



REPORT OF THE IALA SEMINAR ON ARCTIC NAVIGATION

**IALA Headquarters
Saint Germain en Laye, France
November 9 - 10, 2017**



IALA

Report of the IALA Seminar on Arctic Navigation

Executive Summary

IALA hosted a seminar on Arctic Navigation from 9 to 10 November 2017. The Seminar was following-up a meeting held in February 2010 at IALA Headquarters attended by Arctic nations where a number of actions were agreed by the participants.

The seminar was attended by 38 delegates, representing 8 countries and 6 Sister organisations.

The seminar was structured with presentations on relevant topics. Conclusions were agreed on the second day.

The seminar generated six conclusions:

1. A harmonized approach should be adopted for marking polar routes and providing digital services with common standards of provision, web-based services and other means.
2. IALA-NET is a suitable platform for exchanging and storing historical AIS data for statistical analysis and the use of Risk Management tools.
3. Since connectivity is a primary enabler for development in the Arctic, the limited communication infrastructure continues to be a major challenge.
4. VDES-SAT could provide virtual AtoNs and other e-navigation services in the arctic. The frequency allocation needs to be supported at ITU.
5. A multi-system approach should be developed for resilient PNT, using a mixture of GNSS and terrestrial systems and a multi-system receiver.
6. There is a significant shortage of hydrographic survey data to give a comprehensive set of (simplified) ENC for Arctic voyages. Crowd sourcing of hydrographic data can give a significant contribution.

The output documents were forwarded to the IALA Council to note and to all IALA Committees for future development.

Attendees enjoyed an ice breaker reception on the first day.

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IALA Seminar on Arctic Navigation

1. INTRODUCTION

The Seminar was following-up a meeting held in February 2010 at IALA Headquarters attended by Arctic nations where a number of actions were agreed by the participants. See Annex A for the Resolution of the meeting between Canada, Denmark, Norway, Russian Federation, the United States of America and IALA.

After that meeting IALA informed IMO (IMO MSC87/INF.15C) that the nations should take the opportunity to:

- initiate the establishment of a common Arctic ship reporting and data sharing system;
- develop a common approach to marine traffic awareness and monitoring;
- move towards a single, harmonized system of marine aids to navigation; and,
- anticipate and mitigate risk to maritime traffic and the environment.

In this further meeting on Arctic navigation the views on the challenges of ensuring safe navigation in Arctic waters of all Arctic nations and international organizations having an interest in the field were discussed.

The Seminar addressed the needs identified by the Arctic Council concerning hydrography, marine aids to navigation and maritime services. The current status and plans were considered, with regards to weather and climate, commercial shipping, position, navigation and timing (PNT), communications, data exchange, risk assessment, traffic awareness and monitoring, and other relevant topics.

The purpose of the Seminar for nations and organizations which provide maritime services in the Arctic was to exchange information and develop views on:

- traffic awareness, ship reporting and data sharing;
- maritime digital information services;
- positioning services;
- marine aids to navigation.

2. OVERALL PROGRAMME

The overall programme is shown in the following table; the detailed programme is in Annex C.

| Thursday 9 November | Friday 10 November |
|---|---|
| Registration | Session 3 continued Arctic States view and needs (AtoN and related services and IALA resolution) |
| Session 1 Background and purpose of the Seminar | Session 4 Traffic Awareness and Position fixing |
| Session 2 Arctic shipping and trends | Discussion Conclusions |
| Session 3 Arctic States view and needs (AtoN and related services and IALA resolution) | End of the seminar |
| Ice breaker | |



3. SUGGESTIONS, REMARKS AND OBSERVATIONS

During the Seminar suggestions, remarks and observations were made by participants:

- There is still a large need for information-exchange and learning about each other's initiatives, work and projects. There seem to be a number of individual initiatives that are not all involving relevant partners and stakeholders.
- There is a concern about the large number of "databases" presently developed or planned. There is a need to join forces and concentrate resources on a few, relevant, sites/portals.
- A harmonized approach should be adopted for marking polar routes, combining data sharing with common standards of provision and web-based services.
- IALA-NET could be a common platform for collecting and making available AIS data via satellite, if the relevant IALA Members agree to cooperate.
- Virtual AtoNs, Area Notices and other e-navigation services using VDES-SAT could be an important contribution to safety of Arctic navigation, but the frequency allocation needs to be supported at ITU.
- A multi-system approach should be developed for resilient PNT, using a mixture of GNSS and terrestrial systems and a multi-system receiver.
- Global warming is happening which is opening up new Polar routes and increasing summer availability.
- Ice Navigation needs specialist skills to support safe passage.
- Arctic adventure tourism is increasing and this is set to continue.
- The Arctic is still not used as a short cut "over the top" transit route due to concerns about reliability of passage with the present bunker prices.
- There is a significant shortage of hydrographic survey data to give a comprehensive set of ENC for Arctic voyages.
- Offshore exploration and mineral exploitation are likely to continue in the region and traffic for tourism is increasing.
- Avoiding accidents and environmental damage is critically important, since SAR and pollution control resources are limited and operational conditions are difficult.
- The area of the Polar code is limited and should be extended to include other areas of higher traffic density, also subject to ice conditions.
- IBNext Multi information flow – satellite imagery, weather data, ice charts, ship reporting, routing guidance - bandwidth limitations.

- STM provides coordinated real time data, route exchange, port call synchronization, with email/voice confirmation.
- Sharing information and need for cooperation in developing VDES applications to provide communication solutions in Arctic.
- Arctic Web - free to use, open source development – provides tailored weather and ocean current forecasts and ice charts – supports voyage risk management, routing decisions and SAR online services.
- Ideally, from the operators' point of view, there would be one integrated information system for the Arctic, but this may not be achievable politically. Common service specifications would be an important step, allowing easy, reliable exchange of information.
- Improved communication of Vessel Traffic Services (MSP 5) depends on standardized, digital solutions (S-100), for MSI, ice routing etc., leading to an open bridge, not dependent on proprietary equipment.
- New NAVAREAs established a decade ago. E-navigation services, including VTS, must be provided for these areas. VDE-SAT could be an important contribution to providing the necessary connectivity.
- Maritime Connectivity Platform (MCP) can be used for information exchange via online services, utilizing communications available (ref. IALA MRCP). VDES provides a closed network with built-in security and authentication for e-navigation services.
- Main challenge for VDES is adoption by shipowners and manufacturers. Second greatest challenge for VDES in the Arctic is adoption by shore authorities, in competition with other investments in infrastructure.
- Need to free up frequencies for VDES and upgrade infrastructure to handle higher data rates and produce data in standard formats. Can share infrastructure, information systems and develop data sharing tools.
- Need both VDES and MCP in Arctic communications in a coordinated technical solution.

These remarks do contain certain overlap or are redundant but from these remarks, the considerations and final conclusions of the Seminar were drafted and presented (see chapter 4).

4. WORKSHOP REVIEW AND FINAL CONCLUSIONS

4.1 Final conclusions

Considering that:

- Climate change is happening which is opening up new Polar routes and increasing summer availability;
- Ice Navigation needs specialist skills to support safe passage;
- Arctic tourism is increasing and this is set to continue.

Based on the considerations above and suggestions, remarks and personal observations as stated in chapter 3, the Seminar agreed the following **final conclusions**:

1. **A harmonized approach should be adopted for marking polar routes and providing digital services with common standards of provision, web-based services and other means.**
2. **IALA-NET is a suitable platform for exchanging and storing historical AIS data for statistical analysis and the use of Risk Management tools.**
3. **Since connectivity is a primary enabler for development in the Arctic, the limited communication infrastructure continues to be a major challenge.**
4. **VDES-SAT could provide virtual AtoNs and other e-navigation services in the arctic. The frequency allocation needs to be supported at ITU.**
5. **A multi-system approach should be developed for resilient PNT, using a mixture of GNSS and terrestrial systems and a multi-system receiver.**
6. **There is a significant shortage of hydrographic survey data to give a comprehensive set of (simplified) ENC for Arctic voyages. Crowd sourcing of hydrographic data can give a significant contribution.**

4.2 Seminar Report

Wim van der Heijden, Secretary of the Seminar, noted that the workshop presentations, documents, and photographs would be available on the “arctic” page of the seminar file-sharing server: <http://www.iala-aism.org/file-sharing/> till the end of December 2017 (password: FtJmq39BTy). The seminar report will be posted on the file-sharing server within one week and will be permanently available on the IALA website. It will be forwarded to the IALA Council and all IALA Committees.

4.3 Closing of the seminar

The IALA Secretary-General thanked everyone for attending the seminar and the good discussions. He wished everyone a safe journey home and declared the seminar closed.

ANNEX A.

RESOLUTION OF THE MEETING BETWEEN CANADA, DENMARK, NORWAY,
RUSSIAN FEDERATION, THE UNITED STATES OF AMERICA AND IALA ON
10-12 FEBRUARY 2010

THE SAID NATIONS AND IALA:

RECALLING the national responsibility under the SOLAS Convention, Chapter V, for Safety of Navigation and the MARPOL Convention for the protection of the marine environment;

RECOGNISING that the conditions for marine navigation in the Arctic are changing rapidly and can be expected to lead to new seasonal shipping routes opening as a result of the reduction in the area covered by sea ice during the summer months;

RECOGNISING ALSO that due to the extreme distances involved as well as ice and climate conditions in the Arctic, it is difficult to maintain a reliable, conventional Aids to Navigation system, given that buoys and other installations may be damaged and/or moved by ice etc.;

RECOGNISING FURTHER the potential consequences of a serious incident in remote waters with little or no maritime infrastructure and limited hydrographic services;

NOTING that shipping routes need to be flexible and be capable of being moved at short notice, taking into account ice and local hydrographic and meteorological conditions;

NOTING ALSO that development of virtual aids to navigation should be given strong consideration as an adjunct to conventional aids to navigation for use in Arctic waters.

NOTING FURTHER that provision of an effective virtual aids to navigation system depends on adequate hydrographic services as well as the provision of appropriate Maritime Safety Information systems and communications infrastructure;

CONSIDERING that one of the aims of IALA is to foster the safe, economic and efficient movement of vessels and the protection of the marine environment through the improvement and harmonisation of aids to navigation and Vessel Traffic Services;

TAKING INTO ACCOUNT the outcome of the meeting between the said nations and IALA held from 10 to 12 February 2010;

AGREE that it is necessary to adopt a harmonised approach in addressing current and future risk, as described above, in Arctic waters;

ENVISION that the said nations should, in Arctic waters, take the opportunity to:

- initiate the establishment of a common Arctic ship reporting and data sharing system;
- develop a common approach to marine traffic awareness and monitoring;
- move towards a single, harmonised system of marine aids to navigation;
- anticipate and mitigate risk to maritime traffic and the marine environment;

RECOMMEND that, for Arctic waters, IALA support the said nations in relation to:

- enhancing marine traffic awareness and providing a forum for those establishing ship reporting and data sharing systems;
- the marking of polar routes and development of virtual aids to navigation;
- the application of risk management methodology; and
- the importance of improving hydrographic services in the region.

ANNEX B. SEMINAR ON ARCTIC NAVIGATION – ABSTRACTS OF PRESENTATIONS

1. SESSION 1 – BACKGROUND AND PURPOSE OF THE SEMINAR

1.1 Background and purpose of the Seminar. IALA Resolution of February 2010

The presentation was made by **Mr Francis Zachariae**, IALA Secretary-General

Abstract

The work of IALA and the World Wide Academy (WWA) were introduced including the work of the four Committees.

The IALA transition project from a Non-Governmental Organization (NGO) to an Inter-Governmental Organization (IGO) is progressing well. A second Preparatory Diplomatic Conference will take place 7th to 8th February 2018 in Morocco.

The role of IALA is based on Article 1 of the IALA Constitution which describes Marine Aids to Navigation: “A device, system or service, external to vessels, designed and operated to enhance safe and efficient navigation of individual vessels and/or vessel traffic”. Together with the IALA motto: “Successful voyages, sustainable planet” IALA has three principal aims:

- To harmonise standards for Marine Aids to Navigation (AtoN) systems;
- To facilitate the safe and efficient movement of shipping;
- To enhance the protection of the marine environment.

As a result of the increased activity in the Arctic and Polar Regions a meeting was organized in 2010 with the Arctic Nations where a number of actions between these Nations and IALA were agreed described in a resolution to the IMO (MSC87/INF.15) (see full text in Annex A).

Further actions include a workshop in Greenland on the provision of AtoN services in Polar Regions, participation in the Arctic Council WG, PAME and EPPR of the Arctic Council

and the Arctic Marine Best Practice Information Forum. IALA can play a role in traffic monitoring and ship reporting, AtoN provision and harmonisation, Risk analysis and the development of e-navigation services.

The aims of this seminar are:

- To raise awareness of needs of maritime safety in the Arctic;
- To agree on desirable coordinated action;
- To decide on follow up action.

1.2 IALA’s Strategic vision and technical work

The presentation was made by **Mr Michael Card**, IALA Deputy Secretary-General

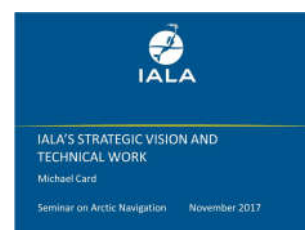
Abstract

IALA strategy is based on two documents:

- Strategic Vision, a high level document setting out longer term Goals and Strategies;
- Position on the Development of AtoN Services, with short and medium term statements and priorities driving the technical policy.

The Strategic Vision describes goals for 2026 resulting in Eight Strategies (briefly quoted):

S1 – Development of Standards for direct citation by States;



- S2 – Position IALA as source for standards, knowledge and expertise;
- S3 – Coordinate development of AtoN;
- S4 – Capacity building to improve the provision of AtoN;
- S5 – Harmonisation of information structure, Maritime Service Portfolios and communications for e-navigation;
- S6 – Improve and harmonise the delivery of VTS globally;
- S7 – Transformation of IALA into an IGO;
- S8 – Sufficient resources and capabilities for the Secretariat.

The Position on the Development of AtoN services is a detailed document at technical management level.

The presentation included the technical work of the Committees resulting in guidance for the improvement and harmonisation of AtoN worldwide. Main results are the Standards, Recommendations and Guidelines with a focus on several levels of management. Also some Manuals are maintained by the Committees. Model Courses provide guidance on training and certification.

The presentation also introduced the seven proposed IALA Standards.

1.3 Aids to Navigation in Polar regions

The presentation was made by **Mr Simon Millyard**, Chair IALA Engineering and Sustainability (ENG) Committee, Trinity House, UK



Abstract

This presentation will provide a brief overview of the current work of the ENG Committee covering the 4 Technical Domains with expected outputs for the 4 year work plan, this will then focus on the relevant areas that are applicable to Polar regions.

Aids to Navigation in Polar regions face a unique set of challenges from the harsh environment, energy supply constraints and difficulties in access for installation and maintenance. The IALA AtoN Engineering and Sustainability committee has drawn on the wealth of knowledge from its delegates to compile an IALA Guideline on Providing AtoN services in Polar Regions. This Guideline will be introduced and its contents reviewed along with other documents and experiences of this topic within the ENG committee.

As well as delivering technical information in the form of Recommendations, Guidelines, Manuals and Capacity Building (Training), the ENG committee considers the Environmental impact of AtoN delivery which is relevant worldwide and in particular in the sensitive Polar regions.

1.4 Climate status – global warming

The presentation was made by **Dr Sarah Grimes**, Scientific Officer, Marine Meteorology & Oceans Affairs Division, World Meteorological Organisation (WMO)



Abstract

The state of the global climate in 2017 was presented with a focus on the sea-ice extent which was well below average caused by metrological conditions. In particular the raise of global temperature with $\sim 1.1^{\circ}\text{C}$ above the pre-industrial period was highlighted.

Second point of attention was the rise of sea level which is not uniform over the globe. Individual contributions of the Global Mean Sea Level Rise were presented.

As a result of the climate changes there is a growing number of weather related disasters with human losses and economic losses.

Attention was given to various initiatives for a sustainable development and goals for the future like the Oceans Conference in 2017 and the Paris Agreement form 2015.

1.5 The work of Arctic Council and working groups

The presentation was made by **Mrs Nina Buvang Vaaja**, Director, Arctic Council Secretariat

Abstract

The Arctic Council is the leading intergovernmental forum promoting cooperation, coordination and interaction among the Arctic States, Arctic indigenous communities and other Arctic inhabitants on common Arctic issues, in particular on issues of sustainable development and environmental protection in the Arctic.

The following States are Members of the Arctic Council: Canada, the Kingdom of Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden, and the United States.

In addition, six organizations representing Arctic indigenous peoples have status as Permanent Participants. The category of Permanent Participant was created to provide for active participation and full consultation with the Arctic indigenous peoples within the Council. They include: the Aleut International Association, the Arctic Athabaskan Council, Gwich'in Council International, the Inuit Circumpolar Council, Russian Association of Indigenous Peoples of the North and the Saami Council.

The work of the Council is primarily carried out in six Working Groups. All deal with the Arctic marine environment in one way or another. In terms of navigation, the two most significant are likely PAME (Protection of the Arctic Marine Environment), which produced the seminal 2009 *Arctic Marine Shipping Assessment*, and EPPR (Emergency Prevention, Preparedness, and Response), which deals with potential emergencies in the Arctic. EPPR is also responsible for tracking the Arctic Council's binding search and rescue agreement (2011) and the MOSPA (2013), a second binding agreement addressing oil pollution preparedness and response.



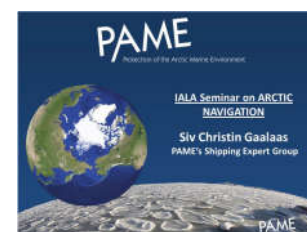
1.6 Work of PAME

The presentation was made by **Ms Siv Christin Gaalaas**, Protection of the Arctic Marine Environment (PAME)

Abstract

The Protection of the Arctic Marine Environment (PAME) is one of the six working groups of the Arctic Council. PAME is the focal point of the Arctic Council's activities related to the protection and sustainable use of the Arctic marine environment and provides a unique forum for collaboration on a wide range of activities in this regard. The working group has six expert groups e.g. shipping, marine protected areas and arctic ship traffic data.

PAME published the first comprehensive overview of polar shipping issues focussed on marine safety and marine environmental protection: Arctic Marine Shipping Assessment (AMSA) Report. It has a lead role implementation. PAME also produced a number of key arctic reports including recommendations like the Arctic Marine Strategic Plan (AMSP). Another publication is the PAME Work Plan 2017-2019 including a Compendium of Arctic Shipping Accidents and the Arctic Ship Traffic Database (ASTD). The last will collect historical information on shipping activity in order to analyse maritime traffic.

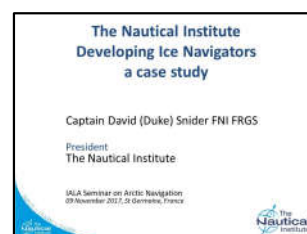


1.7 Arctic Ice Navigation – The Nautical Institute's Ice Navigator Certification

The presentation was made by **Captain David Snider**, Nautical Institute (NI)

Abstract

The Nautical Institute is a global representative body for 7000 maritime professionals involved in the control of seagoing ships, in over 120 countries served locally by more than 50 branches. The Institute provides a wide range



of services to enhance professional standing of members throughout the industry. One primary objective is the establishment and maintenance of appropriate educational and professional standards.

As an NGO at IMO, The Nautical Institute has been integral in many discussions and development of IMO standards. Most recently the NI actively contributed to the development of the Polar Code. Upon formalization of the Code, the Institute and many in industry felt that the Code did not sufficiently cover the aspects of skills, knowledge and competency in operating ships in ice covered waters. At the encouragement of many experienced Arctic operators, the NI finalized development of the first international standard for training and certification of bridge watchkeeping officers as Ice Navigators. This standard applies not only to SOLAS ships in Polar waters but to any ship operating in ice covered waters across the globe.

The Nautical Institute's President, Captain David Snider, an experienced and world renowned Ice Navigator will present how the Nautical Institute Ice Navigator scheme complements and further ensures safety of shipping, in the Arctic and in ice covered waters anywhere.



2. SESSION 2 – ARCTIC SHIPPING AND TRENDS

2.1 Russia – North-East Sea Route

The presentation was made by **Victor Shadurskii**, Federal State Unitary Hydrographic Department, Russia

Abstract

The following overviews were presented:

- Hydrographic branches in the arctic region;
- Radio technical navigation aids including future developments;
- The actual state of Marine Aids to Navigation like 2080 fixed aids and 765 floating aids;
- Future developments of the AtoN system, both shore based and floating.

The presentation informed about the annual hydrographic surveys of the recommended sea routes. Information was given on the developments in navigation warnings in the arctic sectors of the Russian Federation. The Northern Sea Route Administration is the responsible institute for the safety of navigation in the arctic and will coordinate permissions for navigation, navigational equipment, etc. Information was also given on Search and Rescue on the Northern Sea Route Area and Icebreaker assistance.



2.2 Canada – North-West Sea Route: Canadian Coast Guard Arctic Operations

The presentation was made by **Mr Laurent Tardif**, Canadian Coast Guard, Canada

Abstract

The increase of arctic traffic and movements were presented. The essential services in the Arctic provided by the Canadian Coast Guard were shown like Marine Aids to Navigation, Icebreaking operations, Search and Rescue, Communication and Traffic services, etc. Attention was given to the coverage of radio communication.

An opportunity is the establishment of the Northern Marine Transportation Corridors. Arctic challenges are the enormous size of the area which makes navigation complex, the large distance between small communities with minimum facilities, growth of travel trend and the change in climate.



2.3 International Shipping in the Arctic: The Need for Arctic Maritime Infrastructure

The presentation was made by **Mr Matthew Williams**, International Chamber of Shipping (ICS)

Abstract

ICS will provide its view on trends in Arctic shipping. A distinction will be made between the current and future opportunities for:

1. The liquid bulk and offshore sectors arising from extended access to reserves of oil and natural gas in the region;
2. Destination shipping providing means of transporting dry bulk and general cargo to and from Arctic centres of population; and
3. Transits making full use of trans-Arctic shipping routes between Asia, Europe and North America.

ICS will provide its position on the development of Arctic maritime infrastructure as it applies to the participants in the seminar. Whilst the Polar Code provides the regulatory framework for ships operating in the Arctic, there remains a justification for continuing to respond to the Arctic Marine Shipping Assessment 2009 Recommendations, Theme III. This is essential to support safe navigation and protection of the marine environment in the Arctic now and in the future.



2.4 Arctic Cruise Tourism

The presentation was made by **Ms Frigg Jørgensen**, Association of Arctic Expedition Cruise Operators (AECO)

Abstract

Arctic cruise tourism is growing. This includes the expedition cruise tourism segment. The industry is making major investments, and more than 20 new polar class expedition cruise vessels are expected to start operations in the Arctic during the next few years. AECO - the Association of Arctic Expedition Cruise Operators, is working to ensure that cruise tourism in the Arctic is carried out with the utmost consideration of the natural environment, local cultures, as well as challenging safely hazards at sea an on land. The association also represent the concerns and views of the industry. Almost 70 international members, included 40 vessel operators and vessel owners/managements are members of AECO. They presently operate approximately 50 commercial passenger vessels, size ranging from boutique to 400 passengers, in high Arctic areas. This includes Svalbard/Norway, Greenland, Canada and Frans Josef Land/Russia.

AECO's many guidelines, available at www.aeco.no are in many ways the association's backbone and constitute important tools to achieve the association's objectives. However, AECO's engagements stretches further. The association is involved in many activities, including cooperation and project partnerships with organizations within the fields of hydrography-, meteorology, ice information, and communication. AECO partners with search and rescue entities, coast guards and other authorities, and is also involved in citizen science, data collection and coastal cleanups. Representing the majority of Arctic expedition cruise operators, AECO supports an HFO ban in the Arctic, and has banned the recreational use of drones by passengers on Arctic cruise ships. AECO's most recent involvement is with the UN Environment's Clean Seas campaign.



3. SESSION 3 - ARCTIC STATES VIEW AND NEEDS (ATON AND RELATED SERVICES AND IALA RESOLUTION)

3.1 Present hydrographic data and plans

The presentation was made by **Dr Mathias Jonas**, International Hydrographic Organization (IHO)

Abstract

Receding sea ice extent in the Arctic, due to a changing climate, has recently opened up corridors that were previously unnavigable. As Arctic waters become more accessible, there will be an increased need to provide updated nautical charts with modern depth data. The extent of the area, coupled with resource constraints and difficult surveying conditions, make a complete hydrographic survey of the Arctic logistically unfeasible. In an effort to determine how best to deploy assets in an incremental survey approach, a risk based assessment was conducted to assess the current hydrographic holdings relative to potential areas of navigational risk. The results of this work suggests that there are still vast portions of the Arctic that are not adequately surveyed for the present use, implying there is a navigational risk. However, a disproportionate amount of traffic transits within the relatively smaller areas that do have modern bathymetric coverage. The affected coastal states undertake concerted efforts in establishing a recognized and interoperable GIS-based repository that will provide a clear picture of existing ENC and INT charts of the region. In order to expand our knowledge of the area, Crowd-Sourced Bathymetry (CSB) or “passage sounding” using vessels of opportunity appears a valuable source of information for enhanced seabed mapping. The International Hydrographic Organization (IHO) and its Member States have over the last five years been developing a more proactive policy on crowd-sourcing, particularly in remote or less well-frequented areas where commercial and cruise shipping such as in Arctic waters, is increasing and the existing charts require particular improvement.



3.2 Arctic Communications

The presentation was made by **Mr Laurent Tardif**, Canadian Coast Guard, Canada

Abstract

The Canadian Coast Guard (CCG) is a national Special Operating Agency of the Government of Canada. It owns and operates the country’s national civilian fleet. Entrusted to deliver valuable programs and services to Canadians, the Coast Guard ensures the safety of all mariners on Canadian waters, protects the marine environment and supports economic growth through the safe and efficient movement of maritime trade in and out of Canada’s waters. It is essential at-sea support to other federal government departments and agencies. In the Arctic, the Coast Guard performs considerable and critical work.



Coast Guard Icebreakers are deployed every year to the Arctic to perform a broad range of important tasks in support of economic and commercial development; however, they are not the Coast Guard’s only presence in the Arctic. Other essential services are delivered in Canada’s northern seaways, which are used for the resupply of communities, the export of raw materials, tourism, and science-related activity. These services include: Marine Communications and Traffic Services, which entails communicating with vessels to help ensure the safety of people at sea and the protection of the environment through effective traffic management and efficient movement of shipping; Aids to Navigation, to help ensure the safe voyages of vessels by reducing the risks of grounding and collision; Search and Rescue (SAR), typically involving pleasure crafts or local community vessels; and, Environmental Response, given that the Coast Guard has the primary response lead for pollution incidents or marine spills north of 60 degrees.

3.3 Arctic Navigation – Initiatives and needs in Greenland Waters

The presentation was made by **Mr Jan Thorn**, Danish Maritime Authority, Denmark and

Mr Rune Carbuhn Andersen, Danish Geodata Agency, Denmark

Abstract

Safety of navigation in Greenland waters and the Arctic region are one of the Danish Maritime Authority's key areas of interest. The presentation provides an overview of approaches/initiatives/needs in relation to AtoN and related services in Greenland. What have we done and what challenges are we still facing since the IALA Resolution was adopted in 2010.

The Danish Geodata Agency (DGA) is part of the Danish Ministry of Energy, Utilities and Climate. In its role as hydrographic office, DGA is responsible for the hydrographic surveying and the production of nautical charts of the waters surrounding Denmark, the Faroe Islands and Greenland. DGA is also responsible for issuing chart corrections and related nautical publications such as INT 1 and pilots (sailing directions) and for technical support to the delimitation of the Territorial Sea.

The hydrographic surveying in Greenland is part of a prioritized program for the resurveying of Greenland waters. The survey areas are concentrated along the most populated areas on the west coast with focus on the archipelago and near coastal zone, in order to allow safe access to major ports and to locate sheltered coastal fairways. All surveys are carried out with multibeam echo sounder systems. The surveying is done with personnel and ships from the Royal Danish Navy.

DGA was moved to Aalborg from Copenhagen in November 2016. This has affected the work of DGA as the majority of employees have left the organisation. DGA has experienced a severe setback on finalizing new charts and are now focusing on educating new staff and on the re-establishing of the needed knowledge base for chart production. As a consequence of this DGA is considering developing new temporal simplified ENC with updated depth information to a selected user group.



3.4 Waterway management in icy conditions in the Baltic Sea

The presentation was made by **Mr Risto Lang**, Finnish Transport Agency, Finland

Abstract

Finland is situated between latitudes 60-70 degrees. Finland has no access to arctic Sea having its access to Atlantic and North Sea via Baltic Sea and the Danish Straits. During so called « normal winter » Finnish coastline will be totally ice covered. So all Finnish harbours and entrance channels will be frozen. All the so called Winter Harbours and Class 1 Waterways will be kept open by Icebreaker Assistance.

Finnish Transport Agency develops and maintains the Finnish waterway network, which is 16 000 km long. FTA is managing over 25 000 AtoNs. Difficult ice conditions set challenges to fairway and AtoN maintenance. Finland has developed ice buoys and edge marks, which can survive in icy conditions. Edge marks for example are equipped with ice-cones, which turn the moving ice field upwards and causes the ice to break by bending. The bending force of ice is much smaller than the pressure force, which crushing of ice is creating against structures. Without ice-cone moving ice field causes easily damages to the sensitive devices installed on AtoNs. Steel Ice buoys and even plastic spar buoys may be partly or totally under ice during winter without remarkable damages. In most harsh ice conditions AtoNs may be replaced by virtual AtoNs during the winter period. Remote control system is proved to be the best way to monitor especially AtoNs, which are located in remote and challenging places.

As a conclusion conventional Aids to Navigation are also to be considered for use in Arctic waters adjacent to Virtual Aids to Navigation. Finland is happy to offer its experience and knowledge concerning waterway and AtoN management in icy conditions.



3.5 Arctic States' views and needs - Norway

The presentation was made by **Ms Kirsti Slotsvik**, Norwegian Coastal Administration, Norway

Abstract

Norway has sea areas in arctic regions. The areas are shared by several countries and Norway has a common border with several nations. The need for cooperation related to geographical conditions will be highlighted.



Climate change opens up new areas for maritime activity. Presentations provide a general description of the situation and trends. It will elucidate several activities that are established and the consequence of this.

Norway focuses on preventive measures and cooperation with our neighbors. This is particularly important in Arctic regions. An important reason for this is that the environment is vulnerable, oil recovery is difficult and environmental pollution in this area will have a greater impact on the maritime food chain.

Arctic areas have more special challenges and needs. The presentation gives an overall review of several aspects that are distinctive to arctic regions and challenges associated with this.

The presentation also informs about status within, AtoN (navigation), communication, climate, and future new routes. It will eventually elucidate specific challenges that must be resolved in community and ultimately how this can be done.

3.6 Reporting experience from the polar areas including the Baltic

The presentation was made by **Captain Erik Andersson**, Swedish Maritime Administration, Sweden

Abstract

The presentation is about my gathered experiences regarding reporting services in the polar areas and also including the Baltic Sea area. I have focused on the difficulties that Oden have experienced when working in the existing reporting systems. Next part is information about Sweden's and Finland's reporting system regarding the icebreaker services in the Baltic Sea. The Icebreaker services will be a part of the Sea Traffic Management STM, that is a European Union Project to create services to make it safer and easier for all parties involved in a maritime operation.



3.7 Chinese ships sailing in the Polar Regions - Building roads for Polar Navigation Safety

The presentation was made by **Mr Peng Zhang**, China Maritime Safety Administration, China

Abstract

1. Introduction of the Chinese ship in the Arctic and Antarctic sailing conditions, difficulties encountered, and the demand for navigational service and support;
2. Introduction of the China Maritime Safety Administration to do the relevant navigational service and support work;
3. Suggest: The next step for the polar navigation work ;
4. Vision: Under the One Belt And One Road initiative, China is willing to carry out multi-faceted cooperation, and building the road for Arctic navigation safety.



4. SESSION 4 - TRAFFIC AWARENESS AND POSITION FIXING

4.1 ArcticWeb

The presentation was made by **Mr Bjørn Borbye Pedersen**, Danish Maritime Authority, Denmark

Abstract

Bridging the gap between traditional navigation and the future of e-navigation, ArcticWeb is a web based platform for improving the safety of navigation in the Arctic. The platform is a joint regional project funded by the Nordic Council of Ministers and lead by The Danish Maritime Authority. The platform has been operational since 2014 and is free to use. The presentation will demonstrate some of the key services and tools on ArcticWeb such as route sharing, sharing of schedules, ice charts, weather on route, forecasts of wave height and ice accretion, navigational warnings and a search and rescue tool.



4.2 A vision for maritime arctic services

The presentation was made by **Captain Jon Leon Ervik**, Norwegian Coastal Administration, Norway

Abstract

Arctic areas are defined as no areas within e-navigation. In the development of the e-navigation concept, it was noted that this area is especially for several reasons.



There is a need for special information. It is challenging to communicate the information. It is challenging to tailor the information. It is challenging to achieve good quality. There is a need for special knowledge.

And, an error can lead to major consequences for loss of life and damage to the environment.

Areas and responsibilities are complex. Communication is limited. At the same time, shipping, commercialization and tourism are increasing. And, new areas become available.

How will we be able to provide necessary information to users in Arctic regions in a future where more and more of the information becomes digital and integrated into e-navigation concepts?

What should be some visions and goals for relevant service providers?

The presentation will show some examples of today's lack of information and challenges, examples of services being tested today, which may contribute to increased security in arctic regions. Possibilities in today's technology to implement e-navigation services also in arctic areas in the short term. It will also be highlighted some challenges that must be solved.

4.3 VDES service in the Arctic

The presentation was made by **Mr Jean-François Coutu**, Canadian Coast Guard, Canada

Abstract

A Canadian perspective on the VHF Data Exchange System (VDES) place in eNavigation and its role in Arctic maritime communications. The presentation will conclude with an overview of the challenges facing shore authorities wanting to deploy VDES in the Arctic and examples of possible collaboration between shore authorities on Arctic eNavigation.



4.4 Satellite positioning in the arctic

The presentation was made by **Dr Nick Ward**, General Lighthouse Authorities of the UK & Ireland, UK

Abstract

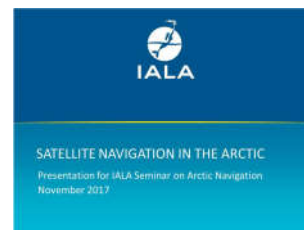
This presentation on satellite navigation in the Arctic is set against the background of increasing traffic in the region and the critical need for reliable, accurate positioning and lack of local infrastructure.

It asks the question 'Do GNSS meet the requirements?'

The requirements set out in IMO Resolution A.1046(27) on the World Wide Radio Navigation System are considered then the current status and expected performance of the various GNSS constellations are discussed. The results of computer simulations of coverage and performance of GNSS, individually and in combination are then presented, together with the modelling assumptions made.

The options for augmentation are discussed and the overall performance assessed, before going on to discuss vulnerability to disruption and a brief consideration of alternatives.

Conclusions are drawn about the advantages and disadvantages of GNSS and the possible way forward.



ANNEX C. PROGRAMME

DAY 1 – Thursday, 9th November 2017

| TIME | ACTIVITY |
|---|---|
| 09:30 – 10:00 | REGISTRATION / WELCOME COFFEE |
| Session 1 10:00 – 11:30 | Background and purpose of the Seminar |
| | Background and purpose of the Seminar. IALA resolution of February 2010 Mr Francis Zachariae , IALA Secretary-General |
| | IALA's Strategic vision and technical work Mr Michael Card , IALA Deputy Secretary-General |
| | Aids to navigation in Polar regions Mr Simon Millyard , IALA ENG Committee , Trinity House, UK |
| | Climate status – global warming Dr Sarah Grimes , Scientific Officer , Marine Meteorology & Oceans Affairs Division, World Meteorological Organisation (WMO) |
| 11:30 – 12:00 | COFFEE BREAK |
| Session 1 cont. 12:00 – 13:00 | The work of Arctic Council and working groups Mrs Nina Buvang Vaaja , Director, Arctic Council Secretariat |
| | Work of PAME Ms Siv Christin Gaalaas , Protection of the Arctic Marine Environment (PAME) |
| | Arctic Ice Navigation – The Nautical Institute's Ice Navigator Certification Captain David Snider , Nautical Institute (NI) |
| 13:00 - 14:00 | LUNCH |

| | |
|-----------------------------------|--|
| Session 2 14:00 – 15:30 | Arctic shipping and trends |
| | Russia – North-East Sea Route Victor Shadurskii , Federal State Unitary Hydrographic Department, Russia |
| | Canada - North-West Sea Route: Canadian Coast Guard Arctic Operations Mr Laurent Tardif , Canadian Coast Guard, Canada |
| | International Shipping in the Arctic: The need for Arctic Maritime Infrastructure Mr Matthew Williams , International Chamber of Shipping (ICS) |
| | Arctic Cruise Tourism Ms Frigg Jørgensen , Association of Arctic Expedition Cruise Operators (AECO) |
| 15:30 – 16:00 | COFFEE BREAK |
| Session 3 16:00 – 17:30 | Arctic States view and needs (AtoN and related services and IALA Resolution) |
| | Present hydrographic data and plans Dr Mathias Jonas , International Hydrographic Organization (IHO) |
| | Arctic Communications Mr Laurent Tardif , Canadian Coast Guard, Canada |
| | Arctic Navigation – Initiatives and needs in Greenland Waters Mr Jan Thorn , Danish Maritime Authority, Denmark Mr Rune Carbuhn Andersen , Danish Geodata Agency, Denmark |
| | Waterway management in icy conditions in the Baltic Sea Mr Risto Lang , Finnish Transport Agency, Finland |
| 17:30 | CLOSING – Day 1 |
| 18:00 – 19:00 | Ice breaker – Wine & Cheese - Lounge area |

| TIME | ACTIVITY |
|---|--|
| Session 3 cont. 09:00 – 10:00 | Arctic States view and needs (AtoN and related services and IALA Resolution) |
| | Arctic States, Views and Needs Ms Kirsti Slotsvik , Norwegian Coastal Administration, Norway |
| | Reporting experience from the polar areas including the Baltic Captain Erik Andersson , Swedish Maritime Administration, Sweden |
| | Chinese ships Sailing in the Polar Regions--Building Roads for Polar Navigation Safety Mr Peng Zhang , China Maritime Safety Administration, People's Republic of China |
| Session 4 10:00 – 11:00 | Traffic Awareness and Position fixing |
| | ArcticWeb Mr Bjørn Borbye Pedersen , Danish Maritime Authority, Denmark |
| | A vision for maritime arctic services Captain Jon Leon Ervik , Norwegian Coastal Administration, Norway |
| | VDES service in the Arctic Mr Jean-François Coutu , Canadian Coast Guard, Canada |
| 11:00 | Photo of the group – In front of the building |
| 11:00 – 11:30 | COFFEE BREAK |
| Session 4 cont. 11:30 – 11:50 | Satellite positioning in the arctic Dr Nick Ward , General Lighthouse Authorities of the UK & Ireland |
| 11:50 – 12:30 | Discussion and conclusion |
| 12:30 | LUNCH |
| | End of the seminar |

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