

**Title** *Efficient, Safe and Sustainable Traffic at Sea*

**Acronym** *EfficienSea*

**Contract No.** *013*

Document No. D\_WP4\_1\_1

Document Access: Restricted

***A report on state-of-the-art e-Navigation  
concepts and solutions***



Part-financed by the European Union (European Regional Development Fund and European Neighbourhood and Partnership Instrument)



## DOCUMENT STATUS


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### Document History

<i>Revision</i>	<i>Date</i>	<i>Organisation</i>	<i>Initials</i>	<i>Revised pages</i>	<i>Short description of changes</i>

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# e-Navigation concepts and solutions

This report describes the current state of e-Navigation. The report is divided into 3 main section (appendices). The first section describes the international organisations involved in e-Navigation. This section also describes the concept itself, since it is derived from an international organisation (IMO).

The second section describes important projects, forums and national organisation, and the final section describes the industry's role.

The report is not describing concrete solutions, since the overall e-Navigation process as driven by IMO has not yet identified these. We have identified potential e-Navigation solutions (services), but these are described in 'D\_WP4\_2a\_2 User requirement specification document'.

# Appendix A

## International organisations

### Introduction

This document contains a description of what e-Navigation is, the strategy plan and implementation of e-Navigation in the future. Furthermore it describes the international organizations who are working with e-Navigation to some extent. The purpose with this document is to give a clear picture of what e-Navigation is and to outline the process in the international organisations. The document is meant to be used as a tool during the work with e-Navigation and it will be updated frequently to keep the reader informed about the process and work undertaken.

The document gives the IMO's definition of what e-Navigation is and what the purpose with e-Navigation in the future is. It gives a description of e-Navigation concerning structure, benefits and strategy.

### E-Navigation, the concept

In this chapter we will describe what e-Navigation is, how it is defined and how it is structured. Furthermore we will describe the e-Navigation Strategy plan and list a time schedule for the work in IMO's committees concerning e-Navigation.

### Definition of e-Navigation

IMO defines e-Navigation as the harmonized collection, integration, exchange, presentation and analysis of marine information onboard and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment.

## E-Navigation, the strategy

It is clearly a must to equip ships on board and shore based stations with modern and improved tools, which are proved to optimize decision making in order to make maritime navigation and communications more reliable and user friendly.

According to the IMO Strategy, the main broad benefits of e-Navigation are expected to be:

- Improved safety, through promotion of standards in safe navigation supported by:
- improved decision support enabling the mariner and competent authorities ashore to select relevant unambiguous information pertinent to the prevailing circumstances;
- a reduction in human error through provision of automatic indicators, warnings and fail-safe methods;
- improved coverage and availability of consistent quality Electronic Navigational Charts (ENCs);
- introduction of standardized equipment with an S-Mode\* option but without restricting the ability of manufacturers to innovate;
- enhanced navigation system resilience, leading to improved reliability and integrity; and
- better integration of ship and shore-based systems; leading to better utilization
- Better protection of the environment both by:
- improving navigation safety as above, thereby reducing the risk of collisions and groundings and the associated spillages and pollution;
- reducing emissions by using optimum routes and speeds; and
- enhancement of ability and capacity in responding and handling of emergencies such as oil spills;
- Augmented security by enabling silent operation mode for shore-based stakeholders for domain surveillance and monitoring;
- Higher efficiency and reduced costs enabled by:
- global standardization and type approval of equipment augmented by a “fast track” change management process (in relation to technical standards for equipment);
- automated and standardized reporting procedures, leading to reduced administrative overhead;
- improved bridge efficiency allowing watch keepers to maximize time to keeping a proper lookout and embrace existing good practice, e.g., using more than one method to ascertain the ship's position; and
- integration of systems that are already in place, precipitating the efficient and coherent use of new equipment that meets all user requirements;



- Improved human resource management by enhancing the experience and status of the bridge team.

The IMO have agreed that the core objectives of an e-Navigation concept should:

- facilitate safe and secure navigation of vessels having regard to hydrographic meteorological and navigational information and risks;
- facilitate vessel traffic observation and management from shore/coastal facilities, where appropriate;
- facilitate communications, including data exchange, among ship to ship, ship to shore, shore to ship, shore to shore and other users;
- provide opportunities for improving the efficiency of transport and logistics;
- Support the effective operation of contingency response, and search and rescue services;
- demonstrate defined levels of accuracy, integrity and continuity appropriate to a safety-critical system; integrate and present information onboard and ashore through a human interface which maximizes navigational safety benefits and minimizes any risks of confusion or misinterpretation on the part of the user;
- integrate and present information onboard and ashore to manage the workload of the users, while also motivating and engaging the user and supporting decision-making;
- incorporate training and familiarization requirements for the users throughout the development and implementation process;
- facilitate global coverage, consistent standards and arrangements, and mutual compatibility and interoperability of equipment, systems, zymology and operational procedures, so as to avoid potential conflicts between users; and
- be scalable, to facilitate use by all potential maritime users

Ref.: <http://www.iala-aism.org>, [www.IMO.org](http://www.IMO.org) and IMO MSC85/26/add1anex20

The key strategy elements for e-Navigation include:

### Architecture

The overall conceptual, functional and technical architecture will need to be developed and maintained, particularly in terms of process description, data structures, information systems, communications technology and regulations.

## Human element

Training, competency, language skills, workload and motivation are identified as essential. Alert management, information overload and ergonomics are prominent concerns. These aspects of e-Navigation will have to be taken into account in accordance with IMO's Human Element work.

## Conventions and Standards

The provision and development of e-Navigation should consider relevant international conventions, regulations and guidelines, national legislation and standards. The development and implementation of e-Navigation should build upon the existing work of IMO.

## Position Fixing

Position fixing systems will need to be provided that meet user needs in terms of accuracy, integrity, reliability and system redundancy in accordance with the level of risk and volume of traffic.

## Communications and Information Systems

Communications and information systems will have to be identified to meet user needs. This work may involve the enhancement of existing systems or the development of new systems. Any impacts affecting existing systems will need to be identified and addressed, based on technical standards and protocols for data structure, technology, and bandwidth and frequency allocations.

## ENCs

At NAV 53 IHO reported, "There would be adequate coverage of consistent ENCs by the time any further mandatory carriage requirements were likely to be adopted by IMO". The Sub-Committee was also of the opinion that the availability of ENCs worldwide was most important and requested IHO and Member Governments to continue their efforts in increasing the coverage. E-Navigation will benefit from the increased functionality of the future IHO S-100 standard.

## Equipment Standardization

This part of the work will follow the development of performance standards and will involve users and manufacturers.

## Scalability

IMO Member States have a responsibility for the safety of all classes of vessels. This may include the scalability of e-Navigation for all potential users. Extension of the concept to non-SOLAS vessels should be seen as an important task, to be addressed, in the first instance through consultation on user requirements.

Ref.: IMODOCS; Nav 54/wp.2, IMO MSC85/26/add1anex20

## E-Navigation, the plan

<b>A COORDINATED APPROACH TO THE IMPLEMENTATION OF IMO'S E-NAVIGATION STRATEGY</b>				
<b>SUMMARY OVERVIEW: TIMELINE + PLANNED OUTPUTS</b>				
<b>Y</b>	<b>Q</b>	<b>meeting</b>	<b>Output</b>	<b>Year deliverable</b>
<b>2009</b>	<b>2</b>	<b>MSC 86</b>	Approval of joint plan of work (coordinated approach) Coordination meeting Chairmen COMSAR, NAV, STW and Secretariat	<b>Identification and prioritization of user needs</b>
	<b>3</b>	<b>NAV 55</b>	Finalization of user needs; Initial identification of system architecture; Start performance of initial gap analysis; Decision on methodology for C/B- and risk analyses	
<b>2010</b>	<b>1</b>	<b>COMSAR 14</b>	Identification of system architecture; Performance of initial gap analysis; Performance of initial C/B- and risk analyses.	<b>Description of system architecture: Initial gap analysis</b>
	<b>1</b>	<b>STW 41</b>	Answers to questions related to initial gap analysis; Answers to questions related to C/B- and risk analyses.	
	<b>2</b>	<b>MSC 87</b>	Coordination meeting Chairmen COMSAR, NAV, STW and Secretariat	
	<b>3</b>	<b>NAV 56</b>	Finalization of initial system architecture; Completion of initial gap analysis; Completion of initial C/B- and risk analyses	
	<b>4</b>	<b>MSC 88</b>	Coordination meeting Chairmen COMSAR, NAV, STW and Secretariat	

2011	1	<b>COMSAR 15</b>	Performance of further gap analysis; Performance of further C/B- and risk analyses.	<b>Final gap analysis; Cost benefit analysis Risk analysis</b>
	1	<b>STW 42</b>	Answers to questions related to further gap analysis; Answers to questions related to C/B- and risk analyses	
	2	<b>MSC 89</b>	Coordination meeting Chairmen COMSAR, NAV, STW and Secretariat	
	3	<b>NAV 57</b>	Finalization of gap analysis; Finalization of cost-benefit and risk analysis; Provisional outline/draft on the Strategy Implementation Plan	
2012	1	<b>COMSAR 16</b>	Relevant input to NAV 58 with regard to the finalization of the Strategy Implementation Plan.	<b>E-Navigation Strategy Implementation Plan</b>
	1	<b>STW 43</b>	Relevant input to NAV 58 with regard to the finalization of the Strategy Implementation Plan.	
	2	<b>MSC 90</b>	Coordination meeting Chairmen COMSAR, NAV, STW and Secretariat	
	3	<b>NAV 58</b>	Finalization of the Strategy Implementation Plan	
	4	<b>MSC 91</b>	Adoption of the Strategy Implementation Plan	

Ref.: IMODOCS; MSC 86/23/4

## IMO

The concept of e-Navigation was proposed by IMO Member States in 2006 as a process for the harmonization, collection, integration, exchange and presentation of maritime information. IMO is the overall lead in the process and “owner” of the term “e-Navigation”. All committees and international organizations refer to IMO in some extent and all directions and guidelines are clearly defined by IMO. E-

Navigation is intended to meet present and future user needs through harmonization of the marine navigation systems and supporting services.

The overall goal is to improve safety of navigation and to reduce errors. IMO's challenge is to ensure that the technological developments adopted are conducive to enhancing maritime safety, security and protection of the environment and they have to take into account for the need of global application. Furthermore to ensure the proper application of information technology and ensure that the new equipment for use on board ships is designed and manufactured with the needs, skills and abilities of all users in mind.

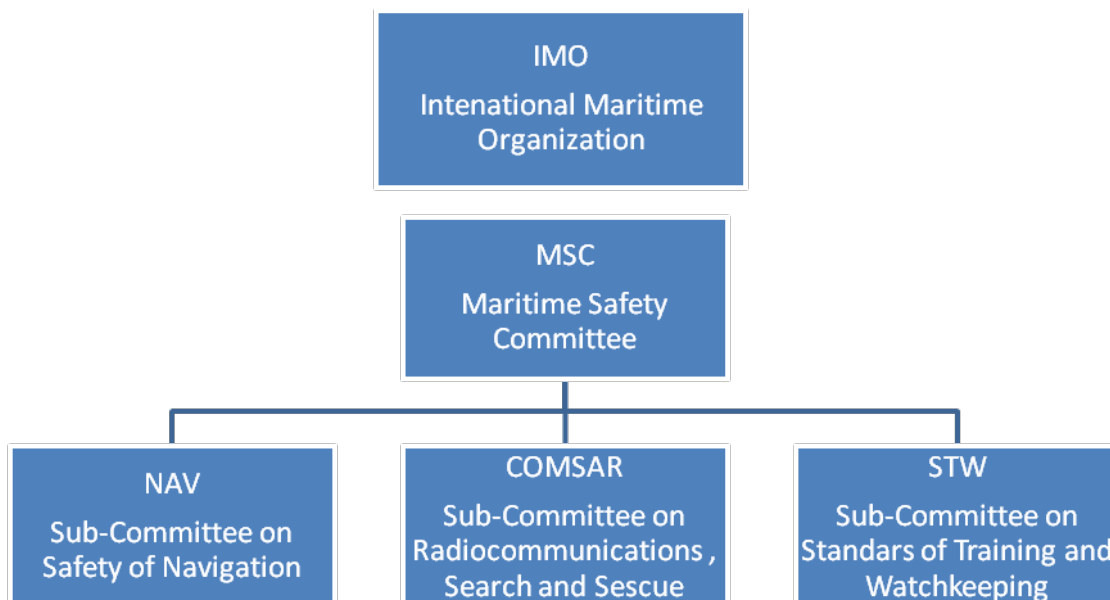
## Responsibilities for ownership and control of the e-Navigation concept by IMO

The responsibilities that come with IMO ownership and control of the concept include:

1. Development and maintenance of the vision;
2. Definitions of the services including their scope in terms of users and geography, and the concept of operations;
3. Identification of responsibilities for the design, implementation, operation and enforcement of e-Navigation, acknowledging the rights, obligations and limitations of flag States, coastal States, port States and the various authorities within those States;
4. Defining the transition to e-Navigation in a phased approach, enabling the realization of early benefits and the re-use of existing and emerging equipment, systems and services;
5. Taking the lead in setting the performance standards appropriate for e-Navigation covering all the dimensions of the system: shipborne, ashore and communications. These standards should be based on user needs and should encourage technology neutrality and interoperability of system components;
6. Ensuring that the concept accommodates and builds on existing maritime systems and funding programs;
7. Facilitating access to funding from international agencies, such as the World Bank, the regional Development Banks as well as international development funding;
8. Assessing and defining the training requirements associated with e-Navigation and assisting the relevant bodies in developing and delivering the necessary training programs;

9. Monitor the implementation of the concept to ensure that contracting States are fulfilling their obligations and ensuring that e-Navigation users within their jurisdiction are also complying with requirements; and
10. Leading and coordinating the external communications effort necessary to support the case for e-Navigation.

## A fracture of IMO's organization plan



## MSC: Maritime Safety Committee

MSC is a committee of the IMO and their role in E-Navigation is generally to take the position on all subjects concerning e-Navigation. MSC is the highest committee in IMO who are working with e-Navigation, this is here e-Navigation is anchored.

The committee has approved a joint plan of work and has coordinated a meeting with the Secretariat, COMSAR, NAV and STW Sub- committees. The deliverables of MSC/NAV/COMSAR AND STW in 2009 should be an identification and prioritization of user needs and in 2010 a description of system architecture. Furthermore an initial gap analysis should be performed. By 2011 the final gap analysis, cost-benefit analysis and risk analysis shall be delivered and finally by 2012 the e-Navigation Strategy Implementation Plan should be delivered. The final gap analysis should take the human element into account throughout the whole process and further gap analyses should focus on technical, regulatory, operational and training aspects. For further information see table page 7.

In co-operation with COMSAR and STW preliminary discussions have been initiated on developing the draft plan for the “coordinated approach to the implementation of IMO’s e-Navigation strategy”.

The first step is to identify the users and their requirements and it includes the groups of functions/services needed to meet primary navigational needs based on a structured, systematic and traceable methodology that leads to tangible operational benefits. The initial user needs should be further reviewed and prioritized by 2009.

The Architecture should by 2010 have developed the overall conceptual, functional and technical architecture, particularly in terms of process description, data structures, information systems, communications technology and regulations. The architecture should include the above mentioned including the hardware and software, which must meet the user needs. The system architecture should be based on a modular and scalable concept and the hard-and software should be based on open architectures.

Ref.: IMODOCS; MSC 86/23/4, MSC 85/26

## NAV - Safety of Navigation Sub-Committee

The MSC has asked the NAV sub-committee to coordinate the work with e-Navigation and their role is to participate in a joint work plan with the COMSAR and STW sub-committees. In 2009 the NAV will review the preliminary work on the architecture referring to NAV 53/13, and thereafter plan and specify the further work needed on the architecture. Their task is also to identify existing systems and new navigation technologies supporting user needs and complying with equipment performance standards. Furthermore the NAV should define conditions for the selection of hardware and the development of corresponding software.

The NAV sub-committee has made a draft strategy for the development and implementation of e-Navigation. The committee has found that technological developments have created new opportunities,

but may also have negative consequences. It is therefore a must that developments in communications and information technology will provide opportunities to develop knowledge management so as to increase transparency and accessibility to information.

The vision of e-Navigation will in the future be services on board and ashore. On board the navigation systems that will benefit from the integration of own ship sensors, supporting information, a standard interface, and a comprehensive system for managing guard zones and alerts.

The management of vessel traffic and related services from ashore enhanced through better provision, coordination and exchange of comprehensive data in formats that will be more easily understood and utilized by shore-based operators in support of vessel safety and efficiency.

Regarding communications an infrastructure providing authorized seamless information transfer onboard ship, ship-ship, ship-shore and shore-shore will bring many benefits including a reduction of single person errors.

## E-Navigation Correspondence Group

The e-Navigation Correspondence group was formed in 2006 and their main task was to submit a Strategy Plan on e-Navigation to be approved by IMO. The Group consisted of around 60 members, with representatives from different flag states, maritime agencies and non-governmental organizations.

The Correspondence group was to consider, provide comments and make recommendations on the following:

1. The definition and scope of the concept of e-Navigation in terms of its purpose, components and limitations to produce a system architecture;
2. The identification of the key issues and priorities that will have to be addressed in a strategic vision and policy framework on e-Navigation;
3. The identification of both benefits of and obstacles that may arise in the further development of such a strategic vision and policy framework;
4. The identification of the roles of the Organization, its Member States, other bodies and industry in the further development of such a strategic vision and policy framework;
5. The formulation of a work programme for the further development of such a strategic vision and policy framework, including an outline migration plan and recommendations on the roles of the NAV and COMSAR Sub-Committees and the input of other parties concerned;



The group concluded that e-Navigation should not be viewed as an end in itself. Its role would be as part of a process that supplements and supports other critical elements of safe navigation, including watch keeping skills, keeping a good lookout, observance of the collision regulations, good ship-handling and seamanship and all the procedures and training that underpin these competencies. The Group has decided to treat e-Navigation not as the physical installations, nor as the service provided, but as a strategic framework for developing existing and future technological infrastructure onboard and ashore. As such the term e-Navigation currently incorporates systems and services, but as an e-Navigation user requirement is developed, it is envisaged that the term will also include an increased focus on more tangible elements. It should be noted that without e-Navigation the multiplicity of systems and equipments will continue to evolve at varying degrees of effectiveness. The development of e-Navigation is an opportunity to optimise these developments, and ensure the focus of future developments is on a holistic approach to safe navigation from berth to berth.

The Strategy Plan was proposed at the NAV54 and was adopted at MSC85. Thereafter the Correspondence Group was dissolved since their work was fulfilled. We believe that the Group will be re-established at the NAV55 due to the future tasks on processing the input they have proposed and contributions from other organizations.

## COMSAR

The COMSAR – Communication and search and Rescue - has a proposed joint plan of work together on e-Navigation with the NAV and STW sub-committees for the period of 2009-2012. The COMSAR's focus will be communication and SAR aspects (equipment and procedures). By 2010 the COMSAR have to consider the interim report on the architecture of the Correspondence Group and to identify existing systems and new communication technologies supporting user needs and complying with equipment performance standards. Furthermore the COMSAR should define conditions for the selection of hardware and the development of corresponding software. These tasks are similar to the tasks of the NAV.

The COMSAR has worked out an e-Navigation strategy, which will include both data and voice communication, but primary it will be data communication. There will be different requirements regarding the accessibility of data, depending on which data is required. The vessels will receive a large quantity of data communication and it is important to the navigators, that they are able to treat the data effectively. E-Navigation will include data communication via satellite as well as traditional radio communication.

Ref.: NAVDOCS; MSC 86/23/4, COMSAR report 12

## STW

The STW - Standards of Training and Watch keeping - has also a joint plan of work together with The NAV and COMSAR sub-committees. The STW's focus will be on training aspects where the e-Navigation strategy identifies training, competency, language skills, work load and motivation as the essential issues. Alert management, information overload and ergonomics are prominent concerns. These aspects of e-Navigation will have to be taken into account in accordance with IMO's Human Element work.

## How we will act in relation to IMO and the sub-committees

MSC is the highest committee working on e-Navigation in IMO and therefore we will of course be aware of their meetings and papers being submitted. MSC delegates the task to the Nav-, STW and COOMSAR sub-committees and they are the main core in the work on e-Navigation and thereby the highest reference to the sub-committees.

However, it is primarily the Nav-sub committee and the e-Navigation Correspondence Group that are interesting to our work on e-Navigation, because they are directly involved in the overall concept of e-Navigation and their process is important to the further concept of e-Navigation. We intend to participate in the upcoming meeting NAV 55 and will try to influence the development on e-Navigation by proposals and comments to the agenda. We believe it is important to influence and follow the work of IMO closely and that is not only to benefit our work but also to participate in shaping the future concept and implementation of e-Navigation.

If and when the e-Navigation Correspondence Group is re-established, it is important to our project, that we monitor their work closely and try to influence their decisions by submitting papers and participating in their meetings and sessions. It is also a benefit to our project that IMO is aware of our work and can follow our process and development.

## IALA

**IALA's - International Association of Maritime Aids to Navigation and Lighthouse Authorities - role in the e-Navigation concept:**

Because of its general mandate, IALA has a responsibility to the maritime community to support national members providing shore-based services (ship to shore, shore to ship and shore to shore).

At the IMO Sub-Committee on Navigation's meeting in July 2007, NAV53, several delegations reiterated the role that IALA could play in the development of e-Navigation, particularly the shore aspects of aids to navigation. They also pointed out that IALA has created an e-Navigation Committee at its 2006 Conference in Shanghai. The conclusion was that IALA will play a key role, working closely with IMO, IHO and other relevant international organizations in developing the e-Navigation concept.

Also in July 2007, at the IALA e-Navigation Seminar the Secretary General of IMO gave a keynote address, stressing that IMO has clearly identified the importance of a common architecture for e-Navigation. The Secretary General of IMO also stressed, "That IALA's participation in the work of IMO on this subject is vital, and will become more so as the concept takes shape and eventually near fruition".

Hence, IMO has invited IALA and other international organizations to participate in its work and provide relevant input.

It is the NAV, STW and COMSAR's sub-committee's task to invite member Governments to actively participate in the committees groups work and have them to submit relevant views, proposals and comments to COMSAR 14 and NAV 56. Also the Industry should be invited and participate in above mentioned tasks. IALA will also be invited to continue its work on the shoreside infrastructure and also actively participate in the committee groups and report to the meetings as appropriate. The IALA's work on e-Navigation as a whole will be presented below.

IALA has set an e-Navigation committee, which consists of 5 working groups mentioned below.

#### WG1 – Strategy and operational issues

This group main task was to work on the strategy plan and delivered it to the NAV committee. The strategy plan is completed and will be followed in the future work on e-Navigation. After the completion of the strategy plan, the first step is to define the users and stakeholders requirements. The next step is the identification of the groups of functions or services needed to meet these primary navigational needs, based on structured, systematic and traceable methodology that relates the functions to tangible operational benefits. The work group has furthermore formed the MIS - Maritime Information Systems Task Group – which will continue the work on e-Navigation. At the moment they are working on the

Shipborne Information Tree, which will identify the present and future shipborne navigations systems.

#### WG2 – Technical issues

This group is looking into all the technical issues combined with e-Navigation and is especially looking into everything regarding radio navigation systems, such as global satellite systems GNSS (GPS, GLONASS, Galileo), their augmentations DGNSS (DGPS, DGLONASS, EGNOS, WASS), radars and racons, Loran-C and e-Loran. They develop a strategic world-wide plan for radio navigation (RNP –eNAV6/9/2) as well as guidance on these issues – IALA NAVGUIDE (2010 edition). They also look into the Galileo standard, which will be a European satellite navigation system completed in 2013. Together with EGNOS it can supply a new maritime user oriented services.

#### WG3 – AIS technical issues

This group was a former independent committee in IALA and their focus is on the continued development on AIS and they work by recommendations from IALA. It is a strong team consisting of representatives from the worlds Maritime Safety Administrations and they work very distinctive with innovation on the newest techniques within the Maritime world. The group is looking into various subjects within radio technology and they are looking into possible technologies which can transmit DGPS signals. The AIS is able to transmit data and communicate different information between Ship/Shore, Shore/Ship and Ship/Ship both autonomously or manually. Real, synthetic or virtual AIS for AtoN objects (fixed and floating) like buoyage) are also subjects to the working group.

#### WG4 – Communication issues

This group is a rather newly formed group and is looking at which technological solutions are desired in the future E-Navigation. AIS, VHF, HF Navtex, etc. are today well-known communication aids and it is the intention that more data will be transmitted in the future, even by other means than above mentioned. For example is the group looking into the radar's ability in transferring communication otherwise than seen today. Perhaps it will be possible to use the radar as a data communication tool? Radio frequencies are available to the maritime world but they are also available for other than maritime bodies. It is essential to keep the frequencies available only for the maritime communication, in order to keep the communication undisturbed. The group is also looking into the need for other frequencies

than those used today and they are communicating and coordinating with ITU on this matter.

#### WG5 – e-Navigation Architecture

This group will set up the framework, technical architecture and work on the mechanics of data modelling. It has also arranged a joint inter-seasonal meeting of the AIS Technical work group (WG3) with the goal to transfer generic engineering modeling descriptions out of the present draft Recommendation on the AIS Service, under development at the AIS TWG, to the future draft Recommendations on the generic technical e-Navigation service engineering model, under development at the WG5.

The e-Nav-committee was established in 2006, which is a combination of the former AIS-committee and the RNAV-committee. The committee is composed of both technicians and operative people in order to discuss all possible matters.

Other groups dealing with e-architecture are:

VTS Committee – concentrating on all issues surrounding vessel services and traffic control,

Aids to Navigation Management – who deal with new buoyage equipment and AIS based monitoring system.

IALA is leading the architecture work for e-Navigation for shore systems and ship-shore/shore-ship services by publishing manuals, guidelines, and recommendations. The recommendations provide the framework for e-Navigation from the shore side. The above recommendations can also be used as the basis for ship side architecture work. So far, IALA has no mandate to deal with ship-board architecture. This would require an invitation of IMO to IALA.

It is our view that IALA's participation should not just include the architecture work on the shore based services and ship to shore/shore to ship, but also the ship-board architecture because e-navigation is a holistic concept and can not just be dealt with from one perspective, but must be dealt with in all aspects. It should also be in their interest that the ship-board architecture is compatible with the shore-based architecture.

Additionally, at the request of IMO, IALA is supporting IMO in the development and implementation of e-Navigation by offering architecture proposals for coordinated review by IMO starting in 2009.

IALA is also contributing proposals for the Universal Maritime Data Model that has been designed to model data object related aspects of e-Navigation.

IALA has worked in the issue of user needs and is expected to put in a paper to NAV 55 on e-Navigation.

## How we will act in relation to AILA

AILA'S overall role in e-Navigation in IMO is rather considerable and they have participated in the framework and structure from the beginning. Furthermore, having set an e-Navigation committee makes this organisation's work very important to our project. Partners from EfficienSea are represented in each work group in the e-Navigation Committee and thereby we can try to make our influence felt in all aspects of the group's work. We work actively in all groups and the information flow is thereby executed rapidly and distributed effectively to the respective groups in the EfficienSea project. This close connection with a major international organisation, gives us a range of possibilities in our process of developing and implementing e-Navigation and therefore we think that IALA is our best channel of influence among the international organisations. We believe that we via IALA have great possibilities for essential influence on the development and implementation of the concept e-Navigation.

*Ref.: IALA's e-nav5/output14/e-nav6/output/2*

## IHO

The International Hydrographic Organization is an intergovernmental consultative and technical organization that was established in 1921 to support the safety in navigation and the protection of the marine environment. One of its primary roles is to establish and maintain appropriate standards to assist in the proper and efficient use of hydrographic data and information.

The object of the Organization is to bring about:

- The coordination of the activities of national hydrographic offices;
- The greatest possible uniformity in nautical charts and documents;
- The adoption of reliable and efficient methods of carrying out and exploiting hydrographic surveys;

- The development of the sciences in the field of hydrography and the techniques employed in descriptive oceanography.

It is our perception that IHO's interest in e-Navigation is concerning charts and hydrographic surveys. It is essential that the charts used in the future e-Navigation are following the given standards and IHO will take an important part in this matter. Hydrography is that branch of applied sciences which deals with the measurement and description of the features of the seas and coastal areas for the primary purpose of navigation and all other marine purposes and activities, including –inter alias- offshore activities, research, protection of the environment, and prediction services. Furthermore IHO also deals with presentation and portrayal issues and has control over one of the most important surface presentation on board.

## S-57 and S-100

IHO Special Publication 57 (IHO S-57) is the current IHO Transfer Standard for Digital Hydrographic Data. It was formally adopted as an official IHO standard at the 14<sup>th</sup> International Hydrographic Conference in May 1992. Although S-57 Edition 3.1 has many good aspects, it does have limitations:

- It has an inflexible maintenance regime. Any addition of new features and attributes to the solitary catalogue for new products would have serious consequences for the ENC product specification. It would trigger continual new editions because it prohibits features and attributes which are not required in the ENC.
- Freezing standards for lengthy periods is counter-productive.
- As presently structured, it cannot support future requirements (e.g., gridded bathymetry, or time-varying information).
- Embedding the data model within the encapsulation (i.e., file format) restricts the flexibility and capability of using a wider range of transfer mechanisms.
- It is regarded by some as a limited standard focused exclusively for the production and exchange of ENC data.

In order to address these and other limitations, the IHO Committee on Hydrographic Requirements for Information Systems (CHRIS) first considered a major revision of S-57 in November 2000 at its 12th meeting. The result is the draft standard S-100 which includes both additional content and a new data exchange format.

## Goals and Objectives for S-100

S-100 is relevant in relation to e-Navigation, because it supports some of the functionalities that e-Navigation should deliver in the future, in particular regarding integrating a number of various information in the nautical charts.

S-100 is intended to support a wide variety of hydrographic-related digital data sources, products, and customers. This includes, but is not limited to, imagery and ridded data, 3-D and time-varying data (x, y, z, and time), and new applications that go beyond the scope of traditional hydrography and the hitherto almost exclusive domain of hydrographic offices. Examples of the potential expanded scope of S-100 include Marine Spatial Data Infrastructure, Marine Information Overlays, resource exploration etc. For this to be achieved, the relevant data domain experts are invited to contribute to the development of S-100 to meet their requirements.

Other goals include:

- Separating the data content from the carrier (file format). In this way, data can be manipulated and encoded without being permanently tied to a single exchange mechanism or portrayal. For example nautical publications encoded in XML could be portrayed in PDF, XHTML, ECDIS or plain text. ENC data could be transferred using the traditional ISO/IEC 8211 format or encoded in GML for use in Web Feature/Mapping Services.
- Manageable flexibility that can accommodate change. The content of future product specifications will be a subset of S-100, including separate feature catalogues. This will allow the core standard to evolve (through extension) without the need to introduce new versions of product specifications.
- An ISO-conforming registry on the IHO Web site containing registers for feature
- Data dictionaries, portrayal and metadata. The registers will accommodate both core hydrographic content and other chart related content, such as, nautical publications, Inland ENC, Additional Military Layers (AMLs) and Marine Information Overlays (MIOs).

Electronic Navigational Chart's conformant with IMO requirements and produced to IHO standards will form the backdrop of navigational chart information within ECDIS. IHO passed a resolution in 2007 calling on Member States to come together to achieve adequate coverage, availability, consistency and quality of ENCs by 2010. IHO will be reporting to Imo on this subject.

## How we will act in relation to IHO

We will follow IHO's process in implementing S100 very closely because the aspect and possibilities in S100 is close related to e-Navigation needs in the future. E-Navigation will be based on sea charts that are able to supply a large quantity of information and must be interactive, so therefore we will follow the evolution of their work and find possible applications to our project. Furthermore it will be necessary to work with



standardization of a new chart symbolic in connection with the prospects and challenges of marking virtual beacons in electronic sea charts and the future e-Navigation display.

Ref.: [www.ih.org](http://www.ih.org)

## Other organisations

### ITU

ITU – the International Telecommunication Union - is the leading United Nations agency for information and communication technology issues, and the global focal point for governments and the private sector in developing networks and services. For nearly 145 years, ITU has coordinated the shared global use of the radio spectrum, promoted international cooperation in assigning satellite orbits, worked to improve telecommunication infrastructure in the developing world, established the worldwide standards that foster seamless interconnection of a vast range of communications systems and addressed the global challenges of our times, such as mitigating climate change and strengthening cybersecurity.

ITU also organizes worldwide and regional exhibitions and forums, such as ITU TELECOM WORLD, bringing together the most influential representatives of government and the telecommunications and ICT industry to exchange ideas, knowledge and technology for the benefit of the global community, and in particular the developing world.

From broadband Internet to latest-generation wireless technologies, from aeronautical and maritime navigation to radio astronomy and satellite-based meteorology, from convergence in fixed-mobile phone, Internet access, data, voice and TV broadcasting to next-generation networks, ITU is committed to connecting the world.

### How we will act in relation to ITU

We believe that ITU's role and interest in e-Navigation mainly is focused on assigning frequencies and deciding how the frequencies are being used world wide. IALA's e-Navigation working group 4 – Communication issues – consults ITU concerning frequencies and technological solutions in the future e-Navigation aspect. We believe it is important that ITU is involved in the work group's discussions in order to make sure e-Navigation will be supplied with the proper frequencies undisturbed.

At this point of stage we do not intend to perform any actions related to ITU, but we will be aware of any actions taken towards e-Navigation and with relevance for our specific project.

Ref.: <http://www.itu.int/net/home/index.aspx>

## IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes international standards for all electrical, electronic and related technologies. These serve as a basis for national standardization and as references when drafting international tenders and contracts.

Through its members, the IEC promotes international cooperation on all questions of electro technical standardization and related matters, such as the assessment of conformity to standards, in the fields of electricity, electronics and related technologies.

The IEC charter embraces all electro technologies including electronics, magnetic and electromagnetic, electro acoustics, multimedia, telecommunication, and energy production and distribution, as well as associated general disciplines such as terminology and symbols, electromagnetic compatibility, measurement and performance, dependability, design and development, safety and the environment.

The IEC has set down a work group TC80, IEC Technical Committee 80 which produces operational and performance requirements together with test methods for maritime navigation and radio communication equipment and systems.

The committee provides industry with standards that are also accepted by governments as suitable for type approval where this is required by the International Maritime Organization's SOLAS Convention. TC 80 does this by ensuring that it has representatives from industry, users, governments and test certification bodies. There are currently 20 participating national members in the committee and liaisons with all the major international maritime bodies.

The committee work programme is associated with that of the IMO by mirroring the performance standards adopted by IMO in its resolutions, with associated relevant ITU recommendations.

TC 80 standards support IMO resolutions and non-SOLAS and shore applications. Its scope is "to prepare standards for maritime navigation and radio communication equipment and systems, making use of electro technical, electronic, electro acoustic, electro-optical and data processing techniques for use on ships and where appropriate on shore".

## How we will act in relation to IEC

IEC's scope to prepare standards for maritime navigation and radio communication equipment is interesting to our project because the future e-Navigation system will require such standards and functionality.

At this point of stage we do not intend to perform any actions related to IEC, but we will be aware of any actions taken towards e-Navigation and with relevance for our specific project.

## WMO

WMO - the World Meteorological Organization is a specialized agency of the United Nations. It is the UN system's authoritative voice on the state and behaviour of the Earth's atmosphere, its interaction with the oceans, the climate it produces and the resulting distribution of water resources.

WMO has a membership of 188 Member States and Territories (since 24 January 2007). It originated from the International Meteorological Organization (IMO), which was founded in 1873. Established in 1950, WMO became the specialized agency of the United Nations in 1951 for meteorology (weather and climate), operational hydrology and related geophysical sciences.

WMO promotes cooperation in the establishment of networks for making meteorological, climatological, hydrological and geophysical observations, as well as the exchange, processing and standardization of related data, and assists technology transfer, training and research. It also fosters collaboration between the National Meteorological and Hydrological Services of its Members and furthers the application of meteorology to public weather services, agriculture, aviation, shipping, the environment, water issues and the mitigation of the impacts of natural disasters. WMO provides the framework for international cooperation such as Operational hydrology, as well as to reap the benefits from their application.

WMO plays a leading role in international efforts to monitor and protect the environment through its Programmes. In collaboration with other UN agencies and the National Meteorological and Hydrological Services, WMO supports the implementation of a number of environmental conventions and is instrumental in providing advice and assessments to governments on related matters. These activities contribute towards ensuring the sustainable development and well-being of nations.

## How we will act in relation to WMO

We believe that WMO interest in e-Navigation will be the provision of meteorological and hydrological data to the integrated system, so it will be useful for route planning and decisions taken. It will be standardized data which will be available in the system when needed and will provide the user with only the essential data necessary for the given route. It should be in WMO interest to be a part of the development, in order to have their influence on the concept.

At this point of stage we do not intend to perform any actions related to WMO, but we will keep us informed of any development and action taken towards e-Navigation because meteorological information will certainly take a considerable role in the future e-Navigation concept.

Ref.: [http://www.wmo.int/pages/index\\_en.html](http://www.wmo.int/pages/index_en.html)

## CIRM

CIRM - COMITE INTERNATIONAL RADIO-MARITIME (CIRM) - The International Association for Marine Electronics Companies is one of the nine original international bodies accredited in 1949 as a non-governmental organization in consultative status to the International Maritime Organization (IMO).

CIRM is a Sector Member of the International Telecommunication Union (ITU-R and ITU-T), and is a Liaison Member both of the International Organization for Standardization (ISO) and of the International Electrotechnical Commission (IEC). CIRM also enjoys mutual observer status with all the other relevant international and regional organizations, including the International Hydrographic Organization (IHO), the International Association of Lighthouse Authorities (IALA), the International Chamber of Shipping (ICS), and the US Radiotechnical Commission for Maritime (RTCM).

CIRM'S task is to promote the application of electronic technology to the safety of life and efficient conduct of vessels at sea; to foster relations between all organizations concerned with electronic aids to marine navigation, communications and information systems.

### CIRM's FUNCTIONS

- To represent the interests of the marine electronics industry, internationally;
- To co-ordinate the views and actions of members in resolving regulatory issues and in the promotion of marine electronics;

- To provide technical and industrial advice to the international regulatory organizations;
- To provide a specialist information service for members;
- To provide a private forum for members to exchange information and business opportunity; To enable members to participate in the development of international regulations and standards affecting their products and services.

## How we will act in relation to CIRM

We believe that CIRM's interest in the e-Navigation rely on their members and their interest. It is important, that their members develop systems which are reliable and trustworthy, and therefore it is important that CIRM is observing and participating in the evolution of the e-Navigation. They provide specialist information to their members and here it is essential that they are taking interest in the work ongoing. They want to be up front in order to influence their members in the best way.

At this point of stage we do not intend to perform any actions related to CIRM, but we will keep us updated on any development and action taken towards e-Navigation.

Ref.: [www.cirm.org](http://www.cirm.org)

## BIMCO

BIMCO - The Baltic and International Maritime Council - is an independent international shipping association, with a membership composed of ship owners, managers, brokers, agents and many other stakeholders with vested interests in the shipping industry.

The association acts on behalf of its global membership to promote higher standards and greater harmony in regulatory matters.

BIMCO is a catalyst for the development and promotion of fair and equitable international shipping policy.

BIMCO is accredited as a Non-Governmental Organisation (NGO), holds observer status with a number of United Nations organs and is in close dialogue with maritime administrations, regulatory institutions and other stakeholders within the EU, the USA and Asia. The association provides one of the most comprehensive sources of practical shipping information and a broad range of advisory and consulting services to its members.

BIMCO is an organisation that takes care of their member's interest, which is the ship owners' interest. BIMCO is participating in foras such as IALA and IMO, where they have members participating in various

meetings, here amongst meetings concerning e-Navigation. They see to that the point of views is canalized to their members and they also advise their members from their conviction.

Their view upon e-Navigation is first of all positive, if the system will be able to higher safety on board. Furthermore they urge that the systems will be supported by already existing system such as ECDIS and AIS, in order to make the expenses as low as possible. Their worries are concerned about new developed technology, which would be very expensive to implement on their members vessels. BIMCO believe that the aim would be to make life easier on the vessel and thereby to the ship owner. That could for example be information transmitted automatically, gathering and distribution of information also performed automatically, route optimizer in order to reduce fuel consumption, route exchange and further on. Hence it is important that the standardization of the ship's equipment is simple and not too complex due to the education of the users.

## How we will act in relation to BIMCO

At this point of stage we have visited BIMCO and presented and discussed our ideas on e-Navigation. BIMCO is interested in following the work on e-Navigation and would perhaps like to participate in our coming e-Navigation conference, which will be held in 2010. It is important to our project to keep good contact to BIMCO, since they are the coming user's organisation and have great influence on decision making.

Ref. Mr. Aron Sørensen, BIMCO, and [www.bimco.org](http://www.bimco.org)

## INTERTANKO

INTERTANKO is the International Association of Independent Tanker Owners INTERTANKO has been the voice of independent tanker owners since 1970, ensuring that the oil that keeps the world turning is shipped safely, responsibly and competitively.

INTERTANKO is a forum where the industry meets, policies are discussed and statements are created. It is a valuable source of first-hand information, opinions and guidance. INTERTANKO has a vision of a professional, efficient and respected industry, which is dedicated to achieving Safe transport, cleaner seas and free competition.

INTERTANKO has 270 members and its associate membership stands at some 300 companies with an interest in shipping of oil and chemicals.

INTERTANKO is actively involved in a wide range of topics, which include commercial, technical, legal and operational matters. INTERTANKO's direct contact with the members and original sources enables it to select and promulgate the information which is essential to the tanker industry.

## How we will act in relation to INTERTANKO

INTERTANKO is not directly working on e-Navigation, but we believe that it would be a financial benefit for their members to introduce e-Navigation in the future, because the enormous paperwork associated with vettings and port entry could be much more efficient and automatically performed with the e-Navigation concept.

At this stage we have not contacted INTERTANKO yet, but that could be a possibility in the future.

Ref.: <http://www.intertanko.com>

## ICS

The ICS- International Chamber of Shipping is the international trade association for merchant ship operators.

ICS represents the collective views of the international industry from different nations, sectors and trades.

ICS membership comprises national shipowners' associations representing over half of the world's merchant fleet.

A major focus of ICS activity is the International Maritime Organization (IMO) – the United Nations agency with responsibility for the safety of life at sea and the protection of the marine environment.

ICS is heavily involved in a wide variety of areas including any technical, legal and operational matters affecting merchant ships.

ICS is unique in that it represents the global interests of all the different trades in the industry: bulk carrier operators, tanker operators, passenger ship operators and container liner trades, including shipowners and third party ship managers.

ICS has consultative status with a number of intergovernmental bodies which have an impact on shipping. Its close ties with IMO stretch back to this body's inception in 1958. Other partners include the World Customs Organization, the International Telecommunications Union, the United Nations Conference on Trade and Development and the World Meteorological Organization. ICS also enjoys close relationships with industry organizations representing different maritime interests such as shipping, ports, pilotage, the oil industry, insurance and classification societies responsible for the surveying of ships.

ICS's is taking an active part of the e-Navigation process and has participated in the Nav Sub-committee's meetings concerning e-Navigation. ICS fully supports the approach that user requirements should dictate the strategic development of e-Navigation. In this regard, human element considerations should be given a high priority and the eventual e-Navigation environment should reflect this. It is essential that the views of ship owners, operators and crews are fully appreciated and taken into account to avoid creating an extensive and technologically advanced system designed and operated for the benefit of administrators, logistics interests, equipment manufacturing and communications industries but where there is little, if any direct gain, or benefit for shipping or seafarers.

ICS is focusing on training, competency and common language skills for all operationally involved, both at sea and ashore. Technological developments should be used to serve the development of e-Navigation as required by users and not be allowed to define the strategy. The associated risk of establishing premature carriage requirements for equipment or systems that hinders rather than helps shipping should be recognized. The potential for establishing an S-mode of operation is strongly supported as underpinning the use and commonality of e-Navigation; consideration should be given to making this a prime requirement. ICS is constantly following the sessions of the Nav sub-committee as well as giving their inputs on e-Navigation frequently.

## How we will act in relation to ICS

ICS is a comparable organisation to BIMCO and the two organisations will have the similar interests in e-Navigation toward their members. At this point of stage we have not had resources to contact ICS, but this will be done if we find it necessary and beneficial to our project.

Ref.: [www.ICS.org](http://www.ICS.org) and IMODOCS; NAV 53/13



## HELCOM

HELCOM - The Helsinki Commission - works to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation between Denmark, Estonia, the European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.

HELCOM is the governing body of the "Convention on the Protection of the Marine Environment of the Baltic Sea Area" - more usually known as the Helsinki Convention.

HELCOM's vision for the future is a healthy Baltic Sea environment with diverse biological components functioning in balance, resulting in a good ecological status and supporting a wide range of sustainable economic and social activities.

In pursuing this objective and vision the riparian countries have jointly pooled their efforts in HELCOM, which works as:

- an environmental policy maker for the Baltic Sea area by developing common environmental objectives and actions;
- an environmental focal point providing information about (i) the state of/trends in the marine environment; (ii) the efficiency of measures to protect it and (iii) common initiatives and positions which can form the basis for decision-making in other international foras;
- a body for developing, according to the specific needs of the Baltic Sea, Recommendations of its own and Recommendations supplementary to measures imposed by other international organisations;
- a supervisory body dedicated to ensuring that HELCOM environmental standards are fully implemented by all parties throughout the Baltic Sea and its catchments area; and a coordinating body, ascertaining multilateral response in case of major maritime incidents.

For three decades HELCOM has been working to protect the marine environment of the Baltic Sea. This work has been driven by the specific environmental, economic and social situation in the Baltic region and the specific sensitivity of the Baltic Sea. The work of HELCOM has led to improvements in various fields, but further work is still needed.

## How we will act in relation to HELCOM

We believe that HELCOM's interest in e-Navigation is mainly the environmental prospect in and around the Baltic Sea. An implemented e-Navigation in the future will hopefully improve the environment significantly in the Baltic Sea as well as the improved safety on board will prevent major hazard accidents, which are malicious to the environment.

At this point of stage we do not intend to act further towards HELCOM, but we will be aware of any actions or processes taken and keep us informed.

Ref.: [www.HELCOM.fi](http://www.HELCOM.fi)

## Baltic Sea Development Forum

Baltic Development Forum is an independent non-profit networking organisation with members from large companies, major cities, institutional investors and business associations in the Baltic Sea Region. Baltic Development Forum works with a wide range of partners, including businesses, governments, regional organisations, research and media institutions. The mission of Baltic Development Forum is to promote the Baltic Sea Region as an integrated, prosperous and internationally competitive growth region.

Baltic Sea Development Forum facilitates and develops new initiatives, partnerships and international contacts to stimulate growth, innovation and competitiveness in the Baltic Sea Region and its 11 dynamic countries. They seek to develop the Baltic Sea Region as a global centre of excellence and establish the Region internationally as a strong and attractive place brand.

Their mission is to position the Baltic Sea Region in the EU and on the global map by advancing the growth and competitive potential through partnership between business, government and academia. They initiate and facilitate the creation of strategies, provide thematic analyses and offer a wide networking arena for high-level decision-makers to meet.

Baltic Development Forum achieves this mission by

- Acting as a catalyst, facilitator and developer of concrete projects and strategies;
- Providing a platform for all interested regional parties;
- Influencing and shaping the regional policy agenda of tomorrow.

## How we will act in relation to Baltic Sea Development Forum

At this point of stage we have not taken any initiatives to cooperate with Baltic Sea Development Forum, but it could be a beneficial opportunity in the future to seek cooperation or support in some way. Furthermore, the organisation could be interesting to influence on e-navigation matters or similar subjects.

[http://www.bdforum.org/show/english/the\\_forum.aspx](http://www.bdforum.org/show/english/the_forum.aspx)

## The Council of the Baltic Sea States

The Council of the Baltic Sea States is an overall political forum for regional inter-governmental cooperation. The Members of the Council are the eleven states of the Baltic Sea Region as well as the European Commission

The Council consists of the Ministers for Foreign Affairs from each Member State and a member of the European Commission. The Presidency of the Council rotates among the Member States on an annual basis. The role of the Council is to serve as a forum for guidance and overall coordination among the participating states. The foreign minister of the presiding country is responsible for coordinating the Council's activities and is assisted in this work by the Committee of Senior Officials (CSO).

The Council does not have a general budget or project fund. Members are responsible for funding common activities and/or for seeking and coordinating financing from other sources. Since 1998, the CBSS Member States have financed jointly the Permanent International Secretariat of the CBSS.

## How we will act in relation to the Council of the Baltic Sea States

At this point of stage we have not taken any initiatives to cooperate with Baltic Sea Development Forum, but it could be a beneficial opportunity in the future to seek cooperation or support in some way. Furthermore, the organisation could be interesting to influence on e-navigation matters or similar subjects.

## EU – DG Tren

European Union Directorate General for Energy and Transport is at the heart of European policies and has a considerable impact on the everyday life of citizens. There can be no unified area without these bridges between countries and people, and the removal of barriers between Member States has facilitated the free movement of persons and goods. Transport policy, plans for which began in 1957, is aimed at sustainable mobility combining Europe's competitiveness with the welfare of its citizens, making for greater safety and security and enhanced rights. It is an essential component of the Lisbon strategy and contributes to the EU's social and territorial cohesion. Energy policy also dates back to the beginnings of European integration, with the ECSC Treaty on coal and steel and the Euratom Treaty on the civil use of nuclear energy. However, it really took off in the 1990s with the creation of a genuine internal market for electricity and gas, the promotion of new energy sources and a more coordinated approach to security of supply.

DG TREN is responsible for developing and implementing European policies in the energy and transport field. Its mission is to ensure that energy and transport policies are designed for the benefit of all sectors of the society. DG TREN carries out these tasks using legislative proposals and programme management, including the financing of projects. The current goals of DG TREN are:

1. Complete the internal market in energy and transport
2. Ensuring sustainable development of transport and energy
3. Deployment of major networks in Europe
4. Space management, i.e. air traffic congestion management
5. Improving transport and energy safety

6. Accomplishing enlargement
7. Developing international cooperation

The EU's approach to e-navigation is mainly the concept e-Maritime which is interactions between all the different stakeholders in the maritime sector. The EU e-Maritime initiative embodies a set of policies, strategies and capabilities facilitating the development of e-Maritime in support of an efficient and sustainable waterborne transport system throughout Europe, fully integrated within the transport logistic chains. The results must be defined through measurable economic, social and environmental benefits. The EU follows the concept of e-Navigation, but overall they look upon the e-Maritime concept in a broader scope than e-Navigation, which is perceived inverse by IMO and IALA.

E-Maritime is the implementation of a system for the maritime exchange of information from ship to shore, shore to ship and between all stakeholders, using services such as SafeSeaNet, LRIT (Long-range Identification and Tracking) and AIS (Automatic Identification System), will facilitate safer and more expedient navigation and logistics operations, thereby improving maritime transport's integration with other transport modes.

## How we will act in relation to DG TREN

We believe that DG TREN's interest in e-Navigation will be rather considerable, since the maritime transport is the backbone of international transport and maritime transport and all related shipping services are essential in helping European companies compete globally. Therefore it is in DG TREN's interest to improve safety and the environment at sea, which e-Navigation will contribute to.

At this moment we do not have any approaches or intentions to withdraw the EU in our work, but we will be aware of the process and their work on e-Maritime, if there should be a prospect for collaboration in the future.

Ref [http://ec.europa.eu/dgs/energy\\_transport/index\\_en.htm](http://ec.europa.eu/dgs/energy_transport/index_en.htm)

## EU - EMSA

The European Maritime Safety Agency, created in the aftermath of the Erika disaster, will contribute to the enhancement of the overall maritime safety system in the Community. Its goals are, through its tasks, to reduce the risk of maritime accidents, marine pollution from ships and the loss of human lives at sea.

In general terms, the Agency will provide technical and scientific advice to the Commission in the field of maritime safety and prevention of pollution by ships in the continuous process of updating and developing new legislation, monitoring its implementation and evaluating the effectiveness of the measures in place. Agency officials will closely cooperate with Member States maritime services.

Some of the key areas where the Agency will be active are: strengthening of the Port State Control regime; auditing of the Community-recognized classification societies; development of a common methodology for the investigation of maritime accidents and; the establishment of a Community vessel traffic monitoring and information system.

## How we will act in relation to EU - EMSA

We believe that EU-EMSA's interest in e-Navigation will mainly rely on reducing maritime accidents, reducing marine pollution and of course secure the human lives at sea. Training and education are also in focus when reducing maritime accidents and loss of human life, so these aspects will play a big role in the whole e-Navigation aspect. The idea on board is to provide the navigator with only the essential information and thereby reduce the stream of information and reduce the possibility for mistakes.

At this moment we do not have any approaches or intentions to withdraw the EU in our work, but we will be aware of the process and their work on e-Maritime, if there should be a prospect for collaboration in the future.

## How we will deal with the organisations and how we create our own e-Navigation network.

This chapter will describe how we together in the project can monitor and perhaps have influence on the development on e-Navigation in the international organisations. We will describe how we will be able to submit comments to their upcoming meetings on e-Navigation and how we can create our own e-Navigation network.

In order to influence the international organisations we must submit papers, which have substance and are discussed in our e-Navigation work group. Therefore we suggest that we create a network and a space, where we can discuss and create papers. Furthermore, we will list all the coming meetings, which we might have an interest in submitting papers to.

We imagine we can create a “knowledge bank” on our e-Navigation home page, and here all members of the workgroup can participate in the discussions and keep up to date with meetings on e-Navigation. The home page should have a “blog” where we can discuss and perhaps put in papers for discussion. We could also create a list of all relevant e-Navigation in order to be kept updated on what is going on in the world

Furthermore we could create an e-Navigation blue book, where we list all participants in all the committees and workgroups. This will give us an easy overview and create a possible network between all involved in e-Navigation. All these above mentioned task will be started soon.

# Appendix B

## Individual organisations, forums and projects

### Introduction

This paper will describe National Organisations, Projects and Foras' work and interest in e-Navigation. It will describe what kind of organisations they are, what they have done so far with e-Navigation and where will they go in the future. Our intention with this paper is to gather information about e-Navigation, so we can get an overall picture of the e-Navigation project worldwide. In our paper on International organisations we concentrate on the governmental and non-governmental organisations and their work on e-Navigation and the Industry is described in a separate report. This paper describes other organisations that also work on e-Navigation to larger or smaller extend.

All references taken directly from homepages and other sources are stated in quotes.

### Organisations and projects on e-Navigation

#### MarNIS

MarNIS -Maritime Navigation and Information Services - was an Integrated Project in the 6th Framework program of DG Energy and Transport of the European Commission (2004-2009). MarNIS was finalized on 1 March 2009 and contributed to the development of e-Maritime. The focus of MarNIS was placed on the improved exchange of information and provision of services and the required infrastructure to meet the requirements placed on both the authority and business level. MarNIS developed a concept which provides for safer and more efficient shipping, whilst furthering the protection of the environment and facilitating



the need for security, thereby meeting the requirements of policy makers, maritime authorities, ports and related industries.

The MarNIS concept was an integrated organizational, operational and legal concept, using electronic information and communication technology. It was a co-operation between maritime authorities, industry and research institutes focused on the definition of particular solutions to meet these requirements. The partners came from most of Europe and represented national and international maritime organisations.

“The MarNIS consortium comprised a wide spectrum of experienced partners and subcontractors who endeavored to find innovative global and European solutions for operations and activities performed and experienced daily in the maritime sector”.

The MarNIS project has held conferences and published folders concerning e-Navigation and e-Maritime. We have included MarNIS in this paper, because we believe they are way ahead in the process of e-Navigation, and they have a clear plan for the future with the e-Navigation and e-Maritime work. The MarNIS project had a final demonstration in Lisbon in October 2008.

According to their homepage, the following describes in short terms, what their intentions with e-Navigation are:

“The MarNIS concept is developing means whereby the Master is only required to report once, all other updates being fed automatically into the information messaging structure and passed on to the relevant authorities. Early reporting leads to improved planning for ports and related nautical services through enhanced traffic organization services and the integral traffic plan.

A messaging structure designed to involve all authorities, not only maritime, is under development so that the passage of a ship may be as safe, efficient and secure as possible whilst rendering less threat to the environment as a consequence of incidents. Through innovative use of resources and technologies, shore-based operators are able to monitor and provide the appropriate level of assistance wherever the ship may be located in the coastal waters, shifting the emphasis from remedial services towards proactive services. Through the identification of High Risk Vessels appropriate measures may be taken in order to relieve the threat to the coastline and oceans. Research in MarNIS into the legal consequences for this more proactive approach has indicated that coastal States have the opportunity to monitor and prevent undesired incidents from developing through the use of appropriate risk-based assessment methods, also under development within MarNIS”.

## How we will act in relation to MarNIS

We think that their concept concerning developing means to reduce the reporting from the vessel to shore by making this process automatically is very close to our studies concerning reducing communication and making it automatic.

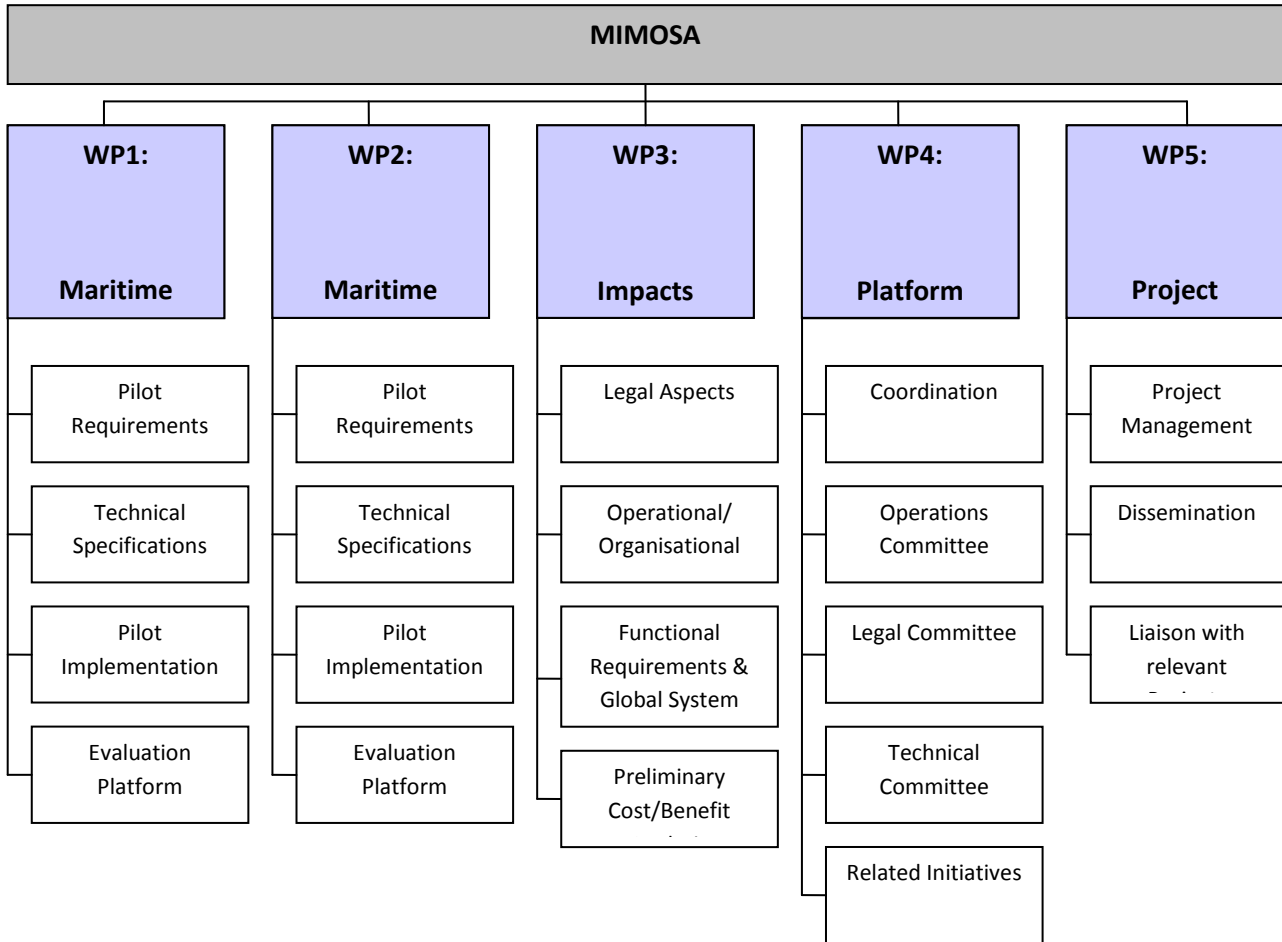
Our Mock-up demonstrates our intension with automatic reporting-points and automatic order of pilot and the further communication between ship and pilot station. Furthermore, it is only the essential information that is shown on the screen which gives the navigator a better overview of the whole situation. The idea with a message structure involving all authorities is very much comparable with our ideas concerning supporting and filtering information and letting the officer on watch concentrate on navigating and not on communicating. It is interesting to our project to look into their results on architecture, risk assessment and presentation methodology and finally their studies on legal consequences.

Ref.: [www.marnis.org](http://www.marnis.org) and the MarNIS Brochure.

## MIMOSA

MIMOSA - is a project still under application and MIMOSA has the aim to do the first steps towards the development of an implementation plan for the MarNIS e-Maritime concept. MIMOSA will focus on the Initialization and Awareness Phases. MIMOSA has the aim to further develop an implementation plan for the MarNIS e-Maritime concept, focusing on the Initialization and Awareness Phases. MIMOSA aims to contribute to and support the development of a number of European and International policies and initiatives for enhancing the safety, security and efficiency of maritime transport whilst promoting means for the improvement of the protection of the environment.

The following schedule describes the work intended of MIMOSA:



## How we will act in relation to MIMOSA

When the project MIMOSA will be adopted, it continues the work where MarNIS completed their work. Since MIMOSA's task is to deliver reports, plans and specifications and thereby no tangible results, we do not intend to seek a specific cooperation and we will follow the process and development by observing and keeping us updated.

## BLAST

BLAST – Bringing Land and Sea together - is a project formed by the maritime communities in the North Sea countries and the aim is to develop a Maritime and Coastal cross-sector knowledge and innovation community supporting EU policies affecting the North Sea Region.

“The project addresses the need for wider interoperability of marine and land information of the North Sea coastal zone for use in decision making and resource management. The North Sea is a geographical region in dire need of new or enhanced urban, rural, industrial and environmental management capabilities”.

“At present, there is little collaboration between Member States and within Member states at the national, regional, and local level to integrate marine and land information. The problem relating to coastal and near shore marine information is that geographic data on the landward side is collected and maintained by topographic mapping and/or cadastral agencies, while seaward the data is collected by hydrographic survey services, focusing primarily on marine navigation issues”.

“This project will create a best practice network amongst stakeholders from data providers and users. It will develop pilot studies focusing on the practical issues and solutions of the harmonization of marine hydrographic, terrestrial topographic, geological and environmental datasets. In doing so, it will look at current best practices among major public and private sector information stakeholders who collect and use such datasets”.

## How we will act in relation to BLAST

The BLAST project is very interesting to the e-Navigation project and we will follow their work closely while it is proceeding and we will also seek collaboration. Their studies focusing on the practical issues are very close to our focus on our Mock-up and studies on user needs. A wider interoperability of marine and land information is one of the main issues of our work package on e-Navigation, especially because this will, when implemented and functioning, take a load of the navigators shoulders and leave him to his essential task; navigating and bringing the vessel safe to port. Furthermore, they have an activity concerning experiences with 3D bridge systems, and this is very interesting to our e-Navigation project because we have contact to T-Kartor, who are participating in that project.

Ref.: BLAST doc. App.7

## Nordic Institute of Navigation

“The Nordic Institute of Navigation (NNF) is a non-profit, independent and non-political organization for professionals working within the field of navigation. The focus of NNF is on all aspects of positioning and navigation related to marine, air, land, and space based applications”.

“NNF is working to:

- improve qualifications of professionals within navigation, among other things by aiming at better educational opportunities
- improve safety for personnel, the environment, and for financial assets dependent on positioning and navigation
- improve efficiency and thereby to reduce costs within applications relying on positioning and navigation.

As a primary means for reaching these goals, the NNF arrange conferences, symposia, and courses to inform on subjects, ideas, and experiences related to the field of navigation. We also make room for coordination and networking opportunities during the events”.

The Nordic Institute of Navigation (NNF) arranged an e-Navigation Conference at the Royal Norwegian Naval Academy in Bergen March 5th – 6th 2009. The conference was open to both civilian and military personnel, and had participants from 5 different countries.

“Presentations covered several issues spanning from overall e-nav architecture through technological development to experiences and concerns from experienced navigators of small high speed ferries operating in confined waters. There was no doubt that the conference theme was a success, and NNF will follow up this conference by making e-Navigation an annual theme in one of the two yearly conferences”.

## How we will act in relation to Nordic Institute of Navigation

We believe that NNF is working seriously with e-navigation and perhaps we can arrange an e-Navigation conference together in 2010 or 2011. At this stage we are actively discussing this possibility with NNF and it could be very beneficial for our project to cooperate with expertise such as NNF so we can share our knowledge and maybe find new ways together. Furthermore there are partners of the EfficienSea project representative in Nordic Institute of Navigation, which gives the whole concept a more mutual understanding and perception.

Ref.: [www.nornav.org](http://www.nornav.org) and [www.messe.no/templates/ProjectStartPage.aspx?id=2692&epslanguage=EN](http://www.messe.no/templates/ProjectStartPage.aspx?id=2692&epslanguage=EN)

## BRISK

Sub-regional risk of spill of oil and hazardous substances in the Baltic Sea – BRISK - is a strategic project that has been launched by the Baltic Sea countries under the HELCOM umbrella. In order to address the increasing risk of accidental pollution from shipping connected to increasing maritime transportation in the Baltic.

“The overall objective of BRISK is to substantially contribute to the development of an appropriate level of preparedness in the whole Baltic Sea area to tackle major accidental spills”.

“The project area covers all transnational maritime areas in the Baltic, divided into 6 sub-regions. All Baltic Sea countries participate in BRISK. Danish Admiral Fleet leads the project”.

## How we will act in relation to BRISK

The BRISK project is dealing mainly with accidental pollution from shipping connected to the increased transportation in the Baltic Sea, and this subject is not exactly the main issue of the e-Navigation project. BRISK interests are more compatible with WG 5 and WG 6 in the EfficienSea project and we recommend that this work group consults the work of BRISK and follow the development of their work. The project will last for 3 years, and because it is not directly related to e-Navigation or any of the services e-Navigation is intended to provide, we will not review the progress any further.

Ref.: [www.helcom.fi/projects/on\\_going/en\\_GB/BRISK/](http://www.helcom.fi/projects/on_going/en_GB/BRISK/)

## BaltSeaPlan

Baltic Sea Use Planning – BaltSeaPlan – is an EU financed project, which has 18 partners from 9 different countries in the Baltic Region and will run until summer 2011.

“The growing pressure on the Baltic Sea as a result of increasing use demands and resulting conflicts on- and offshore calls for urgent and a unified action by all countries of the region. Whereas in the past the coordination of different demands was comparatively easy, the growing number of mutually excluding use interests needs to be balanced in a multi-sectored perspective. Shipping, wind farming, coastal and boat tourism, nature protection, mineral extraction and utility networks are only a selection of sectors affected. On top of this climate change developments call for increased adaptation strategies”.

This aims of the project will be achieved by (in short)

- Creation of a Baltic Marine Spatial Planning expert group
- Creating and collecting the necessary GIS based information
- Support to preparation of integrated marine policies and offshore development strategies and guidelines for use prioritization
- Development of Marine Spatial Plans in selected regions of the Baltic Sea with regard to agreed standards of the expert group
- Support to develop consistent strategic environmental assessments of Marine Spatial Plans in the Baltic Sea
- Policy Recommendations and proposals for Marine Spatial Plans and tools
- Interface and networking, exchange of experience.

## How we will act in relation to BaltSeaPlan

We find the BaltSeaPlan very interesting to our project and we will follow their work closely and even try to influence or cooperate with them. Their issues are close connected to the issues of the EfficienSea project, where e-Navigation plays a major role. However, e-navigation is not a specific aspect in the BaltSeaPlan, but nevertheless it could be connected to our main project – EfficienSea. Both projects take place in the Baltic and that leaves us with possibility for synergy and exchanging of knowledge and expertise.

One of the purposes with e-Navigation is to gather information for navigational use on board and on shore, whereas the BaltSeaPlan is gathering information for the use of spatial planning. Such two systems could most likely benefit from exchanging information.

Ref.: HELCOM HOD 25/2008, Document 2/12,  
[http://eu.baltic.net/Project\\_Database.5308.html?&&contentid=4&contentaction=single](http://eu.baltic.net/Project_Database.5308.html?&&contentid=4&contentaction=single)

## StratMoS

StratMos – Strategy and Motorway of the Sea project - is funded by EU and the Norwegian government through the Interreg IV B North Sea Region Programme. The project comprises for the time being 27 partners, covering the North Sea Region from Flanders in the south and Northern Norway in the north. The Murmansk, Arkhangelsk and Nenets regions in Russia are associated partners.

The StratMoS project was approved in December 2007, and the first formal International Management Group meeting was held in April 2008. It will end in March 2011.

The core aim and idea of the StratMoS project is to promote and facilitate shift of cargo from road to seabased intermodal transport, and improve accessibility within the North Sea Region by supporting the implementation of Motorway of the Sea (MoS) and related transport networks in an integrated logistical chain.

The project has been organized with 4 Work packages and 5 Strategic Demonstration Projects, each with separate tasks and purposes.

### **The work packages are;**

- WP A: Project coordination
- WP B: Tools for Motorway of the Seas Applications
- WP C: Motorway of Seas Development in Hubs and Hinterland
- WP D: Transport Networks and Corridors

## How we will act in relation to StratMoS

The project has no directly connection with the e-Navigation project; however it is interesting to our project because their aim to improve accessibility within the North Sea Region by supporting the



implementation of Motorway of the Sea (MoS) and related transport networks in an integrated logistical chain. To create Motorways of the Sea it is necessary to use new technology and systems. Our ideas concerning communication and automatic reporting will be useful to MoS because it will relieve the workload from the navigators and thereby make the roads of the seas more secure.

Ref.: [www.stratmos.no/stratmos/public/openIndex?ARTICLE\\_ID=100](http://www.stratmos.no/stratmos/public/openIndex?ARTICLE_ID=100)

## Baltic Master II

We have looked into their project Baltic Master II, which is a continuation of the project Baltic Master I and their focus is on the Baltic Sea Region and issues concerning pollution prevention, coastal zone management and on land response capacity to an oil spill at sea.

## How we will act in relation to Baltic Master II

We find no directly connection with our project e-Navigation, although it would be interesting for our partners in WP group 5 In the EfficienSea project to look into their work, as the environment and pollution prevention are two of their main objects.

For further information about the project Baltic Master II please consult [www.balticmaster.org](http://www.balticmaster.org) .

Ref.: [www.balticmaster.org](http://www.balticmaster.org)

# Appendix C

## Industry

The industry has for many years been prime mover in the development of state of the art communication and navigation solutions.

With the introduction of the e-Navigation concept it is the idea to harmonize the collection, integration, exchange, presentation and analysis of marine information onboard and ashore.

The industry is continuously developing new services and technologies and integrate existing technologies which in many cases may be categorized as e-Navigation services.

The e-Navigation concept has not until now been favored by the industry. This is changing with the kick-off in IMO and is among other places seen in the establishment of a working group on e-Navigation in CIRM (The International Association for Marine Electronics Companies).

Due to the very recent introduction of the concept it is not possible to give a comprehensive description of the industry work with e-Navigation.

The present document will be updated as we learn more about initiatives in the industry.

The project expect the industry to continue the development of new products/services – in the future probably described as e-Navigation services – and see the harmonization as crucial for the easy and successful implementation of these services into the world of e-Navigation.

Some of the identified e-Navigation services found in the project is however also being developed or investigated by commercial companies. These services are e.g.:

- Route exchange
- Chart corrections
- Communication switch box and communication solutions that support the anticipated increase in data to be transferred from shore to ship, ship to shore and ship to ship.
- Intelligent integration of navigation systems

The project is planning to cooperate closely with several commercial partners ranging from communication companies to navigation system companies both in the feedback process, the development process and the testing process.