

SUB-COMMITTEE ON SAFETY OF
NAVIGATION
59th session
Agenda item 6

NAV 59/WP.8
5 September 2013
Original: ENGLISH

DISCLAIMER

As at its date of issue, this document, in whole or in part, is subject to consideration by the IMO organ to which it has been submitted. Accordingly, its contents are subject to approval and amendment of a substantive and drafting nature, which may be agreed after that date.

E-NAVIGATION**Report of the Working Group****1 GENERAL**

1.1 As instructed by the Sub-Committee, the Working Group on e-navigation (the Group) met from 2 to 5 September 2013 under the chairmanship of Mr. John Erik Hagen (Norway).

1.2 The group was attended by delegates from the following Member States:

ANGOLA	JAPAN
ANTIGUA AND BARBUDA	LIBERIA
ARGENTINA	MALAYSIA
AUSTRALIA	MARSHALL ISLANDS
BAHAMAS	MONACO
BELGIUM	NETHERLANDS
BRAZIL	NORWAY
BULGARIA	PANAMA
CANADA	PERU
CHILE	POLAND
CHINA	REPUBLIC OF KOREA
DENMARK	RUSSIAN FEDERATION
FINLAND	SINGAPORE
FRANCE	SWEDEN
GERMANY	UKRAINE
GREECE	UNITED KINGDOM
IRAN (ISLAMIC REPUBLIC OF)	UNITED STATES
ITALY	

1.3 The group was also attended by a delegate from the following Associate Member of IMO:

HONG KONG, CHINA



1.4 The group was also attended by observers from the following intergovernmental organizations:

INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO)
MARITIME ORGANISATION OF WEST AND CENTRAL AFRICA (MOWCA)

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

INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERNATIONAL ASSOCIATION OF MARINE AIDS TO NAVIGATION
AND LIGHTHOUSE AUTHORITIES (IALA)
COMITÉ INTERNATIONAL RADIO-MARITIME (CIRM)
BIMCO
OIL COMPANIES INTERNATIONAL MARINE FORUM (OCIMF)
INTERNATIONAL MARITIME PILOTS' ASSOCIATION (IMPA)
INTERNATIONAL ASSOCIATION OF INSTITUTES OF NAVIGATION (IAIN)
INTERNATIONAL FEDERATION OF SHIPMASTERS' ASSOCIATIONS (IFSMA)
COMMUNITY OF EUROPEAN SHIPYARDS' ASSOCIATIONS (CESA)
INTERNATIONAL ASSOCIATION OF INDEPENDENT TANKER OWNERS
(INTERTANKO)
CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA)
INTERNATIONAL SAILING FEDERATION (ISAF)
INTERNATIONAL TRANSPORT WORKERS' FEDERATION (ITF)
THE NAUTICAL INSTITUTE (NI)

2 TERMS OF REFERENCE

2.1 The group, taking into account any decisions of, and comments and proposals made in Plenary, plus the outcome of NAV 58, COMSAR 17 and STW 44, should:

- .1 review the report of the correspondence group, taking into account documents NAV 59/6/1, NAV 59/6/2, NAV 59/6/3, NAV 59/6/4, NAV 59/6/5, NAV 59/6/6 (except paragraphs 22.2 and 22.3) and NAV 59/6/7 including document NAV 59/WP.3 (Chairman) and provide comments and recommendations with respect to the actions requested in paragraphs 84.1 to 84.10 of document NAV 59/6;
- .2 consider documents NAV 59/6/1, NAV 59/6/3 and, specifically, ISO standard 9421-110, with respect to the draft *Guidelines on Human Centred Design (HCD) for navigational equipment and systems*, and provide comments and recommendations, as appropriate;
- .3 consider document NAV 59/6/2 with respect to the need to take into account the link between Human Centred Design (HCD) and Software Quality Assurance (SQA) as part of the ongoing work, and provide comments and recommendations, as appropriate;
- .4 review and revise the terms of reference for a correspondence group to progress work intersessionally for reporting to HTW 1 and NCSR 1, based on the revised joint plan of work approved by MSC 90; and
- .5 submit a report to Plenary on Thursday, 5 September 2013 for consideration.

3 CONSIDERATION OF THE REPORT OF THE CORRESPONDENCE GROUP ON E-NAVIGATION AND RELATED DOCUMENTS

Prioritized potential e-navigation solutions

3.1 The group noted that the Correspondence Group on e-navigation (CG) had prioritized five main potential solutions from the preliminary list of potential e-navigation solutions endorsed by NAV 58 (NAV 58/WP.6, annex 2), taking into account the following criteria:

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

3.2 The group also noted that the CG had agreed that:

- .1 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;
- .2 the CG should not concentrate on determining causes of marine casualties; and
- .3 the list of potential e-navigation solutions should be limited solely to achieve the criteria described in paragraph 3.1 above.

3.3 The group considered the five prioritized potential e-navigation solutions identified by the CG and agreed to include a footnote to clarify the scope of Solution 9 related to improved communication of VTS Service Portfolio. Accordingly, the group agreed with the following five potential e-navigation solutions which were used as the basis for the Risk and Cost-Benefit Analyses:

- 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 Portfolio¹.

3.4 In considering the proposal made in paragraph 22.1 of document NAV 59/6/6, the group noted that the development of the Strategy Implementation Plan (SIP), which according to the revised joint plan of work approved by MSC 90 was expected to be completed in 2014, would focus on the above five above-mentioned potential e-navigation solutions. However, it was noted that this should not prevent addressing other potential solutions in the future as part of the iterative process of e-navigation.

¹ Not limited to VTS stations.

3.5 In this respect, the group recalled that, in accordance with the already adopted e-navigation strategy, the implementation of e-navigation should be a phased iterative process of continuous development (MSC 85/26/Add.1, annex 20, paragraph 9.6 and figure) and thus, the prioritization and limiting of solutions should not be seen as a reduction in the ambition level required for e-navigation.

3.6 The group recommended the Sub-Committee to endorse the above-mentioned five prioritized potential e-navigation solutions.

Formal Safety Assessment (FSA)

3.7 The group, recalling Plenary's decision that the Formal Safety Assessment (FSA) set out in annex 1 of document NAV 59/6 should not be subject to a comprehensive review, noted the Risk and Cost-Benefit Analyses with the five prioritized main solutions and the seven corresponding Risk Control Options (RCOs) conducted as part of the FSA.

3.8 The group invited the Sub-Committee to endorse the FSA, including the finalized Risk and Cost-Benefit Analyses and the identified RCOs, as set out in document NAV 59/6, annex 1.

3.9 The ICS observer expressed concern that the cost figures used for the FSA in the CG report (NAV 59/6, annex 1) did not match the experience of shipowners who have fitted comparable equipment (NAV 59/6/6, paragraph 12). The Observer advised that, for this reason, the outcome of the FSA could not be fully supported. Antigua and Barbuda, the Bahamas, Germany, Greece, Liberia, the Marshall Islands, Panama, the United States, BIMCO and INTERTANKO aligned themselves with the statement made by ICS.

Use of additional and/or alternative analysis tools to evaluate solutions and/or enhance the current FSA process

3.10 With respect to the use of additional and/or alternative analysis tools to evaluate solutions and/or enhance the FSA process in the future, the group agreed that this should be further explored and discussed by a CG without delaying the current e-navigation process.

Development of a framework for communication protocols and standards

3.11 With regard to the proposal made in paragraph 22.5 of document NAV 59/6/6, the group agreed that the identification and description of future communication protocols and capacity for e-navigation should be further considered by the CG and included in the SIP, as appropriate.

Detailed ship and shore architecture

3.12 The group considered the examples of technical e-navigation infrastructure set out in document NAV 59/6, annex 2, and whether they could be used for the future detailed ship-shore architecture.

3.13 The concept of the proposed maritime cloud, which could be combined or complemented with the example of single window for maritime safety information, was supported by some delegations. However, it was recognized that certain issues should be further expanded or investigated, like for example, its development and funding, operational and legal issues, including liability, quality and accessibility of the information, its global functional operation, its benefits compare with other alternatives and the administrative burden. This should also address, in parallel, the required shipboard elements.

3.13bis In this respect, the delegations of Denmark and France offered to coordinate this development and provide inputs to the CG, taking into account the work carried out by the CG on the modernization of the GMDSS.

3.14 The group agreed that the relevant description of the ship and shore architecture should be further considered by the CG and included in the SIP.

3.15 The group also agreed that the CG should consider whether the use of practical realistic examples of e-navigation solutions should be included in the SIP, as proposed in document NAV 59/6/7 (Republic of Korea).

Maritime Service Portfolios

3.16 During the consideration of the preliminary list of Maritime Service Portfolios (MSPs) contained in annex 3 of document NAV 59/6, the group agreed that:

- .1 MSPs should be linked to the corresponding potential e-navigation solutions;
- .2 those responsible for the operation or coordination of MSPs services should be identified;
- .3 relevant International Organizations, in particular IHO and IALA, should contribute to the further development of the identified MSPs;
- .4 the description of the following MSPs should be reviewed and clarified: MSP 2 (vague expressions), MSP 4 (vague expressions), MSP 6 (responsibilities of pilot services), MSP 11 (to include port State) and MSP 17 (with respect to reception of distress alarms and the GMDSS master plan); and
- .5 MSP 9 should be deleted.

3.17 The group agreed that the CG should take into account the above comments during the finalization of the MSPs as part of the SIP and that MSPs descriptions should preferably be kept generic.

3.18 The group recognized that MSPs should be categorized by geographical areas instead of by type of operation. This would facilitate 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.

3.19 In this respect, the group agreed that MSPs should consider operations in the following areas:

- .1 port areas and approaches;
- .2 coastal waters and confined or restricted areas;
- .3 open sea and ocean areas;
- .4 areas with offshore and/or infrastructure developments;
- .5 Polar areas; and
- .6 other remote areas.

3.20 The group further agreed that the above-mentioned six areas should be defined.

3.21 The group also agreed that, with respect to the above-mentioned areas, and with reference to communications requirements, it would be necessary to be aware of the existence of the GMDSS sea areas and any changes that could be made to these areas in the future.

3.22 The group noted the following views expressed by some delegations:

- .1 the above-mentioned areas should be similar to the GMDSS sea areas due to carriage communication equipment requirements by sea operations;
- .2 the development of e-navigation could include the use of non-mandatory equipment;
- .3 the main focus of e-navigation was safety of navigation and not only reception of distress alerts;
- .4 the development of the Polar Code and the review of the GMDSS should be taken into account;
- .5 MSPs would focus on the provision of services in certain areas;
- .6 that IHO would submit further comments to the CG with regard to the information contained in document NAV 59/6/4;
- .7 although the majority of the delegations were in favour of the deletion of MSP 9, other delegations were of the opinion that MSP 9 should not be deleted and could be redrafted instead; and
- .8 that the delegation of Poland presented a proposal of non-mandatory equipment in document NAV 59/INF.2.

3.23 The group agreed that the CG should take into account the above-mentioned comments during the further development of MSPs as part of the SIP.

Resilient and integrated Position, Navigation and Timing (PNT) system

3.24 The group had a lengthy exchange of views related to resilient and integrated Position, Navigation and Timing (PNT) systems. The group noted the following views expressed by some delegations:

- .1 the development of eLoran by the United Kingdom and the Republic of Korea should be noted;
- .2 the development of eLoran would be limited to regional or national coverage;
- .3 eLoran global implementation would be very expensive;
- .4 there was a need for an appropriate level of resilience in all areas and the provision of worldwide coverage;
- .5 satellite information could be vulnerable;

- .6 users should be informed if satellite information was affected in order to take the necessary measures;
- .7 the development of performance standards for multi-system shipborne navigation receivers which would be conducted by NCSR could address some of the PNT issues;
- .8 other alternatives of backup systems should be considered, like for example, inertial systems, use of radar, gyrocompass, magnetic compass, GNSS compass, eLoran, etc.; training and skills on these systems should be taken into consideration;
- .9 a backup system should, preferably, be automatic;
- .10 a combination of potential integrated solutions could be considered;
- .11 areas with high density traffic would require precise information; and
- .12 resolution A.1046(27) on *Worldwide Radio navigation System* requirements should be taken into consideration.

3.25 The group recalled that MSC 90, having considered document MSC 90/25/8 (Finland, France, Republic of Korea, IALA and CIRM), had agreed to include in the post-biennial agenda of the Committee, an unplanned output on "Development of performance standards for multi-system shipborne navigation receivers", with two sessions needed to complete the work, assigning the NAV Sub-Committee as the coordinating organ.

3.26 The group noted that there was an identified user need for resilient PNT for the implementation of e-navigation and that requirements and potential technical solutions were under development.

3.27 The group agreed that the CG should take the above comments into account during the further development of the SIP.

Development of related guidelines

3.28 The group reviewed the different guidelines which were currently under development or would need to be developed and considered the potential linkages and relationships between all of them.

3.29 After consideration, the group 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:

- .1 draft *Guidelines on Human Centred Design (HCD) for navigational equipment and systems*;
- .2 draft *Guidelines on Usability evaluation of navigational equipment*;
- .3 draft *Guidelines for Software Quality Assurance (SQA) in e-navigation*; and
- .4 draft *Guidelines for the Harmonization of test beds reporting*.

3.30 Due to the amount of work required, the group encouraged Member States concerned and related International Organizations to contribute to their further development as part of the work of the CG. The group was of the view that the draft *Guidelines for the Harmonization of test beds reporting* could be finalized along with the SIP.

3.31 Although there were evident linkages between HCD, usability and SQA, the group recognized that, for simplicity, the guidelines should be kept separate and should not be combined. However, their further development should progress in parallel and in cooperation in order to identify synergies and interdependencies.

3.32 The group recognized that, during the development of the above-mentioned Guidelines, it would be necessary to identify new or existing performance standards that would need to be revised or developed, in particular, from the hardware and software perspective. This could be identified as part of the development of the SIP.

3.33 The group reviewed the draft *Guidelines on Human Centred Design (HCD) for navigational equipment and systems*, set out in document NAV 59/6, annex 4, and provided the following comments:

- .1 in paragraph 1, ISO should be spelt out as "International Organization for Standardization"; and
- .2 paragraph 7 should be redrafted with regard to the concept of SQA.

3.34 The group agreed that document NAV 59/6, annex 4, should be used as the basis for the further development of the HCD Guidelines and that the above-mentioned comments should be taken into consideration during their further development.

3.35 With regard to the draft *Guidelines on Usability evaluation of navigational equipment*, the group agreed that documents NAV 58/6/6, NAV 58/INF.12, NAV 58/INF.13 (Japan) and NAV 59/6/3 (Republic of Korea) should be taken into account for their development.

3.36 The group reviewed the draft *Guidelines for Software Quality Assurance in e-navigation*, set out in the annex of document NAV 59/6/2 (Republic of Korea), and provided the following comments:

- .1 existing standards for SQA already in use by different equipment manufactures should be taken into consideration;
- .2 the SQA Guidelines should be applicable only to e-navigation; its expansion to other equipment could be considered in the future;
- .3 the SQA Guidelines should be used for new equipment; its use for existing equipment would require further consideration;
- .4 in paragraph 1, the second sentence should be amended to read: "In particular, the SQA Guidelines should be used for the installation and...";
- .5 in paragraph 5, the last sentence should be deleted; alternatively, the terms "safety-critical systems" and "non-safety-critical systems" should be defined;

- .6 paragraphs 12 to 17 should be completely redrafted in line with the development of the HCD Guidelines;
- .7 paragraphs 18 and 19 should be further considered, in particular, with respect to time frames, software life cycle, introduction of a time table for implementation and testing, and overseen process by an expert group or organization; and
- .8 MSC.1/Circ.1389 on *Guidance on Procedures for updating shipborne navigation and communication equipment* should be taken into consideration.

3.36bis The delegation of China expressed concern with respect to the certification of SQA and disagreed with the recommended way forward described in paragraphs 18 and 19 of the annex to document NAV 59/6/2.

3.37 The group agreed that the annex of document NAV 59/6/2 (Republic of Korea) should be used as the basis for the further development of SQA and that the above comments should be taken into consideration during this further development.

3.38 With respect to the draft *Guidelines for the Harmonization of test beds reporting*, the group agreed that these should focus on harmonizing the way in which the results of test beds would be reported instead of harmonizing test beds themselves. The group was of the opinion that test beds were based on innovating ideas that could not be predefined.

3.39 The group reviewed the draft *Guidelines for the Harmonization of test beds reporting*, set out in document NAV 59/6, annex 5, and provided the following comments:

- .1 a list of systems or equipment that should be subject to a test bed could be included in the SIP;
- .2 IALA was currently making progress on the development of these guidelines;
- .3 test beds should be based on user needs, gaps and potential e-navigation solutions;
- .4 the guideline should be redrafted with focus on harmonizing reporting of results;
- .5 the reference to IHO S-100 Data Registry should be corrected; and
- .6 test beds results should not be reported in a scientific format.

3.40 The group agreed that document NAV 59/6, annex 4, should be used as the basis for the further development of the draft *Guidelines for the Harmonization of test beds reporting* and that the above-mentioned comments should be taken into consideration during their further development.

Development of a Strategy Implementation Plan (SIP)

3.41 The group considered the framework for the SIP prepared by the CG, as set out in document NAV 59/6, annex 6, along with document NAV 59/WP.3 and NAV 59/6/5 (Australia), and provided the following comments:

- .1 the SIP should be kept general; being too descriptive or prescriptive should be avoided to allow certain level of flexibility in future required developments;
- .2 some level of detail would be required to expand the concept of the prioritized e-navigation solutions and the corresponding RCOs;
- .3 the focus should be on how to achieve the seven identified RCOs;
- .4 synergies with other relevant International Organizations should be reflected (e.g. IALA, IHO, ITU); and
- .5 the examples of key enablers for e-navigation contained in document NAV 59/WP.3 were found to be very relevant for the further development of the SIP.

3.42 The group noted that the ITU World Radiocommunication Conference (WRC) would consider the allocation of frequencies for e-navigation in 2018, subject to IMO confirmation to WRC 15. The group agreed that the required timeline and requirements should be reflected in the SIP.

3.43 The group reviewed the contents of document NAV 59/6, annex 6, in conjunction with document NAV 59/WP.3, and prepared a preliminary draft Strategy Implementation Plan, as set out in the annex, which the Sub-Committee was invited to endorse. The group agreed that this should be used as the basis for the further work of the CG and that comments provided in document NAV 59/6/5 (Australia) should be taken into consideration.

4 RE-ESTABLISHMENT OF THE CORRESPONDENCE GROUP ON E-NAVIGATION

4.1 As instructed, the group prepared terms of reference for a CG to progress the work intersessionally under the coordination of Norway*, as outlined below, and invited the Sub-Committee to re-establish the CG on e-navigation and approve its terms of reference.

"Taking into account the revised joint plan of work for the COMSAR, NAV and STW Sub-Committees for the period 2012–2014, as approved by MSC 90, as well as decisions made, comments and recommendation provided at NAV 59, the Correspondence Group on e-navigation should:

- .1 finalize the draft Strategy Implementation Plan (SIP), using as a basis the annex of document NAV 59/WP.8 and taking into account comments provided in document NAV 59/6/5 (Australia);
- .2 include as part of the SIP, at least, the following elements according to the coordinated approach to the implementation of the e-navigation strategy approved by MSC 86:
 - .1 identification of responsibilities to appropriate organizations/parties;

*

Coordinator:

Mr. John Erik Hagen
Regional Director, Norwegian Coastal Administration
Norway
Tel: +4752733249
E-mail: john.erik.hagen@kystverket.no

-
- .2 transition arrangements;
 - .3 a phased implementation schedule along with possible roadmaps to clarify common understanding necessary for the implementation;
 - .4 priorities for deliverables, resource management and a schedule for implementation and the continual assessment of user needs;
 - .5 proposals for a systematic assessment of how new technology can best meet defined and evolving user needs, taking into account existing technologies;
 - .6 a plan for the development of any technology and institutional arrangements necessary to fulfil the requirements of e-navigation in the longer term;
 - .7 proposals on public relations and promotion of the e-navigation concept to key stakeholder and user groups; and
 - .8 identification of potential sources of funding for development and implementation, particularly for developing regions and countries and of actions to secure that funding;
- .3 include also as part of the SIP the following additional elements:
- .1 the relevant description of the ship and shore architecture;
 - .2 the set of operational and technical services which would be part of the Maritime Service Portfolios;
 - .3 the possible use of additional and/or alternative analysis tools to evaluate solutions and/or enhance the FSA process in the future;
 - .4 the identification and description of future communication protocols and capacity for e-navigation; and
 - .5 the required timeline and requirements for radio frequency/spectrum allocations;
- .4 consider whether the use of examples of technical e-navigation solutions should be included as part of the SIP, taking into account document NAV 59/6/7 (Republic of Korea);
- .5 in cooperation with Member States concerned and relevant International Organizations, and in consultation with relevant stakeholders, as appropriate:
- .1 finalize the draft *Guidelines for the harmonization of test beds reporting*, using as a reference document NAV 59/6, annex 5;
 - .2 further develop and include in the SIP the finalization of:

- .1 draft *Guidelines on Human Centred Design (HCD) for navigational equipment and systems*, using as a reference document NAV 59/6, annex 4;
- .2 draft *Guidelines on Usability evaluation of navigational equipment*, taking into account documents NAV 58/6/6, NAV 58/INF.12, NAV 58/INF.13 (Japan) and NAV 59/6/3 (Republic of Korea); and
- .3 draft *Guidelines for Software Quality Assurance (SQA) in e-navigation*, using as a reference document NAV 59/6/2 (Republic of Korea);
- .6 if necessary, submit a report to HTW 1 raising specific questions related to training aspects; and
- .7 submit a consolidated final report to NCSR 1."

4.2 Given the anticipated size and technical nature of the SIP and the CG report, the group was of the opinion that, during the process of the CG, all comments to the CG should be adjudicated. In this respect, comments that are accepted should be identified in the text (in track changes) and comments that are rejected should be noted as to why they were rejected.

4.3 The group was of the view that, given the above number of tasks and the time available for finalization before NCSR 1, the Sub-Committee should consider the need for holding an intersessional meeting on e-navigation to assist with the timely completion of the necessary work, according to the Revised joint plan of work approved by MSC 90. If agreed, the intersessional meeting could focus primarily on the finalization of the SIP.

5 ACTION REQUESTED OF THE SUB-COMMITTEE

5.1 The Sub-Committee is invited to:

- .1 endorse the five prioritized potential e-navigation solutions and note the criteria used for their prioritization (paragraphs 3.1 to 3.6);
- .2 endorse the Formal Safety Assessment, including the finalized Risk and Cost-Benefit Analyses and the identified Risk Control Options (paragraphs 3.7 and 3.8 and document NAV 59/6, annex 1);
- .3 agree with the views of the group with regard to MSPs (paragraphs 3.16 to 3.23);
- .4 endorse the further development of (paragraphs 3.28 to 3.40):
 - .1 the draft *Guidelines on Human Centred Design (HCD) for navigational equipment and systems*;
 - .2 the draft *Guidelines on Usability evaluation of navigational equipment*;
 - .3 the draft *Guidelines for Software Quality Assurance (SQA) in e-navigation*; and
 - .4 the draft *Guidelines for the Harmonization of test beds reporting*;

- .5 endorse the preliminary draft Strategy Implementation Plan (paragraphs 3.41 to 3.43 and annex);
- .6 re-establish the Correspondence Group on e-navigation (paragraph 4.1);
- .7 consider the need for holding an intersessional meeting on e-navigation to assist with the timely completion of the necessary work according to the Revised joint plan of work approved by MSC 90 (paragraph 4.2); and
- .8 approve the report, in general.

ANNEX

PRELIMINARY DRAFT OF THE STRATEGY IMPLEMENTATION PLAN

Contents of the SIP

1 The implementation plan should identify responsibilities to the appropriate parties, IMO, other international organizations, States, users and industry, as well as timelines for implementation actions and reviews.

2 A strategic stable and realistic implementation plan will create forward enthusiasm and momentum for e-navigation across the maritime sector. The implementation plan should identify responsibilities and appropriate methods of delivery. Implementation of the strategy will also need to take into account promotion of the e-navigation concept to key stakeholder and user groups.

3 A structured approach will be required to capture evolving user needs, making use of the existing agreed methodology, to incorporate any ensuing changes into the strategy and implementation plan.

4 The strategy implementation plan should include priorities for deliverables, identification of potential sources of funding and a schedule for implementation and the continual assessment of user needs. The deployment of any new technologies should be based on a systematic assessment of how the technology can cost effectively meet defined and evolving user needs, taking into account existing technologies. Cooperation with relevant maritime test beds and other projects should be maintained throughout the implementation process in order to benefit from synergies.

5 The SIP should contain chapters detailing the work required to bring into being each of the identified e-navigation solutions and their corresponding RCOs. This will involve identification of regulatory and technical requirements to be undertaken. A further topic to cover will be the monitoring of any significant changes to training regimes.

6 Additional research tools that could be used for further and more detailed analyses on particular e-navigation solutions should be considered.

7 The SIP will also need to cover transition planning, taking into account the phasing needed to deliver early benefits and to make the optimum use of existing systems and services in the short term. The plan should be phased such that the first phase can be achieved by fully integrating and standardizing existing technology and systems and using a reduced concept of operations.

8 Also needed within the SIP are processes for review and capturing lessons learned. E-navigation is not a static concept, and that development of logical implementation phases will be ongoing as user requirements evolve and also as technology develops enabling more efficient and effective systems. However, it is critical that this development takes place around a stable set of core systems and functions configured to allow extension over time.

Examples of fundamental key enablers of e-navigation:

GOAL	INITIAL ACTION
Globally Standardized Data Exchange	IHO's S-100 standard exist and other data providers to adopt the standard
A harmonized data communication standard	International organizations with industry; IALA is developing VDE and working with ITU
Maritime Service Portfolios (define and manage)	Defining: IMO Managing: TBD
Providers and onboard systems for resilient PNT	Onboard: available IMO will be developing multi-receiver PS
Connect all relevant equipment and functionality	IEC are developing a family of standards including a firewall with the support of the industry
Software Quality Assurance	IMO CG already working on the issue
Ensure that relevant e-navigation functions will be accepted as complying with the relevant IMO performance standards for shipborne navigational and radiocommunications equipment	NCSR Sub-Committee to undertake as need arises
Connect all relevant equipment and functionality for VTS	Member States to address individually. IALA may assist in developing standards
Coastal States to provide the required infrastructure	Seek assistance from IALA and CIRM in developing required infrastructure including relevant standards
Establish Human Centred Design principles	Continue to refine on INS and IBS performance standards and guidelines

IMO responsibilities

- 9 The responsibilities that come with IMO ownership and control of the concept include:
- .1 leading the development and maintenance of the vision and the concept;
 - .2 definition 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 and operation 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 reuse of existing and emerging equipment, systems and services;
 - .5 taking the lead in setting the international requirements appropriate for e-navigation covering all the dimensions of the system: ship borne, ashore and communications. These requirements 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 leading and monitoring the implementation of the concept; and
- .10 leading and coordinating the external communications effort necessary to support the case for e-navigation.

10 In sum, the SIP will be a phased implementation schedule, including roadmaps to clarify common understanding necessary for the implementation.

Description of the prioritized e-navigation solutions and RCOs

S1: improved, harmonized and user-friendly bridge design:

[TBD]

S2: means for standardized and automated reporting:

[TBD]

S3: improved reliability, resilience and integrity of bridge equipment and navigation information:

[TBD]

S4: integration and presentation of available information in graphical displays received via communication equipment:

[TBD]

S9: improved Communication of VTS Service Portfolio²:

[TBD]

To give effect to the proposed main solutions, the following RCOs have been identified:

[Note: take into account document NAV 59/6/1 (Australia)]

RCO 1: integration of navigation information and equipment including improved software quality assurance

[TBD]

² Not limited to VTS stations.

RCO 2: bridge alert management

[TBD]

RCO 3: standardized mode(s) for navigation equipment

[TBD]

RCO 4: automated and standardized ship-shore reporting

[TBD]

RCO 5: improved reliability and resilience of onboard PNT systems

[TBD]

RCO 6: improved shore-based services

[TBD]

RCO 7: bridge and workstation layout standardization

[TBD]

* * *

ANNEX

**DRAFT FRAMEWORK FOR OVERALL PLANNING OF IMO'S
E-NAVIGATION STRATEGY IMPLEMENTATION PLAN
(TECHNICAL ASPECT)
2015-2019**

RCO	Remarks/Proposed initial actions
RCO 1 NAV 59/6, annex 1, section 7.2.1	SN.1/Circ.266/Rev.1 and MSC.1/Circ.1389 are of relevance; Guidelines on software quality assurance need to be developed. IHO's S-100 Data model needs to be developed further IHO with input from other users. INS (resolution MSC.252(83)) including resolution MSC.191(79) plus SN./Circ.243 are relevant.
RCO 2 NAV 59/6, annex 1, section 7.2.2	Resolution A.1021(26) – <i>Code on alerts and indicators, 2009</i> provides general design guidance and promotes uniformity of type, location and priority for alerts and indicators.
RCO 3 NAV 59/6, annex 1, section 7.2.3	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.
RCO 4 NAV 59/6, annex 1, section 7.2.4	SOLAS regulation V/28, resolution A.851(20) of 1997 and FAL forms are available; AIS and LRIT already exist. Review and, if necessary, develop updated guidance on the matter including the use of IHO's S-100 Data model.
RCO 5 NAV 59/6, annex 1, section 7.2.5	Still to be addressed by Member Governments. Trials on resilient PNT systems are ongoing. A resilient PNT is a must for e-navigation. Provision of resilient PNT data relies on the exploitation of existing, modernized and future radionavigation systems, sensors and services.
RCO 6 NAV 59/6, annex 1, section 7.2.6	IALA, IHO and other relevant organizations e.g. national Port authorities and IHMA. 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.
RCO 7 NAV 59/6, annex 1, section 7.2.7	A.694(17), A.997(25), MSC/Circ.982 on <i>Guidelines on Ergonomic Criteria for Bridge Equipment and Layout</i> , resolutions MSC.64(67), annex 1 and MSC.86(70), annex 3, as amended by resolution MSC.252(83). Guidelines to be reviewed/developed in consultation with ISO/IEC. SN.1/Circ.265, 274 and 288 also of relevance. ISO 8468:2007 Ship's bridge layout and associated equipment.

RCO	TIMELINE FOR THE IMO'S E-NAVIGATION STRATEGY IMPLEMENTATION PLAN (TECHNICAL ASPECT) 2015-2019														
	2015			2016			2017			2018			2019		
	NCSR	HTW	MSC	NCSR	HTW	MSC	NCSR	HTW	MSC	NCSR	HTW	MSC	NCSR	HTW	MSC
RCO 1															
RCO 2															

RCO	TIMELINE FOR THE IMO'S E-NAVIGATION STRATEGY IMPLEMENTATION PLAN (TECHNICAL ASPECT) 2015-2019														
RCO 3															
RCO 4															
RCO 5															
RCO 6															
RCO 7															

-
- * 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.
-