5TH MEETING OF THE HYDROGRAPHIC SERVICES AND STANDARDS COMMITTEE
Shanghai, China, 5-8 November 2013

Paper for Consideration by HSSC

E-navigation development affecting HSSC

Submitted by:	IHB
Executive Summary:	This paper summarizes e-navigation development that may be relevant to the work of HSSC and outlines its potential impact on HSSC.
Related Documents:	HSSC Work Programme.
Related Projects:	Development of S-100 and related Product Specifications. Structure of HSSC Working Groups

Background

1. The development of an e-navigation strategy was proposed at the 81st session of the IMO Maritime Safety Committee (MSC 81, May 2006). MSC 81 decided to include, in the work programmes of the Safety of Navigation (NAV) and Radiocommunications and Search and Rescue (COMSAR) Sub-Committees, a high priority item on "Development of an e-navigation strategy", with a target completion date of 2008 and with NAV acting as co-ordinator. At its 52nd session (July 2006), NAV established a Correspondence Group (CG), under the coordination of the United Kingdom, to progress the work on this item.

2. At its 54th session (July 2008), NAV finalised a draft e-navigation strategy for consideration by the MSC and requested the MSC to include a work programme item on "Development of an e-navigation strategy implementation plan" and allocated four sessions to complete the work (2009-2012). MSC 85 (December 2008) approved the strategy for the development and implementation of e-navigation (Annex 20 to MSC 85/26/Add.1) and the framework for the implementation of the strategy.

3. Following the approval by MSC 86 (June 2009) of a joint plan of work for the COMSAR, NAV and Standards of Training and Watchkeeping (STW) Sub-Committees for the period 2009-2012, NAV 55 (July 2009) re-established a Correspondence Group under the coordination of Norway.

4. NAV 57 (June 2011) agreed on:

- the overarching e-navigation architecture,
- the development of a Common Maritime Data Structure (CMDS),
- the use of the IHO's S-100 standard as the baseline for creating a framework for data access and services under the scope of SOLAS,
- the establishment of an IMO/IHO Harmonization Group on Data modelling,
- the revision of a joint plan of work for the COMSAR, NAV and STW Sub-Committees, and extending the target completion date for the work programme item "Development of an e-navigation strategy implementation plan" to 2014,
- the re-establishment of the Correspondence Group under the coordination of Norway.

These outcomes were approved by MSC 90 (May 2012).

5. Following further reports and progress at NAV 58 (July 2012) and NAV 59 (September 2013), the Correspondence Group is continuing its work under the coordination of Norway with the objective to finalize a draft strategy implementation plan and to provide a consolidated final report to the new Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) at its first session in July 2014 (NCSR 1).

6. Noting that ECDIS and ENCs form a core element of any e-navigation strategy, the IHO supported the initiative from the beginning, notably in liaison with IALA. The IHB as well as a number of HOs have been participating in the work of the IMO Correspondence Group.

7. It was agreed at CHRIS 18 (September 2006) that CHRIS (now HSSC) would monitor e-navigation developments "to ensure that work items of CHRIS and its WGs support e-navigation to the maximum extent possible". Accordingly, e-navigation developments have been discussed at subsequent CHRIS and then HSSC meetings. The IHO contribution has been focused on the provision of adequate ENC coverage (now monitored by the WEND WG of IRCC) and the development and promotion of S-100. In addition to participating in the work of the IMO Correspondence Group, the IHO has also contributed to the work of IALA. The IHB and a number of HOs have been active in the IALA e-Navigation Committee.

Status of e-navigation issues relevant to HSSC

E-navigation solutions and risk control options

8. Based on a preliminary list of about 40 e-navigation solutions endorsed by NAV 58 (July 2012), NAV 59 endorsed five prioritized main solutions taking into account the following criteria:

- seamless transfer of data between various equipment on board; and
- seamless transfer of electronic information/data between ship and shore and vice versa and between ship to ship and shore to shore.

The five prioritized main solutions are:

- S1: improved, harmonized and user-friendly bridge design;
- S2: means for standardized and automated reporting;
- S3: improved reliability, resilience and integrity of bridge equipment and navigation information;
- S4: integration and presentation of available information in graphical displays received via communication equipment; and
- S9: improved communication of VTS service portfolio.

Seven risk control options (RCO) have been identified as part of the IMO formal safety assessment procedure:

- RCO 1: integration of navigation information and equipment including improved software quality assurance;
- RCO 2: bridge alert management;
- RCO 3: standardized mode(s) for navigation equipment;
- RCO 4: automated and standardized ship-shore reporting;
- RCO 5: improved reliability and resilience of onboard PNT systems;
- RCO 6: improved shore-based services; and
- RCO 7: bridge and workstation layout standardization.

It has also been agreed that "the work should be based on systems that were already in place (according to the already adopted Strategy for the development and implementation of e-navigation (MSC 85/26/Add.1, annex 20)) and that the development of potential future carriage requirements should therefore be strictly limited".

9. Potential improvements in the provision of hydrographic services in relation with e-navigation come under solutions S3 and S4 and RCO 1, RCO 3 and RCO 6 with a focus on better integration of navigation information.

Detailed ship and shore architecture

10. Two examples of technical e-navigation architecture have been offered for consideration. One relates to the concept of a "single window for Maritime Safety Information" (MSI) and the other to the concept of the "maritime cloud". Discussion at NAV has identified a number of issues that require further investigation, including the shipboard elements. At NAV 59, Denmark and France offered to coordinate this work and to provide inputs to the Correspondence Group (CG), taking into account the work carried out by the CG on the modernization of the GMDSS.

11. It is recognized that the development of the detailed architecture will be based on the implementation of S-100. So far, no specific requirements have been identified by the CG or by IMO that might call for the S-100 framework to be extended.

Maritime Service Portfolios

12. In the e-navigation context, a "Maritime Service Portfolio (MSP)" defines and describes the set of operational and technical services and their level of service provided by stakeholders in a given sea area, waterway, or port, as appropriate. An MSP may also be construed as a set of "products" provided by a stakeholder.

13. A preliminary list of 17 MSP has been considered by the e-navigation CG. It includes five elements within the scope of IHO:

- (MSP 5) Maritime Safety Information (MSI) service;
- (MSP 12) nautical chart service;
- (MSP 13) nautical publications service;
- (MSP 14) ice navigation service; and
- (MSP 16) real-time hydrographic and environmental information services.

14. Noting that the arrangement of these five elements reflects the traditional methods of promulgating nautical information, which mainly rely on the use of paper products (nautical charts and publications), the IHO has recommended to consider the following adjustment:

- merge proposed MSP 12 and 13 and the hydrographic component of MSP 16 into a single MSP called "Hydrographic services" in accordance with the definition of regulation 9 of SOLAS chapter V; and
- delete MSP 5 (MSI service) and assign the functionalities of MSP 5 as the "update" component of the basic services concerned (for example: include the provision of navigational warnings and chart correction data in MSP "Hydrographic services").

15. These proposals made by the IHO have been neither approved nor rejected and the IHO has been invited to provide further input to the CG.

16. It has been agreed that MSPs should be categorized by geographical areas instead of by type of operation. This would assist the determination of the kind and amount of information to be transmitted, taking into account the type of communication system(s) to be used, along with the identification of the relevant authorities or stakeholders which would be responsible for the dissemination of the information.

17. Six types of geographic areas have been identified:

- port areas and approaches;
- coastal waters and confined or restricted areas;
- open sea and ocean areas;

- areas with offshore and/or infrastructure developments;
- Polar areas; and
- other remote areas.

They need to be defined more precisely.

Development of related guidelines

18. It has been agreed that the following draft guidelines were very important for the future development and implementation of e-navigation and that these should be further developed:

- draft guidelines on human centred design (HCD) for navigational equipment and systems;
- draft guidelines on usability evaluation of navigational equipment;
- draft guidelines for software quality assurance (SQA) in e-navigation; and
- draft guidelines for the harmonization of test beds reporting.

19. The e-navigation CG has been tasked to focus on finalizing the draft guidelines for harmonizing the way in which the results of test beds would be reported. The current draft of these 'test bed' guidelines refers to S-100 as the baseline data model agreed for the development of e-Navigation.

20. The three other guidelines could have some impact on the provision of hydrographic services, either directly or via associated systems.

Development of a strategy implementation plan (SIP)

21. NAV 59 has instructed the e-navigation CG to focus on the finalization of the e-navigation strategy implementation plan for the period 2015-2019.

22. The current preliminary draft (Annex to NAV 59/WP.8) acknowledges explicit IHO input for two RCOs:

- RCO 1: "IHO's S-100 Data model needs to be developed further - IHO with input from other users."
- RCO 6: "IALA, IHO and other relevant organizations e.g. national Port authorities and IHMA[1]. Guidance will need to be developed, as appropriate. Implementation of a system for automatic and digital distribution of shore support services would make information more available, updated and applicable for navigators. MSI could be displayed on ENC/ECDIS or AIS/RADAR displays, including the use of IHO's S-100 Data model."

23. The initial status of RCO 3 is recorded as follows: "No work has been done until now; [Performance standards] / Guidelines on standardized mode(s) for navigational systems need to be developed for accommodating e-navigation as an alternative solution."

IALA contribution to e-navigation development

24. Besides its direct involvement in the IMO CG, IALA is contributing actively to developing S-100 based product specifications for aids to navigation and vessel traffic services (VTS) in the context of e-navigation. This work may lead to the need to evolve S-100 and activate the IMO/IHO Harmonization Group on Data Modelling, established by MSC 90, which provides the appropriate framework to address coordination issues, if and when they arise (see submission HSSC5-07.1B).

Impact on HSSC

25. Based on the progress of e-navigation development reported in paragraphs 8 to 24, it is recommended that HSSC considers the timely implementation of the following tasks:

a. Secure the completion of S-100;

[1] IHMA: International Harbour Masters' Association.

b. Consolidate and publicize the use of the S-100 Geospatial Information Registry;

c. Consider the need to further develop guidance documents for non-IHO users of S-100;

d. Specify and develop an S-101 based ENC environment for test-beds;

e. Specify and develop S-100 based MSI integration for test-beds;

f. Investigate further the integration of nautical charts and nautical publications in an S-100 based e-navigation environment and develop the relevant strategy including the specification and implementation of test-beds;

g. Assist the specification and development of S-100 based additional services for test-beds;

h. Introduce the revision of the relevant IMO Performance Standards and other instruments required to implement S-100 based products and services in ECDIS and other systems as a component of the e-navigation strategy implementation plan (see HSSC5-05.1D);

i. […]

26. Additionally, it is suggested that HSSC should consider ways and means to improve coordination with IMO and IALA such as:

a. establishing a sub-group on hydrographic matters/themes within the e-navigation CG to facilitate coordination on IHO issues;

b. designating an IHO focal point to liaise with the IALA e-nav Committee.

27. The impact of e-navigation development on the structure of HSSC working groups is discussed in a separate paper (HSSC5-04.2A).

Action Required of HSSC

28. The HSSC is invited to:

a. **Note** this report,

b. **Consider** the proposals outlined in paragraphs 25 and 26, and

c. **Take any other actions** considered necessary.