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IMO

SUB-COMMITTEE ON SAFETY OF
NAVIGATION
53rd session
Agenda item 13

NAV 53/WP.4
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DEVELOPMENT OF AN E-NAVIGATION STRATEGY

Report of the Working Group

1   General

1.1   As instructed by the Sub-Committee, the Working Group on development of an E-Navigation strategy met from 24 to 25 July 2007 under the chairmanship of Mr. M. Sollosi (United States).

1.2   The Working Group was attended by delegates from the following Member Governments:

ARGENTINA	PANAMA
AUSTRALIA	POLAND
BRAZIL	PORTUGAL
CHINA	REPUBLIC OF KOREA
DENMARK	RUSSIAN FEDERATION
FINLAND	SPAIN
FRANCE	SWEDEN
JAPAN	THE NETHERLANDS
IRELAND	UNITED KINGDOM
MARSHALL ISLANDS	UNITED STATES
NORWAY	

and observers from the following inter-governmental and non-governmental organizations in consultative status:

INTERNATIONAL FEDERATION OF SHIPMASTERS' ASSOCIATIONS (IFSMA)
CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA)
INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERNATIONAL RADIO-MARITIME COMMITTEE (CIRM)
INTERNATIONAL ASSOCIATION OF MARINE AIDS TO NAVIGATION AND
    LIGHTHOUSE AUTHORITIES (IALA)
INTERNATIONAL MARITIME PILOTS' ASSOCIATION (IMPA)
INTERNATIONAL ASSOCIATION OF DRY CARGO SHIPOWNERS
    (INTERCARGO)
INTERNATIONAL ASSOCIATION OF INSTITUTES OF NAVIGATION (IAIN)

2 Terms of Reference

2.1 The E-Navigation Working Group should consider all relevant documents submitted under agenda item 13 (NAV 53/13, NAV 53/13/1, NAV 53/13/2, NAV 53/13/3, NAV 53/13/4, NAV 53/13/5 and NAV 53/13/6) including the outcome of COMSAR 11 and taking into account any decisions of, and comments and proposals made in Plenary, undertake the following tasks:

.1 consider the report of the Correspondence Group (NAV 53/13) and, in particular:

.1 finalize provisionally the definition of E-Navigation (NAV 53/13, paragraph 6 and NAV 53/13/3);

.2 finalize provisionally the core objectives of an integrated E-Navigation strategy (NAV 53/13, paragraph 8.1 to 8.15);

.3 provide comments and guidance on the proposed onboard, shore and communications elements of E-Navigation (NAV 53/13, paragraph 11);

.4 provide comments and guidance on the three proposed E-Navigation systems architectures in order to further develop such a structure (NAV 53/13, paragraphs 12 to16 and annex 2);

.5 provide comments and guidance on the user requirements to further develop and define such requirements including the need for developing a standard mode (S-mode) for mariners (NAV 53/13, paragraphs 17 to 20); and

.6 provide comments and guidance on the preliminary gap analysis in order to assist further development of a gap analysis on the basis of user requirements (NAV 53/13, paragraphs 21 to 24, annex 3 and NAV 53/13/6); and

.2 consider NAV 53/13/1 and provide comments and guidance on the identification of essential functions of E-Navigation by marine accidents analysis;

.3 consider NAV 53/13/2 and NAV 53/13/5 and provide comments and guidance on the issue of necessary redundancy of position fixing systems;

.4 consider NAV 53/13/4 and (NAV 53/13, paragraphs 9 to 10) and provide comments and guidance on the introduction and use of AIS and as Aid to Navigation (AtoN);

.5 prepare revised terms of reference for the Correspondence Group on E-Navigation to progress work for finalization at NAV 54 (NAV 53/13, paragraphs 28 to 30);

.6 take into account the role of the human element guidance as updated at MSC 75 (MSC 75/24, paragraph 15.7) including the Human Element Analysing Process (HEAP) given in MSC/Circ.878/MEPC/Circ.346 in all aspects of the items considered; and

.7 submit a report to Plenary on Thursday, 26 July 2007 for consideration at Plenary.

2.2   The group considered documents NAV 53/13 (United Kingdom), NAV 53/13/1 (Japan), NAV 53/13/2 (United Kingdom), NAV 53/13/3 (IALA), NAV 53/13/4 (IALA), NAV 53/13/5 (IALA), NAV 53/13/6 (ICS), the outcome of COMSAR 11 and decisions made in Plenary and the outcome is reflected in the ensuing paragraphs.

2.3   In this context, the group generally agreed that the following issues should be considered when developing a strategic vision for e-navigation:

     .1   global coverage of ENCs;

     .2   training, competency and common language skills for all involved in ship operations, both at sea and ashore;

     .3   safety and environmental concerns relating to migration from physical to virtual aid to navigation;

     .4   workload and motivation of the watchkeepers; and

     .5   users' requirements.

3   OUTCOME OF THE CORRESPONDENCE GROUP

Definition

3.1   The group noted that the correspondence group (CG) agreed to adopt the definition developed by IALA's e-NAV Committee (NAV 53/13, paragraph 6 and NAV 53/13/3, paragraph 2) and provisionally finalized the following definition for e-navigation as a concept based on harmonization of marine navigation system and supporting shore services driven by users' needs:

    "E-Navigation is the harmonized collection, integration, exchange, presentation and analysis of maritime 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."

Core objectives of e-navigation

3.2   The group considered the core objectives identified by the CG (NAV 53/13, paragraphs 8.1 to 8.15) and provisionally agreed that the core objectives of an e-navigation concept using electronic data capture, communication, processing and presentation should:

     .1   facilitate safe and secure navigation of vessels having regard to hydrographic, meteorological and navigational information and risks;

     .2   facilitate vessel traffic observation and management from shore/coastal facilities, where appropriate;

     .3   facilitate communications, including data exchange, among ship to ship, ship to shore, shore to ship, shore to shore and other users;

.4   provide opportunities for improving the efficiency of transport and logistics;

.5   support the effective operation of contingency response, and search and rescue services;

.6   demonstrate defined levels of accuracy, integrity and continuity appropriate to a safety-critical system;

.7   integrate and present information onboard and ashore through a human interface which maximises navigational safety benefits and minimises any risks of confusion or misinterpretation on the part of the user;

.8   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.

.9   incorporate training and familiarization requirements for the users throughout the development and implementation process.

.10   facilitate global coverage, consistent standards and arrangements, and mutual compatibility and interoperability of equipment, systems, symbology and operational procedures, so as to avoid potential conflicts between users; and

.11   be scalable, to facilitate use by all potential maritime users.

Key outcomes of e-navigation

3.3   The group considered the three key outcomes agreed by the CG (NAV 53/13, paragraph 11)   focusing on the onboard, shore and communications elements of e-navigation:

.1   **Onboard**
        navigation systems that benefit from the integration of own ship sensors, supporting information, a standard user interface, and a comprehensive system for managing guard zones and alerts. Core elements of such a system will include high integrity electronic positioning, electronic navigational charts (ENCs) and system functionality with analysis reducing human error, actively engaging the mariner in the process of navigation while preventing distraction and overburdening;

.2   **Ashore**
        the management of vessel traffic and related services from ashore enhanced through better provision, co-ordination, and exchange of comprehensive data in formats that will be more easily understood and utilised by shore-based operators in support of vessel safety and efficiency; and

.3   **Communications**
        an infrastructure providing authorized seamless information transfer onboard ship, between ships, between ship and shore and between shore authorities and other parties with many related benefits, including a reduction of single person error.

3.4   In this context, the group agreed that these were broad expectations rather than outcomes and should be taken into account by the CG as a starting point, when developing the users' requirements.

System architecture

3.5   The group considered the three proposed e-navigation architectures developed by the CG (NAV 53/13, paragraphs 12 to 16 and annex 2) and noted that COMSAR 11 did not opt to formally favour any particular one, but stressed the importance of basing the vision and system architecture on agreed users' requirements. The group agreed that it was premature to agree on any one of the system architectures proposed by the CG before finalising the users' requirements. The group further agreed that the system architecture should only be considered after MSC 85 had agreed upon the policy direction based on the strategic vision finalized by NAV 54.

User requirements

3.6   The group considered the views of the CG on the users' requirements to further develop and define such requirements including the need for developing a standard mode for mariners (NAV 53/13, paragraphs 17 to 20) and noted that an e-navigation system should reduce some of the basic errors in perception, communication and decision-making that occurs on board and ashore. The group agreed that the E-Navigation strategy should be user driven rather than technology driven. In this context, the group was advised that the United Kingdom, IALA and IFSMA were working on developing a methodology to identify users and their needs and, would be providing the appropriate input to the CG. Accordingly, the group further agreed that the CG should continue its work related to identification of users and their needs.

3.7   The group was advised by IFSMA outlining the project being undertaken by the Nautical Institute, titled 'S-mode'. The project was aimed at developing a standard presentation of information using a standard menu system for shipboard units. The group welcomed this initiative and invited IFSMA to keep the CG informed of their progress on the project. The group noted the recommendations of COMSAR 11 and agreed that pending further development, it would be premature at this stage to endorse a standard mode (S-mode) for mariners.

Gap analysis for e-navigation

3.8   The group considered the preliminary gap analysis based on the current understanding of what is likely to be contained within an agreed e-navigation users' requirements and the consequential e-navigation capabilities (NAV 53/13, paragraphs 21 to 24 and annex 3) and the comments of ICS (NAV 53/13/6) thereof. The group noted with appreciation the work done by the CG in carrying the preliminary gap analysis. However, the group agreed that at this stage it was premature and could pre-empt the development of users' requirements, users' services and system architecture. The group further agreed that the gap analysis should be undertaken after development of users' requirements.

3.9   The Sub-Committee is invited to endorse the consideration of the report of the Correspondence Group as referred to in paragraphs 3.1 to 3.8 above to be taken into account in its on-going work related to the development of an E-Navigation strategy.

4   IDENTIFICATION OF ESSENTIAL FUNCTIONS OF E-NAVIGATION BY MARINE ACCIDENTS ANALYSIS

4.1   The group considered the information provided by Japan (NAV 53/13/1) on a method for identifying necessary functions for avoiding collisions with a view to facilitate the development of an E-Navigation strategy and agreed that this information should be considered by the CG when developing the users' requirements. Accordingly, the group invited the Sub-Committee to endorse this view.

5   REDUNDANCY OF POSITION FIXING SYSTEMS

5.1   The group considered the information provided by the United Kingdom (NAV 53/13/2) and IALA (NAV 53/13/5) on the need to provide a back-up to the Global Navigation Satellite Systems (GNSS) because of the vulnerabilities of GNSS. The group agreed that there was a need to provide an internationally agreed alternative system for complementing the existing satellite navigation, positioning and timing services to support e-navigation and recognized that potential back up systems could be made available. However, it was still premature to identify any specific system before the users' requirements for e-navigation had been finalized. Accordingly, the group invited the Sub-Committee to endorse this view.

6   INTRODUCTION AND USE OF AIS AND AS AID TO NAVIGATION (AToN)

6.1   The group considered the information provided by IALA (NAV 53/13/4) relating to the introduction and use of AIS and as Aid to Navigation (AtoN). In this context, the group noted that IALA would submit a more detailed proposed to NAV 54.

Migration from traditional aids to navigation (AtoN) to virtual e-navigation aids

6.2   The group noted the views of the CG relating to developing an e-navigation strategy is to reduce navigational errors - from whatever cause - to prevent shipping accidents and ship-source marine pollution and that the traditional aids would not necessarily disappear once e-navigation had been adopted (NAV 53/13, paragraphs 9 and 10). The group agreed that e-navigation should not be viewed as a mean to reduce or eliminate existing AtoN. The group further agreed any decision to employ e-navigation as a means to replace traditional AtoN should only be considered once a full risk assessment had been carried out and the users' requirements had been finalised. Accordingly, the group invited the Sub-Committee to endorse this view.

7   REVISED TERMS OF REFERENCE FOR THE CORRESPONDENCE GROUP ON E-NAVIGATION

7.1   The group agreed that, to progress the work for NAV 54, an intersessional Correspondence Group should be re-established under the co-ordination of the United Kingdom* and approved the draft terms of reference of the proposed Correspondence Group, given below.

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7.2   Taking into account documents NAV 53/WP.4 and NAV 53/13/1 (Japan) and, the progress made at NAV 53 relating to the development of an E-Navigation strategy and the guidance in MSC/Circ.1091 on Issues to be considered when introducing new technology on board ship and MSC/Circ.878/MEPC/Circ.346 on Human Element Analysing Process (HEAP); the Correspondence Group on e-navigation should:

 .1   identify all potential users of e-navigation;

 .2   define the user needs for e-navigation;

 .3   review the need to consult other maritime agencies and interest groups – navigational practitioners, support agencies, research organizations, equipment manufactures and port managers; and

 .4   continue to develop other aspects of the strategic vision for e-navigation.

In order to structure the task of developing an Strategic vision for E- Navigation using a holistic and top-down approach it is essential to provide a methodology and logical phases to define the essential elements of e-navigation. In this context, the Correspondence Group should develop a strategic vision taking into account the logical phases relating to:

-    user identification;
-    user requirements;
-    user services;
-    identify existing systems;
-    system requirements;
-    gap analysis;
-    role of cost benefit analysis; and
-    system architecture.

The Correspondence Group should note that this is not a comprehensive list of logical phases and that some of the work can be undertaken simultaneously.

The Correspondence Group should submit a document to COMSAR 12 raising specific questions that should be addressed by COMSAR and prepare a final comprehensive report for submission to NAV 54.

7.3   The Sub-Committee is invited to re-establish the Correspondence Group and approved its aforementioned terms of reference.

8   ACTION REQUESTED OF THE SUB-COMMITTEE

8.1   The Sub-Committee is invited to approve the report in general and, in particular, to:

 .1   endorse the consideration of the report of the Correspondence Group (paragraphs 3.1 to 3.8);

 .2   endorse the group's view that identifying necessary functions for avoiding collisions with a view to facilitate the development of an E-Navigation strategy should be considered by the CG when developing the user requirements (paragraph 4.1);

.3   endorse the group's view that there was a need to provide an internationally agreed alternative system for complementing the existing satellite navigation, positioning and timing services to support e-navigation and recognized that potential back up systems could be made available. However, it was still premature to identify any specific systems before the users' requirements for e-navigation had been finalised (paragraph 5.1);

.4   endorse the group's view that any decision to employ e-navigation as a means to replace traditional AtoN should only be considered once a full risk assessment had been carried out and the users' requirements had been finalised (paragraph 6.2); and

.5   re-establish the Correspondence Group and approve its revised terms of reference (paragraphs 7.2 and 7.3)

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