

SUB-COMMITTEE ON NAVIGATION,  
COMMUNICATIONS AND SEARCH AND  
RESCUE  
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Agenda item 9

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## DEVELOPMENT OF AN E-NAVIGATION STRATEGY IMPLEMENTATION PLAN

### Report on the international joint test for e-navigation solutions in Korean waters as a first step toward implementing a global e-navigation testbed

Submitted by Denmark, the Republic of Korea and Sweden

#### SUMMARY

*Executive summary:* This document contains information on international joint trials of e-navigation solutions in Korean waters

*Strategic direction:* 5.2

*High-level action:* 5.2.6

*Planned output:* 5.2.6.1

*Action to be taken:* Paragraph 32

*Related documents:* NAV 56/8; NAV 57/6; NAV 58/6 and NAV 59/6

#### Introduction

1 To develop e-navigation solutions, their concept, design, and implementation need to be validated or verified by using testbeds. Testbeds for e-navigation may be established in a live or simulated test environment.

2 Several e-navigation testbeds, such as the EfficienSea<sup>1</sup>, ACCSEAS<sup>2</sup>, MONALISA<sup>3</sup>1 & 2, and SMART-Navigation<sup>4</sup>, have been established to validate new concepts

<sup>1</sup> EfficienSea was a Baltic Sea Region project aimed at improving maritime safety and the environmental state of the Baltic Sea region, by the implementation of e-navigation tools developed and improved with a transnational perspective. Website: [www.efficientsea.org](http://www.efficientsea.org)

<sup>2</sup> ACCSEAS is a North Sea Region project to demonstrate how e-navigation can assist accessibility of shipping to the region, whilst recognizing the increased pressure of non-shipping use of the sea space. Website: [www.accseas.eu](http://www.accseas.eu)

<sup>3</sup> MONALISA is a Motorways of the Sea project within EU, contributing to the efficient, safe and environmentally friendly maritime transport through development and demonstration of innovative e-navigation services for the shipping industry. Website: [www.monalisaproject.eu](http://www.monalisaproject.eu)

<sup>4</sup> SMART-Navigation is the initiative of the Republic of Korea for future e-navigation to improve the safety of navigation systems and supporting shore services

and technologies. However, there are concerns that these testbeds have been limited to a domestic or regional level. Considering that navigation is a global concern, global implementation of e-navigation testbeds is necessary for the successful implementation of e-navigation.

3 A global e-navigation testbed needs to support both the full implementation process of e-navigation solutions as well as their continuous development. In order to achieve this, such a testbed is required to have all the components and sub-components of e-navigation solutions available either as physical/real-time or simulated functions. Such a testbed should also be sustainable for the continuous development of e-navigation.

4 A global e-navigation testbed would give important inputs to the development of the Maritime Service Portfolio (MSP). Furthermore, such a testbed needs to include a variety of stakeholders in order to review the technology, feasibility and suitability of e-navigation solutions.

## **Background**

5 During the "1st International Workshop on Global e-navigation Testbed", organized and hosted by the Korea Research Institute of Ships and Ocean Engineering (KRISO) in Daejeon, Republic of Korea, on 12 September 2013, one of the major conclusions was that there is a strong need for global collaboration on e-navigation testbeds.

6 At a side meeting during the 14th meeting of the IALA e-NAV Committee, it was proposed by the Republic of Korea, Denmark and Sweden to work towards conducting a joint sea trial of e-navigation solutions, eventually leading to the conclusion of an MoU between the three parties.

7 The MoU between the three parties, which was signed at the E-navigation Underway Conference 2014, is aimed at establishing cooperation for the development of e-navigation and identifying projects and activities within the domain for the establishment of a global e-navigation testbed and testing and demonstration of e-navigation solutions. The MoU between the three parties is open to all interested parties and new signatories are welcomed.

8 Honouring the conclusion of the MoU, it was decided that the first trials of the global e-navigation testbed would take place in April 2014 in the waters of the Republic of Korea.

## **Purpose**

9 Facilitated by the establishment of the global e-navigation testbed, the combination of resources allowed testing of potential e-navigation solutions on a trans-regional basis.

10 The objective of the collaboration on studies and demonstration was to provide a good basis for an extended cooperation on the development of e-navigation solutions, aiming at accelerating the development of e-navigation.

## **Test items**

11 "Real-time port information service" which has been developed to provide ships with real-time information such as meteorological and oceanographic information and vessel traffic information by analyzing accumulated AIS data in port area where the ship intend to call. This service is expected to help the ship approaching harbour to make a safe and efficient route plan to berth, by use of real-time information such as sea state, wind, current and visibility.

12 "Integrated navigation assistance service" which provides veering information and makes it appear on the ECDIS to near vessels when a ship changes her route, by sending this evasive route information it can be possible to avoid collision. This service is expected to reduce the probability of misjudgment and mariner's operational burden by using AIS-ASM.

13 A prototype of the Maritime Messaging Service component of the Maritime Cloud was tested as an information carrier service in a real environment.

14 The feasibility of using the open source e-navigation Prototype Display system (EPD), developed during different European projects, such as EfficienSea, MONALISA and ACCSEAS, as a common prototype e-navigation platform for a global testbed was studied.

15 Two separate studies on the functionalities of route exchange of the Sea Traffic Management (STM) concept and enhanced Maritime Safety Information (MSI) were carried out: A hazard identification study on the implementation of e-navigation solutions related to the concepts of route exchange and enhanced MSI; and a usability and acceptance study on e-navigation solutions related to the concepts of route exchange and enhanced MSI.

### **Resources of the trial**

16 Two training ships were used in the test: **T/S Sae Nuri**, Mokpo National Maritime University and **T/S Hanbada**, Korea Maritime and Ocean University. The training bridges of the ships were used for installing additional equipment for the trial, as to give flexibility in space and in manning. Both training ships modified their original voyage plan for coastal navigation training to support the trial, performed along the south coast of the Republic of Korea.

17 The "Real time port information service" used a shore-based server as a service providing information such as meteorological and oceanographic information including high-resolution current and tide information combined with the vessel's AIS information to an onboard client system, using coastal mobile communication network (3G/4G).

18 The "Integrated navigation assistance service" used two onboard systems using dedicated AIS transponders for the exchange of intended route between the two ships participating in the test.

19 The study on hazard identification on the implementation of e-navigation solutions related to the concept of route exchange as part of the STM concept and enhanced MSI was based on interviews in connection with the study on usability and acceptance for the STM concept and functionalities.

20 The study on usability and acceptance for e-navigation solutions related to the concept of route exchange as part of the STM concept and enhanced MSI used the EPD as a test platform and the Maritime Messaging Service over the Internet using mobile broadband and satellite as a communication link.

21 For the studies focusing on hazard identification and usability and acceptance respectively, both navigating officers and officer cadets from the two ships were used as subjects.

### **Findings from the trial**

22 It is valuable to work on a more global scale which includes cultural barriers as well as language barriers.

23 In the further development of e-navigation, it would be valuable to include a mapping between specific solutions and their respective communication needs.

24 The findings from the test of the "Real time port information service" indicated that a service with good quality was available within the coverage of the 3G network. Users evaluated the availability of this service as appropriate for making a route plan, if the ship gets the meteorological and oceanographic information and traffic information near the port, before the ship enters into the port area. But the overabundance of information could be another burden to users in the point of distracting mariners' concentration and increase burden. According to this, the service should be developed to the direction that relevant and timely information is provided for mariners.

25 The finding from the test on "Integrated navigation aids service", based on a questionnaire on the usefulness and reality of intended route exchange using AIS-ASM, found that the representation of intended route as used by the prototype system could be a valuable addition to current navigational information. The validity of the service when two vessels encountered was acknowledged by captain and cadets of the ship. The intention of each ship was clearly understood by users with displaying the collision avoidance-route information graphically, and the communication with other ship was much simpler than conventional VHF radio communication in voice.

26 The use of the EPD as a common test platform, being based on open source, freely available, and open for collaboration for all interested parties, was found to be a valuable tool for testing and evaluating e-navigation solutions.

27 It was indicated that the use of the Maritime Messaging Service of the Maritime Cloud as an information carrier is a viable solution for the exchange of maritime information in a volatile environment.

28 The hazard identification study indicated that there is an envisaged risk of de-skilling as well as a risk that deviations from planned routes may cause negative cascading effects. The study also indicated that there may be a need for a shift in training of navigating officers with the introduction of e-navigation solutions.

29 The study on usability and acceptance for e-navigation solutions related to the concept of route exchange as part of the STM concept and enhanced MSI tested 19 navigating officers and officer cadets during the sea trials. The participants responded mostly positive and rated the tested e-navigation solutions and the test platform environment as "acceptable" or "very acceptable" on the Professional Acceptance Rating Scale developed for the study.

30 As a complement to the *Guidelines on Usability and Human Centered Design*, as proposed in the draft SIP, it was found that it was valuable to use a Professional Acceptance Rating Scale as an indicator of user experiences.

31 The full report from the trial and the studies performed follows the proposed draft Guideline for Harmonized Testbed Reporting and can be found on [www.e-navigation.net](http://www.e-navigation.net) as run by IALA.

#### **Action requested of the Sub-Committee**

32 The Sub-Committee is invited to take note of the information provided in this document.