing immediate rescue. Celebrities are on board and sharing updates of the disaster broadly on social media.
- ⇒ Major growing infectious disease outbreak developing in Baffin Island and Western Greenland. Hundreds affected by water supply contamination and damage to infrastructure. Dozens reported severely ill or dead.
- ⇒ News Headlines:
 - *Maritime nightmare In Greenland unfolds: “Bodies floating in hallways”*
 - *High-Seas Havoc: Chinese Vessel Sparks Global Internet Chaos as Cable Catastrophe Unfolds*
 - *Inhabitable towns? Waste Dumps leak On Coast of Greenland*
 - *Disease Outbreaks in Greenland: The experts weigh in*
 - *Reports of Missing Celeb come in: “We don’t know if she will be found”*
 - *Maritime Nightmare Unfolds: Stricken Ship On It’s Side, Oil Spill Crisis Looms Large*
 - *White house Press conference on Greenland Disaster “It’ll take a few weeks to recover”*
 - *White house Press conference on Greenland Disaster “It’ll take a few weeks to recover”*
 - *Anonymous sources: “they cut the cables!”*
 - *Casualty increase in Greenland Disaster*
 - *Students bodies found dead in Canadian Wilderness*
 - *Dozens dead in Indigenous villages due to flooding*
 - *First Nations protest in Ottawa over Government Neglect and Disease Outbreak*
 - *Students and Inuits band together to protest Government Mismanagement and lack of performance*

NAACW TTX Flow Script for Tuesday Dec. 12
For Group Moderators and TTX Pilots

11:40: Introduction to Exercise I: Terry O’Sullivan (10 min + 10 min Q+A)

12:00: Lunch

12:45: Introduction to Exercise II

- Overview of “history” (Notional Time: Four weeks out to Day Zero)
- Day Zero scenario, updates, injects – including Cruise Ship Scenario

13:00 – 14:00 (60 min.): BREAKOUT ONE

14:00 – 14:45 (45 min. max -- IF NEEDED): *Group Report-out* from BO1

- By each of 4 groups
- Discussion by the plenary

14:45 – 14:50: (5-10 minutes) BRIEF break for coffee, bio-.

- And then working coffee during injects, part 2 intro

14:50 – 15:00: *New INJECTS* for BREAKOUT TWO and any Q&A

15:00 – 15:30 (30 min.): BREAKOUT TWO

15:30 – 16:00 (30 min. max -- IF NEEDED): *Group Report-out* from BO2

- By each of 4 groups
- Discussion by the plenary

16:00 – 16:05: *New INJECTS (IF ANY)* for BO3

16:05 – 16:35 (30 min.): BREAKOUT THREE

16:35 – 17:00 (25 min. -- IF NEEDED):

- *Group Report-out* from BO2
- *Final Thoughts and discussion*

17:00 – 17:30 (30 min.): EVALUATION, fill out FORMS

13:00 Breakout Group **ONE** session (60 min.)

- Introductions, methodology review,
- Focus Question ONE (~20+ min.):

Go around the table to each person and answer

1) “What would the response be during the four weeks preceding today?

- *What, why, by whom, and how specifically*

2) Focus Question TWO (~25 min.)

Go around the table to each person and answer

“What would the response be NOW?

- *What and why, by whom, and how specifically*

3) Discussion Questions to specific groups (10-15 min. IF TIME):

Group A: How to handle situational awareness

Group B: What international or other communication systems and channels employed

Group C: Who need to know what? (and general “sense-making”)?

Group D: Who is (should be) in charge and How will we/they make decisions at this point (given the multi-jurisdiction nature of the problem set)?

15:00-15:30: Breakout Group **TWO** session (30 min.)

Simulated/Notional Time: Still DAY ONE of Cruise Ship reports/response

Re: Cruise ship, *Missing student group, Baffin and Greenland damage/distress escalating, cable severed, Russia/Chinese, etc.

- Focus Question One (~20+ min.): How will we manage?

Go around the table to each person and answer

1) What would the response be now? (*What, why, by whom, where, and how specifically*)

- Weather disasters on Baffin, Greenland?
- Chinese – Russian situation, severed Cable at Svalbard?
- Cruise ship rescue
- Fuel Oil Spill
- Starving sled dogs
- Geomagnetic interference with comms
- Other issues

2) Discussion Questions specific to groups (10 minutes):

Group A: What Information flow issues, platforms are relevant?

Group B: How to handle Incident management?

Group C: What International assistance and collaboration would be required?

Group D: How should the multiple situations be triaged/prioritized?

16:05 – 16:35 Breakout Group **THREE** session (30 min.): Life Safety

Simulated/Notional Time: ****DAY FIVE**** after first Cruise Ship reports/response

Re: Cruise ship, fuel spill, Baffin and Greenland civilian damage/distress, cable severed, Russia/Chinese, other injects

- Focus Question One (20+ min.):

****Go around the table to each person and answer****

1) What would the response be **now**? (*What, why, by whom, where, and how specifically*)

- Weather disasters on Baffin, Greenland?
- Chinese – Russian situation
- Severed Cable at Svalbard?
- Cruise ship rescue
- Fuel Oil Spill
- Other issues


2) Discussion Questions specific to groups (10-15 minutes if time):

Group A: What are the Ethical issues at stake in response?

Group B: What are the political issues at stake?

Group C: How to deal with public (including press) relations, misinformation, and stakeholder push-back?


Group D: What resources will have to be deployed, and who pays?



Pre-TTX

Four weeks prior to the scenario presented during the Face-to-Face TTX

Ted Stevens Center For Arctic Security Studies



12/12/23

Four weeks out...

Scenario begins in the middle of June

focusing on conditions in the North Atlantic sector of the Arctic

12/12/23

Four weeks out...

- ▶ **Week One: Wednesday, November 15: Twenty-eight-day notice of what is happening in the North Atlantic/Eastern Arctic.**
- ▶ **Focus and Assignments: Introduction to Online phase of Tabletop**
- ▶ **Please do the following for this Week One of the "Pre-Workshop" Exercise; This will be an interactive process with other participants.**
 - 1) **Familiarize** yourself with the exercise format and intent
 - 2) **Introductions:** Go to **DISCUSSIONS** and introduce yourself (name, affiliation, role, anything else you'd like to add)

Four weeks out...

Scenario: MID-JUNE (in a near-future summer)

- ❖ For much of the summer, there has been a persistent "Omega" atmospheric blocking pattern bringing a series of increasingly strong high-pressure ridges, or heat domes, to Eastern Nunavut's Baffin Island and to the entire Greenland ice sheet. This pattern is consistent with a wavier Jet Stream than normal and a negative phase of the North Atlantic Oscillation (NAO) climate mode, both associated with a changing climate.
- ❖ Another unusually dry winter has once again led to late spring and summer wildfires across Canada, including in Quebec and the Maritime Provinces. By mid-June wildfire smoke is reaching as far north as Baffin Island and southern Greenland.
- ❖ Surface melt is pervasive throughout the lower and a growing portion of even higher elevations of Greenland, leading to some flooding
- ❖ NOAA's Space Weather Prediction Center is monitoring multiple regions on the Sun that are producing occasional solar eruptions. The largest active region is currently rotating away from Earth with a risk of producing extremely large flares or CMEs (coronal mass ejections) in approximately three weeks when it rounds the Sun's east limb to once again face Earth.

"Arctic Amplification"

As Earth's climate changes, the Arctic is warming 3-4 times faster than the global average.

Likely explanations involve changes to albedo (melting ice allows the ice-free ocean and land to absorb more sunlight) and shifts in circulation patterns (enhanced transport of warm air and ocean waters from lower latitudes).

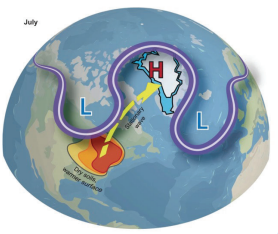
This Arctic Amplification is leading to a more wavy Jet Stream, more frequent heat waves over Greenland, and more intense atmospheric rivers bringing moisture and heat from lower latitudes over the ice sheet.

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Atmospheric scenario for mid-June

Greenland High Pressure Blocking Pattern

Since April, there has been a persistent Greenland Blocking Pattern bringing a series of increasingly strong high-pressure ridges, or heat domes, to the ice sheet.



This pattern is consistent with a wavier Jet Stream than normal and a negative phase of the North Atlantic Oscillation (NAO) climate mode, both likely associated with a changing climate.

Scenario based on conditions in 2019.

12/12/23



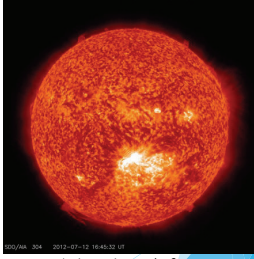
This blocking pattern is transporting warm, moist air from lower latitudes and **promoting widespread melt of the Greenland Ice Sheet.**
 ([NPR radio story](#))

While areas of the US have experienced cooler than normal summer temperatures, residents of much of **Europe are baking** in an unrelenting heat wave.

The Sun is also extremely active.

The Sun currently has multiple active regions that could result in solar eruptions.

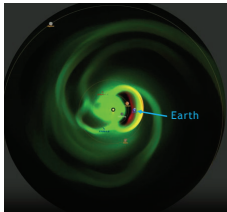
The largest active region is currently rotating away from Earth. As the Sun rotates every 27 days, we are concerned that this region has the *potential to produce a damaging Carrington size* disruption in three to four weeks.



2022/MAY 204 2012-11P-12 16:45:32 UT
Active region on the Sun

Scenario based on solar storm of 2012. ([video](#))

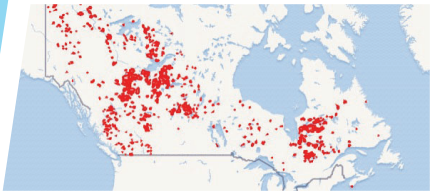
The **Space Weather Prediction Center** is monitoring the potential for solar storms.



[NASA animations](#)

Solar Flares can cause particles to reach Earth in tens of minutes, disrupting the ionosphere and degrading radio waves leading to temporary communication blackouts.

More severe **Coronal Mass Ejections** can perturb Earth's magnetic field in 15 hours to several days - disrupting radio waves, GPS coordinates, and navigation systems as well as induce damaging currents in electrical grids and undersea cables.



Wildfires across Canada

There are a growing number of wildfires across Canada, including in Quebec and the Maritime Provinces.

This increase in wildfires across North America is in part caused by [melting Arctic ice](#). ([PBS news - video](#))

Scenario based on widespread wildfires of summer 2023.

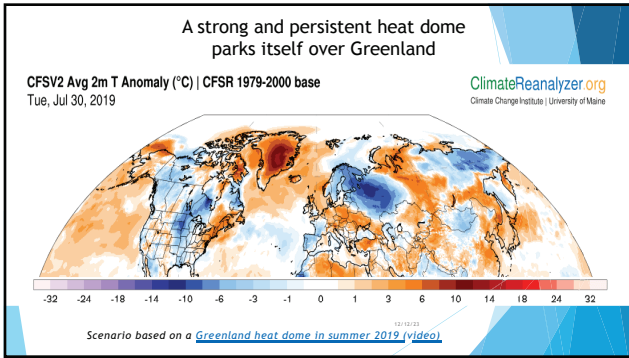
Links and References

- ▶ Rantanen, M., Karpechko, A.Y., Lipponen, A. et al. The Arctic has warmed nearly four times faster than the globe since 1979. *Commun Earth Environ* 3, 168 (2022). <https://www.nature.com/articles/s43247-022-00498-3>
- ▶ Masters, J., 2014. The jet stream is getting weird. *Scientific American*, 311(6), pp. 68-75. <https://www.jstor.org/stable/26040762>
- ▶ <https://www.washingtonpost.com/weather/2019/06/26/record-challenging-greenland-climate-pattern-is-boosting-extreme-weather-north-america-europe/>
- ▶ Cohen et al. (2023) - <https://www.nature.com/unh.idm.oclc.org/articles/s41467-023-39466-6/figures/9>
- ▶ <https://www.wbur.org/npr/746983401/greenland-heatwave-ice-melt> (NPR news story)
- ▶ <https://www.nationalgeographic.com/environment/article/greenland-melting-second-time-this-summer-bad>
- ▶ <https://www.climate.gov/news-features/event-tracker/europes-rogue-heatwave-melts-Greenland>
- ▶ <https://apps.npr.org/arctic-ice-melting-climate-change/>
- ▶ https://en.wikipedia.org/wiki/2023_Canadian_wildfires
- ▶ <https://www.swpc.noaa.gov/>
- ▶ <https://www.space.com/26669-huge-solar-storm-2012-destruction.html>
- ▶ https://insider.si.edu/wp-content/uploads/2012/07/667436main_20120712_164532_orig_full.jpg
- ▶ <https://www.space.com/the-carrington-event>
- ▶ <https://www.swpc.noaa.gov/phenomena/coronal-mass-ejections>
- ▶ <https://earthky.org/sun/is-a-solar-flare-the-same-thing-as-a-cme>
- ▶ <https://svs.gsfc.nasa.gov/4167/>

Three weeks out...

Extreme heat continues into late June over Greenland and Baffin Island

Suspicious Chinese and Russian ship movements



Focus: Early Structure and Communications

- ▶ What is important at this point?
- ▶ Implications of what is developing
- ▶ Beginning to work together, across institutions

Situation

- ▶ A record-breaking heat dome settled over parts of Baffin Island and the entire Greenland ice sheet.
- ▶ Meanwhile, forecasters predict that Greenland may experience additional significant ice melt and rainfall in the days ahead.
- ▶ A major mid-latitude storm has the potential to produce an atmospheric river as it travels from the continental US over the North Atlantic, bringing heat and moisture poleward.

Situation (cont'd)

Russian Federation Tanker SN Bravo:

- Russian Federation oil tanker SN Bravo is fully loaded with oil and is a single hull tanker.
- Currently docked in Murmansk Harbor.
- Possible reconfiguration for ship-to-ship transfer of crude oil.

Chinese PLA Navy Cruisers:

- The four Chinese PLA Navy Renhai Class Cruisers left Venezuela after several port stops along the coast.
- They appear to be moving well into the Caribbean Sea and traveling towards Cuba.
- The cruisers are being shadowed by the US Navy and Coast Guard.
- Their follow-on port destinations are not yet known.

Over 80 percent of the ice sheet surface has already begun melting

Image shows Greenland 40% surface melt in early [July 2012](#) (half the above extent)


Both Greenland and eastern Nunavut (Canada) are experiencing significant ice melt and flooding with some damage to infrastructure, but as-yet no reports of major casualties.

The photo is from [June 2019](#) in the [Inglefield Fjord](#) region of northwestern Greenland, when [4 trillion pounds of ice](#) melted off Greenland in a single day.

Mid-latitude storms that sweep from West to East across the continental US uplift warm moist air as they leave the East coast over the Atlantic and can produce [Atmospheric Rivers](#).

These narrow filaments of water vapor in the atmosphere that can [bring significant amounts of heat and moisture](#) to the Arctic.

An [atmospheric river from July 2012](#)
(Photo : Don Murray, CIRES/NOAA)



Prompts

- Implications? As this is an exercise, we can assume more will be happening.
- What are the best ways to keep track of these situations, and what if any planning or response should occur?
- Who needs to know?
- How do stakeholders work together?

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Links and References

- ▶ <https://www.climate.gov/news-features/event-tracker/eurores-roque-heatwave-melts-Greenland>
- ▶ <https://www.jpl.nasa.gov/news/satellites-see-unprecedented-greenland-ice-sheet-melt>
- ▶ <https://www.forbes.com/sites/trevornace/2019/06/19/surreal-image-of-a-melting-greenland-iced-dogs-mushing-through-endless-water/?sh=738e88743228>
- ▶ <https://www.nipor.ac.jp/arcs/blog/en/assets/map.png>
- ▶ <https://www.colorado.edu/today/2014/04/24/cu-boulder-researchers-find-common-factors-behind-greenland-melt-episodes-2012-1889>
- ▶ <https://climate.copernicus.eu/esotc/2022/greenland-heatwaves>
- ▶ <https://news.wisc.edu/atmospheric-rivers-linked-to-melting-greenland-ice-sheet/>

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Two weeks out... (week of Nov. 27th)

Focus: Working across domains

- Assessing the situation
- Domestic and International considerations
- Incident Management System requirements

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Scenario - Early July (in a near-future summer)

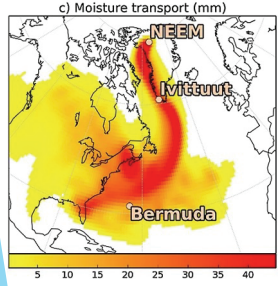
- ▶ **Chinese PLA Navy Task Force** is now well into the mid-Atlantic and moving north at fast speed. It is being shadowed by a USN Destroyer and aircraft. Destination not currently known.
- ▶ A low-pressure system and **atmospheric river travel over Greenland**, bringing large amounts of warm, moisture-laden air from the warmer lower latitudes.
- ▶ Over 98% of the surface of the Greenland ice sheet shows evidence of melt, breaking the summer 2012 record.. **Glacial melt flooding** is becoming an increasing threat to villages and towns in glacial runoff basins (breaking the summer 2012 record).
- ▶ Ice melt and heavy rainfall have caused **permafrost thaw** has caused roads to sink and flood, becoming increasingly dangerous to travel on.

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- ▶ **Pitufik Space Force Base** is temporarily closed to incoming aircraft due to flooding. While the runway is still operable, buildings and roadways on the base are flooded and some utilities have been disrupted. Currently assessing the condition of pipes and other critical infrastructure with expected return to operations is to be determined. Pitufik Space Force Base resupply flights are postponed until further notice.
- ▶ The **sewage pumping station** at Nuuk in Southern Greenland has shut down due to flooding and may overflow into the water and ocean.
- ▶ A group of **twenty USA college students, tribal nation students, and professors** arrive on **Baffin Island** for a 3-week **study abroad program** involving coastal erosion and other climate related subjects. While based in Pond Inlet, the team will kayak and camp to study the coastline. The group is striving to follow Inuit Circumpolar Council ethical engagement guidelines and is accompanied by a local Inuit guide
- ▶ **Eyjafjallajökull Volcano** on Iceland (last eruption 2010 as a VEI Four level volcano) showing signs of becoming active again. The 2010 eruption seriously disrupted air travel in the North Atlantic and Europe. The tremors might precede an eruption by days or hours, or they might not lead to an eruption at all.

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c) Moisture transport (mm)



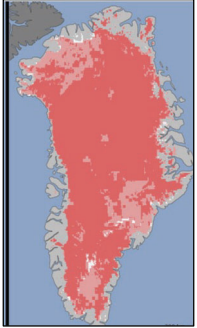
An **atmospheric river** is bringing large amounts of warm, moisture-laden air poleward from the warmer lower latitudes.

There is extreme precipitation on the upslope of the mountains of Western Greenland, extending far north to **Pitufik Space Force Base**.

There is a threat of widespread flooding.

[\[Video describing atmospheric rivers\]](#)

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The unusually warm summer along with moisture and heat from atmospheric rivers has cause over [98% of the surface of Greenland](#) to melt.

Scenario based on July 2012.

There are concerns over [severe flooding](#) from glacial melt.



[Flooding of a bridge in Kangerlussuaq in 2012](#)
(Additional [video 1](#), [video 2](#), [video 3](#)).

There is also a threat of avalanches (slushflow) causing damage to infrastructure and communities

Images show events from 2016 where more than [800 slush avalanches](#) ("slushflows") were triggered a rain on snow event in southwestern Greenland




Threats to Pitufik From A Changing Climate and Extreme Weather



Logos for the Department of Defense and the University of New Hampshire are present.

Threats to Pitufik From A Changing Climate and Extreme Weather

- Severe Winter Weather conditions.
- Thawing permafrost.
- Aging or damaged infrastructure
- Floods by rivers and streams on or near the base.
- Extreme winds and accompanying storms.
- Photo is from a 2006 storm that continued over several days.




Logos for the Department of Defense and the University of New Hampshire are present.

Threats to Pitufik From A Changing Climate and Extreme Weather


- 2017- The airfield and two structures at Thule Air Base had experienced damage from permafrost thaw.
- Photo is of one of the two damaged facilities.
- The most critical building was the primary facility for the Ballistic Missile Early Warning System.



Logos for the Department of Defense and the University of New Hampshire are present.




Threats to Pitufik From A Changing Climate and Extreme Weather




- Cracks and depressions on runway and shoulder caused by water thawing and refreezing, Thule AB, Greenland.
- Photo: Evaluation of the Department of Defense's Efforts to Address the Climate Resilience of U.S. Military Installations in the Arctic and Sub-Arctic, 2022 located in the module.

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- Photo: Evaluation of the Department of Defense's Efforts to Address the Climate Resilience of U.S. Military Installations in the Arctic and Sub-Arctic, 2022. Located in the module.
- Damaged embankments on the North River, Pitufik SFB.

(U) Figure 8. Damaged Embankment Armoring to Prevent Flooding of the North River, Thule AB, Greenland.
(U) Source: The DoD OIG.


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- North River, which runs through Pitufik adjacent Barracks, offices, hangers, the runway and other facilities.

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Pitufik has been struck by very high winds and extreme winter weather since its inception:

- During March 8, 1972, Thule has the fifth highest wind speed ever recorded, and the meteorological record for the highest low altitude wind speed ever recorded, with a wind speed of 207 MPH (334.134 KPH)
- Winds speeds were higher but were not recorded due to destruction of the Bendix Anemometer by the storm! (see pic of type Anemometer destroyed)
- In an average year, Thule will experience 12 to 15 Storms on- and off-base with an average duration of 18-30 hours. Many will have peak winds of more than 100 mph.


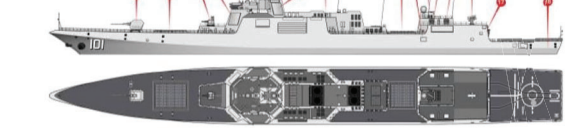



Chinese PLA Navy Renhai Class Cruisers

- USNI Combat Fleets: Type 055 Renhai-Class Cruiser, China's Premier Surface Combatant
- <https://www.youtube.com/watch?v=2Np-9KfVrk>

Military-Today.com

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1. PJ-45 130-mm multipurpose gun
2. Forward universal VLS cells (8x8)
3. PJ-11 30-mm CIWS (11 barrel)
4. L/S-346B multifunctional S-band AESA radar
5. Optic system
6. Optic purfire control system
7. Multifunctional X-band AESA radar
8. Navigational radar
9. Electronic countermeasures system
10. Electronic intelligence/communications intelligence systems
11. Laser warning receiver/optic jammer
12. Air universal VLS cells (6x6)
13. Triple 324-mm torpedo launchers (covered)
14. 24-barreled decoy launchers
15. 18-barreled decoy launchers
16. HHQ-10 short-range SAM launcher
17. Hangars for two Z-20 or Z-9 helicopters
18. Variable-depth towed-array sonar(s)

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Chinese PLA Navy Renhai Class Cruisers- Some statistics

- Displacement : 11,000 tons (standard); 12–13,000 tons (full load);
- Propulsion: COGAG; 4 × QC-280 gas turbines (28 MW (38,000 hp) each); Total: 112 MW (150,000 shp);
- Range: 5,000 nmi (9,300 km) at 12 kn (22 km/h; 14 mph)
- Cost: CN¥6 Billion (US\$888 million) per unit including R&D (FY 2017)
- Length: 180 m (590 ft 7 in)
- Planned: 16
- Speed: 30 knots (56 km/h; 35 mph)



Four Renhai Class Cruisers Location and current course

- The Renhai Class Cruisers left Venezuela after several port stops along the coast.
- They appear to be moving well into the Caribbean Sea and traveling towards Cuba.
- The cruisers are being shadowed by the US Navy and Coast Guard. Their follow on port destinations are not yet known.

Links and References

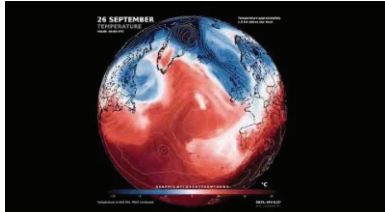
- ▶ <https://eupubs.oxfordlibrary.wiley.com/doi/abs/10.1002/2014J0027609>
- ▶ <https://earthobservatory.nasa.gov/images/78685/flooding-in-kaneeq-tusuaq-greenland>
- ▶ https://www.youtube.com/watch?v=BaizdVtV0e6m&referring_host=ottok47x2342&referring_site=ottok47x2342&referring_domain=ottok47x2342
- ▶ <https://journals.ametsoc.org/view/journals/clim/33/16/jcli10190835.xml>
- ▶ https://www.youtube.com/watch?v=75Uj1tFn_80
- ▶ <https://www.youtube.com/watch?v=KX0X6Aa1t8>
- ▶ <https://www.youtube.com/watch?v=BaizdVtV0e6t-56s>
- ▶ <https://link.springer.com/article/10.1007/s11069-019-03655-8>
- ▶ <https://www.asiaq-greenlandsurvey.gl/forskniptilforretter/extreme-weather-in-southwest-greenland-frequency-magnitude-and-impact/>
- ▶ <https://insideclimatenews.org/news/26022023/the-air-base-greenland-russia-climate-change/>
- ▶ <https://www.cerdc.usace.army.mil/Media/News-Stories/Article/1120812/three-cerdc-labs-come-together-for-a-week-in-the-snow-and/>
- ▶ <https://www.youtube.com/watch?v=GD2Np-9KEV4>

One week out...

Focus: Incident Management


- Put together a system.
- Types of resources likely to be required.

Another atmospheric river is exacerbating melting and flooding, with moisture transport enhanced by the first Atlantic hurricane of the season.



Video

Flooding has wiped out two bridges in Qaanaaq, Greenland separating the town from critical infrastructure.



Based on the summers 2015 and 2016, when the village of Qaanaaq experienced flooding that separated the town from its airport.

Record heat and thaw in Kangerlussuaq has damaged and the end of the runway, making the airport unsafe to use.

The runway in Kangerlussuaq (former Sondrestrom Air Base) has sections that are not on bedrock and continue to settle and crack from permafrost thaw.



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Thawing, flooding, and aging infrastructure is also threatening access to clean water on **Baffin Island**

Similar to the situation in 1999, heavy rains and strong winds have caused two bridges to be unusable in Pangnirtung, separating residents from access to the water reservoir sewage treatment plant and garbage dump.

Although much of its system has been upgraded, Clyde River is also having problems with its Water Pump Station and is concerned with a repeat of the water crisis of 2021.

85% of Nunavut's drinking water infrastructure is in poor condition



Ice melt and permafrost thaw also is also of great concern to subsistence livelihoods & transportation...with fishing season well underway.



Aasiaat, Greenland, (Photo Kari Medig)

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Sled dogs falling through the ice, (Photo: Ed Struzik)

Warmer air and water temperatures is increasing iceberg calving in Greenland



Large Iceberg Breaking near Ilulissat



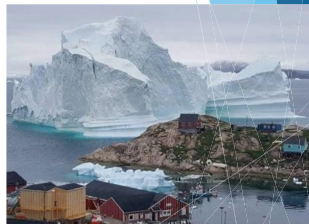
Ilulissat Icefjord - iceberg turning over

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A large iceberg near Ilulissat, Greenland is threatening local villages. A tsunami waves could result if the iceberg breaks apart.



The village of Ilulissat is seen near the icebergs that broke off from the Jakobshavn Glacier, on July 24, 2013 in Ilulissat, Greenland.



Residents of Inarsuit were evacuated when a 100-metre high iceberg parked next to the village.

Eyjafjallajökull Volcano on Iceland (last eruption 2010 as a VEI Four level volcano) showing signs of becoming active again.

The 2010 eruption seriously disrupted air travel in the North Atlantic and Europe. The tremors might precede an eruption by days or hours, or they might not lead to an eruption at all.