

# National Research Council Update

Mariners Workshop 2021

January 28, 2021

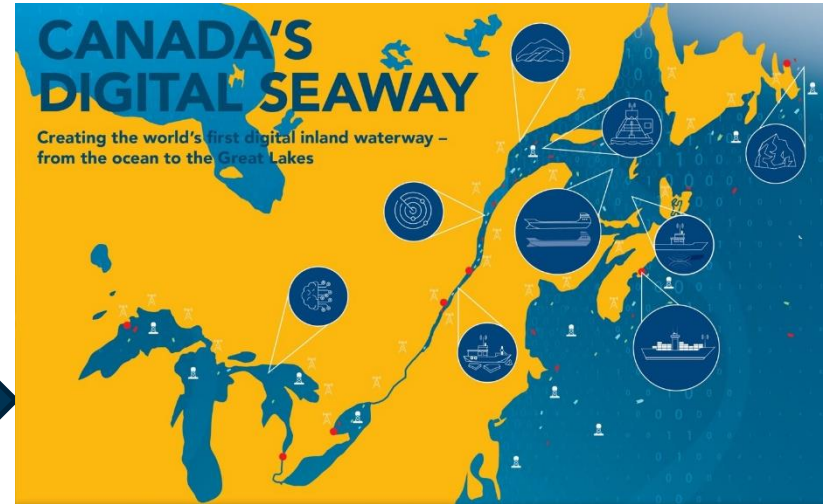
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Program Director, Ocean Program



- 1. Where are we with the Digital Seaway**
- 2. Enabling MASS - Federally**
- 3. NRC Specific Activities**
- 4. Collaborations**

# Last Year: Canada's Digital Waterways: Digital Seaway

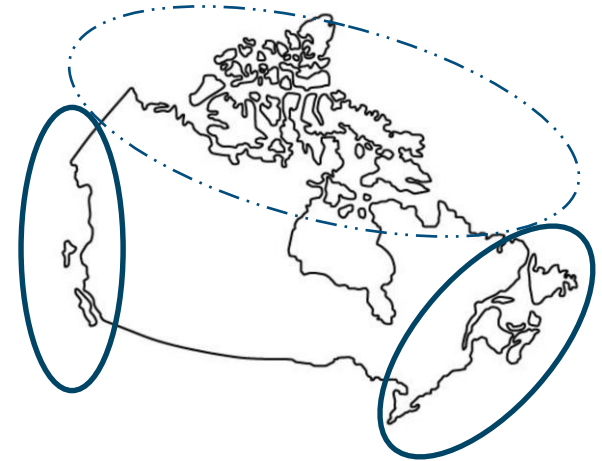


- > Fully-instrumented waterway
- > Intelligent sensors & data fusion
- > Hydrodynamics
- > AI navigation in ice & harsh environments
- > Autonomous ships & digital twinning
- > Discernible & predictable ice conditions
- > Advanced icebreaking operations
- > Increased human performance & safety
- > Decreased underwater noise
- > Smart & resilient coastlines
- > Smart ports & infrastructure

# Now: Enabling MASS in Canadian Waters

## NRC continues to Chair Canadian Forum for Maritime Autonomous Surface Ships (CFMASS) Testing/Research and Development Subcommittee

- Hold monthly webinars to keep national stakeholders informed and engaged
  - Next Webinar: February 12th, 2021 at 11 am EST
  - Topic: Environmental scan on Enabling MASS technologies
    - Leading jurisdictions
    - Emerging and hot new technology trends
- Interdepartmental Working Group created to:
  - Align all relevant federal bodies and initiatives
  - Guide committee activities in commitments
- Long term vision to establish Canadian expertise under Blue Economy Strategy
  - MASS is necessary for zero emissions shipping



# NRC: Enabling Maritime Autonomous Surface Ships (MASS)

## NRC strategic research is dedicated to Intelligent Marine Assets

- Focus on Operational Performance and longer term environmental prediction
- Primary Sector: Ships and Shipping to enable MASS

## Workshop held on Marine Assets to understand barriers and potential solutions

- 10 Year Vision:
  - Fully connected and fully instrumented waterways that have a mix of vessel types and levels of automation
  - Zero point source emissions
- Areas identified that may be considered
  - Creating living labs in ships to co-develop technologies with captain, pilots, crew
  - Potential to develop a new “pre-review” advisory committee to support industry through the MTRB process, which is currently a barrier to innovation in Canada
  - Full report will be shared in both official languages by summer 2021

# Enabling MASS Activities

## Harsh Environment Autonomous Vessel Experimental Test-platform (HEAVET) Base Platform

Facility to aid in ALL aspects of R&D related to MASS and Autonomous Surface Vessels (ASV) operations in ice-covered waters in the St. Lawrence River (Gulf of St. Lawrence to Montreal)

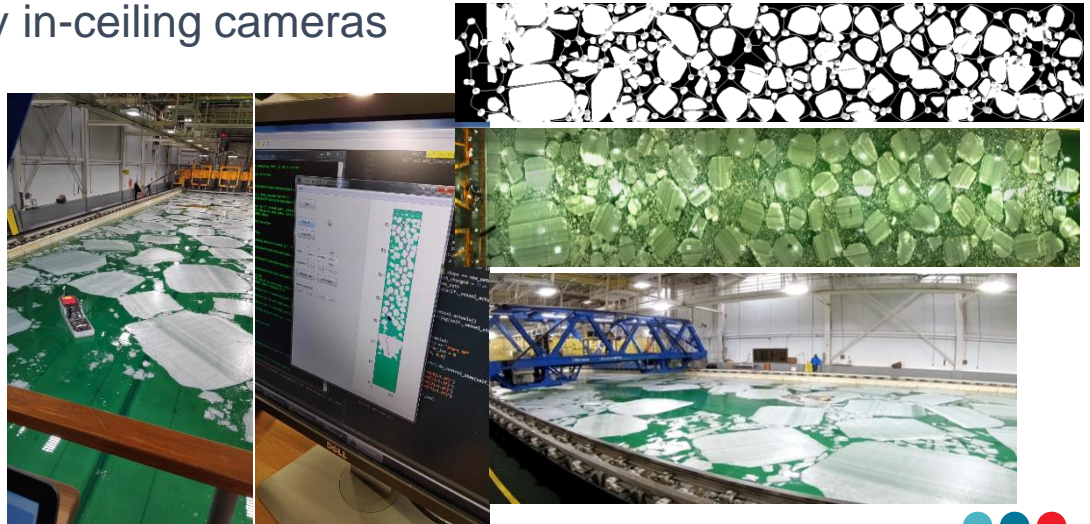
- Research Test Facility for development of MASS/ASV components, applications software/hardware
- Will provide steppingstone development device to enable autonomous technology developers and researchers an integrated, robust platform to add equipment and/or software to in pursuit of novel research and development

## Developing a business case for a potential test range in Rimouski

# Example of Research Success

Demonstrated the first successful integration of NRC's scalable testbed system in the St. John's Ice Tank facility.

- Real-time imagery from twenty in-ceiling cameras was stitched together and processed to detect routes through a managed ice field.
  - Algorithms were implemented to determine the shortest open-water path. A free-running autonomous model vessel was able to receive and follow the path.



# NRC Research Open to Collaboration

**Call for Expression of Interest for Collaborative Research closes January 29th, 2021, 5 pm PST ([CISMaRT.ca](http://CISMaRT.ca) for details)**

## Areas of NRC Research:

- Use of Machine Learning for Identification and Characterization of Vessel Operational Best Practices
- Digital Twin Technology for Autonomous Operation in Harsh Environment
- Prediction of Ice in the St. Lawrence Waterway Using Artificial Intelligence
- Ship Situational Awareness in Ice
- St. Lawrence Seaway Autonomous Marine Testbed
- Extension of Driving Automation Research Activities at NRC to the Marine Use Case



# Examples of Collaborative Projects

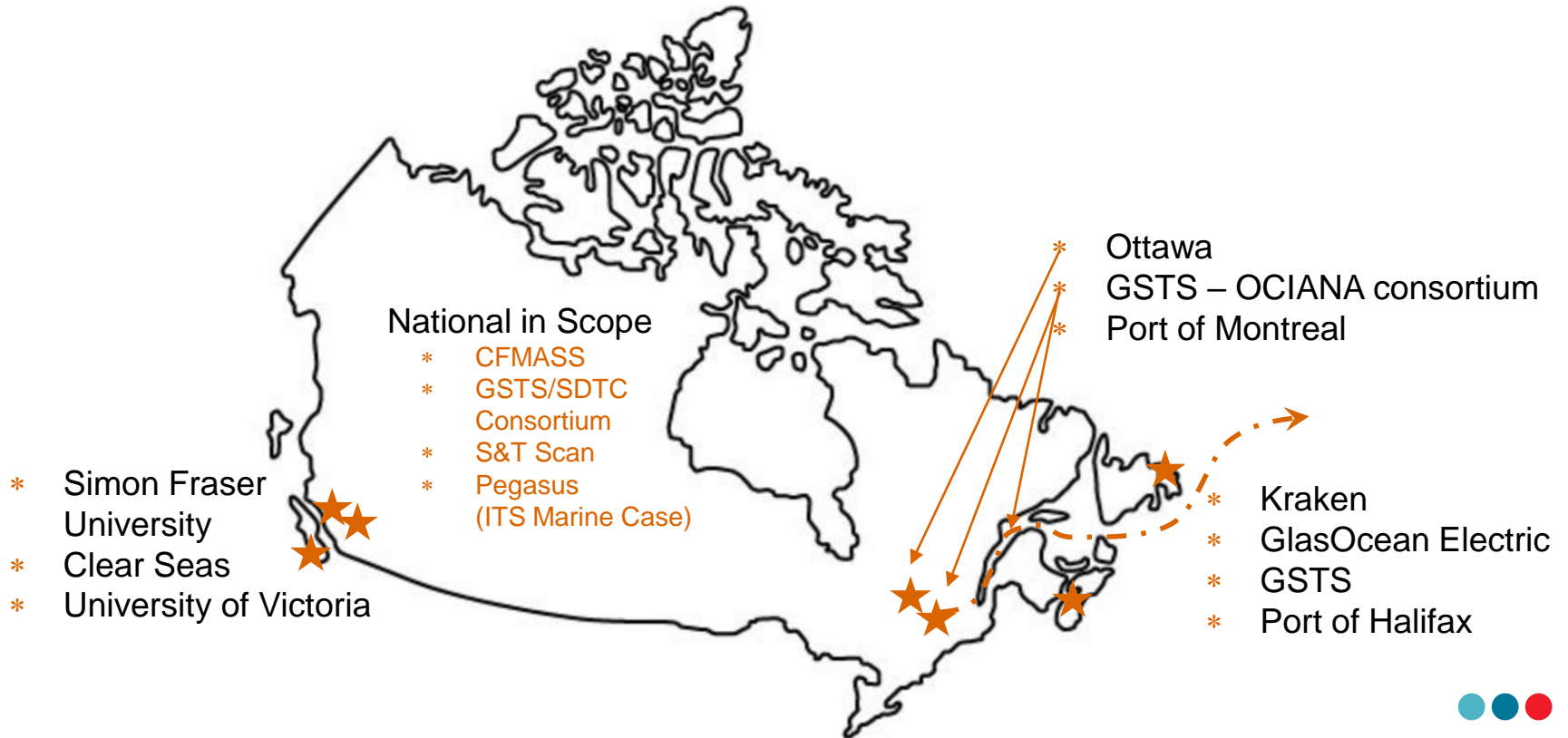
## Industry

- Creating maritime use case using Intelligent Transportation System (ITS) reference architecture – Pegasus
- Developing a sensor suite for ice prediction – C-CORE

## Academia

- Validated control systems for path planning and integrated tactical autopilot for MASS in Ice – Waterloo
- Enhanced computing capacity (equipment investment) to offer free computational services to our collaborators for digital twinning and numerical simulations - MUN
- High resolution climate modelling and analysis of the St. Lawrence seaway in current and future climates – McGill
- Identification and characterization of vessel operational best practices using ML - SFU

# Activities Coast to Coast



# Thank you!

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