



SUB-COMMITTEE ON SAFETY OF
NAVIGATION
55th session
Agenda item 11

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DEVELOPMENT OF AN E-NAVIGATION STRATEGY IMPLEMENTATION PLAN

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 implementation plan met on 28 and 29 July 2009 under the chairmanship of Mr. John Erik Hagen (Norway).

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

ARGENTINA
AUSTRALIA
BAHAMAS
BRAZIL
CANADA
CHINA
DENMARK
FINLAND
FRANCE
GERMANY
JAPAN
MARSHALL ISLANDS

NETHERLANDS
NIGERIA
NORWAY
PANAMA
POLAND
REPUBLIC OF KOREA
RUSSIAN FEDERATION
SOUTH AFRICA
TURKEY
UNITED KINGDOM
UNITED STATES

1.3 The session was attended by a representative from the following United Nations specialized agency:

WORLD METEOROLOGICAL ORGANIZATION (WMO)

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

EUROPEAN COMMISSION (EC)
BIMCO
INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO)
INTERNATIONAL MARITIME PILOTS' ASSOCIATION (IMPA)
INTERNATIONAL MARITIME RESCUE FEDERATION (IMRF)
INTERNATIONAL MOBILE SATELLITE ORGANIZATION (IMSO)
INTERNATIONAL RADIO-MARITIME COMMITTEE (CIRM)
INTERNATIONAL TRANSPORT WORKERS' FEDERATION (ITF)
INTERNATIONAL ASSOCIATION OF MARINE AIDS TO NAVIGATION AND
LIGHTHOUSE AUTHORITIES (IALA)
INTERNATIONAL ASSOCIATION OF INSTITUTES OF NAVIGATION (IAIN)
OIL COMPANIES INTERNATIONAL MARINE FORUM (OCIMF)
THE NAUTICAL INSTITUTE

2 TERMS OF REFERENCE

2.1 The e-navigation Working Group should consider the relevant documents submitted under agenda item 11, namely, NAV 55/11/1 (IALA), NAV 55/11/3 (Germany), NAV 55/11/4 (United Kingdom), NAV 55/INF.8 (IFSMA) and NAV 55/INF.9 (Germany) including documents NAV 53/13, (MSC 85/26, annexes 20 and 21), MSC 86/23/4 plus the outcome of COMSAR 13 and STW 40 including relevant outcome of MSC 86 and, taking into account any decisions of, and comments and proposals made in, Plenary, and undertake the following tasks:

- .1 consider documents NAV 55/11/1, NAV 55/11/3, NAV 55/11/4, NAV 55/INF.8 and NAV 55/INF.9 and finalize the more detailed user needs;
- .2 consider document COMSAR 13/14 (paragraphs 4.60 to 4.64) and provide comments and recommendations regarding future spectrum requirement with respect to e-navigation;
- .3 consider document STW 40/14 (paragraph 7.11.8) and provide advice on the correct generic term to replace the terms "Decca" and "Loran";
- .4 consider documents NAV 53/13 (paragraphs 12 to 16) and MSC 85/26 (annex 20, paragraph 9.7.2 and annex 21, paragraph 5) and develop the initial identification/outline of the system architecture;
- .5 consider document MSC 85/26 (annex 20, paragraph 9.7.3 and annex 21, paragraph 6) and undertake an initial gap analysis;
- .6 consider document MSC 85/26 (annex 21, paragraph 7) and develop/recommend an appropriate methodology for carrying out cost-benefit and risk analyses;
- .7 develop the terms of reference for a correspondence group to progress work intersessionally based on the joint plan of work approved by MSC 86 and report to COMSAR 14 and NAV 56;

- .8 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
- .9 submit a report to Plenary on Thursday, 30 July 2009 for consideration at Plenary.

3 USER NEEDS

3.1 The group considered documents NAV 55/11/1 (IALA), NAV 55/11/3 (Germany), NAV 55/11/4 (United Kingdom), NAV 55/INF.8 (IFSMA) and NAV 55/INF.9 (Germany) in determining the user needs for e-navigation. The group recalled that the working group at NAV 54 (NAV 54/WP.6) had:

- .1 identified the user needs for a typical SOLAS ship and a generic shore authority (paragraph 8.2);
- .2 identified potential ship and shore-based users of e-navigation (annex 2); and
- .3 agreed that the first step should be to identify users and their requirements. The next step should be to identify the groups of functions or services needed to meet these primary navigational needs, based on a structured, systematic and traceable methodology **that relates the functions to tangible operational benefits** (paragraph 9.7.1),

and that MSC 85 had approved the Strategy for the development and implementation of e-navigation (MSC 85/26, annex 20).

3.2 The group noted that:

- .1 there was a need to standardize and harmonize reporting procedures to avoid repetition and to reduce workload;
- .2 mariners favour the possibility of presentation of information received through communication equipment directly to navigation display to assist in decision-making and for the safety of navigation;
- .3 VHF, HF and satellite broadband communication might be required and the reliability of systems and equipment should be improved;
- .4 an ongoing procedure to verify and update user requirements as deemed necessary was essential during the development and implementation of the e-navigation strategy.

3.3 After some discussions, the group agreed that:

- .1 there should be harmonization between the shipboard and shore-based systems and procedures;
- .2 there should be coordination of inputs into the e-navigation development from shipboard and shore-based users, and other relevant bodies;

.3 while the shipboard user needs had been identified to a more detailed level, the shore-based user needs require to be further developed; and

.4 there was a need for an effective ship-shore inter-operability.

3.4 The group also recognized that to facilitate the development of shore-side user needs, it was important that there should be a national coordination process between all relevant authorities/organizations which could identify all data providers and data users for a single window concept.

3.5 With regards to shore-based user needs, the group recognized that the development of user needs was a complex exercise and that the method to develop user needs based on functions as proposed by the United Kingdom (NAV 55/11/4) could be effectively used. However, the group acknowledged that IALA could follow whichever method was suitable even if it was different from the approach taken in developing the shipboard user needs.

3.6 Furthermore, the group agreed that user needs were of paramount importance and the driving force for the e-navigation concept and that it was necessary to verify and update the user requirements as and when necessary during the implementation process of the Organization's e-navigation strategy.

3.7 After an extensive discussion, the group agreed that:

- .1 information contained in documents NAV 55/11/3, NAV 55/INF.8 and NAV 55/INF.9 could form the basis for the preliminary shipboard user needs;
- .2 review the preliminary detailed shipboard user needs as developed by NAV 55 and update them as appropriate, and to consider priorities;
- .3 develop a detailed shore-based user needs, taking into account input provided by IALA and other relevant organizations and to consider priorities; and
- .4 identify functions and services to support the shipboard and shore-based user needs in a harmonized and holistic manner.

3.8 Furthermore, the group agreed that IALA should be invited to provide the input and contributions of the various IALA Committees to the IMO Secretariat and the correspondence group. In this context, the IALA observer confirmed that IALA was ready to provide input to the correspondence group on shore-based user needs and that the work would be further progressed during the next IALA Committee meetings in September and October 2009 to which all interested organizations were invited.

3.9 The group also recognized that the results of relevant maritime projects, e.g., MarNIS and MEH, should be taken into account during the further development of the user needs. In this context, the European Commission observer agreed to provide the correspondence group with the outcome of the EU/MarNIS project relating to Maritime Information Management which could be used as a background document for the development of shore-based user needs and architecture.

3.10 Accordingly, the group developed the preliminary detailed shipboard user needs as set out in annex 1.

3.11 In light of the foregoing, the Sub-Committee is invited to:

- .1 note the preliminary detailed shipboard user needs as set out in annex 1;
- .2 agree that the correspondence group should further progress the work intersessionally to:
 - .1 review the preliminary detailed shipboard user needs, as developed by NAV 55, and update them as appropriate, and to consider priorities;
 - .2 develop detailed shore-based user needs, taking into account input provided by IALA and other relevant organizations and to consider priorities;
 - .3 identify functions and services to support the shipboard and shore-based user needs in a harmonized and holistic manner;
- .3 agree that it would be necessary to verify and update the user needs, as and when necessary during the implementation process of the Organization's e-navigation strategy.

4 FUTURE SPECTRUM REQUIREMENT WITH RESPECT TO E-NAVIGATION

4.1 The group noted that COMSAR 13 had requested NAV 55 to consider future spectrum requirements with respect to e-navigation and to advise COMSAR 14 accordingly. In this context, the group further noted that COMSAR 13 had endorsed the view of IHO (COMSAR 13/4/2/Rev.1) that there might be a requirement for an additional spectrum to be allocated for broadcasting of additional security-related information on port security levels in major ports and coastal waters and agreed that band 495-505 kHz could be of interest to IMO for this purpose.

4.2 In this context, the group also recognized that the Technical working group had also been tasked to provide its advice to the Plenary on this matter under agenda item 8.

4.3 The group recalled that the Strategy for the Development and Implementation of e-navigation approved by MSC 85 provided for specific high-level needs for robust communication and, data and system integrity. Although the details of these requirements had yet to be defined, it was anticipated that these requirements would be applied to VHF, HF and satellite technologies, as well as onboard networks capable of effectively integrating onboard e-navigation systems. Hence, there was a need for resiliency and integrity of such capacities. Furthermore, the work of COMSAR, ITU working party 5B, and the IEC TC80 and its continuous work on onboard digital interface networks to develop such communication capabilities was relevant.

4.4 In light of the foregoing, the group agreed that:

- .1 e-navigation would require a stable broadband VHF, HF and satellite data communications system;
- .2 maritime frequency spectrum should not be given up;

- .3 e-navigation would probably require additional frequency allocation which would be communicated to COMSAR 14 in due course for onward transmission to ITU; and
- .4 ITU should be informed accordingly.

Accordingly, the group advised the Technical working group of its deliberations and discussions on this matter with a view to providing consolidated advice to the Plenary.

5 CORRECT GENERIC TERM TO REPLACE THE TERMS “DECCA” AND “LORAN”

5.1 The group noted that STW 40 had agreed to replace the terms “Decca” and “Loran” with a more generic term. However, STW 40 could not agree on the exact text and, bearing in mind the continuing development of e-navigation, it agreed to seek the advice of NAV 55 on the correct terminology. In this context, the group further noted that STW 40 had the following three alternative proposals in square brackets pending advice from NAV 55:

- .1 terrestrial radio navigation systems; or
- .2 terrestrial navigation systems; or
- .3 hyperbolic navigation systems.

5.2 After some discussions, the group agreed that in light of rapid advancement of technology, it would be appropriate to use a more generic term and that the term “terrestrial electronic position fixing systems” should replace the terms “Decca” and “Loran”. The Sub-Committee is invited to instruct the Secretariat to inform STW 41 and the STW Intersessional Working Group accordingly.

6 INITIAL IDENTIFICATION/OUTLINE OF THE SYSTEM ARCHITECTURE

6.1 The group gave preliminary consideration to initial identification/outline of the system architecture taking into account information contained in documents NAV 53/13 (paragraphs 12 to 16) and MSC 85/26 (annex 20, paragraph 9.7.2 and annex 21, paragraph 5) and noted that there were no submissions to this session on this issue. Accordingly, the group agreed that this work should be progressed further intersessionally by the correspondence group, taking into account the components identified at NAV 54, namely the hardware, data, information, communications technology and software needed to meet the user needs and should be based on a modular and scalable concept. Furthermore, the system hardware and software should be backward compatible based on open architectures to allow scalability of functions according to the needs of different users and to cater to continued development and enhancement. When new systems are introduced that cannot be made compatible, a suitable transitional period should be provided for, during which existing systems could continue to be in use. The group also noted that development of system architecture had taken place in the interim period within IALA. Accordingly, the group invited IALA to provide the results of these developments to the correspondence group.

7 INITIAL GAP ANALYSIS

7.1 The group noted that MSC 85 (MSC 85/26, annex 20, paragraph 9.7.3 and annex 21, paragraph 6) had approved that the gap analysis should focus on:

- .1 regulatory gap analyses particularly identifying gaps in the present frameworks that need to be filled, e.g., in the provision of services in international waters. Based on this analysis, any institutional reform that is needed should be proposed for implementation;
- .2 operational gap analyses to define a reduced concept of operations that could be used based on the integration of existing technology and systems;
- .3 identification and description of existing systems that could be integrated into the e-navigation concept covering functionality, reliability, operational management responsibilities, regulatory status as to specification/standardization, fitment and use, generational status and integration with e-navigation system requirements; and
- .4 technical gap analyses, comparing the capabilities and properties of existing systems with the architectural requirements to identify any technology or system development that might be needed, based solely on the user needs. This should result in a programme of development work that needs to be done to provide technology solutions to user requirements in their entirety.

7.2 In this context, the group reviewed the preliminary gap analysis as set out in annex 3 of document NAV 53/13. Each of the various elements was discussed briefly, and it was noted that it could be a source of information for the correspondence group in preparing its more complete gap analysis, which include areas of business practices and holistic liability issues. To this end, the group further noted that this preliminary gap analysis was undertaken before the e-navigation strategy was completed, and to some extent was based on assumptions. The group also noted that in certain areas further development had taken place during the interim period within IHO and IALA. Accordingly, the group invited IALA and IHO to provide inputs to the correspondence group.

7.3 The IHO observer expressed the view that the group and subsequently the correspondence group should not attempt to identify, analyse and describe all possible users and uses of e-navigation. The work should be confined to identifying the key purposes of e-navigation and the stakeholders involved from an IMO perspective. It would be unrealistic to attempt to identify and cater for all possible stakeholders, many of whom will be outside the jurisdiction of IMO. The guiding reference for the correspondence group should always be the definition of e-navigation agreed by MSC, in other words, *does its work relate directly to the definition?* The e-navigation system architecture should nevertheless be implemented in such a way that new or additional stakeholders can access or input to e-navigation as and when it is appropriate. Accordingly, the principal outcome of the work being undertaken by the correspondence group should be to describe, in functional terms, the key requirements of e-navigation from the perspective of IMO stakeholders and to what extent systems are already in place or need to be further developed. From this, IMO would be able to determine what measures, including performance standards, guidelines, etc., it must put in place to ensure that e-navigation can be successfully implemented.

7.4 After some discussion, the group agreed that the work should be progressed further intersessionally by the correspondence group in a holistic manner taking into account the components agreed at MSC 85 and that the preliminary gap analysis as set out in document NAV 53/13, annex 3 could be used as a background document for the proposed gap analysis.

8 COST-BENEFIT AND RISK ANALYSES

8.1 The group recalled that MSC 85 (MSC 85/26, annex 21, paragraph 7) had agreed that cost-benefit and risk analysis should be an integral part of the development of e-navigation and should be used to identify strategic decisions and, support decision-making on where and when certain functions need to be enabled. However, as there were no submissions to this session on this issue, the group agreed that this work should be progressed intersessionally by the correspondence group.

9 TERMS OF REFERENCE OF A CORRESPONDENCE GROUP

9.1 In light of the discussions set out in sections 3, 6, 7 and 8 above and, to maintain the proposed time schedule approved by MSC 86, the group developed the terms of reference for a correspondence group to progress the work intersessionally under the coordination of Norway* as set out in annex 2. In case the correspondence group needs to continue its work beyond NAV 56, these terms of reference would need to be reviewed by NAV and COMSAR Sub-Committees.

9.2 Furthermore, the group recalled that, in the joint work plan for COMSAR, NAV and STW Sub-Committees approved by MSC 86, it was envisaged that STW 41 would provide answers to questions related to initial gap analysis and initial cost-benefit and risk analyses, and that no submissions had been made to this session relating to these issues. Hence, bearing in mind that the deadline for submission of documents to STW 41 was 6 November, it would not be possible for the correspondence group to submit any meaningful questions to STW 41. Accordingly, it would be more appropriate for the correspondence group to request STW 42 to answer any questions that might have been identified.

10 ACTION REQUESTED OF THE SUB-COMMITTEE

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

- .1 note the preliminary detailed shipboard user needs (paragraph 3.11.1 and annex 1);
- .2 agree that the correspondence group should further progress the work intersessionally to:
 - .1 review the preliminary detailed shipboard user needs, as developed by NAV 55, and update them as appropriate, and to consider priorities (paragraph 3.11.2.1);

*

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- .2 develop detailed shore-based user needs, taking into account input provided by IALA and other relevant organizations and to consider priorities (paragraph 3.11.2.2);
- .3 identify functions and services to support the shipboard and shore-based user needs in a harmonized and holistic manner (paragraph 3.11.2.3);
- .3 agree that it would be necessary to verify and update the user needs, as and when necessary during the implementation process of the Organization's e-navigation strategy (paragraph 3.11.3);
- .4 note the deliberation and discussions relating to future spectrum requirement with respect to e-navigation, as conveyed to the Technical working group (section 4);
- .5 agree that "terrestrial electronic position fixing systems" would be the appropriate generic term to replace the terms "Decca" and "Loran" and instruct the Secretariat to inform STW 41 and the STW Intersessional Working Group accordingly (paragraph 5.2);
- .6 note the discussions of the group relating to system architecture, initial gap analysis and cost-benefit and risk analysis (sections 6, 7 and 8); and
- .7 approve the terms of reference for the correspondence group to progress the work intersessionally on the development of an e-navigation strategy implementation (paragraph 9.1 and annex 2).

ANNEX 1

PRELIMINARY SHIPBOARD USER NEEDS AND PRIORITIES

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Human Machine Interface Issues				
Improved Ergonomics Mariners have expressed a desire for bridge layouts, equipment and systems to be better designed from an ergonomic and user friendly perspective.	Many bridges have been designed without much thought given to the effective layout of equipment or workstations. Mariners have expressed that in an e-navigation era, work stations, navigation displays, communication devices, and other bridge equipment must be designed to improve effective bridge operation. Such layouts should take into account expanded bridge teams and the pilot.	<ul style="list-style-type: none"> Human Machine Interface Human Centred presentation needs 	Harmonize and apply existing documentation Take note of: IMO documents: <ul style="list-style-type: none"> MSC.252(83) (INS) MSC/Circ.982 (Ergonomic Criteria for Bridge Equipment and Layout) NAV 55/4, annex 1 (Bridge Equipment, System Arrangements and Integration) MSC.191(79) (Pres. Of Nav-Related Info on NavDisplays) Other industry standards.	It should be noted that much work has been done in this area, however not widely applied. Consideration of more prescriptive bridge layout requirements. Consideration of more prescriptive work station requirements. Better application of centralized and effective dimming of screens. Innovations and new technology solutions, should concentrate on the needs and capabilities of the users. Promotion of access to information at one place where appropriate (multi-functional workplaces).

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Standard Interface Mariners expressed a desire for greater standardization of functionality for navigation displays (human/machine interface).	Navigation system functions, operations and presentation (including ECDIS, Radar, AIS, GPS, GMDSS, etc.) can vary widely between manufacturers and even between models by a single manufacturer. The differences include where certain information is displayed (i.e. Speed and Course), how it is displayed, menu functions and interface devices such as knobs or joysticks. This makes type specific training difficult, and leads to ineffective use of features particularly by those watchkeepers who are new to a vessel.	<ul style="list-style-type: none"> Human Centred Presentation needs Human Machine Interface Analysis 	Research should be conducted regarding the functionality of standard interfaces. Take note of: IMO documents <ul style="list-style-type: none"> MSC.191(79) (Pres. Of Nav-Related Info on NavDisplays) MSC.252(83) (INS) NAV 55/4, annex 1 (Bridge Equipment, System Arrangements and Integration) Other industry standards.	Design specification for current equipment. Note should be made of concept of S-Mode as proposed at NAV 54 (NAV 54/13/1). Need to update and establish balance between standardization and innovation.
Familiarization Requirements Mariners need all safety-related equipment to be provided with familiarization material specific to the model and installation.	Mariners often join ships where non-standard equipment and functions exist. It was thought that if these pieces of equipment or systems could be provided with familiarization material or tutorials safety would improve.	<ul style="list-style-type: none"> Human Machine Interface Analysis Implementation issues 	Identify where familiarization material specifications need to be developed for existing and developing performance standards. Take note of: IMO document (SN.1/Circ.274) Guidelines for application of the modular concept to performance standards.	Consideration should be given to requiring such familiarization material to be provided by the manufacturer. Consider example using INS Performance Standard (MSC.252(83)).
User-Selectable Presentation of Information Received via Communication Equipment	Mariners expressed to have a desire to have the possibility to present user-selectable information received via communication equipment on the navigational displays	<ul style="list-style-type: none"> Effective communication: <ul style="list-style-type: none"> Human Centred Presentation needs Human Machine Interface 	Research should be conducted regarding the type of information, equipment and systems involved and how to present and/or filter such information.	Availability of information in real-time with possible presentation on the navigational displays. Information overload

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
	<p>(e.g., vessel in distress, wind speed/ direction, AtoN status, restricted areas).</p> <p>They further requested the possibility to filter some transmitted data for presentation according to user-set parameters (e.g., only information from user-selected sea areas).</p>	<ul style="list-style-type: none"> Analysis 		<p>needs to be prevented – therefore, presentation of information should be user-selectable to filter required information.</p> <p>Task-oriented presentation based on INS-tasks MSC.252(83).</p>
<p>Marine Safety Information (MSI)</p> <p>Mariners expressed a desire to sort and display MSI, such as NAVTEX, SafetyNET more effectively.</p>	<p>On most ships, NAVTEX information is displayed on a separate screen or printed on a scroll of paper. The Latitude and Longitude of the MSI must then be mentally compared to that of the vessel by the watchkeeper to calculate risk. Notification of a new and dangerous wreck carries the same weight as a buoy that has drifted off station, which may be hundreds of miles away from the ship's intended voyage. This is a very time-consuming and distracting task, and susceptible to human error. Mariners considered that presenting such safety information on the ship's navigation display would be far more effective and a clear benefit of e-navigation.</p>	<ul style="list-style-type: none"> Effective communication Human Centred Presentation needs Human Machine Interface Analysis 	<p>Work with relevant stakeholders to address technical requirements for presenting MSI on navigation displays.</p> <p>Take note of Methodology for developing e-navigation user needs using a task-based approach (NAV 55/11/4).</p>	<p>Possible re-formatting of NAVTEX data and continuing with transmitting data on same frequencies</p> <p>Transition from old to new format.</p> <p>Task-oriented presentation based on INS-tasks MSC.252(83).</p>

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Alert Management Bridge alerts (emergency alarms, alarms, warnings and cautions) must be co-ordinated, weighted, and support decision making without undue distraction.	It is not uncommon for the bridge of a ship to have in excess of 500 alarms pertaining to navigation, propulsion, cargo, and communication systems. These alarms are usually uncoordinated, physically located all over the bridge, and give little indication of severity without interrogation, which distracts the navigator. As systems become increasingly complex, all bridge alarms must be coordinated to avoid undue distraction.	<ul style="list-style-type: none"> • Human Centred Presentation Needs • Data and System Integrity • Analysis 	Investigate possibility to apply existing IMO regulations on INS alert management and bridge alert management. Take note of: IMO documents <ul style="list-style-type: none"> • MSC.252(83) (INS) • NAV 55/4, annex 2 (BAM) • DE 52/4/2 (Code on Alerts and Indicators) 	
Indication of Reliability	Mariners have expressed a concern that on systems such as ECDIS, the vessel's position is always indicated as an absolute, leaving mariners to rely on their understanding of technically complex systems to assess the accuracy of such indicated positions. Mariners have expressed a desire for systems to automatically assess the accuracy and integrity of hydrographic data, position fixing data, radar, and other ship sensors to return a graphical indication of assessment.	<ul style="list-style-type: none"> • Human Centred Presentation Needs • Human Machine Interface • Data and System Integrity • Analysis 	Investigate effective ways to indicate levels of reliability using graphical representation. Take note of: <ul style="list-style-type: none"> • IMO MSC.252(83) (INS) • Other industry/naval standards. 	Consideration of using, e.g., ellipses of uncertainty to indicate expected accuracy. Consideration of using, e.g., colour or shading changes to indicate integrity of information.

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Operational Issues				
Improved Reliability Before mariners can feel confident about relying on systems under the e-navigation concept, they must prove far more reliable than many of the present systems.	Mariners today often struggle with electronic equipment that fails or malfunctions in some respect. This may relate to poor performance from radar; electronic chart software faults; incorrect AIS data, GMDSS alerts or loss of position fixing systems. Even a 99% reliability rating, would result in a problem for one voyage in every 100. This has resulted in many mariners distrusting electronic systems, and now having grave doubts about relying on e-navigation. It must be recognized that there is little competence for fixing such systems on board, and obtaining the services of a qualified technician in some ports can be difficult.	<ul style="list-style-type: none"> • Effective and Robust Communications • Data and System Integrity 	It will be necessary to carry out an assessment to quantify reliability parameters. To include specific assessment of reliability of electronic position fixing systems.	Design specification for current equipment. Type approval process. Competence of installation and repair technicians. Better control and visibility of software and hardware updates.
Standardized and Automated Reporting Mariners have expressed a keen desire to reduce the amount of ship/shore reporting and to adopt the principle of single	A major frustration and distraction for mariners is the repeated reporting of static and dynamic information pertaining to the vessel, cargo, crew, and voyage to shore authorities. A major benefit of e-navigation would be for ships crew to enter such information into their system	<ul style="list-style-type: none"> • Common Maritime Information/Data Structure • Automated and Standardized Reporting Functions • Effective and Robust Communications 	Investigate methods for global standardization of reporting procedures and technology. Investigate the legal aspects associated with access and sharing of information.	Possible increased use of AIS. Possible increased demands on communication means, i.e. spectrum and bandwidth.

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
entry for any information into the system. They have further expressed a desire for globally standardized reporting procedures and forms to avoid repetition of reporting and to reduce workload.	only once and for it to be shared by authorized authorities without further intervention by the ship.			
Improved Target Detection Mariners would be grateful if e-navigation could facilitate better detection of targets.	Mariners are constantly concerned with identifying targets, including leisure and fishing craft, pirates, flotsam and jetsam, ice, etc. Anything that can be done to improve detection would be appreciated.	<ul style="list-style-type: none"> • Effective and Robust Communications • Human Centred Presentation Needs • Data and System Integrity • Analysis 	Investigate technologies to assist with better detection of targets and risk of collision.	High resolution X-band NT radar has potential benefit in this area.
Guard Zones Mariners expressed a desire to have more effective Guard Zones to notify watchkeepers of hazards pertaining to collisions and groundings.	As target detection become more effective, MSI becomes integrated, and passage plans are programmed onto ECDIS, mariners feel that guard zones in three dimensions can be an effective way to warn watchkeepers of undetected hazards. This should include hazards of grounding taking into account UKC in a dynamic environment; air draft; and risk of collision. Warnings from this Guard Zone feature should be integrated into the bridge alert system.	<ul style="list-style-type: none"> • Human Centred Presentation needs • Human Machine Interface • Data and System Integrity • Analysis 	Research effective means of implementing the use of Guard Zones or other means in order to avoid collisions and groundings.	It should be noted that the use of such Guard Zone facility will need to be intrinsic in the training syllabus. Use of Guard Zones must be taught as a decision support feature. Many ships have aspects of Guard Zones on present equipment but don't use them due to poor training with reference to their function and their value.

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Reduction of administrative burden and increase use of electronic documentation	<p>Users expressed the need to reduce the amount of administrative work on board.</p> <p>They also expressed a desire to provide paper information and documentation in electronic form with means for easy location of information.</p>	<ul style="list-style-type: none"> • Human Centred Presentation Needs • Data and system integrity 	Investigate the best way to harmonize and present maritime documentation in an electronic format to improve efficiency and reduce administrative burden.	<p>Electronic documents should support:</p> <ul style="list-style-type: none"> - easy localization of information (e.g., with the help of a search function) - automatic updates (e.g., of Notices to Mariners) - Possible integration of information from multiple sources. - the integration of information in other systems on the bridge (e.g., ECDIS) <p>electronic documents should be printable or be additionally provided as paper version.</p> <p>The need for raceability and ability to audit.</p>
<p>Automated Updating of Base Line Data and Documents</p> <p>Mariners expressed a desire for documents such as Charts, and Voyage planning publications to be automatically updated,</p>	<p>Mariners are required to use a plethora of publications associated with voyage planning and monitoring. These include, but are not limited to Charts, Light list, list of radio signals, sailing directions, port guides, etc. Currently, most of these are kept on board in a paper</p>	<ul style="list-style-type: none"> • Common Maritime Information/Data Structure • Effective and Robust Communications • Human Centred Presentation Needs • Analysis 	Investigate and harmonize means for automated updating of baseline data and documents, including consideration of legal aspects communication costs.	Consideration should be given to a proper electronic format for the data rather than digital copies of existing paper publications. This would allow the presentation of relevant data in a succinct manner.

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
with minimal shipboard intervention.	<p>format and require a considerable amount of time to keep constantly updated. Mariners believe that e-navigation can be of benefit if it ensures that all these sources of information are automatically maintained up-to-date, and all of this information is accessible from a centralized location.</p> <p>Mariners have also expressed a desire for this information to be easy to access, sort and make sense of. This may be achieved by standard formats or “smart” systems. Mariners are very concerned that e-navigation may lead to more information being made available to them, leading to further overburdening. It is essential that the provision of information via e-navigation should be managed and presented effectively.</p>			The need for traceability and ability to audit.

ANNEX 2**TERMS OF REFERENCE FOR CORRESPONDENCE GROUP**

Taking into account document MSC 86/23/4 (Secretariat) relating to the joint work plan for COMSAR, NAV and STW Sub-Committees for the period 2009-2012, the comments and general views expressed at NAV 55 and, decisions taken by NAV 52 including 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 review the preliminary detailed shipboard user needs as developed by NAV 55 and update them as appropriate, and to consider priorities;
 - .2 develop detailed shore-based user needs, taking into account input provided by IALA, IHO and other relevant organizations and to consider priorities;
 - .3 identify functions and services to support the shipboard and shore-based user needs in a harmonized and holistic manner;
 - .4 consider documents NAV 53/13 (paragraphs 12 to 16) and MSC 85/26 (annex 20, paragraph 9.7.2 and annex 21, paragraph 5) and develop an outline of system architecture, taking into account input provided by IALA, IHO and other relevant organizations;
 - .5 consider documents NAV 53/13 (annex 3) and MSC 85/26 (annex 20, paragraph 9.7.3 and annex 21, paragraph 6), and undertake an initial gap analysis;
 - .6 consider document MSC 85/26 (annex 21, paragraph 7) and develop/recommend an appropriate methodology for carrying out cost-benefit and risk analysis; and
 - .7 submit a document to COMSAR 14 (8 to 12 March 2010) raising specific questions, if required, that should be addressed by COMSAR and prepare a comprehensive report for submission to NAV 56 (26 to 30 July 2010).
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