

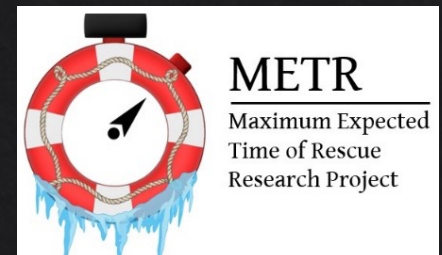


Photo courtesy of Winnie Hatkaiittuq.

# Arctic SAR: Issues, Challenges, and Pathways to Solutions



Peter Kikkert, St. Francis Xavier University  
Ron Pelot, Dalhousie University





# Increasing Hazards and Vulnerabilities at the Community Level

- ◆ Rapidly changing environmental conditions (sea, ice, weather)
- ◆ Limited survival gear, personal locators, marine charts
- ◆ Loss of land safety knowledge
- ◆ Weak boating safety culture
- ◆ Pressures of food insecurity

Photos courtesy of P. Whitney Lackenbauer and Baba Pedersen

# Increasing Outside Activity and Risk

More vessels  
Uncharted seabed  
Ice hazards  
Extreme weather  
Inexperienced operators  
Bad decisions



Cruise ship Bremen, at anchor outside Cambridge Bay (Nunatsiaq News); adventurer Karl Kruger, who plans to stand up paddleboard the NWP ([karlkrugerofficial.com](http://karlkrugerofficial.com)); pleasure craft in Gjoa Haven, August 2022 (Kikkert).

## Close Calls

2010: *Clipper Adventurer* ran aground on a known shoal in Coronation Gulf, with 197 people on board.

2016: the fishing vessel *Saputi* struck a piece of ice and was holed in Davis Strait, with 30 people on board.

2018: the research vessel *Akademik Ioffe* grounded on a rocky shoal in the Gulf of Boothia, with 163 people on board.



# SAR Response Challenges in Arctic

- ❖ Difficult, dangerous operating environment
- ❖ Limited support infrastructure
- ❖ Communications difficulties
- ❖ Fewer vessels of opportunity to respond
- ❖ Primary SAR assets based in South
- ❖ Tyranny of time and distance

# Community SAR Responders: Challenges

Increasing case load

Training gaps

Equipment shortages

Administrative burden

Lack of mental and physical health supports

Community engagement

Coordination/ Cooperation challenges

Slow federal response times

Fundraising

Volunteer burnout

# An Innovative Policy and Programming Space

Risk-based Analysis of Maritime SAR Delivery (RAMSARD)

Coast Guard Auxiliary expansion

Indigenous Community Boat Volunteer Program (ICBVP)

Rankin Inlet Inshore Rescue Boat Station / Marine Rescue Station

Coast Guard Arctic Region's Training and Exercise Program

Hiring of Inuit SAR officers and trainers

Longer icebreaker operating seasons

New hardware (icebreakers / OPVs)

Improved satellite coverage

Others: Garmin inReach; SmartICE; CASARA drone project



# Moving Forward

Continue to fund,  
support, and  
expand existing  
initiatives

Greater support  
and more tools for  
community  
responders

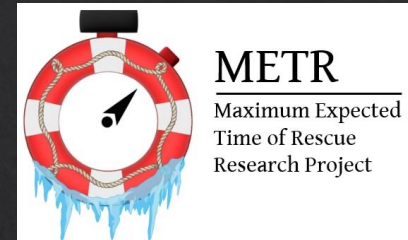
Re-establish  
Northern Search  
and Rescue  
Roundtable

Develop Northern  
SAR Strategy

Arctic Mass  
Rescue Operations  
Planning  
Committee

Ensure regulations  
and guidelines  
reflect SAR  
realities

# Canadian Maximum Expected Time to be Rescued – METR Project



- ❖ No guidance for shipowners or regulators related to “maximum time to be rescued” for Polar Code Certificate
- ❖ No comprehensive information on “place of safety” in the context of Canadian arctic communities
- ❖ To provide open-source information to enable ship owners and regulators to have realistic numbers for polar code certificates for voyages into Canadian arctic waters
- ❖ To provide a methodology that can be exported to other jurisdictions

Transport Canada / Transports Canada

Document no. – N° du document

**POLAR SHIP CERTIFICATE**  
This Certificate shall be supplemented by a Record of Equipment for the Polar Ship Certificate

**CERTIFICAT POUR NAVIRE POLAIRE**  
Le présent Certificat doit être complété par une Fiche d'équipement pour le Certificat pour navire polaire

Issued under the provisions of the *International Convention for the Safety of Life at Sea, 1974*, as modified by the Protocol of 1988 relating thereto, under the authority of the Government of Canada, by:

Déjà en vertu des dispositions de la *Convention Internationale de 1974 pour la sauvegarde de la vie humaine en mer*, telle que modifiée par le Protocole de 1988 y relatif, sous autorité du Gouvernement du Canada, par :

Full designation of competent person or organization authorized under the provisions of the *Convention*  
Titre officiel complet de la personne ou de l'organisme compétent autorisé en vertu des dispositions de la *Convention*

Name of ship Nom du navire	Distinctive number or letters Lettres ou numéro distinctifs	Port of registry Port d'immatriculation	Gross tonnage Jauge brute	IMO number 1 Numéro OMI 1
Type of ship (dry cargo, passenger ship, tanker, tug, etc.) Type de navire (navire de charge sèche, navires à passage, pétrolier, remorqueur etc.)				
Ship restricted to operate in: Navire devant être exploité uniquement dans: <input type="radio"/> Ice free waters / Eaux libres de glace <input type="radio"/> Open waters / En eaux libres <input type="radio"/> Other ice conditions / Dans d'autres conditions de glace <input type="radio"/> N/A – s.o.				
Ship intended to operate in low air temperature: Navire censé être exploité dans des températures de l'air basses: <input type="radio"/> Yes – Oui <input type="radio"/> No – Non <input type="radio"/> N/A – s.o.				
Polar Service Temperature: Température de service pour la navigation polaire: °C or/ou <input type="radio"/> N/A – s.o.				
Maximum expected time of rescue: Délai maximal de sauvetage prévu: days – jours				
Is the ship subject to alternative design and arrangements in pursuance of regulation XIV/4 of the SOLAS Convention? Le navire a-t-il fait l'objet d'autres conceptions et dispositifs en application de la règle XIV/4 de la Convention SOLAS? <input type="radio"/> Yes – Oui <input type="radio"/> No – Non <input type="radio"/> N/A – s.o.				

Is a document of approval of alternative design and arrangements for structure, machinery and electrical installations/fire protection/life-saving appliances and arrangements appended to this Certificate?  
Y a-t-il un document d'approbation d'une autre conception ou d'un autre dispositif pour la structure, les machines,  Yes – Oui  No – Non  N/A – s.o.

# Project Funding

- ◆ Major funding from National Search and Rescue Secretariat under New SAR Initiatives Fund
- ◆ 3-year study: 2021 - 2024
- ◆ Other contributions from
  - ◆ Canadian Coast Guard
  - ◆ Ocean Frontier Institute
  - ◆ MEOPAR (Marine Environmental Observation, Prediction and Response Network)
  - ◆ Transport Canada, National Research Council, Royal Canadian Air Force (RCAF), Canadian Hydrographic Services, American Bureau of Shipping, FedNav Ltd., Nunavut Eastern Arctic Shipping (NEAS), GNWT Marine Transportation Services, Lloyd's Register Canada Ltd.

# Project Team

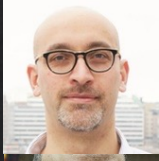
## ◆ Principal Investigators



◆ Dr. Ronald Pelot – Dalhousie University



◆ Capt. Jack Gallagher – Hammurabi Consulting



◆ Dr. Floris Goerlandt – Dalhousie University



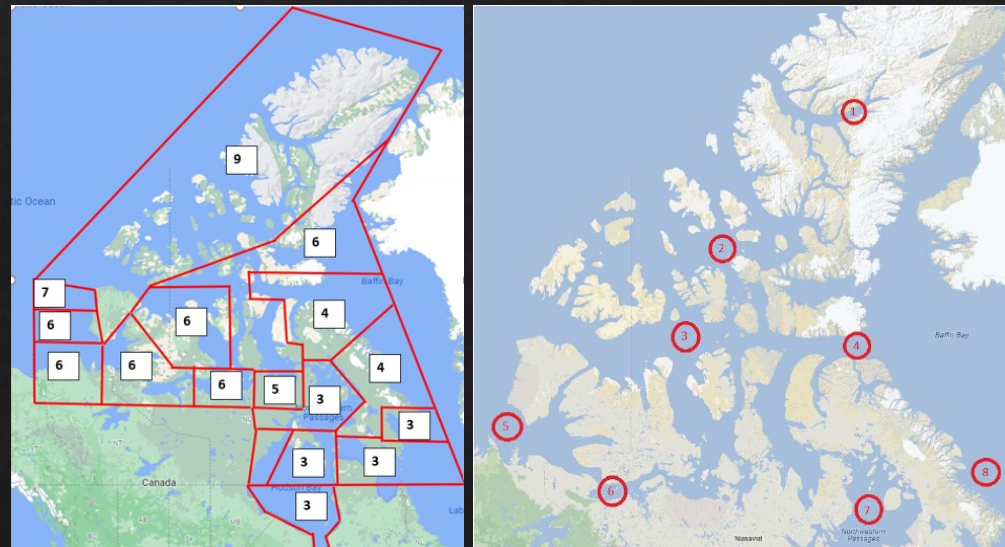
◆ Dr. Robert Brown – Marine Institute, MUN



◆ Dr. Peter Kikkert – St. Francis Xavier University

# Project Assumptions

- ◇ Where a ship is going matters
- ◇ When the ship is going matters
- ◇ Total complement to be rescued matters
- ◇ All SAR response capability considered
- ◇ Need to determine whether there are other important variables

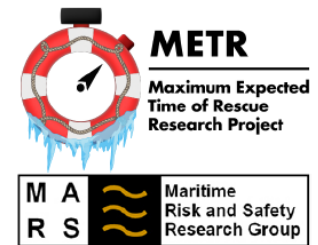


# Research Methods

- ◆ Consultation with SAR response community
- ◆ Consultation with vessel operators in the north
- ◆ Roundtables with northern communities and officials
- ◆ Modelling of vessel traffic and incident risks
- ◆ Modelling of response resource capacity and capability

# Questionnaire

- ◇ >50% felt 5 days is not sufficient for all cases
- ◇ Distance from SAR assets is major factor
- ◇ No clear consensus on “place of safety”
- ◇ Confirmed project planning assumptions



Maximum Expected Time of Rescue (METR) in Canadian Arctic waters - Pre-research questionnaire summary report

Conducted for  
METR Project

By  
Jessica Cucinelli, Dr. Ronald Pelot, Dr. Floris Goerlandt, Capt. Jack Gallagher, Dr.  
Robert Brown, Dr. Peter Kikkert

# Literature Search

◆ Over 200 documents found and catalogued

25	An ILP and simulation model to optimize search and rescue helicopter operations	2	Google Drive	Mumtaz Karatas, Nasuh Razi & Murat M. Gunal	Journal of the Operational Re	2017	Uses ILP model and simulations to develop a deployment purpose is to optimize resource allocation of SAR helicop provides an overview of the SISAR incident database. Ten insight into when SAR incidents are most likely to occur, more incidents occur in july (summer) over the weekends, vessels and closer to shore. This information is important and can help guide decisions as to where SAR resources/s
26	Historical Maritime Search and Rescue Incident Data Analysis	2	Google Drive	Mark Stoddard and Ronald Pelot		2020	explores helicopter capacity to respond to SAR incidents i highlights the importance of joint exercises and bilateral a preparedness and response capacity. Can leverage resource helicopters, vehicles, planes etc.) to transport people from adequet shelter and medical care so there is less demand o Interviews experts as part of their research methodology, s this project. There is a need to have a rescue helicopter ba
27	Emergency response logistics in the High Arctic	1	Google Drive	Lisbeth Andreassen Harlia	master thesis	2019	ETR (lots of time wasted in refueling and traveling from t Arctic states agree to work together to support Arctic SAR increases coordination. Russia , the USA, and Denmark w improving SAR capacity in the Canadian Arctic.
28	Transport Canada is getting a long-range droi	3	<a href="http://hdl.handle.net/11374/531">http://hdl.handle.net/11374/531</a>		Arctic Council	2011	emphasizes the need to raise common situation awareness SAR responders. This text further supports Canada's appro Canada has implemented the ICS response management sy increasing situational awareness (e.g. EMSA program und interpretation which makes it more difficult to enforce and are in compliance. Provides recommendations to improve
	Maritime Operations and Emergency Preparedness in the Arctic—Competence Standards for Search and Rescue Operations			Johannes Schmied, Odd Jarl Borch, Ensieh Kheiri Pileh Roud, Tor Einar Berg, Kay Fjortoft, Ørian Selvik, and	The interconnected Arctic		

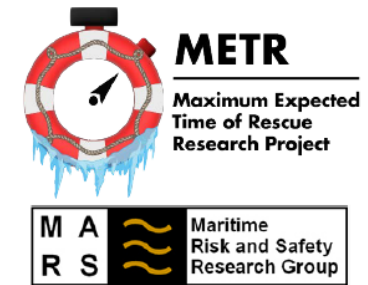


# Interviews

- ◇ Conducted January – May, 2022
- ◇ Transport Canada and Classification Societies
- ◇ JRCC Trenton and Halifax
- ◇ Shipping companies and associations

# Response Workshops

- ◇ SAR Planners (JRCC Trenton & Halifax)
- ◇ Air Responders
- ◇ Marine Responders (including CCG, ice navigators, commercial vessels)



Maximum Expected Time of Rescue (METR) in Canadian Arctic Waters

Search and Rescue Response Workshop Summary Report

By  
Capt. Jack Gallagher, Jessica Cucinelli, Dr. Ronald Pelot, Dr. Floris Goerlandt, ,  
Dr. Robert Brown, Dr. Peter Kikkert



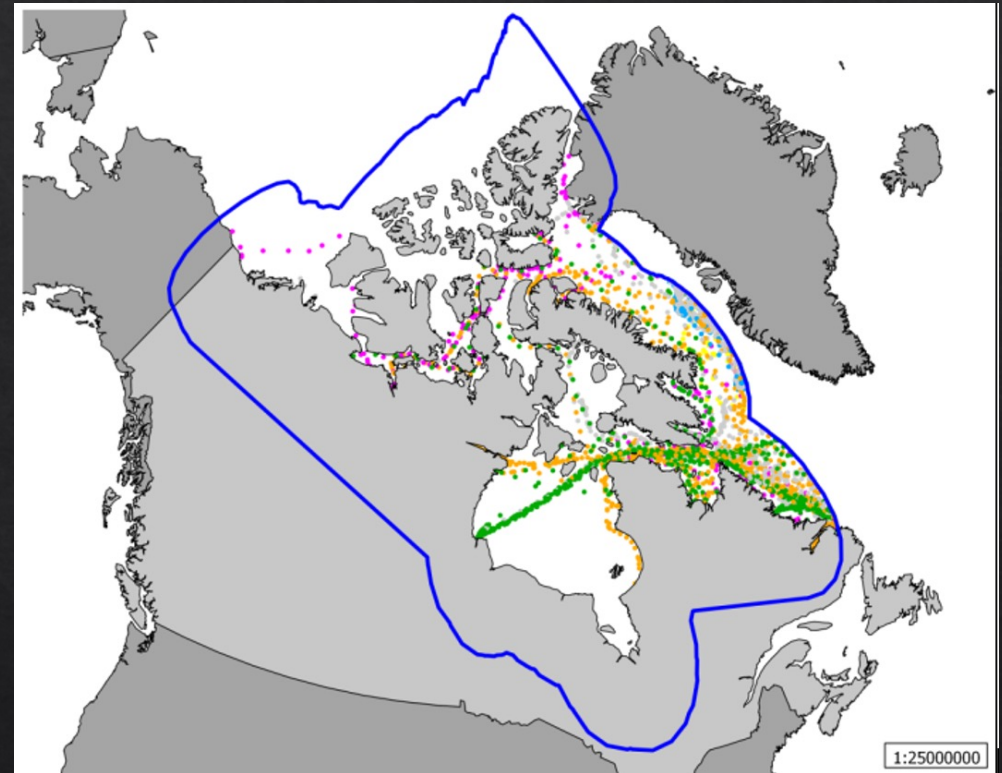
Government  
of Canada

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du Canada



# Modelling

- ◇ Modelling marine traffic as well as air and marine responses
- ◇ Varying locations, times of year and numbers of persons to be rescued
- ◇ Probabilistic modelling for all elements where practicable



# METR Future Work

- ◇ Arctic Roundtables and TTX
  - ◇ Qikiqtani Roundtable - Iqaluit - Nov 11-14
  - ◇ Kivalliq Roundtable - Rankin Inlet Nov 15-17
  - ◇ Kitikmeot Roundtable – Yellowknife Nov 20-22
- ◇ Complete modelling
- ◇ Confirm modelling outputs with planners and responders
- ◇ For more information:
  - ◇ [www.maritimeriskandsafety.ca](http://www.maritimeriskandsafety.ca)
  - ◇ Ronald.Pelot@dal.ca



