



# e-Navigation Underway 2017 (North America)

FINAL REPORT





## **e-NAVIGATION UNDERWAY 2017 (NORTH AMERICA) FINAL REPORT OF THE CONFERENCE**

### **EXECUTIVE SUMMARY**

***e-NAVIGATION Underway (North America) 2017*** was held 16-19 October 2017 at the Sheraton Hotel, St. John's, Newfoundland, Canada. Organized under the auspices of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) the conference was hosted by the Fisheries and Marine Institute of Memorial University of Newfoundland. The conference was conducted as a joint undertaking with ***Ocean Innovation 2017***, an annual conference regularly presented by the Marine Institute. The conference was attended by 130 delegates, representing 8 countries. Sponsorship was provided by eight firms. Four organizations supported the conference and these are identified on Page 2 hereof. The associated exhibition attracted 10 organizations, displaying e-navigation related systems and services.

33 Presenters and Panelists covered a wide variety of e-NAVIGATION topics which were grouped in five Sessions.

- I. Recent User e-NAVIGATION Experience: The Canadian Perspective
- II. International Perspective for e- NAVIGATION
- III. e-NAVIGATION – Industry Perspective
- IV. e-NAVIGATION – What's Under Development?
- V. The Way Forward for e-NAVIGATION

Each Session concluded with a discussion of the topics presented. In the session entitled "The Way Forward", which included presentations by a panel made up of the moderators of the earlier sessions underscoring key points, delegates reached consensus on a series of conclusions and recommendations. A summary of these appears in Section 9.

Presentation materials are available on the conference website <http://www.e-navnorthamerica.org>. Links are shown in the "Agenda" section.

## SUPPORTING ORGANIZATIONS



**Comité International Radio-Maritime (CIRM)** is the principle non-profit international association for marine electronics companies, promoting the application of electronic technology for the Safety of Life at Sea and efficient conduct of vessels; fostering relations between all organizations concerned with electronic systems for maritime navigation and information technology.

**Danish Maritime Authority** is the national authority responsible for:

- The construction, equipment and operation of Danish ships (including safety, terror prevention, navigational regulations, manning, occupational health and environmental protection) as well as port State control of foreign ships calling at Danish ports.
- Ship registration.
- Seafarers' employment, health and conditions of social security.
- Shipping policy, maritime law as well as industrial policy, both nationally and internationally.
- Tasks related to buoying at sea and navigation marks ashore (lighthouses and buoys), including ships and repair workshops.
- Navigational information in the form of navigational analyses, warnings, GIS and specialist publications.
- The national pilot authority.

**International Hydrographic Organization (IHO).** The International Hydrographic Organization is an intergovernmental consultative and technical organization established to support safety of navigation and the protection of the marine environment. The mission of IHO is to create a global environment in which states provide adequate and timely hydrographic data, products and services and ensure their widest possible use.

**Nautical Institute.** The Nautical Institute is an international representative body for maritime professionals involved in the control of sea-going ships. It provides a wide range of services to enhance the professional standing and knowledge of members who are drawn from all sectors of the maritime world. It is a non-governmental organization (NGO) with consultative status at the International Maritime Organization (IMO), whose aim is to represent seafarers' and practical maritime professionals' views at the highest level.

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## 1. INTRODUCTION

***e-Navigation Underway 2017 (North America)*** was organized by IALA as the fourth North American regional version of the highly successful ***e-Navigation Underway International*** series held annually at sea in the Baltic. Hosted by the Fisheries and Marine Institute, Memorial University of Newfoundland the conference combined ***e-Navigation Underway (North America) 2017*** and ***Ocean Innovation 2017*** with the goal of encouraging greater understanding, stimulate thought about e-navigation's needs and application within North American and Polar Regions and to promote the identification of specific actions needed to implement and enhance e-navigation.

Under the all-encompassing theme “Enhancing Technology and Innovation for Polar Navigation” the conference examined e-navigation as it relates to the following areas:

- Infrastructure
- Ice Navigation and Passage Planning (User Needs and Local Knowledge)
- Incident Response (Including Antarctic)
- Sea Traffic Management (Arctic Corridors)
- Governmental Programs and Plans (Polar Code)

In addition to the information gained from the presentations, networking and cross fertilization of ideas the delegates led to the formulation of “Conclusions” and “Recommendations” about e-navigation issues and needs. Forming part of the Final Report of the conference, these will be reviewed by IALA for subsequent distribution to the appropriate governmental and standard setting agencies.

The program was developed by a Steering Committee the membership of which is listed in Section 13. The process included reaching out to other affected parties such as the insurance industry, with the intent to begin interchanges that would break down the “stove piping” of information.

## 2. OPENING OF THE CONFERENCE

### 2.1. Welcoming

Paul Brett, Head, School of Ocean Technology opened the conference by welcoming everyone to St. John's and he introduced David Boland, Program Manager with the Atlantic Canada Opportunities Agency (ACOA), a major partner in the event. Mr. Boland brought welcome comments on behalf of the Federal Government of Canada.

### 2.2. Opening Remarks

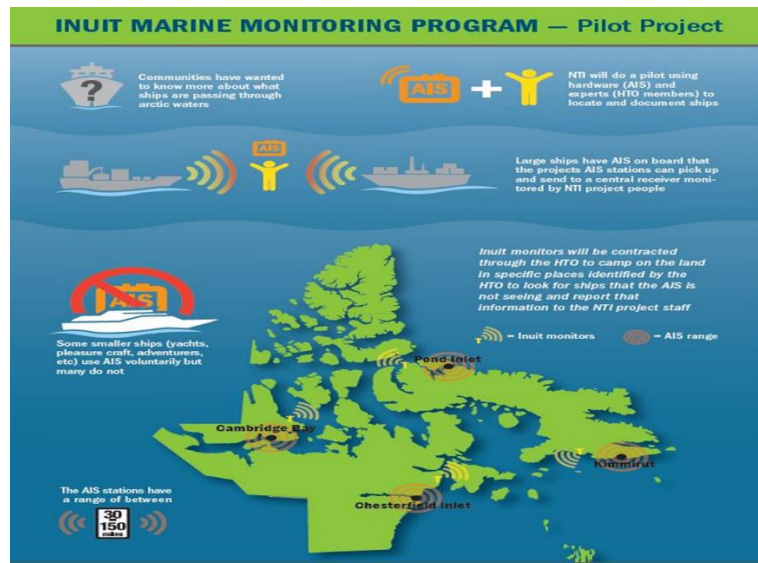
The conference was opened by welcoming remarks by **Ms. Catherine Dutton**, Head, School of Maritime Studies, the Fisheries and Marine Institute, Memorial University of Newfoundland, who then introduced Ms. Udloriak Hanson.

### 2.3. Keynote Address

Ms. Udloriak Hanson, Chief Operating Officer, Department of Corporate Services, Nunavut Tunngavik, Inc articulated her thoughts on what has been ongoing in the communities with regards to the Northwest Passage. Work of IMMP - Inuit Marine Monitoring Project was explained by emphasising that safe and efficient shipping is essential to the wellbeing of Nunavummiut and shipping poses significant risks due oil spills, marine wildlife disturbance, break-up of sea-ice on hunting grounds, etc. to the community. Due to this it is critical that strong monitoring and management efforts be undertaken to prevent serious impacts from shipping. The two key components of IMMP are:

- Building a network of local Inuit marine monitors, who are employed during the shipping season to record observations of vessel activities in Nunavut's coastal areas;
- Tracking data on shipping activities in Nunavut with Off-Grid and In-town AIS making it accessible to interested community members, NTI, RIAs, and HTOs.

She also emphasized to have effective group discussions that generate thoughtful insight on how to address various issues with regards to the navigation in Northwest Passage and how the local community and people can be involved.



### 3. SESSION I – RECENT USER E-NAVIGATION EXPERIENCE: THE CANADIAN PERSPECTIVE

#### 3.1. Topics and Presenters

Facilitator: Mr. Desmond Raymond, Regional Director, Marine Safety & Security, Transport Canada	
	TOPIC
Panel 1	The panel's focus was upon the Crystal Serenity transit, and will facilitate discussions in key areas such as large ship passage planning needs and general arctic passage planning.
Panel II	The focus was on resupply operators and the challenges and opportunities with Arctic navigation and e-navigation, and facilitated discussion of key areas such as equipment and infrastructure needs.
Panel III	Representatives of non-governmental organizations (NGO) spoke about initiatives now underway with respect to the Arctic, and facilitated discussions in areas such as local incident response planning and preservation of local communities and wild life.

### Panelists:

Mr. Ryan Barry, Nunavut Impact Review Board  
Mr. Fred Constantine, The Woodward's Group  
Mr. Christopher Debiki, Oceans North (The Pew Foundation)  
Mr. Andrew Dumbrille, World Wildlife Fund Canada  
Mr. Tim Keane, Fednav  
Mr. Christopher King, Petro Nav  
Mr. Dermot Loughlane, Marine Tactical Solutions and Crystal Cruises  
Mr. Waquih Rayes, Arctic Sealift & Transportation Management, Desgagnés Transarctic, Inc.  
Mr. Trevor Taylor, Oceans North (The Pew Foundation)  
Mr. John Vandenberg, NWT Marine Transportation Services

### 3.2. Summary of Session

The intent of this opening session was to provide a narrative of the voyages highlighting key factors applicable to the joint management aspect of shipping in the Canadian Arctic, Arctic e-navigation for major vessels, and do so in the context of the joint oversight of safety, security and stewardship concerns that exists within the Canadian Arctic. By the date of the conference, the *Crystal Serenity* had completed two Northwest Passage voyages, each of which included excursions to sites within the Canadian Arctic Archipelago. This session was broken into three panels, each examining specific areas of navigating in arctic waters, from the actual navigation in the Arctic to the impact of navigation on cultural and environmental environments.

Each Panel was asked the following questions to provide insight on recent e-navigation experience from their different perspectives.

***Q1: Please tell us about your organization and it's and your role in respect to Arctic shipping***

***Q2: Risks and Realities in the Arctic are always a hot topic. What do you see as perceived versus actual risks? What do you see as solutions or opportunities to address actual risks?***

***Q3 - The Government of Canada recently announced the \$1.5 Billion Oceans Protection Plan. For the Canadian Arctic initiatives and funds have been announced for training, infrastructure and oversight. What are your thoughts on the OPP?***

### 3.3. Salient Points

The Ocean Protection Plan (OPP) can be a good start but given the limited amount of funding allocated to the North strategic assessment of needs to inform investments

Corridors as a strategy can help bridge the issues from the traditional operations and the community concerns into a new means to allow for safe and sustainable shipping in the Arctic.

Shipping is a multi-faceted and multi-partner activity and needs to evolve to reflect all partner needs, concerns and opportunities.

## 4. SESSION II – INTERNATIONAL PERSPECTIVE FOR E- NAVIGATION

### 4.1. Topics and Presenters

<b>Moderator: Captain Christopher Hearn, Director, Centre for Marine Simulation, Marine Institute</b>	
TOPIC	PRESENTER
The Polar Code and the Canadian Arctic	Ms. Marie Helene Roy, Manager, National Marine Safety Program
Canadian Coast Guard	Mr. Neil O'Rourke, Senior Director, Safe Shipping and Economic Intelligence, Canadian Coast Guard
Introduction and Prospect of e-navigation in the Asia-Pacific Region	Mr. Tae Hyung Cho, Ministry of Oceans and Fisheries (Republic of Korea)
The Arctic Coast Guard Forum	Mr. Neil O'Rourke, Senior Director, Safe Shipping and Economic Intelligence, Canadian Coast Guard
Measures in Alaskan Waters	Captain Edward E. Page, Executive Director, Marine Exchange of Alaska
Topic to be announced	Mr. Peter Pamel, Partner, Borden Ladner Gervais (BLG)
Pilotage Act Review	Ms. Sarah Graham, Senior Marine Safety Inspector, Transport Canada

### 4.2. Summary of Session

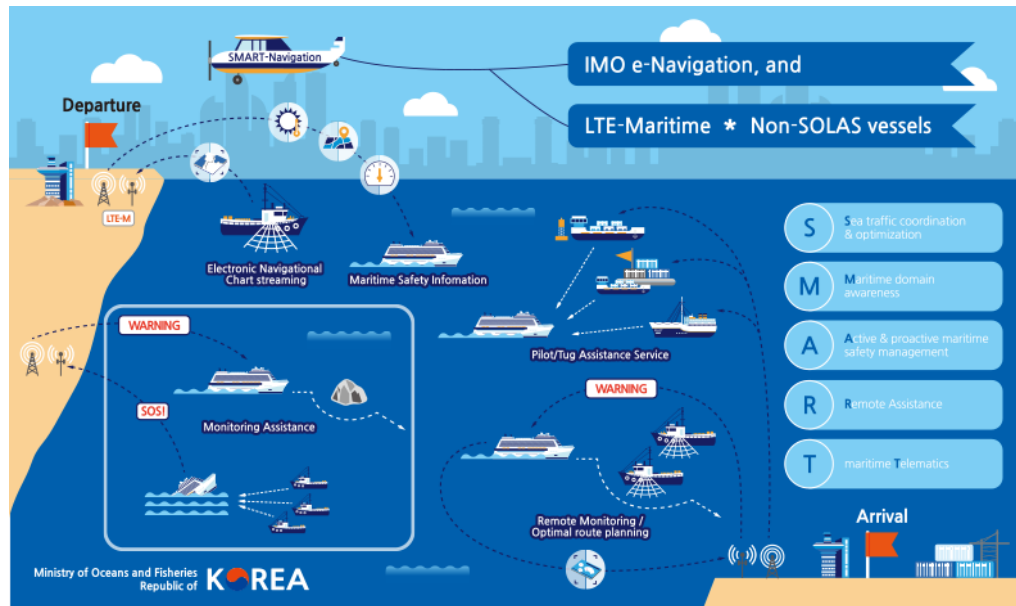
The Canadian and United States governments, together with agencies such as the International Maritime Organization (IMO) and the State of Alaska have significant roles to play in the safety and security of the North American Arctic Region, and for stewardship of its environmental and living resources. This session provided an overview of governmental needs from e-navigation and ongoing activities, programs and planning that will provide e-navigation infrastructure and affect the region in the future.

### 4.3. Salient Points

- Canada's Marine Safety System – The domestic framework consists of Canada Shipping Act, 2001 (CSA, 2001) is main federal legislation and this applies to all vessels operating in Canadian waters and Canadian vessels worldwide. It implements international conventions adopted by Canada. Marine Liability Act sets out requirements for ship-owners to carry compulsory insurance to cover liability for ship-source pollution. Other key Acts: Marine Transportation Security Act, Pilotage Act, Canada Marine Act, Coasting Trade Act, Arctic Waters Pollution Prevention Act. Canada's marine safety system is built on 3 pillars – Environmental protection by prevention, preparedness / response and Liability / compensation. This is built in partnership with Transport Canada, Canadian coastguard, ports pilots etc. Transport Canada has published the Arctic Shipping Safety and Pollution Prevention Regulations in Canada Gazette Part I, which incorporates the Polar Code by reference with specific Canadian modifications. The Polar code will increase international safety and environmental standards for ships operating in Arctic and Antarctic waters by introducing

requirements for ship design and construction, onboard equipment, operations and manning, and protection of the marine environment. The existing prohibition on the discharge of pollutants from ships has been maintained.

- **E-Nav Related Initiatives** - The unique Canadian requirements for two gyrocompasses, two echo sounders and a weather facsimile receiver for operation in certain Shipping Safety Control Zones will be replaced by the Polar Code requirements of SOLAS XIV. Canada is proposing additional AIS carriage requirements that will harmonize with USCG and St. Lawrence Seaway carriage requirements (Navigation Safety Regulations). A graphical display (beyond the MKD) will be mandatory, this means can be external to the AIS. Implementation of mandatory SOLAS carriage requirement for domestic vessels 500gt or more outside the Great Lakes. ECDIS will be required on all new builds operating solely in the Great Lakes. Canada is participating in several IMO Correspondence Groups such as the group on consequential work related to the new polar code to supplement performance standards for navigation and communication equipment used in polar waters in support of the implementation of the Polar Code.
- **Canada's Maritime Information Portal** - This portal gives mariners access to all the official electronic data and services needed to plan a voyage in Canada, including marine weather, tides, currents, hazards, notices, ice conditions, charts and sailing directions.
- **Voyage Provision of Real and Near Real Time Data - Strategy:** Identify mariners' requirements with regard to AIS Application Specific Messages (AIS ASM) through a national survey. Take advantage of the Regional e-Nav Committees to collect information. Develop a national work plan with data providers. Use Coast Guard AIS Network to optimize federal investments and facilitate the monitoring of AIS time slot allocation. Conduct test beds with mariners
- **Voyage AIS AtoN - Potential Benefits** – This will enable timely marking in critical situations, transmit dynamic position of a critical aid, monitor the status of a critical aid, unique possible solution in some circumstances (water depth, sea state conditions, etc.) and complement conventional AtoNs. Implementation of e-navigation solutions in the Arctic will be progressive due to sparse coverage of electronic nautical charts (ENC) makes it difficult to fully benefit from ECDIS capabilities, Communication challenges and low density of traffic. Canada's approach based on mariners' requirements allows to evaluate the potential and usefulness of communication technologies and to make proper adjustments. Current test beds across the country showed that a transition period towards e-Navgation solutions is necessary to allow mariners to get familiar with information provided electronically and to evaluate accuracy of technology such as AIS AtoN.
- The main objective of e-Navgation is to enhance safety to navigation and to reduce errors and to achieve that goal, a period of adaptation needs to be considered
- **The SMART-Navgation** implements the concept of IMO's e-Navgation, providing additional services for Non-SOLAS ships such as fishery boats, coastal vessels and ferries.



- Arctic Coast Guard Forum - ACGF is an independent, informal, operationally-driven organization, not bound by treaty, to foster safe, secure, and environmentally responsible maritime activity in the Arctic. 8 member states, representing coast guard functions: Canada, Denmark, Finland, Iceland, Norway, Russian Federation, Sweden and the United States of America. The goal of the ACGF is to gather knowledge, develop and enhance cross national collaboration, and demonstrate the ability to conduct search and rescue operations in the Arctic. ACGF emphasizes the importance of cooperation, mutual understanding, partnership and consensual decision-making within the ACGF framework
- Marine Exchange of Alaska - A non-profit maritime organization established to provide the Alaska maritime community information, communications and services to ensure safe, secure, efficient and environmentally responsible maritime operations.
- Implementation of e-Nav technologies to mitigate risk by having responsibility of coastal states to provide information to vessels and responsibility of vessels to have technical capability to receive and process information
- Marine Insurance e-Navigation Strategy Implementation Plan (SIP) contains a list of tasks required to be conducted in order to address 5 prioritized e-navigation solutions, namely - improved, harmonized and user-friendly bridge design; means for standardized and automated reporting; improved reliability, resilience and integrity of bridge equipment and navigation information; integration and presentation of available information in graphical displays received via communication equipment; and improved Communication of VTS Service Portfolio (not limited to VTS stations).
- Scope of the Pilotage Act Review - The review will examine the following themes based on suggestions of past reviews of the Pilotage Act and stakeholder feedback on- Governance, Safety including technology, Labour Models, Tariff setting process and revenue. Economic and Public Policy Considerations and Enforcement and Emerging Issues.
- The Pilotage Act Review will:
  - Seek feedback from communities, partners and stakeholders in Canada's Arctic Region regarding any shipping concerns;

- Review the concerns received and determine how the Review can respond to these concerns;
- Monitor the development of shipping in the Arctic; and
- Explore ways to modernize the legislation and regulatory framework to respond to current concerns and potential future developments

## 5. SESSION III – e-NAVIGATION: INDUSTRY PERSPECTIVE

### 5.1. Topics and Presenters

Moderator: Ms. Cheryl Bidgood, Senior Advisor, Atlantic, Canadian Marine Pilots' Association	
TOPIC	PRESENTER
Industry Perspective	In keeping with <i>Ocean Innovation's</i> goal of promoting industry and research a 30 minute period was devoted to brief presentations by industry, designed to inform delegates about products or initiatives bearing upon safety, security or stewardship in the Arctic.
Ocean Observation and Marine Traffic Monitoring in the Canadian Arctic	Mr. Ryan Flagg, Ocean Networks Canada
Canadian Arctic Shipping Risk Assessment System	Ms. Ivana Kubat, National Research Council Canada (NRC)
Advancements in Ship-Borne Ice Radar Technology	Mr. Stephen Hale, Rutter, Inc.
The Sesame Straits Research Program	Mr. Reidar <b>Olsen</b> , Senior Sales Representative (Norway), Kongsberg Norcontrol AS
The Local Operators' Perspective – Experience in the Arctic and the IceNav dual display radar	Mr. Tim Keane, Senior Manager, Fednav Arctic Operations and Vice President, Enfotec Technical Services
Risk Mitigation Through e-Navigation	Captain Ashok Pandey, Massachusetts Maritime Academy
Sea Traffic Management in Polar Regions	Mr. Fredrik Karlsson, Swedish Maritime Authority
The Last Stop before Autonomous Navigation: Augmented Reality using Microsoft HoloLens	Captain Samuel R. Pecota, California Maritime Academy

### 5.2. Summary of Session

The session examined the presentation of information in forms immediately available for decision-making, reported on selected test bed activities, encouraging attendees to think about future avenues for development.

### 5.3. Salient Points

- Canadian Arctic Shipping Risk Assessment System (CASRAS) provides a comprehensive system for the storage, search and visualization of all key environmental data with specific application to shipping, icebreaking and mitigation in northern waters and Arctic marine corridors. CASRAS is PC-based, easy to learn, easy to use, and allows quick access to essential information at northern latitudes where internet access is limited. CASRAS supports NRC Arctic Program goal to ensure sustainable, low-impact development of the North while increasing the quality of life for Northerners.
- Enhanced ice analysis providing additional tactical information for ice defense systems and to aid ice navigation
- Secure, Efficient and SAfe maritime traffic ManagEment in the Straits of Malacca and Singapore is SESAME and its objective is to develop and validate shared situational awareness and collaborative decision making between ship's bridge team and shore based Vessel Traffic Service personnel.
- The Canadian Ice Service is arguably the most experienced in the world today. Commercial operations in Canada have come to rely heavily on their expertise. Notwithstanding the appreciation for all the support that we receive, we recognise the limitations of their capability. The vastness of the Canadian Arctic is such that it is very often unrealistic to produce large scale charts with sufficient detail. Within an area of 10,000 sq km, there are likely several ice regimes of varying composition.
- A PC-based optimized routing tool aptly called 'CAROM'-Computer-aided Arctic Route Optimization Model. The 'CAROM' is a good first step towards risk mitigation and decision making in ice. It is, however, not intended to replace the judgment of the Shipmaster.
- For better sea traffic control in the Polar Region, in the era of digitalization we are ready for next step, ease up communication and information sharing to increase efficiency and safety via Voyage plan sharing and Time stamps on a new level.

## 6. SESSION IV – e-NAVIGATION: WHAT'S UNDER DEVELOPMENT?

### 6.1. Topics and Presenters

<b>Moderator: Mr. Neil O'Rourke</b> , Senior Director, Safe Shipping and Economic Intelligence, Canadian Coast Guard	
TOPIC	PRESENTER
The Maritime Connectivity Platform	Dr. Han Jin Lee, Project Leader, SMART-Navigation Project, Korea Research Institute of Ships & Ocean Engineering (KRISO)
The Arctic Web	Ms. Cajsa Jersler Fransson, Swedish Maritime Authority, and Mr. Christopher Anderberg, Chalmers University of Technology
Efficensea2 and Danish Maritime Authority Initiatives	Mr. Henrik Skovmark, Danish Maritime Authority (DMA)

Regional e-Navigation Projects	A regionally focused viewpoint on e-navigation from an Atlantic Canada perspective. Representation from companies/ organizations currently working in the North or assisting those working in the North, using e-navigation.
C-CORE – Innovative Satellite Imaging Technology & Cloud Processing	Mr. Desmond Power, Vice President, Remote Sensing, C-CORE, Memorial University of Newfoundland
e-Navigation – A Pilot's Perspective	Captain Andrew Rae, Atlantic Canada Pilotage Authority

## 6.2. Summary of Session

The session dealt with things being developed or used in other regions. The purpose was to acquaint delegates with what's going on elsewhere and trigger thinking about the utility of applying these or similar applications to the North American Arctic.

## 6.3. Salient Points

- Develop the MCP concept with the aim of becoming the global infrastructure for e-Navigation. Develop the MCP in order to meet infrastructure requirements in EfficienSea2, STM validation and KRISO/ETRI e-navigation projects.
- The Arctic Web provides a tool to self-organize. SAR and maritime safety in Polar regions are complicated and there exist a need for a platform, where local maritime units could trigger a response – common operating picture with RCC .
- There can be no doubt that autonomous vessels are coming. The transition period from manned to unmanned vessels could be messy and dangerous. New navigational tools like HoloLens for HUD Maritime could make that hazardous period just a little bit less hazardous. But it will definitely have a limited lifespan.
- The aim for EfficienSea2 is global impact. This includes Creating the global standard S124 , Offering an open source editor for authorities to produce warnings , Placing the services in the Maritime Cloud Service Registry ,Services description ,Technical design and endorsement .
- Innovative Satellite Imaging Technology and Cloud Processing for Improved Navigation through the Arctic **is a** functioning platform, set of capabilities focused on icebergs to demonstrate concept. There is need for additional data ,new processors to be developed and new capabilities, such as routine and batch processing capabilities
- An overview of current projects in the Region was given. Some of the projects are :Canadian Coast Guard Met/Hydro Test Beds Across Atlantic Region, Smart Atlantic Alliance Inshore Weather Buoy Network, AIS AtoN Test Bed: Atlantic Region, iHeave Project: Port of Halifax, NS, Halifax Harbour Bridges Virtual AtoN, E-Nav Concerns ,ECCC demo project for OPP ,AIS Ice Routes

## 7. SESSION V – THE WAY FORWARD FOR e-NAVIGATION

### 7.1. The Panelists

<b>Moderator: Captain Mary Ellen J. Durley, USCG</b> , Chief, Office of Navigation Systems, U.S. Coast Guard	
SESSION	PANELIST
Moderator, Session I	<b>Mr. Desmond Raymond</b> , Regional Director, Marine Safety & Security, Transport Canada
Moderator, Session II	<b>Captain Christopher Hearn</b> , Director, Centre for Marine Simulation, Marine Institute
Moderator, Session III	<b>Ms. Cheryl Bidgood</b> , Senior Advisor, Atlantic, Canadian Marine Pilots' Association
Moderator, Session IV	<b>Mr. Neil O'Rourke</b> , Senior Director, Safe Shipping and Economic Intelligence, Canadian Coast Guard

### 7.2. Synopsis of Discussion

This session was both the conference Wrap Up and a moderated discussion period serving as a User Forum during which the views of the delegates were collected about specific e-navigation needs and ideas for development and application. Those are documented below for consideration by IALA and subsequent distribution to the appropriate governmental and standard-setting agencies.

### 7.3 CONCLUSIONS AND RECOMMENDATIONS

In the final Wrap Up session conferees reached the following series of Conclusions and articulated a number of Recommendations.

#### CONCLUSIONS

- Private/Public Partnerships Private/Public Partnerships are a viable way to fill user needs
- Value of AIS Data AIS data is a marketable commodity
- Maritime Domain Awareness In addition to navigational safety and facilitation of transportation, MDA can be used by (indigenous) communities to share situational awareness
- Navigational Display Types Information relevant to safe navigation can be presented on devices beyond traditional ECDIS and ECS (i.e. Tablets, Smart Phones)
- Real-Time Monitoring Machine-based real-time ship traffic analysis that uses rules to interpret a ship's behavior can automatically alert Shore-based authorities of potentially dangerous situations well before they become critical
- AIS Infrastructure Tracking open ocean polar ship traffic can successfully be achieved using satellite-based systems, however, marine domain awareness of polar near shore traffic and traffic through marine life protection and shallow areas requires an infrastructure of interconnected terrestrial AIS stations
- ENC's Currently Electronic Nautical Charts (ENC's) of some polar ports are inadequate
- Hydrophones - Hydrophones can detect marine life in real-time that mariners could use to minimize interference
- Navigational Display - Display near real-time ice information as a layer on the navigation display along with ice radar information.

- Suggested Routes - Route exchange can be used to suggest routes that take into account shore-based expertise and experience as well as traffic congestion and berth availability
- Autonomous Ships - Social and legal acceptance of autonomous ships lags well behind technology currently being developed and tested
- Governance - Governance of Maritime Connectivity Platform and MSP's that will use MCP requires an international governance structure that has yet to be established
- Ice Thickness Sensors

## RECOMMENDATIONS

- Safety of shipping can be improved by using real-time ship traffic analysis
- Encourage International Collaboration to develop World-wide Standards
- Improve digital wireless communications infrastructure in polar regions
- ASM to convey Max Wave Height
- ECDIS Systems software meet minimum software standards (IEC 62288 Ed 2)
- Require display ASM Information on radar
- Traditional navigation methods will need to be taught to mariners even in the age of highly automated bridge systems particularly in polar regions
- GNSS systems used in polar regions should be able to use all available GPS Satellite Systems

## 8. INDIVIDUAL PRESENTATIONS

### October 17 Luncheon

Mr. Francis Zachariae, Secretary-General of IALA

## 9. SPONSORS



The **Atlantic Pilotage Authority (APA)** is a Federal Crown Corporation responsible for providing marine pilotage service to Atlantic Canada. The APA was established in 1972 by the Pilotage Act, with the following objective: *"to establish, operate, maintain and administer in the interests of safety an efficient pilotage service"*. The APA works with ports, the shipping industry, and other stakeholders to provide the safest and most efficient marine pilotage service possible to Atlantic



Fednav is Canada's largest ocean-going dry-bulk shipowning and chartering group. For over 70 years, we have been delivering practical, innovative maritime transportation solutions as a pioneer in the international shipping industry. With offices on four continents and a reputation built on a commitment to customer care and reliability, Fednav is the leader in international shipping on the Great Lakes, as well as the Canadian Arctic, boasting the world's largest fleet of ice-class bulk carriers.



management.

The Journal of Ocean Technology is a scientific periodical published by the Fisheries and Marine Institute of Memorial University of Newfoundland. It is designed to cater to all segments of the global ocean technology community. Its mission is to expand global knowledge and understanding of ocean technologies, to serve as the medium for publishing world-leading research, and to promote innovation that contributes to responsible ocean utilization and



Kongsberg provides innovative and reliable solutions for on- & offshore, merchant marine, subsea, navy, coastal marine, aquaculture, port & harbor surveillance, training services.

**KONGSBERG**



The National Research Council (NRC) is the Government of Canada's premier research organization supporting industrial innovation, the advancement of knowledge and technology development, and fulfilling government mandates.



Established in 2007 as a major initiative of the University of Victoria, Ocean Networks Canada operates world-leading ocean observatories for the advancement of science and the benefit of Canada. The observatories collect data on physical, chemical, biological, and geological aspects of the ocean over long time periods, supporting research on complex Earth processes in ways not previously possible.



Rutter, Inc., a Canadian based company, offers a wide range of enhanced Radar imaging technologies including its Oil Spill Detection System, Ice Navigator Radar, and Small Target Detection System.

## 10. EXHIBITIONS

A select group of exhibitors were available throughout the conference for participants to informally talk about products and services related to e-navigation.

EXHIBITOR
Transport Canada – OPP
Fednav
Xylem, Inc
Swedish Maritime Administration
Kongsberg Norcontrol, AS
Canadian Space Agency
National Research Council
Oceans Network Canada – Center for Enterprise and Engagement
Marine Institute – Journal of Ocean Technology
Rutter

## 11. OTHER EVENTS

Two evening receptions were held at the Sheraton Hotel, providing conferees with an opportunity to interact and network.

## 12. ACKNOWLEDGEMENTS

Organization of the conference was greatly assisted by the Steering Committee, the membership of which was:

### Chair

**Ms. Catherine Dutton**, Head, School of Maritime Studies, Fisheries and Marine Institute, Memorial University of Newfoundland

Secretary – Mr. Fred Pot, AFNI - Marine Management Consulting

### Members

Dr. Lawson W. Brigham - *University of Alaska*

Mr. Michael Card - *International Association of Marine Aids to Navigation and Lighthouse Authorities*

Mr. Thomas Christensen – *Danish Maritime Authority*

Captain Robert G. Moore, FNI – *North American Conference Secretariat*

Captain Andrew Rae - *Vice President, Atlantic Canadian Marine Pilots' Association*

Mr. Desmond Raymond - *Regional Director, Marine Safety & Security, Transport Canada*

Captain David Snider, FNI - *CEO, MARTECH Polar and President, the Nautical Institute*

Sherry Del Rizzo, *Conference Coordinator, Fisheries and Marine Institute, Memorial University of Newfoundland*