INTERNATIONAL MARITIME ORGANIZATION

E

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56th session
Agenda item 8

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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 27 and 28 July 2010 under the chairmanship of Mr. John Erik Hagen (Norway).

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

ARGENTINA
AUSTRALIA
BAHAMAS
BELGIUM
BRAZIL
CANADA
CHINA
DENMARK
FINLAND
FRANCE
GERMANY
GREECE
IRELAND
ITALY
JAPAN
KENYA
NETHERLANDS
NIGERIA
NORWAY
PANAMA
POLAND
REPUBLIC OF KOREA
RUSSIAN FEDERATION
SINGAPORE
SOUTH AFRICA
SWEDEN
TURKEY
UKRAINE
UNITED KINGDOM
UNITED STATES
VANUATU

1.3 The Working Group was attended by a delegate from the following Associate Member of IMO:

HONG KONG, CHINA

1.4 The Working Group was attended by a representative from the following United Nations specialized agency:

WORLD METEOROLOGICAL ORGANIZATION (WMO)

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

BIMCO
EUROPEAN COMMISSION (EC)
CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA)
INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO)
INTERNATIONAL MOBILE SATELLITE ORGANIZATION (IMSO)
COMITÉ INTERNATIONAL RADIO-MARITIME (CIRM)
INTERNATIONAL TRANSPORT WORKERS' FEDERATION (ITF)
INTERNATIONAL ASSOCIATION OF MARINE AIDS TO NAVIGATION AND LIGHTHOUSE AUTHORITIES (IALA)
INTERNATIONAL ASSOCIATION OF INSTITUTES OF NAVIGATION (IAIN)
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
OIL COMPANIES INTERNATIONAL MARINE FORUM (OCIMF)
THE NAUTICAL INSTITUTE (NI)

2 TERMS OF REFERENCE

2.1 The e-navigation Working Group should consider the relevant documents submitted under agenda item 8, in particular, NAV 56/8 (Norway), NAV 56/8/8 (Singapore), NAV 56/8/9 (Japan) including the information provided in documents NAV 56/INF.6 (Canada), NAV 56/INF.7 (Singapore), NAV 56/INF.9 (Nautical Institute), NAV 56/INF.10 (Republic of Korea), NAV 56/INF.13 and NAV 56/INF.14 (Japan), plus the outcome of NAV 55, COMSAR 14 and documents submitted by IALA in support of the Correspondence Group and, taking into account any decisions of, and comments and proposals made in, Plenary, undertake the following tasks:

.1 review the report of the Correspondence Group and provide comments and recommendations with respect to the actions requested in paragraphs 71.2 to 71.10 of document NAV 56/8;

.2 review and finalize the user needs (NAV 56/8, annexes 2, 3, 4 and 5);

.3 review and consolidate the process of completing initial gap analysis and provide comments/recommendations including methodology for addressing future user needs;

.4 review and consolidate the process of completing initial cost/benefit and risk analysis and provide comments/recommendations;

.5 review and revise the terms of reference for a correspondence group to progress work intersessionally for reporting to STW 42, COMSAR 15 and NAV 57, based on the joint plan of work approved by MSC 86;

.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, 29 July 2010 for consideration at Plenary.

3 REPORT OF THE CORRESPONDENCE GROUP

3.1 The Group reviewed the report of the correspondence group (NAV 56/8) and agreed to recommend to the Sub-Committee, as set out in paragraphs 3.2 to 3.8 below.

3.2 The Group endorsed the recommendations of COMSAR 14 concerning the various components of the e-navigation architecture with the understanding that these should be reviewed as the work on e-navigation progresses performed by the ongoing work of the correspondence group. The delegations of Germany and the Netherlands expressed the view that the correspondence group should be encouraged to draft a revised scheme of foreseen e-navigation architecture (figure 2 of document NAV 56/8 – Report of the correspondence group).

3.3 The Group endorsed the concept of the functional architecture as outlined in the report of the correspondence group and recommended by COMSAR 14, taking into account that the outcome of various analyses (gap, cost and risk) would lead to the identification of a proposed technical architecture for e-navigation. Furthermore, as instructed by the Sub-Committee, the Group agreed to delete reference to Vessel Traffic Management, as set out in annex 1.

3.4 The Group endorsed the initial gap analyses prepared by the correspondence group. In this context, the Group recognized that issues related to legal restriction on the use and reuse of data would need to be addressed at some stage. The Group confirmed that the reliability and availability of information was critical to address the user needs.

3.5 The Group endorsed the initial cost benefit and risk analyses and agreed to consolidate the outcome of its initial analyses with that of COMSAR. In this context, the Group recognized that the terms "reduced workload" and "reduced regular releases" could be related to "efficient management of workload" and "reduction of regular reports sent by a vessel to shore authorities" respectively.

3.6 The Group endorsed that the identified user needs of e-navigation should be taken into account in regards to the scoping exercise concerning an eventual review of GMDSS.

3.7 The Group noted that the common maritime information and data structure, which could contain IALA's Universal Maritime Data Model (UMDM), IHO's Universal Hydrographic Data Model (UHDM), etc., would require some form of overarching coordination to ensure the ongoing management and maintenance of the structure.

3.8 The Group supported the identification of areas of services of e-navigation, i.e.:

.1 harbour operations;

.2 operations in coastal and narrow water;

.3 trans ocean voyages;

.4 offshore operations; and

.5 operations in arctic and remote areas.

3.9 The Sub-Committee is invited to concur with the decisions as set out in paragraphs 3.2 to 3.8 above.

4 USER NEEDS

4.1 The Group reviewed the user needs prepared by the correspondence group and considered the information provided in documents NAV 56/8/9 (Japan), NAV 56/INF.6 (Canada), NAV 56/8/1 (IALA), NAV 56/INF.3 (IALA) and NAV 56/INF.14 (Japan).

4.2 In this context, the Group noted the information provided in documents NAV 56/8/1 (IALA), NAV 56/INF.3 (IALA) and NAV 56/INF.14 (Japan).

4.3 Having considered the information contained in document NAV 56/INF.6 (Canada), after some discussions, the Group agreed that:

.1 the information relating to e-navigation on the IMO website should be updated;

.2 users, in particular seafarers, should continue to be involved during the development of an e-navigation strategy implementation plan;

.3 the correspondence group should develop an information document and presentation material to assist any Member States and international organizations that might want to promote e-navigation;

.4 Member States and international organizations holding such promotion events should be encouraged to provide feedback reports to the Sub-Committee; and

.5 "Frequently Asked Questions" relating to e-navigation should be posted on the IMO website and updated on a regular basis,

and invited the Sub-Committee to concur with the decision of the Group.

4.4 The Group considered the information set out in document NAV 56/8/9 (Japan) and recognized that there was a need to establish procedures and criteria to develop the methodology to assess the usability of navigational equipment. In this context, the delegation of Japan informed the Group that they would consider these issues and make an appropriate submission to NAV 57. The Group also noted the information provided in document NAV 56/INF.13 (Japan).

4.5 After some discussions, the Group finalized the user needs as prepared by the correspondence group with some amendments, as set out in annexes 2 to 5, which the Sub-Committee is invited to approve. In this context, the Group agreed that the methodology used in documents NAV 55/11/4 (United Kingdom) and NAV 56/INF.10 (Republic of Korea) should be used to identify future user needs and that the correspondence group should consider merging these two methodologies.

5 INITIAL GAP ANALYSIS

5.1 The Group reviewed the initial gap analysis prepared by the correspondence group along with the information contained in documents NAV 56/8/2 (IALA), NAV 56/8/3 (IALA), NAV 56/8/4 (IALA), NAV 56/8/6 (IALA), NAV 56/8/8 (Singapore), NAV 56/INF.7 (Singapore), NAV 56/INF.9 (NI) and NAV 56/INF.10 (Republic of Korea).

5.2 The Group noted the information provided in documents NAV 56/8/3 (IALA), NAV 56/8/4 (IALA), NAV 56/8/6 (IALA), NAV 56/8/8 (Singapore) and NAV 56/INF.7 (Singapore).

5.3 The Group further noted that the United Kingdom had undertaken a preliminary laboratory based study into the possible effects of WiMAX transmissions within bands both at 2.6 GHz and 3.4 GHz on the performance of S-Band maritime radars. The results of the study were not conclusive but demonstrated the potential for detrimental effects to radar performance; these effects appeared to be frequency dependent according to the type of radar being used. As a result the United Kingdom was considering further work both to confirm and to better quantify these effects. It was also noteworthy that more profound effects had been identified from research with Air Traffic Control radars also operating within "S" Band and further work was also being undertaken in this area. A report on the initial study and hopefully an update on work currently being done would be provided by the United Kingdom to MSC 88.

5.4 The Group noted the information provided in document NAV 56/INF.9 (NI) relating to the development of a common data infrastructure for e-navigation. In this context, the Group considered the need for a workshop on the creation of a framework for data access and information services under the scope of SOLAS to ensure that these are harmonized and interoperable. To this end, the Group agreed that the correspondence group could be tasked to develop the aforementioned framework. Furthermore, the delegation of Norway expressed the view that they could consider holding a workshop that could provide input to the correspondence group. The IHO observer offered their Headquarters in Monaco as the venue for this workshop.

5.5 Having considered the information provided in document NAV 56/INF.10 (Republic of Korea), the Group agreed that this could be considered as the basis for initial gap analysis of the shipboard user needs. Furthermore, the Group recalling the joint work plan for COMSAR, NAV and STW Sub-Committees for the period 2009-2012, invited the Sub-Committee to invite IALA and IHO to finalize the gap analysis on shore-side aspects and report to COMSAR 15 and NAV 57.

5.6 The Group also agreed that the methodology used by the Republic of Korea could be the basis for the gap analysis and to a blank template presented by the Chairman, as set out in annex 6, which could be used for new issues identified. The Group further agreed that this work should be carried out intersessionally by the correspondence group.

5.7 Having considered the information provided in document NAV 56/8/2 (IALA), the Group expressed the view that the IALA Maritime Radio Communication Plan could assist in the selection of radio communication systems required to support e-navigation.

5.8 With reference to supporting the continued use of existing maritime channels for general analogue and digital communication, and more specifically the spectrum around 500 kHz and the Appendix 17 channels, the Group noted that other IMO sub-committees and/or partner organizations, forming the World-Wide Radio Warning Service, might have an interest in implementing a new digital broadcasting system on 500 kHz. The Group also noted that ITU Working Party 5B had developed a preliminary Draft New Report on the utilization of 500 kHz band for safety and security-related information. The Group recognized that this was an important service and agreed that the Joint IMO/ITU Expert Group on Maritime and Radiocommunication Matters should be invited to consider further use of the 500 kHz band to support e-navigation. The Sub-Committee is invited to instruct the Joint IMO/ITU Working Group accordingly.

6 COST-BENEFIT AND RISK ANALYSES

6.1 The Group reviewed the cost benefit and risk analyses prepared by the correspondence group and agreed that the gap analysis along with the proposed solutions would need to be completed before undertaking the task of cost benefit and risk analyses.

6.2 The Group further agreed that when conducting the gap, cost benefit and risk analyses, emphasis should be placed on the needs of the end user, which could include reliability and availability of systems proposed.

6.3 Furthermore, cost benefit and risk analyses may include an impact assessment providing an overall and transparent view on the consequences of the implementation of the proposed solutions on all stakeholders. The results of this impact assessment should support all stakeholders in the strategy implementation plan process.

7 TERMS OF REFERENCE OF A CORRESPONDENCE GROUP

7.1 In light of the discussions set out in sections 3 to 6 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[1] as set out in annex 7. In case the correspondence group needed to continue its work beyond NAV 57, these terms of reference would need to be reviewed by NAV and COMSAR Sub-Committees. The Sub-Committee is invited to establish the correspondence group and approve the terms of reference.

7.2 Furthermore, the Group, noting that NAV 57 was now scheduled from 6 to 10 June 2011, recognized that the correspondence group would not be able to meet the bulky document deadline to report the outcome of COMSAR 15 in its report to NAV 57. Accordingly, the Group invited the Sub-Committee to extend the deadline for submission of its report to 1 April 2011.

8 ANY OTHER BUSINESS

8.1 The Group noted the information provided in document NAV 56/INF.16 (United Kingdom) and agreed that the information could be used as input for the gap analysis along with other alternative solutions that might be available.

9 ACTION REQUESTED OF THE SUB-COMMITTEE

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

.1 endorse the recommendations of COMSAR 14 concerning the various components of the system architecture with the understanding that these should be reviewed as the work on e-navigation progresses (paragraph 3.2);

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.2 endorse the concept of the functional architecture, as outlined in the report of the correspondence group and recommended by COMSAR 14, taking into account that the outcome of various analyses (gap, cost and risk) will lead to the identification of a proposed technical architecture for e-navigation (paragraph 3.3 and annex 1);

.3 endorse the initial gap analyses prepared by the correspondence group (paragraph 3.4);

.4 endorse the initial cost benefit and risk analysis (paragraph 3.5);

.5 endorse that the identified user needs of e-navigation should be taken into account in regards to the scoping exercise concerning an eventual review of GMDSS (paragraph 3.6);

.6 note that the common maritime information and data structure, which could contain IALA's UMDM, IHO's UHDM, etc., would require some form of overarching coordination to ensure the ongoing management and maintenance of the structure (paragraph 3.7);

.7 support the identification of areas of services of e-navigation (paragraph 3.8);

.8 agree that:

.1 the information relating to e-navigation on the IMO website should be updated;

.2 users, in particular seafarers, should continue to be involved during the development of an e-navigation strategy implementation plan;

.3 Member States and international organizations holding e-navigation promotion events should be encouraged to provide feedback reports to the Sub-Committee; and

.4 "Frequently Asked Questions" relating to e-navigation should be posted on the IMO website and updated on a regular basis (paragraph 4.3);

.9 note the discussions of the Group relating to the development of the methodology to assess the usability of navigational equipment (paragraph 4.4);

.10 approve the user needs prepared by the Group, as set out in annexes 2 to 5 (paragraph 4.5 and annexes 2 to 5);

.11 invite IALA and IHO to finalize the gap analysis on shore-side aspects and report to COMSAR 15 and NAV 57 (paragraph 5.5);

.12 note the discussions of the Group relating to initial gap analysis (section 5);

.13 invite the Joint IMO/ITU Expert Group on Maritime Radiocommunication Matters to consider further use of the 500 kHz band to support e-navigation (paragraph 5.8);

.14 note the discussions of the Group relating to cost benefit and risk analyses (section 6);

.15 establish the correspondence group and approve its terms of reference (paragraph 7.1 and annex 7); and

.16 bearing in mind that the correspondence group would not be able to meet the bulky document deadline to report the outcome of COMSAR 15 in its report to NAV 57, extend the deadline for submission of its report to 1 April 2011, subject to endorsement by the Committee.

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ANNEX 1

ARCHITECTURE TO THE "DEVELOPMENT OF AN E-NAVIGATION STRATEGY IMPLEMENTATION PLAN"

ABBREVIATIONS

AIS	Automatic Identification System
AToN	Aids To Navigation
BRM	Bridge Resource Management
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
COMSAR	IMO's Sub-Committee on Radiocommunications and Search and Rescue
CG	Coordination Group
EC	European Commission
ECDIS	Electronic Chart Display and Information System
EGNOS	European Geostationary Navigation Overlay Service
ENC	Electronic Navigation Chart
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
GMDSS	Global Maritime Distress Safety System
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IAMSAR	International Aeronautical and Maritime Search And Rescue manual
IBS	Integrated Bridge System
ICT	Information and Communication Technology
IEC	International Electrotechnical Commission
IFMSA	International Federation of Shipmasters' Associations
IHO	International Hydrographic Organization
IMDG	International Maritime Dangerous Goods Code
IMSBC	International Maritime Solid Bulk Cargoes Code and Supplement
IMO	International Maritime Organization
ISM	International Safety Management Code
INS	Integrated Navigation System
	Information Service (in the context of VTS)
ISO	International Organization for Standardization
ISPS	International Ship and Port Facility Security Code
LRIT	Long Range Identification and Tracking
MARNIS	(Project) Maritime Navigation Information Services
MARPOL	International Convention for Prevention of Pollution from Ships
MEPC	IMO's Marine Environment Protection Committee
MRCC	Maritime Rescue Coordination Centre
MSC	IMO's Maritime Safety Committee
MSI	Maritime Safety Information
NAS	Navigation Assistance Services
NAV	IMO's Sub-Committee on Safety of Navigation
NAVTEX	Navigation Telex
NI	The Nautical Institute
OPRC	International Convention on Oil Pollution Preparedness, Response and Cooperation
PAN	Possible Assistance Needed
S-MODE	A function to bring navigation displays into standard format
SOLAS	Safety Of Life At Sea
SRS	Ship Reporting Systems
TOS	Traffic Organization Service
STCW	Standard of Training, Certification and Watchkeeping for seafarers
VDR	Voyage Data Recorder
VOS	Voluntary Observing Ship
VTM	Vessel Traffic Management
VTS	Vessel Traffic Services

WMO	World Meteorological Organization
WMU	World Maritime University
WWRNS	World Wide Radio Navigations Systems

Table of Contents

1. Introduction

1.1. Background

Brought forward by IALA, adopted by NAV 53/13 and further developed by NAV 54/WP.6, the objective of e-navigation was formulated as follows:

"*E-navigation is intended to meet present and future user's needs through harmonization of marine navigation systems and supporting shore services.*"

In the same document e-navigation is defined in the following way:

"*E-navigation is the harmonized collection, integration, exchange, presentation and analysis of marine 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*"

To become workable the definition of e-navigation needs to be given a more concrete form. The work of breaking it down into detail should be guided by an architecture.

NAV 54/13 confirms the need for an architecture stating that "… *Key strategy elements for e-navigation include: Architecture, Human Element, Convention and Standards, Position Fixing, Communication and Information Systems, ENCs, Equipment and Standardization and Scalability* …"

The document further states "*The overall conceptual, functional and technical architecture will need to be developed and maintained, particularly in terms of process description, data structures, information systems, communications technology and regulations.*"

Architecture is thus the framework within which the Correspondence Group should work. Architecture will safeguard that work is conducted in a systematic manner, that processing of information will be continuously kept at the centre of the work, that those results that have already been achieved will be integrated in the continued work, and eventually, that work will be oriented towards tangible results.

The architecture shall:

- Assist in defining e-navigation concepts and terminology
- Assist in making analyses that provides consistent and firmly based solutions.
- Provide an overall understanding of the e-navigation concept (responsibilities, roles, functions, flows of information, etc.)
- Assist in finding new needs for new solutions, i.e. needs that are not captured by the current user requirements
- Assist in finding new and improved solutions, e.g., new and simplified procedures can be enabled by means of new technology and new systems.
- Define non-technical requirements to the realization
- Specify technical realization

The first step is to assess User Needs/User Requirements. Based on these, the required functions and flows of information related to e-navigation should be identified. The boundaries of e-navigation need to be defined.

This paper is a first outline of the architecture that will assist in achieving the objective of e-navigation. It is understood that much work still remains to be done.

1.2. User requirements

The work to develop e-navigation starts by studying the navigators' requirements for new harmonized technology applications that may significantly facilitate processing and

presentation of navigation information. The ship and more specifically the navigation bridge are at the centre.

Much work has already been done by IALA, E-NAV and COMSAR. At this stage it constitutes a major source of input to Architecture.

The IALA documents on User Needs/User Requirements, specifically the "IALA E-navigation User Needs Capture Methodology Template" (NAV 54/13, annex 4) are of specific interest.

Shipboard/Shore-based "User Needs"
MSC 86/23/4 states that the identification of user needs should be "the first step in the implementation process" of the e-navigation implementation plan. It further states that a structured approach will be required to capture evolving user needs, making use of the existing agreed methodology, to incorporate ensuing changes into the strategy and implementation plan. MSC 85/26/Add.1 lists in annex 2 a number of "potential ship borne and shore-based users". Annex 21 of the same describes the "Framework for the implementation process for the e-navigation strategy".

IFSMA and the Nautical Institute (NI) were involved with addressing the issue of User Needs from the point of view of mariners of all ranks. In NAV 55/INF.8, IFSMA presents a table of ship-board user needs. Due to the *ad hoc* method of capturing these user needs, and the wide diversity of mariners and ship types, no prioritization of these needs should be assumed.

NAV 55/INF.9 describes the results of a worldwide survey conducted by Germany to determine detailed e-navigation user needs. It also contains a questionnaire based on high-level user needs as specified in NAV 54/25. The survey focuses primarily on onboard user needs.

NAV 55/WP.5/4. In an annex to this document, U.K. proposes a methodology for development of user needs as well as the table "Preliminary User Requirements".

Eventually NAV 55/WP.5 developed the "Preliminary Detailed Shipboard User Needs and Priorities" (NAV 55/WP.5, annex 1).

NAV 55/WP.5 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. The European Commission 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.

NAV 55/WP.5 confirms that user needs are of paramount importance and the driving force for the e-navigation concept and that it is necessary to verify and update the user requirements as and when necessary during the implementation process of the Organization's e-navigation strategy.

The introduction of e-navigation will require interoperability of technical components, standardization of information exchange and automation. New functions as well as procedures will need to be integrated with existing ones. Care must be taken that new components, roles, functions as well procedures are compatible with the existing ones during the overall transition process. Attention to a proper education, training and familiarization for all operators involved is paramount.

1.3. The architecture specification process

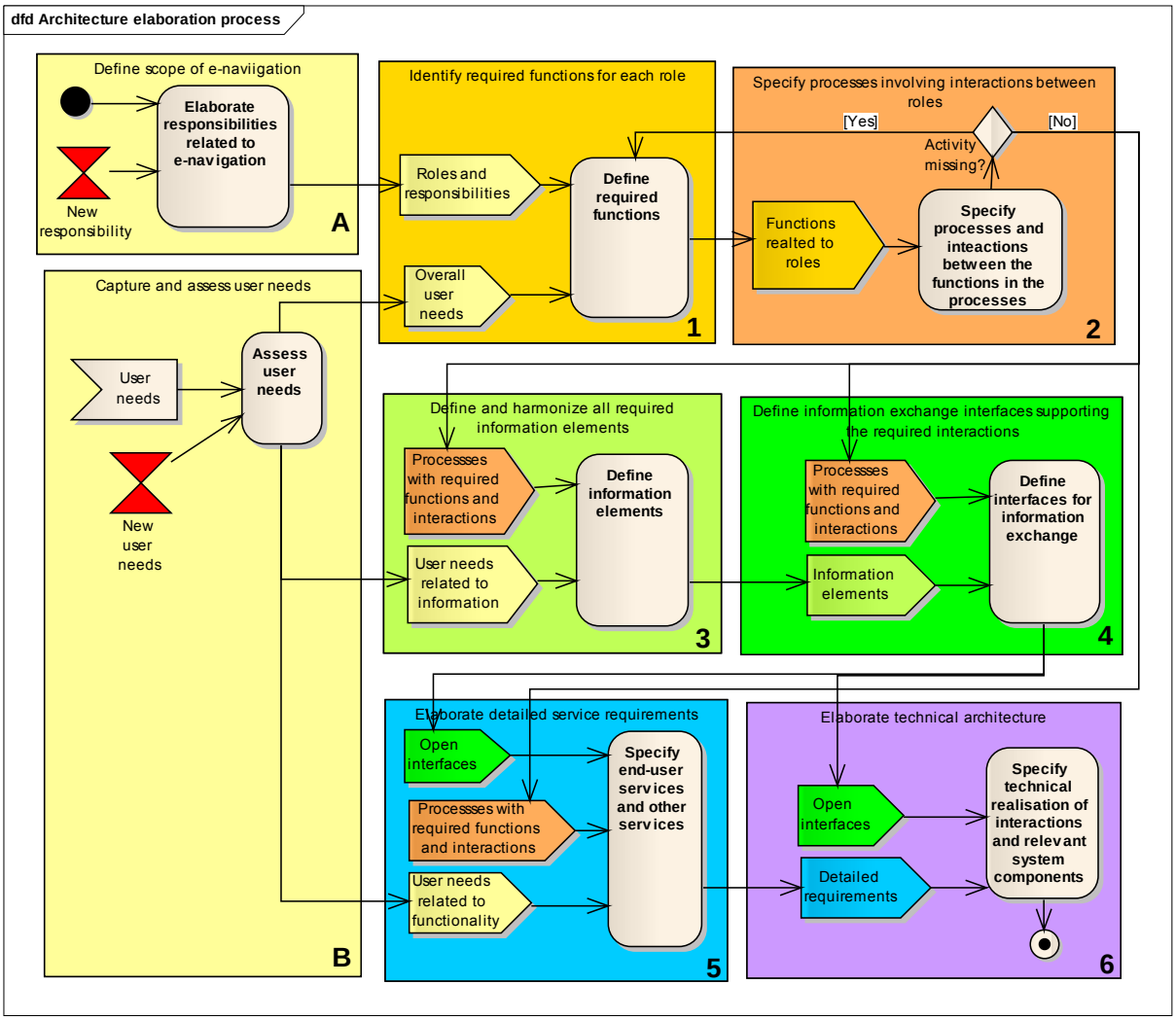

Figure 1: The architecture elaboration process

Figure 1 illustrates the architecture specification process, and the figure is explained in the following.

The scope and content of e-navigation (area A and B):
Area A and B in the figure addresses the premises for the architectural work:

- The scope of e-navigation is defined by means of the responsibilities that are considered as a part of e-navigation (area A)
- User needs are captured and assessed (area B)

As indicated by the red events in the figure, the specification is an iterative process. New responsibilities may at any time be defined to be a part of the e-navigation concept (e.g., due to policy decisions or due to a more mature definition of e-navigation) and, in the same way, new user needs may emerge (e.g., needs detected during the work on the architecture or provided by other sources).

Functions (area 1)
Area A will as mentioned above define responsibilities, and a role represents a unique and generic set of such responsibilities. A stakeholder (a person or an organization) may have several different responsibilities (roles), and a stakeholder with a role accounts for functions (or activities) contributing to the fulfilment of the responsibilities of the role. In area 1 the functions of the roles related to e-navigation are identified.

Processes (area 2)
The functions identified in area 1 may require input and they may also generate output. The input and the output will be provided from or delivered to other functions, functions belonging to other roles included. Thus, the functions belong to processes. Several roles may be involved in a process, and there may be interactions between functions belonging to different roles.

The specifications of the processes are important for more reasons:

- The required interactions are identified.
- Missing functions and insufficient function descriptions can be detected (feedback must be provided to area 1, as indicated in the figure).
- The process descriptions may expose cumbersome procedures and facilitate assessments and, if required, reengineering of the processes. New technology may for example be utilized to simplify procedures.
- In case of reengineering, harmonization of interactions should be considered (to reduce the number of different interfaces).

Information elements (area 3)
The required information elements are identified and specified based on the functions that are to be carried out and the required interactions.

The user needs (from area B) may also address information needs. Note that additional user needs may emerge leading to the identification of new information needs.

The same information elements may be required by many functions and in many interactions. Thus, the naming of the information elements and the specification of the information content should be harmonized across the whole e-navigation concept.

Information exchange interfaces (area 4)
The interactions between the functions identified in the process descriptions (see area 2) are defined by means of the information elements (see area 3). Information elements are combined into specifications of the content of the information that is exchanged (i.e. the information exchange interfaces), e.g., between on-board and on-shore systems. In this way the interactions are defined in a precise, but technology independent way.

Service requirements (area 5)
The process description from area 2 (functions and interactions) and the information exchange interfaces from area 4 (how to interact) are together with user needs from area B the basis for the specification of ICT services (i.e. the functionality of the ICT solutions). This includes both end-user services and services provided to other systems (e.g., single window services). Thus, user interface, Information validation and processing, communication requirements (use of the interfaces from area 4), etc., must be specified.

Technical architecture (area 6)
The technical architecture will specify the implementation of the ICT services (see area 5), i.e. the systems, the system components, the communication, etc. Different options could exist for technical realization of interactions and relevant system components. A technical assessment process is necessary to select the best choice of technical realization, e.g., need for redundancy.
A.

2. Responsibilities (the roles of stakeholders)

The e-navigation concept defined by means of roles.
Refer § §10 and 11 of the Report.

3. Functions

As mentioned above, stakeholders have various responsibilities. A role represents a unique and generic set of such responsibilities. The stakeholder should within the role account for functions (or activities) contributing to the fulfilment of the responsibilities of the role. A stakeholder (a person or an organization) may have several different responsibilities (roles). The functions to fulfil the responsibilities may be carried out by person(s) or system(s), or a combination of both.

In the following, for each role the generic functions related to e-navigation are described in the Tables below.

In e-navigation the level of automation will increase. Some functions may be automated, while others will continue to be carried out through interactions between persons and systems. Seamless information flows and improved access to electronic information will arrange for automated processing and assessments across different information sources. Information should be made useful in a context of decision support by increasing situation awareness and should lead the decision maker to rational decisions and actions.

3.1. Functions carried out on board ship – Master's formal responsibilities

The Master role is formally responsible for all functions carried out onboard a vessel. Although the Master delegates tasks to crew members, e.g., bridge team, the formal responsibility remains with him.

This paper does not address delegation of tasks by the Master, e.g., to the bridge team.

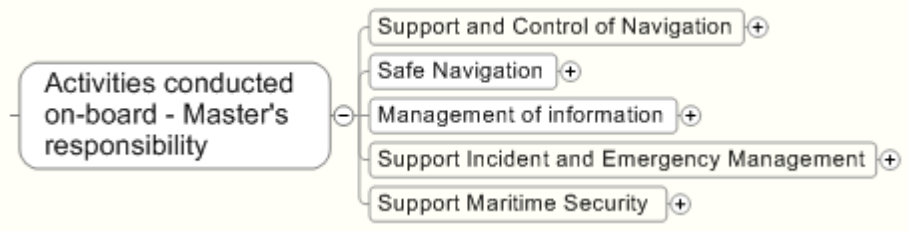

Figure 2: The overall onboard functions that are under the formal responsibility of the Master

Information processing functions conducted on the ship's navigation bridge were divided into sub-functions:

- Support and Control of Safe Navigation
- Safe Navigation
- Management of Information
- Support to Incident Handling and Emergency Management
- Support Maritime Security

Several conventions, regulations and practices define the rules and premises for the functions, e.g.:

SOLAS	International Convention for the Safety of life at sea, 1974, as amended
	ISM International Safety Management Code
	ISPS International Ship and Port Facility Security Code
COLREG	Convention on the International Regulations for Preventing Collisions at Sea, 1972
STCW	Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended (including Bridge Resource Management, BRM)
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973, as amended
IMDG	International Maritime Dangerous Goods Code

3.1.1. Support and Control of Navigation

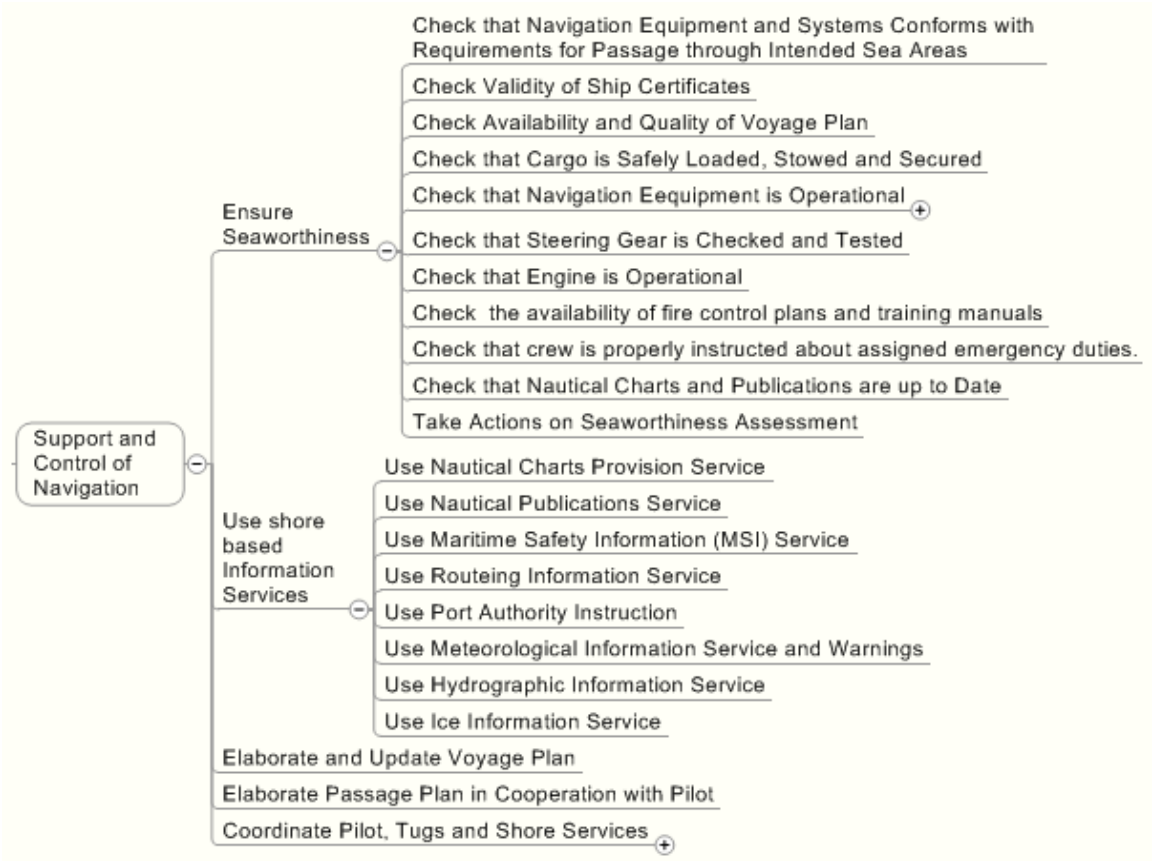

Figure 3: Decomposition of Support and Control of Navigation

These functions shall support and control the Safe Navigation function (see 3.1.2).

Functional decomposition	References to existing requirements
A1 Ensure seaworthiness This function is carried out in connection with the ships departure from port/anchorage for the sea. Fulfilment of the tasks listed below is part of ensuring safe navigation. However, the execution of the tasks themselves may not be within the scope e-navigation. It includes: A1.1 Check that Navigation Equipment and Systems Conforms with Requirements for Passage through Intended Sea Areas A1.2 Check Validity of Ship Certificates A1.3 Check Availability and Quality of Voyage Plan A1.4 Check that Cargo is Safely Loaded, Stowed and Secured A1.5 Check that Navigation Equipment is Operational (back up systems included). A1.6 Check that Steering Gear is Checked and Tested A1.7 Check that Engine is Operational A1.8 Check the availability of fire control plans and training manuals. A1.9 Check that crew is properly instructed about assigned emergency duties. A1.10 Check that Nautical Charts and Nautical Publications are up to Date A1.11 Take Actions Based on Seaworthiness Assessment	A1 Resolution A.741 (18), ISM Code A1.1 SOLAS, Chapter V, Regulations 15, 16 and 19 SOLAS, Chapter IV, Radio communications Proposal: DE 53/18/2 ("Polar Code"), Chapter 12, Navigation Equipment A1.2: SOLAS, Chapter I, Regulation 14 and ISM Code A1.3: SOLAS, Chapter V, Regulation 34 and ISM Code A1.4: SOLAS, Chapters VI – VIII A1.5: SOLAS, Chapter V, Regulation 19, paragraph 2.9:4 A1.6: SOLAS, Chapter V, Regulations 24, 25, 26 A1.8: SOLAS, Chapter II-2, Part E, Regulation 15 A1.9: SOLAS, Chapter III, Part B, Regulation 19 A1.10: SOLAS, Chapter V, Regulation 27
A2 Use Shore Based Information Services Information required for navigation in the areas of the voyage plan is captured either by automatic transmission (MSI), by specific information requests or purchase/subscription of publications. A2.1 Use Nautical Charts Provision Service A2.2 Use Nautical Publication Service (e.g., sailing directions) A2.3 Use Maritime Safety Information (MSI) Service A2.4 Use Routeing Information Service A2.5 Use Port Authority Instruction (e.g., berth, time slot) A2.6 Use Meteorological Information Service and Warnings A2.7 Use Hydrographic Information Service A2.8 Use Ice Information Service (e.g., "Ice Patrol" service)	A2.1 SOLAS, Chapter V, Regulation 27 A2.2 SOLAS, Chapter V, Regulation 27 A2.3 SOLAS, Chapter IV, Radio communications A2.4 SOLAS, Chapter V, Regulation 10 A2.5 According to local bye-laws A2.6 SOLAS, Chapter V, Regulation 5 A2.7 SOLAS, Chapter V, Regulation 9 A2.8 SOLAS, Chapter V, Regulation 6 **NAV 55/WP.5, annex 1, "Preliminary Shipboard User Needs and Priorities":** • Mariners expressed a desire for documents such as Charts and voyage planning publications to be automatically updated with minimal shipboard intervention. • Give consideration to a proper electronic format for the data rather than digital copies of existing documents. • Note the need for traceability and ability to audit • Possible re-formatting of NAVTEX data and continuing with transmitting data on same frequencies. • Consider transition from old to new format • Task-oriented presentation based on INS-tasks MSC.252(83).

Functional decomposition	References to existing requirements
A3 Elaborate and Update Voyage Plan The voyage plan is elaborated before the ship's departure from port/anchorage. It is continuously updated during the voyage.	**Error! Reference source not found.** SOLAS, Chapter V, Regulation 34
A4 Elaborate Passage Plan in Cooperation with Pilot Carried out when appropriate.	A4 Resolution A.893(21) and Resolution A.960, Annex II, Paragraph 5
A5 Coordinate Pilot, Tugs and Shore Services Coordination of pilots, tugs and port services (e.g., mooring). Coordination includes ordering of services (pilot, tugs, mooring, etc.) as well as coordination of the actual function (e.g., pilot boarding location and boarding time).	A5 Resolution A.960, Annex II, Paragraph 4

3.1.2. Safe Navigation

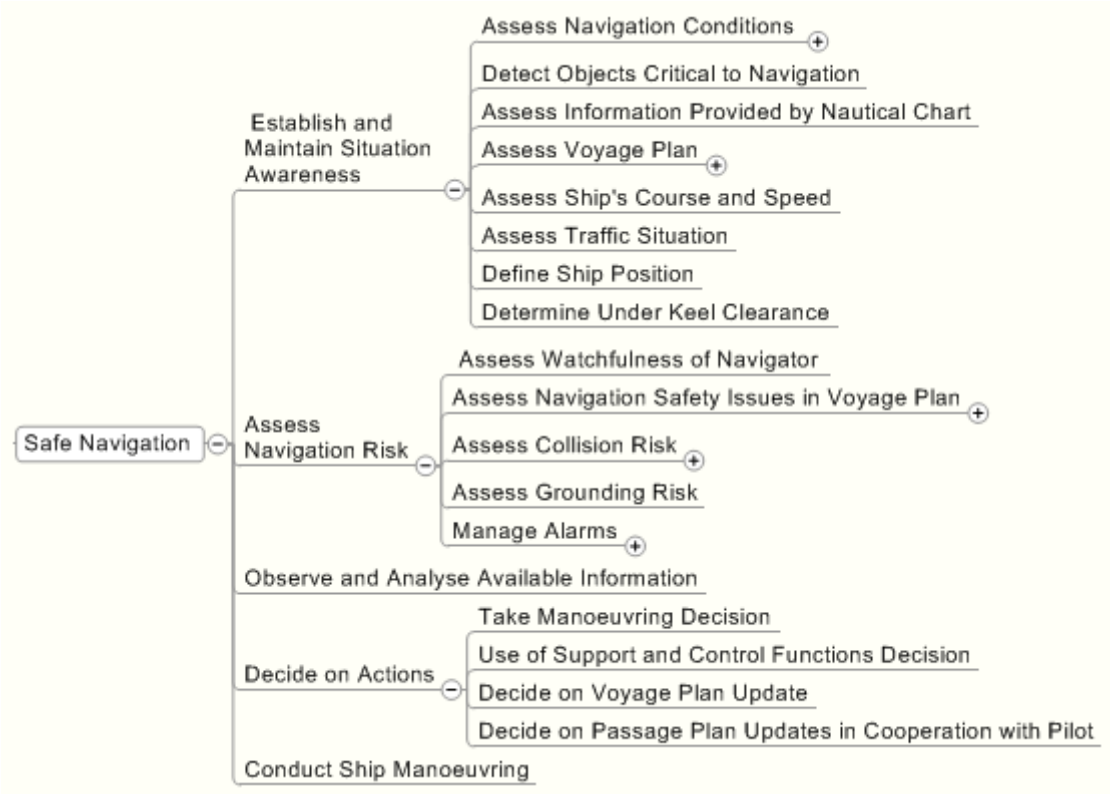

Figure 4: Decomposition of Safe Navigation

Functional decomposition	References to existing requirements
A6 Establish and Maintain Situation Awareness Based on available information (observations, forecasts, etc.), the current and expected navigation situation is assessed. Assessment includes: A6.1 Assess Navigation Conditions: a) Meteorological and Hydrographical Observations done by the Vessel itself (e.g., tide, wind, current, draft, other ships) and/or by information received from external sources. b) Meteorological and Hydrographical Forecasts Received from Shore c) Information Provided by the Pilot d) Other Information that may Affect Sailing Conditions A6.2 Detect Objects Critical to Navigation (e.g., other ships, floating objects, e.g., containers/growlers/icebergs, and land) A6.3 Assess Information Provided by Nautical Chart A6.4 Assess Voyage Plan (includes among others follow-up on adherence to plan, assessment of the quality of the plan, and calculation of ETA) A6.5 Assess Ship's Course and Speed A6.6 Assess Traffic Situation (Traffic Image) A6.7 Define Ship Position A6.8 Determine Under Keel Clearance	A6 STCW Section B-VIII/2, Bridge Resource Management (BRM) A6.1 SOLAS, Chapter V, Regulation 34 A6.1c) Resolution A.960 Annex ll, Paragraph 5.1 **NAV 55/WP.5, annex 1, "Preliminary Shipboard User Needs and Priorities":** • More effective guard zones to detect hazards pertaining to collisions and groundings • 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. • Training syllabus should include the use of such Guard Zones
A7 Assess Navigation Risk A7.1 Assess Watchfulness of Navigator A7.2 Assess Navigation Safety Issues in Voyage Plan. a) Assess Draft - Under Keel Clearance Compatibility b) Assess Air Draft c) Assess Compliance with Master's Standing Orders A7.3 Assess Collision Risk. a) Define Guard Zones b) Detect Targets (e.g., by radar, AIS hearing and sight) c) Monitor Ship's Position Related to targets d) Detect Collision Risk A7.4 Assess Grounding Risk A7.5 Manage Alarms a) Configure Alarms (alarm trigger levels, prioritization criteria, etc.) b) Assess Alarm Situation. c) Release Alarm	A7 MSC/Circ.878 & MEPC/Circ.346 (Interim Guidelines for the application of human Element analysing process (HEAP) to the IMO rule-making process) A7.3 COLREG, Rule 5

Functional decomposition	References to existing requirements
A8 Observe and Analyse Available Information Supported by the functions mentioned in 3.1.1, 0, 0 and 0, and by knowledge and experience based observation and analysis by bridge team, by data and information input from navigation systems safety of navigation is achieved.	A8 SOLAS, Chapter V, Regulations 15, 19, 22, 24, 25, 27 & A8 COLREG Rule 5 & Resolution A.960, BRM Procedures A8 Resolution A.960 Annex ll, Paragraph 5.1 **NAV 55/WP.5, annex 1, "Preliminary Shipboard User Needs and Priorities":** • Bridge layout should take expanded bridge teams and the pilot into account • Access to information at one place (multifunctional workplaces) • Availability of information in real-time with possible presentation on navigation displays. • Task-oriented presentation based on INS-tasks MSC.252(83). • Avoid risk of information overload by using user-selectable filters. • Greater standardization of functionality for bridge displays (humans/machine interface • Ergonomics and user friendliness should be included in bridge design • Design specification for current equipment • Bridge layout should take expanded bridge teams and the pilot into account • S-Mode function proposed at NAV 54 should be considered • Maintain balance between standardization and innovation
A9 Decide on Actions Based on the awareness established by the observations and analyses, the navigator undertakes A9.1 Take Manoeuvring Decisions A9.2 Use of Support and Control Function Decisions (e.g., decision to collect and analyse further data/ information - see 0) A9.3 Decide on Voyage Plan Update A9.4 Decide on Passage Plan Updates in Cooperation with Pilot	A9 SOLAS, Chapter V, Regulation 24 & COLREG Part B Rules 5-19 A9.4 Resolution A.960 Annex ll, Paragraph 5.1
A10 Conduct Ship Manoeuvring The actual manoeuvring actions are ordered and executed by navigator by means of the bridge equipment (engine orders, course orders, rudder orders, orders to tugs).	A10 COLREG Part B Rules 5-19 A10 Resolution A.960 Annex ll, Paragraph 5.1

3.1.3. Management of Information

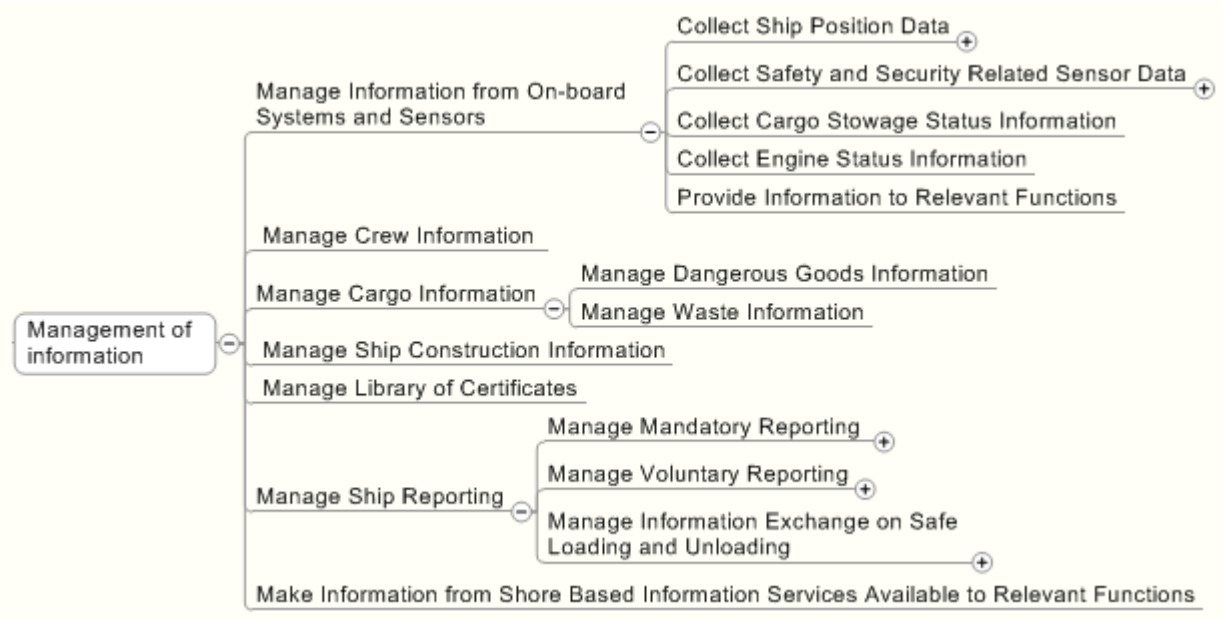

Figure 5: Decomposition of Management of Information

Functional decomposition	References to existing requirements
A11 Manage Information from On-board Systems and Sensors A11.1 Collect Ship Position Data (Various position-fixing systems: Lat/long by bearings to land, by global navigation satellite systems) A11.2 Collect Safety and Security Related Sensor Data (e.g., Voyage data recording, fire, security violations, oxygen/gas, humidity, etc.) A11.3 Collect Cargo Stowage Status Information (e.g., lashings) A11.4 Collect Engine Status Information A11.5 Provide Information to Relevant Functions	A11.1Chapter IV, Part C, Regulation 18 A11.2 Chapter V, Regulation 20 A11.3 Chapter IV, Regulation 5 A11.4 Chapter II-2, Regulation 14 and 16 A11.5 Chapter II-2, Regulation 16, paragraph 4 and Regulation 16
A12 Manage Crew Information	A12 SOLAS, Chapter XI-2, Regulation 5

Functional decomposition	References to existing requirements
A13 Manage Cargo Information A13.1 Manage Dangerous Goods Information A13.2 Manage Waste Information	A13.1 IMDG Code and IMSBC Code A13.1 IBC Code and IGC Code A13.2 MARPOL Annex V
A14 Manage Ship Construction Information (ship particulars included)	SOLAS, Chapter II-1, Part A_1, "Structure of Ships", Regulation 3-7
A15 Manage Library of Certificates	A15 SOLAS, Part 1, Appendix, "Certificates" & SOLAS, Part 2, Annex 1, "Certificates and documents to be carried on board ships"
A16 Manage Ship Reporting A16.1 Manage Mandatory Reporting a) Report Tracking Information b) Report Failure of Aids to Navigation (AToN) c) Report to Authorities (ISPS, IMDG, etc.) d) Send Danger Messages e) Report to "Ship Reporting System" f) Report Incident Report A16.2 Manage Voluntary Reporting • Report from Voluntary Observing Ship (VOS) A16.3 Manage Information Exchange on Safe Loading and Unloading • Report BLU (Bulk Loading and Unloading) Code • Report Waste	A16.1 SOLAS, Chapter V "Safety of Navigation", Regulation 11 "Ship reporting systems". Regulations for mandatory ship reporting systems vary between coastal states/ports. For EC ports: Directive 2002/59 A16.1 □ MSC 85 A16.1 d) SOLAS Chapter V, Regulation 31 A16.1 e) SOLAS Chapter V, Regulation 11 A16.1 f) MARPOL Article 8 A16.2□ World Meteorological Organization VOS Scheme A16.3 □ IMO Assembly Resolution 862 A16.3 □ MARPOL Annex V **NAV 55/WP.5, annex 1, "Preliminary Shipboard User Needs and Priorities":** • Investigate the best way to harmonize and present maritime documentation in an electronic format to improve efficiency and reduce administrative burden- • To reduce reporting burden electronic documents should support • Easy localization of information • Automatic updates • Integration of information from multiple sources • Integration of information in other bridge systems (e.g., ECDIS) • Electronic documents should be printable or be additionally provided as paper version • Electronic documents should be traceable and possible to audit • Mariners express a desire for globally standardized reporting procedures and forms to avoid repetition of reporting and to reduce workload.
A17 Make Information from Shore-Based Information Services Available to Relevant Functions (information acquired in A2 is made available for on-board systems)	

3.1.4. Support Incident and Emergency Management

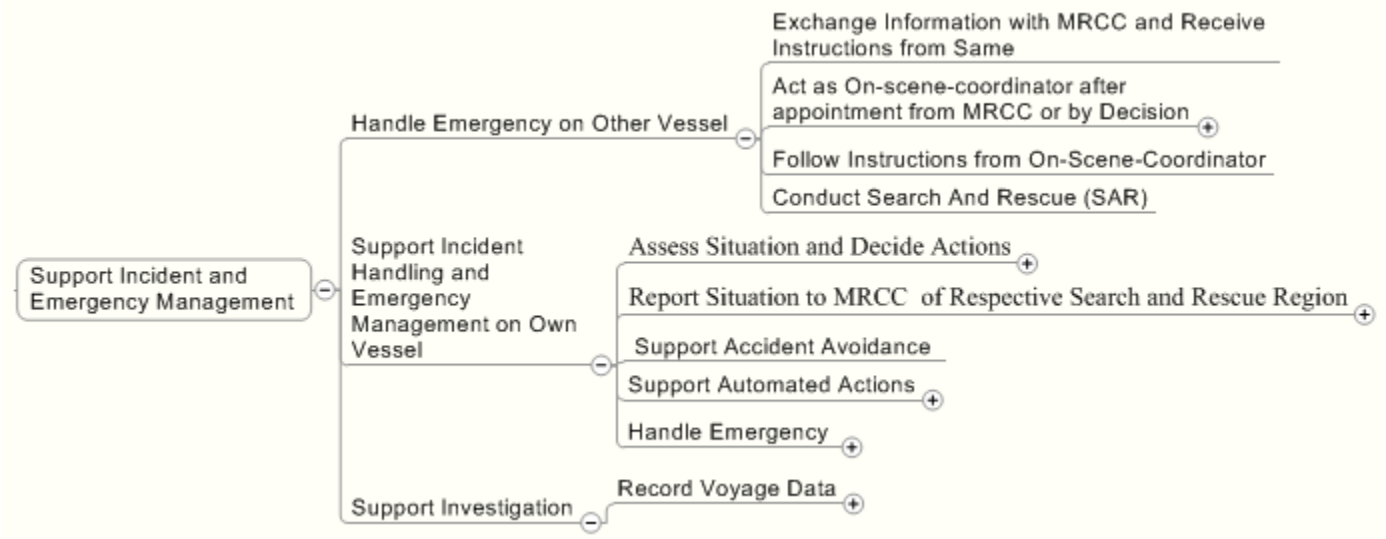

Figure 6: Decomposition of Support Incident and Emergency Management

Functional decomposition	References to existing requirements
A18 Handle Emergency on Other Ship A18.1 Exchange Information with MRCC and Receive Instructions from Same A18.2 Act as On-Scene-Coordinator after Appointment from MRCC or by own Decision • Relay Emergency Communication (PAN) A18.3 Follow Instructions from On-Scene-Coordinator (if another vessel acts as On-scene-coordinator) A18.4 Conduct Search and Rescue (SAR)	A18 SOLAS, Chapter V, Regulation 21 (IAMSAR Manual)
A19 Support Incident Handling and Emergency Management on Own Ship A19.1 Assess Situation and Decide Actions • Assess Alarms (configured in 2.1.1 above) • Assess Incident Information • Assess Probable Development of Incident A19.2 Report Situation to MRCC of Respective Search and Rescue Region. • Report Technical Status of Ship (e.g., engine) • Report Situation of Ship (level of risk) A19.3 Support Accident Avoidance	A19.1 SOLAS, Chapter V, Regulation 33 A19.2 SOLAS, Chapter V, Regulation 21 (IAMSAR Manual) A19.3 SOLAS, Chapter II-1, Regulation 52 A19.4 SOLAS, Chapter II-1, Regulation 51& SOLAS, Chapter x-2, Regulation 6 A19.5 SOLAS, Chapter V, Regulation 34-1 and Chapter XI-2, Regulation 8 **NAV 55/WP.5, annex 1, "Preliminary Shipboard User Needs and Priorities":**

Functional decomposition	References to existing requirements
A19.4 Support Automated Actions (e.g., if other measures fail or watch does not react on alarms) • Release General Alarm • Stop Engine A19.5 Handle Emergency • Manage Casualty Situation • Reduce Impact of Emergency • Manage Ship's Progress to Place of Refuge • Manage Evacuation	• Mariners need all safety-related equipment to be provided with familiarization material specific to the model and installation • Identify where familiarization needs to be developed for existing and developing performance standards. • Consider example using INS Performance Standard (MSC.252(83)).
A20 Support Investigation A20.1 Record Voyage Data (e.g., by means of VDR)	A20 SOLAS, Chapter V, Regulation 20

3.1.5. Support Maritime Security

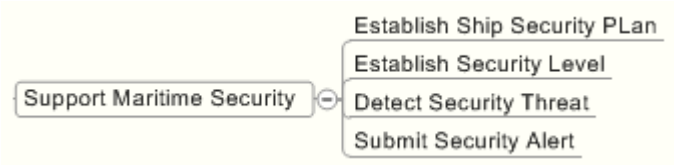

Figure 7: Decomposition of Support Maritime Security

Functional decomposition	References to existing requirements:
A21 Establish Ship Security Plan To be further elaborated	A21 SOLAS, Chapter XI, Regulation 9
A22 Establish Security Level To be further elaborated	
A23 Detect Security Threat	A23 SOLAS, Chapter XI-2
A24 Submit Security Alert	A24 SOLAS, Chapter XI-2

3.2. Functions related to pilotage – Pilot's responsibilities

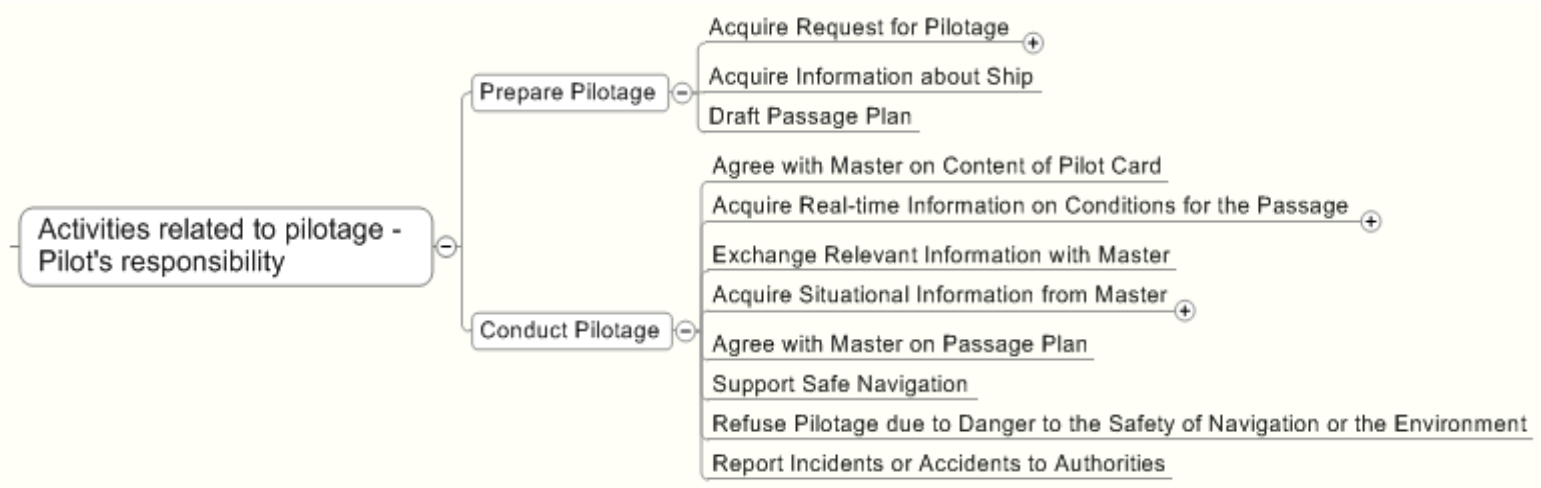

Figure 8 Decomposition of functions related to pilotage

Functional decomposition	References to existing requirements
A25 Prepare Pilotage A25.1 Acquire Request for Pilotage • Acquire Ship Identification (e.g., ship's name, call sign) • Acquire Static Ships Characteristics (e.g., length, beam, thruster(s)) • Acquire Dynamic Ship Characteristics (e.g., draught, air draught, speed) • Acquire ETA Pilot Boarding Point • Acquire Destination, Berth • Acquire ETD from Berth • Acquire Other Relevant Requirements and Information A25.2 Acquire Information about Ship A25.3 Draft Passage Plan	A25.1 Resolution A.960, Annex 2, Paragraph 4.4 A25.2 Resolution A.960, Annex 2, Paragraphs 5.1/5.2 A25.3 Resolution A.960, Annex 2, Paragraphs 5.5/5.6

Functional decomposition	References to existing requirements
A26 Conduct Pilotage A26.1 Agree with Master on Content of Pilot Card A26.2 Acquire Real-time Information on Conditions for the Passage • Acquire Information on Weather • Acquire Information on Under Keel Clearance • Acquire Information on Tidal Current • Acquire Information on Traffic Situation A26.3 Exchange Relevant Information with Master A26.4 Acquire Situational Information from Master • Acquire Information from On-board Systems • Acquire Information on Machinery Difficulties • Acquire Information on Navigation Equipment Problems • Acquire Information on Crew Limitations Affecting Safety of Navigation • Acquire Information on Rate of Turn at Different Speeds • Acquire Information on Turning Circles • Acquire Information on Stopping Distances A26.5 Agree with Master on Passage Plan A26.6 Support Safe Navigation A26.7 Refuse Pilotage due to Danger to the Safety of Navigation or the Environment A26.8 Report Incidents or Accidents to Authorities	A26 Resolution A.960 & STCW, Section B-VIII/2 Resolution A.960, Paragraph 5.4; STCW, Section B-VIII/2 STCW, Section B-VIII/2 SOLAS, Chapter V, Regulation 34, Resolution A.960; Paragraph 5.6; STCW Code, Section A-VIII, Part 2 A26.7 Resolution A.960, Annex II, Paragraph 8 A26.8 Resolution A.960, Annex II, Paragraph 7

3.3. Functions related to tug services

3.4. Functions carried out on-shore

The on-shore e-navigation functions are related to the following overall functions:

- Fairway Utilization Planning (Elaboration of traffic management policy)
- Vessel Traffic Services (VTS)
- Port Operation Support
- Emergency management

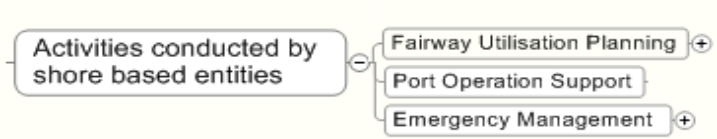

Figure 9: Decomposition of functions carried out on-shore

3.4.1. Fairway Utilization Planning

The strategic planning of the traffic organization policy is a part of the e-navigation concept.

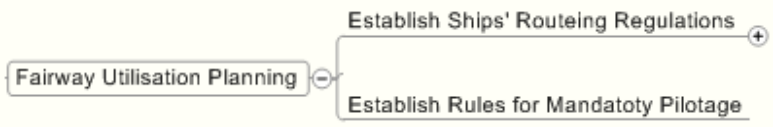

Figure 10: Decomposition of Fairway Utilization Planning

Functional decomposition	References to existing requirements
~~A27 **Establish VTM Policy Are as**~~	~~MSC 85/26/Add.1, annex 20 "Strategy for the development and implementation of e-navigation", paragraph 3.3.~~ ~~MSC 86/23/4, annex: "E-navigation: A coordinated approach to the implementation of IMO's e-navigation strategy", page 5.~~
A28 Establish Ships' Routeing Regulations	A28 SOLAS Chapter V, Regulation 10
A29 Establish Rules for Mandatory Pilotage	A29 By authority of Designated Authority within Contracting Government

3.4.2. Vessel Traffic Services

3.4.2.1. Monitor High Seas

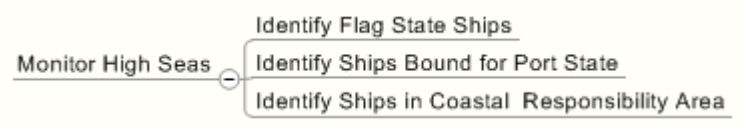

Figure 11: Decomposition of Monitor High Seas

Functional decomposition	References to existing requirements
A30 Identify Flag State Ships	A30 SOLAS Chapter V, Regulation 19-1, paragraph 8.1.1
A31 Identify Ships Bound for Port State	A31 SOLAS Chapter V, Regulation 19-1, paragraph 8.1.2
A32 Identify Ships in Coastal Responsibility Area	A32 SOLAS Chapter V, Regulation 19-1, paragraph 8.1.3

3.4.2.2. Manage Vessel Traffic Services (VTS)

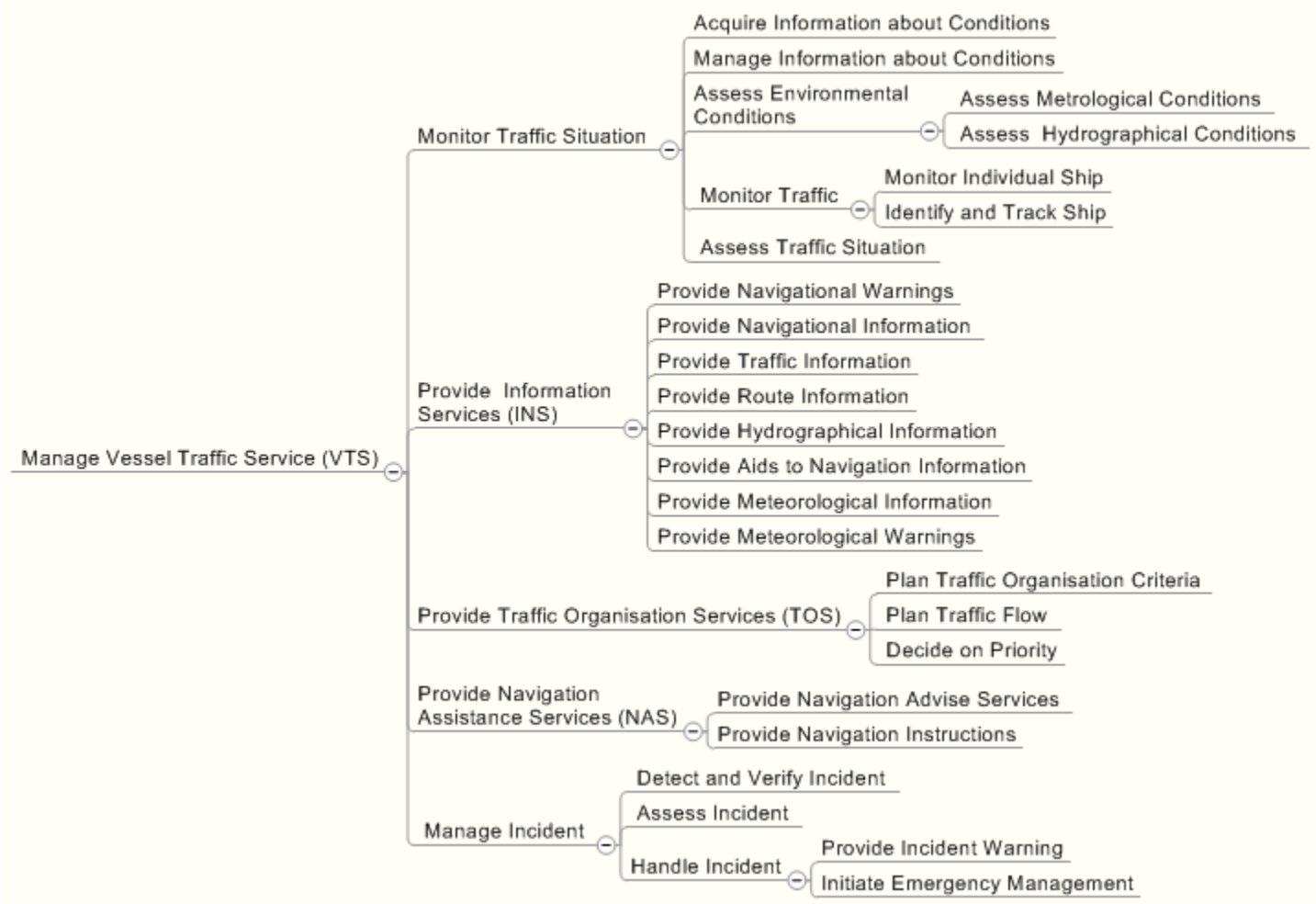

Figure 12: Decomposition of Vessel Traffic Services (VTS)

Functional decomposition	References to existing requirements
A33 Monitor Traffic Situation To be able to provide qualified services, situation awareness should be established. A33.1 Acquire Information about Conditions A33.2 Manage Information about Conditions A33.3 Assess Environmental Conditions • Assess Metrological Conditions • Assess Hydrographical Conditions A33.4 Monitor Traffic • Monitor Individual Ship • Identify and Track Ship A33.5 Assess Traffic Situation	A33.1:– A33.5 SOLAS, Chapter V, various Regulations **User needs** A33.1: Acquire information: • Accurate marine domain awareness is essential for the early identification of risk and effective response, to support safety, security, environment protection and efficiency. This allows for faster and more informed decisions. Relevant information may be both static and dynamic information including hydrographic, environmental, vessel data, AToN information and known hazards. • Fill the gap between the information collected and information required. • Automated information acquisition functions • All information should be provided electronically in a standardized way. Use maritime information exchange standards. Take into account AIS and GMDSS standards • Effective and robust communications. • Human centred presentation. • Data and system integrity. • Consider how information can have a quality rating. • Consider the data that will be required, the data sources required, the key data providers, the standards to which they work, types of data they provide and limitations. • Consider relevant legislation. • Identify harmonization needs for standards, formats and protocols. • Allow the global exchange of ship and other maritime reporting data. A33.2: The acquired information must be managed properly • Identify the sources and ownership of information to be managed. • Quality parameters for different pieces of information, including accuracy, reliability, latency etc. • Consider requirements for alerting for the loss of integrity or system failure. • Consider the legal issues pertaining to capturing, storing and sharing data. • Seek to harmonize policies for the security and use of data. A33.4 Monitor Individual ship. Must have confidence in that • The navigation systems being used onboard are operational. • Information received is correct.
A34 Provide Information Services (INS) A34.1 Provide Navigation Warnings A34.2 Provide Navigation Information A34.3 Provide Traffic Information A34.4 Provide Route Information A34.5 Provide Hydrographical Information A34.6 Provide Aids To Navigation Information A34.7 Provide Meteorological Information A34.8 Provide Meteorological Warnings	A34 IALA VTS Manual (2008), 0506 **User needs** • Provide information to the mariner efficiently and effectively. This pertains to traffic information, MSI, security-related information, updates to nautical publications, met-ocean information etc. • Must have confidence in that that information sent to the ship is correct. • Must be capable of establishing effective communication with bridge teams and other shore users. • Automated information exchange.

Functional decomposition	References to existing requirements
	• All information should be provided electronically in a standardized way. Use maritime information exchange standards. Take into account AIS and GMDSS standards • Effective and robust communications. • Data and system integrity. • Take into account existing IEC standards / IMO Performance Standards for on board equipment • Consider how information can have a quality rating • Take into account the need for scalability. • Consider a facility to assess the real time status of shore systems and to disseminate this information as appropriate. System faults ashore should be brought to the attention of mariners • Take into account the use of AIS application specific messages.
A35 Provide Traffic Organization Services (TOS) A35.1 Plan Traffic Organization Criteria A35.2 Plan Traffic Flow A35.3 Decide on Priority (e.g., allocation of time slots)	A35 IALA VTS Manual (2008), 0507 By authority of Designated Authority within Contracting Government
A36 Provide Navigation Assistance Services (NAS) A36.1 Provide Navigation Advice Services A36.2 Provide Navigation Instructions	A36 IALA VTS Manual (2008), 0508 A36.1 – A36.2 By authority of Designated Authority within Contracting Government
A37 Manage Incident A37.1 Detect and Verify Incident A37.2 Assess Incident A37.3 Handle Incident • Provide Incident Warning • Initiate Emergency Management	A37 SOLAS, Chapter X-2, Regulation 8 **User needs** • All information should be provided electronically in a standardized way

3.4.2.3. Manage Tracking Information

Tracking information is managed on-shore and may be provided to ships, VTS, and others entitled to the tracking information.

References to existing requirements:
SOLAS Chapter V, Regulation 19, paragraph 2.4.5.3 and 2.4.5.4

3.4.2.4. Operate Ship Reporting System

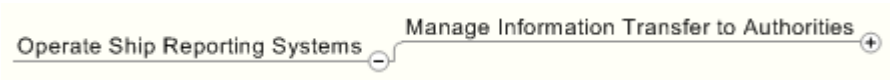

Figure 13: Decomposition of Operate Ship Reporting System

Functional decomposition	References to existing requirements
A38 Manage Information Transfer to Authorities Single window functionality may facilitate information exchange between stakeholder on shore and between on-shore and on-board.	A38 SOLAS, Chapter V, Regulation 11 **User needs** • Information exchange between authorities to share maritime information to ensure consistency and reduce the reporting burden by ship personnel. • More information exchange to aid safety, security, the identification of risk, environmental protection and improve logistics management. • Common maritime information/ data exchange standards. • Automated and standardized information exchange functions. • Effective and robust communications. • Data and system integrity. • Identify and/or develop necessary protocols, formats and data structures • Global information sharing • Consider legal and regulatory implications • Consider the need for data security and ownership issues. • Consider work done in other relevant industries. • Consider the use of standard data exchange protocols.

3.4.2.5. Exchange Information with Relevant Authorities

References to existing requirements:

- MSC 85/26/Add.1, annex 20 "Strategy for the development and implementation of e-navigation", paragraph 3.3.
- MSC 86/23/4, annex: "E-navigation: A coordinated approach to the implementation of IMO's e-navigation strategy" page 5.

3.4.2.6. Exchange Information on Emergency

3.4.3. Port Operation Support

Berthing, mooring, locks, etc.
Coordination of loading and discharge (safety issues).

3.4.4. These tasks are about the support to and coordination of the ship's port operations. Fulfilment of the tasks is part of ensuring safe navigation and protection of marine environment in ports and locks. Emergency Management

Figure 14: Decomposition of Emergency Management

Functional decomposition	References to existing requirements
A39 Manage Emergency Response A39.1 Manage Search and Rescue Management (SAR) A39.2 Manage Pollution Response Management (e.g., OPRC) A39.3 Manage Hazardous Goods Emergency	A39 Chapter V, Regulation 34-1 and Chapter XI-2, Regulation 8 A39.1 SOLAS, Chapter V, Regulation 21 (IAMSAR Manual)

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ANNEX 2

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.	• Human Machine Interface • Human Centred presentation needs	Harmonize and apply existing documentation Take note of: IMO documents: • 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). Methodology to consider usability of navigational equipment

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.	• Human Centred Presentation needs • Human Machine Interface • Analysis	Research should be conducted regarding the functionality of standard interfaces. Take note of: IMO documents -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.	• 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 Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
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 (e.g., vessel in distress, wind speed/ direction, AtoN status, restricted areas). 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).	• Effective communication: • Human Centred Presentation needs • Human Machine Interface • Analysis	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 needs to be prevented, therefore, presentation of information should be user-selectable to filter required information. Task-oriented presentation based on INS-tasks MSC.252(83).
Maritime Safety Information (MSI) Mariners expressed a desire to sort and display MSI, such as NAVTEX, SafetyNET more effectively.	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.	• Effective communication • Human Centred Presentation needs • Human Machine Interface • Analysis	Work with relevant stakeholders to address technical requirements for presenting MSI on navigation displays. Take note of Methodology for developing e-navigation user needs using a task-based approach (NAV 55/11/4).	Possible re-formatting of NAVTEX data and continuing with transmitting data on same frequencies. Transition from old to new format. Task-oriented presentation based on INS-tasks MSC.252(83).

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.	• 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 • 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.	• 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: • 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.	• 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 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.	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 only once and for it to be shared by authorized authorities without further intervention by the ship.	• 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
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.	• 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.	• 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.
Reduction of administrative burden and increase use of electronic documentation	Users expressed the need to reduce the amount of administrative work on board. They also expressed a desire to provide paper information and documentation in electronic form with means for easy location of information.	• 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.	Electronic documents should support: -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) electronic documents should be printable or be additionally provided as paper version. The need for raceability and ability to audit.

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Automated Updating of Base Line Data and Documents Mariners expressed a desire for documents such as Charts, and Voyage planning publications to be automatically updated, with minimal shipboard intervention.	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 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. 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.	• 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. The need for traceability and ability to audit.

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Effective and robust Communications	A clear need was expressed for there to be an effective and robust means of communications for ship and shore users. Shore-based users require an effective means of communicating with vessels to facilitate safety, security and environmental protection and to provide operational information. To be effective, communication with and between vessels should make best use of audio/visual aids and standard phrases to minimize linguistic challenges and distractions to operators. Research has indicated that a high percent of mariners regards language incompatibility and non-standard phrases a major problem. They also highlighted equipment failure and busy communication channels a concern that needs to be addressed.	Automated and standardized reporting functions. Effective and robust communications. Common Marine/Data Structure Data and System Integrity Human Centred Presentation Needs	Research into how voice and digital communication can be made more effective. Plan for greater use of IMO SMCP. Identify reliability standards for communication technology. Identify communication capacity issues to ensure adequate bandwidth for essential communication needs.	Navigational intention exchange Use of AIS application specific messages. Use of Wireless technology (Wi-Fi and Wi-MAX).

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ANNEX 3

SHORE-BASED USER NEEDS

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Collection of information	Accurate marine domain awareness is essential for the early identification of risk and effective response. The collection of information is necessary to build an enhanced domain awareness, to support safety, security, environment protection and efficiency. This allows for faster and more informed decisions. There are rules that require some coastal states to maintain domain awareness. There is currently a gap between the information collected and information required. A change in the type of service offered by a VTS (i.e. Information Service, Navigational Assistance Service or a Traffic Organization Service) may change the functional requirements of the domain awareness system.	Common maritime information/ data structure. Automated and standardized reporting functions. Effective and robust communications. Data and system integrity. Analysis.	Identify the data that will be required. Identify the data sources that will be required. Identify the key data providers, the standards to which they work, types of data they provide and any limitations. Identify the relationship between key data providers and users. Identify relevant legislation. Identify harmonization needs for standards, formats and protocols. Develop a system to allow the global exchange of ship and other maritime reporting data.	Such information may include both static and dynamic information including hydrographic, environmental, vessel data, AtoN information and known hazards. Take into account AIS and GMDSS standards Take into account the functionality of existing web based systems. Take into account the development of Service Level Agreements with data providers. Take into account existing ship reporting systems. There are a multitude of communication methods that should be considered. Consideration will need to be given to legal and liability issues, specifically with regard to the handling of data. Take into account the lessons learnt from development of ECDIS.

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Management of information	Shore authorities need tools for managing increased levels of information pertaining to the maritime domain awareness. A harmonized and holistic approach to information management will enable shore authorities to manage resources more efficiently. The harmonized and enhanced presentation of domain awareness will improve situational awareness for allied[1] and other support services. Enhanced information management is required for improving logistics management and in support of safety, security and environment protection. Currently, there are major challenges to managing and sharing a diverse range of information from dissimilar systems. Current systems suffer without a harmonized approach to quality and structure.	Common maritime information/data structure. Automated and standardized reporting functions. Effective and robust communications. Human centred presentation needs. Data and system integrity. Analysis.	Identify the sources and ownership of information to be managed. Identify communication methods/ variety of communication methods. Identify quality parameters for different pieces of information, including accuracy, reliability, latency, etc. Identify specific requirements for alerting for the loss of integrity or system failure. Identify the legal issues pertaining to capturing, storing and sharing data. Seek to harmonize policies for the security and use of data.	A gap analysis should be used to identify the capability of present information management systems to deal with an increasing amount of information in a timely manner. Take into account best practice for information management and examples from other industries, such as aviation. Take into account the benefits of open architecture systems.

[1] Allied services are services actively involved in the safe and efficient passage of the vessel through the VTS area (IMO resolution A.857(20)).

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Provision of information to vessels	Shore authorities have an obligation to provide maritime information to vessels. There is a need to improve the delivery and presentation of such information to enhance on-board decision making. Effective and harmonized communication should allow for the provision of such information in an operationally effective manner.	Common maritime information/ data structure. Automated and standardized reporting functions. Effective and robust communications. Human centred presentation needs. Data and system integrity. Analysis.	Identify the information necessary to be provided to vessels, taking into account the responsibility assigned to the shore based provider. Identify the means of communicating the information to vessels.	Consider the efficient provision of relevant information pertaining to logistics and commercial activities. Consider how to provide information to the mariner efficiently and effectively. This pertains to traffic information, MSI, security-related information, updates to nautical publications, met-ocean information etc. Take into account the need for scalability. Consider a facility for shore authorities to assess the real time status of shore systems and to disseminate this information as appropriate. Take into account the use of AIS binary messages.
Quality assurance	The shore authority needs to have confidence that the navigation systems being used onboard are operating correctly. Shore authorities need to be confident that the information which they receive from and send to the ship is correct. Shore authorities have a need to be capable of establishing effective communication with bridge teams and other shore users.	Common maritime information/ data structure. Automated and standardized reporting functions. Effective and robust communications. Data and system integrity. Analysis.	It will be necessary to carry out an assessment to quantify reliability parameters, taking into account existing IEC standards/IMO Performance Standards for on board equipment. Investigate the technical and procedural capabilities for monitoring quality Consider how information can have a quality rating.	Consider how shore authorities are assured of the navigation system status on board ships in real time. And for system faults ashore to be brought to the attention of mariners as appropriate. Consider the effectiveness of communications in terms of technology and language. Consider legal and liability issues.

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
Shore-to-shore information exchange	Shore authorities need an enhanced ability to share maritime information amongst authorized shore users to ensure consistency and reduce the reporting burden by ship personnel. More effective shore-to-shore information exchange will aid safety, security, the identification of risk, environmental protection and improve logistics management.	Common maritime information/ data structure. Automated and standardized reporting functions. Effective and robust communications. Human centred presentation need. Data and system integrity. Analysis.	Identify and/or develop necessary protocols, formats and data structures Investigate methods for global data sharing Identify relevant legal and regulatory implications	Consider the need for data security and ownership issues. Consider work done in other relevant industries. Consider the use of standard data exchange protocols.
Effective and robust Communications	A clear need was expressed for there to be an effective and robust means of communications for ship and shore users. Shore-based users require an effective means of communicating with vessels to facilitate safety, security and environmental protection and to provide operational information. To be effective, communication with and between vessels should make best use of audio/visual aids and standard phrases to minimize linguistic challenges and distractions to operators. Research has indicated that a high percent of mariners regards language incompatibility and non-standard phrases a major problem. They also highlighted equipment failure and busy communication channels as concerns that needs to be addressed.	Automated and standardized reporting functions. Effective and robust communications.	Research into how voice and digital communication can be made more effective. Plan for greater use of IMO SMCP. Identify reliability standards for communication technology. Identify communication capacity issues to ensure adequate bandwidth for essential communication needs.	

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ANNEX 4

SAR AUTHORITY USER NEEDS FOR E-NAVIGATION

User Need	Justification	Relation to IMO Strategy (Section 8.2)	Priority in terms of work required	Issues to Consider
SAR should have access to relevant information contained within the e-nav domain	SAR need a full range of information pertaining to ships and their domain to support the saving of lives.	Common Data Structure Automated reporting Robust Communications Data Integrity		
Effective Communication and information sharing.	SAR must be able to use the e-nav infrastructure to communicate and share information effectively with all parties involved in an incident.	Common Data Structure Automated reporting Robust Communications Data Integrity		
Priority for distress communications	Within the e-nav domain, distress communications should take priority over all other communications.	Common Data Structure Automated reporting Robust Communications Data Integrity		
SAR Authorities need access to the details of all relevant onboard communication equipment and capabilities.	To maximize incident response, SAR need to be able to determine the best means for communications.			

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ANNEX 5

EXISTING SYSTEMS AND NEW COMMUNICATION TECHNOLOGIES SUPPORTING USER NEEDS AND COMPLYING WITH EQUIPMENT PERFORMANCE STANDARDS

Equipment	Regulation SOLAS 74	Relevant regulations, resolutions and circulars of the IMO or ITU, as applicable	Testing standards	Current Functions and Future User Needs	Technical Constraints (bandwidth, frequency, etc.)
VHF radio capable of transmitting and receiving DSC and radiotelephony	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. IV/7, -Reg. X/3, -IMO Res. A.385(X), -IMO Res. A.524(13), -IMO Res. A.694(17), -IMO Res. A.803(19), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO MSC/Circ.862, -IMO COMSAR/Circ.32, -ITU-R M.489-2 (10/95), -ITU-R M.493-10 (05/00), -ITU-R M.541-8 (10/97), -ITU-R M.689-2 (11/93).	-ETSI ETS 300 162-1 V1.4.1 (2005-05), -ETSI EN 300 338 V1.2.1 (1999-04), -ETSI EN 300 828 V1.1.1 (1998-03), -ETSI EN 301 925 V1.1.1 (2002-09), -EN 60945 (2002), -IEC 61097-3 (1994), -IEC 61097-7 (1996), -EN 61162 series, -IMO MSC/Circ.862.	Transmit ship-to-shore distress alerts † Receive shore-to-ship distress alerts † Transmit and receive ship-to-ship distress alerts † Transmit and receive search and rescue co-ordinating communications † Transmit and receive on-scene communications † Transmitting signals for locating † Receiving signals for locating † Transmit and receive general radio communications to and from shore-based radio systems or networks† Transmit and receive bridge-to-bridge communications† Receive maritime safety information †	VHF channels have been assigned to other services in some places

Equipment	Regulation SOLAS 74	Relevant regulations, resolutions and circulars of the IMO or ITU, as applicable	Testing standards	Current Functions and Future User Needs	Technical Constraints (bandwidth, frequency, etc.)
Table 1: Table of current related communications equipment, performance standards and test standards					
VHF DSC watchkeeping receiver	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. IV/7, -Reg. X/3, -IMO Res. A.694(17), -IMO Res. A.803(19), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO COMSAR/Circ.32, -ITU-R M.489-2 (10/95), -ITU-R M.493-10 (05/00), -ITU-R M.541-8 (10/97).	-ETSI EN 300 338 V1.2.1 (1999-04), -ETSI EN 300 828 V1.1.1 (1998-03), -ETSI EN 301 033 V1.2.1 (2005-05), -EN 60945 (2002), -IEC 61097-3 (1994), -IEC 61097-8 (1998).	Receive shore-to-ship distress alerts † Receiving signals for locating †	
NAVTEX receiver	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. IV/7, -Reg. X/3, -IMO Res. A.694(17), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO Res. MSC.148(77), -IMO COMSAR/Circ.32, -ITU-R M.540-2 (06/90), -ITU-R M.625-3 (10/95).	-ETSI EN 300 065-1 V1.1.3 (2005-5), -ETSI EN 301 011 V1.1.1 (1998-09), -EN 60945 (2002), -IEC 61097-6 (2005-12).	Receive maritime safety information †	Bandwidth: Too much information for available time in some cases – digital technologies may allow improvement.
EGC receiver	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. IV/7, -Reg. X/3, -IMO Res. A.570(14), -IMO Res. A.664(16), -IMO Res. A.694(17), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO COMSAR Circ.32.	-ETSI ETS 300 460 Ed.1 (1996-05), -ETSI ETS 300 460/ A1 (1997-11), -ETSI EN 300 829 V1.1.1 (1998-03), -EN 60945 (2002), -IEC 61097-4 (1994).	Receive maritime safety information †	

Equipment	Regulation SOLAS 74	Relevant regulations, resolutions and circulars of the IMO or ITU, as applicable	Testing standards	Current Functions and Future User Needs	Technical Constraints (bandwidth, frequency, etc.)
HF marine safety information (MSI) equipment (HF NBDP receiver)	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14	-Reg. IV/7, -Reg. X/3, -IMO Res. A.694(17), -IMO Res. A.699(17), -IMO Res. A.700(17), -IMO Res. A.806(19), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO COMSAR/Circ.32, -ITU-R M.491-1 (07/86), -ITU-R M.492-6 (10/95), -ITU-R M.540-2 (06/90), -ITU-R M.625-3 (10/95), -ITU-R M.688 (06/90). -Reg. IV/7,	-ETSI ETS 300 067 Ed.1 (1990-11), -ETSI ETS 300 067/ A1 Ed.1 (1993-10), -EN 60945 (2002), -EN 61162 Series.	Receive maritime safety information †	MSI could be more efficiently transmitted with modern digital technologies
406 MHz EPIRB (Cospas-Sarsat)	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. X/3, -IMO Res. A.662(16), -IMO Res. A.694(17), -IMO Res. A.696(17), -IMO Res. A.810(19), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO MSC/Circ.862, -IMO COMSAR/Circ.32, -ITU-R M.633-2 (05/00), -ITU-R M.690-1 (10/95).	-ETSI EN 300 066 V 1.3.1 (2001-01), -EN 60945 (2002), -IEC 61097-2 (2002), -IMO MSC/Circ.862. Note: IMO MSC/Circ.862 is applicable only to the optional remote activation device, not to the EPIRB itself.	Transmit ship-to-shore distress alerts † Transmitting signals for locating †	Current technology does not provide for rescuer communication with mariners in distress

Equipment	Regulation SOLAS 74	Relevant regulations, resolutions and circulars of the IMO or ITU, as applicable	Testing standards	Current Functions and Future User Needs	Technical Constraints (bandwidth, frequency, etc.)
MF radio capable of transmitting and receiving DSC and radiotelephony	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. IV/9, -Reg. IV/10, -Reg. X/3, -IMO Res. A.694(17), -IMO Res. A.804(19), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO COMSAR/Circ.32, -ITU-R M.493-10 (05/00), -ITU-R M.541-8 (10/97).	-ETSI EN 300 338 V1.2.1 (1999-04), -ETSI ETS 300 373-1 V1.2.1 (2002-10), -EN 60945 (2002), -IEC 61097-3 (1994), -IEC 61097-9 (1997), -EN 61162 series, -IMO MSC/Circ.862.	Transmit ship-to-shore distress alerts † Receive shore-to-ship distress alerts † Transmit and receive ship-to-ship distress alerts † Transmit and receive search and rescue co-ordinating communications † Transmitting signals for locating † Receiving signals for locating † Transmit maritime safety information † Transmit and receive general radio communications to and from shore-based radio systems or networks†	
MF DSC watch-keeping receiver	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14.	-Reg. IV/9, -Reg. IV/10, -Reg. X/3, -IMO Res. A.694(17), -IMO Res. A.804(19), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO COMSAR/Circ.32, -ITU-R M.493-10 (05/00), -ITU-R M.541-8 (10/97), -ITU-R M.1173 (10/95).	-ETSI EN 300 338 V1.2.1 (1999-04), -ETSI EN 301 033 V1.2.1 (2005-05), -EN 60945 (2002), -IEC 61097-3 (1994), -IEC 61097-8 (1998).	Receive shore-to-ship distress alerts † Receive ship-to-ship distress alerts †	

Equipment	Regulation SOLAS 74	Relevant regulations, resolutions and circulars of the IMO or ITU, as applicable	Testing standards	Current Functions and Future User Needs	Technical Constraints (bandwidth, frequency, etc.)
Inmarsat-B SES	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. IV/10, -Reg. X/3, -IMO Res. A.570(14), -IMO Res. A.694(17), -IMO Res. A.808(19), -IMO Res. MSC.36(63) -(1994 HSC Code) 14, -IMO Res. MSC.97(73) -(2000 HSC Code) 14, -IMO MSC/Circ.862, -IMO COMSAR/Circ.32.	-EN 60945 (2002), -IEC 61097-10 (1999), -IMO MSC/Circ.862.	Transmit ship-to- shore distress alerts † Receive shore-to-ship distress alerts † Transmit and receive ship-to-ship distress alerts † Transmit and receive search and rescue co-ordinating communications † Transmit maritime safety information † Transmit and receive general radio communications to and from shore-based radio systems or networks†	(Inmarsat B services are being closed)
Inmarsat-C SES	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. IV/10, -Reg. X/3, -IMO Res. A.570(14), -IMO Res. A.664 (16), (applicable only if the Inmarsat C SES comprises EGC functions), -IMO Res. A.694(17), -IMO Res. A.807(19), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO MSC/Circ.862, -IMO COMSAR/Circ.32.	-ETSI ETS 300 460 Ed.1 (1996-05), -ETSI ETS 300 460/ A1 (1997-11), -ETSI EN 300 829 V1.1.1 (1998-03), -EN 60945 (2002), -IEC 61097-4 (1994), -EN 61162 series, -IMO MSC/Circ.862.	Transmit ship-to-shore distress alerts † Receive shore-to-ship distress alerts † Transmit and receive ship-to-ship distress alerts † Transmit and receive search and rescue co-ordinating communications † Transmit maritime safety information † Transmit and receive general radio communications to and from shore-based radio systems or networks†	

Equipment	Regulation SOLAS 74	Relevant regulations, resolutions and circulars of the IMO or ITU, as applicable	Testing standards	Current Functions and Future User Needs	Technical Constraints (bandwidth, frequency, etc.)
MF/HF radio capable of transmitting and receiving DSC, NBDP and radiotelephony Note: In line with IMO and ITU decisions, the requirements for Two Tone Alarm generator and transmission on A3H are no longer applicable in testing standards.	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14.	-Reg. IV/10, -Reg. X/3, -IMO Res. A.694(17), -IMO Res. A.806(19), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO MSC/Circ.862, -IMO COMSAR/Circ.32, -ITU-R M.476-5 (10/95), -ITU-R M.491-1 (07/86), -ITU-R M.492-6 (10/95), -ITU-R M.493-10 (05/00), -ITU-R M.541-8 (10/97), -ITU-R M.625-3 (10/95), -ITU-R M.1173 (10/95).	-ETSI ETS 300 067 Ed.1 (1990-11), -ETSI ETS 300 067/ A1 Ed.1 (1993-10), -ETSI EN 300 338 V1.2.1 (1999-04), -ETSI ETS 300 373-1 V1.2.1 (2002-10), -EN 60945 (2002), -IEC 61097-3 (1994), -IEC 61097-9 (1997), -EN 61162 series, -IMO MSC/Circ.862.	Transmit ship-to-shore distress alerts † Receive shore-to-ship distress alerts † Transmit and receive ship-to-ship distress alerts † Transmit and receive search and rescue co-ordinating communications † Transmitting signals for locating † Receiving signals for locating † Transmit maritime safety information † Transmit and receive general radio communications to and from shore-based radio systems or networks †	
MF/HF DSC watchkeeping receiver	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14.	-Reg. IV/10, -Reg. X/3, -IMO Res. A.694(17), -IMO Res. A.806(19), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO COMSAR/Circ.32, -ITU-R M.493-10 (05/00), -ITU-R M.541-8 (10/97).	-ETSI EN 300 338 V1.2.1 (1999-04), -ETSI EN 301 033 V1.2.1 (2005-05), -EN 60945 (2002), -IEC 61097-3 (1994), -IEC 61097-8 (1998).	Receive shore-to-ship distress alerts † Receive ship-to-ship distress alerts †	
Aeronautical two way VHF radio telephone apparatus	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. IV/7, -IMO Res. A.694(17), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO Res. MSC.80(70), -IMO COMSAR/Circ.32, -ICAO Convention, Annex 10, Aeronautical Telecommunications.	-ETSI EN 301 688 V1.1.1 (2000-07), -EN 60945 (2002).	Transmit and receive search and rescue co-ordinating communications † Transmit and receive on-scene communications †	
Portable survival craft two-way VHF radiotelephone apparatus	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. III/6, -IMO Res. A.694(17), -IMO Res. MSC.36(63)-(1994 HSC Code) 8, 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 8, 14, -IMO Res. MSC.149(77), -ITU-R M.489-2 (10/95), -ITU-R M.542.1 (07/82).	-ETSI EN 300 225 V1.4.1 (2004-12), -EN 300 828 V1.1.1 (1998-03), -EN 60945 (2002), -IEC 61097-12 (1996).	Transmit and receive search and rescue co-ordinating communications † Transmit and receive on-scene communications †	

Equipment	Regulation SOLAS 74	Relevant regulations, resolutions and circulars of the IMO or ITU, as applicable	Testing standards	Current Functions and Future User Needs	Technical Constraints (bandwidth, frequency, etc.)
Fixed survival craft two-way VHF radiotelephone apparatus	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. III/6, -IMO Res. A.694(17), -IMO Res. A.809(19), -IMO Res. MSC.36(63)-(1994 HSC Code) 8, 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 8, 14, -ITU-R M.489-2 (10/95).	-ETSI EN 301 466 V1.1.1 (2000-11), -EN 60945 (2002), -IEC 61097-12 (1996).	Transmit and receive search and rescue co-ordinating communications † Transmit and receive on-scene communications †	
Inmarsat-F SES	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 14, -IMO Res. MSC.97(73) (2000 HSC Code) 14.	-Reg. IV/10, -IMO Res. A.570(14), -IMO Res. A.808(19), -IMO Res. A.694(17), -IMO Res. MSC.36(63)-(1994 HSC Code) 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 14, -IMO MSC/Circ.862, -IMO COMSAR/Circ.32.	-EN 60945 (2002), -IEC 61097-13 (2003), -IMO MSC/Circ.862.	Transmit ship-to-shore distress alerts † Receive shore-to-ship distress alerts † Transmit and receive ship-to-ship distress alerts † Transmit and receive search and rescue co-ordinating communications † Transmit maritime safety information † Transmit and receive general radio communications to and from shore-based radio systems or networks †	
VHF EPIRB	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code), -IMO Res. MSC.97(73) (2000 HSC Code).	-Reg.IV/8, -IMO Res. A.662(16), -IMO Res. A.694(17), -IMO Res. A.805(19), -IMO Res. MSC.36(63)-(1994 HSC Code), -IMO Res. MSC.97(73)-(2000 HSC Code), -ITU-R M.489-2 (10/95), -ITU-R M.693 (06/90).	-EN 60945 (2002). Or, -IEC 60945 (2002).	Transmit ship-to-shore distress alerts † (short range) Transmitting signals for locating †	(Never produced)
Radio reserve source of energy	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63)-(1994 HSC Code), -IMO Res. MSC.97(73) (2000 HSC Code).	-Reg. IV/13, -IMO Res. A.694(17), -IMO Res. MSC.36(63)-(1994 HSC Code), -IMO Res. MSC.97(73)-(2000 HSC Code), -IMO COMSAR/Circ.16, -IMO COMSAR/Circ.32.	-EN 60945 (2002). Or, -IEC 60945 (2002).	[Provide power for radio systems in event of main and emergency generator loss]	
Distress panel	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code), -IMO Res. MSC.97(73) (2000 HSC Code).	-Reg. IV/6, -IMO Res. A.694(17), -IMO Res. MSC.36(63)-(1994 HSC Code), -IMO Res. MSC.97(73)-(2000 HSC Code), -IMO MSC/Circ.862, -IMO COMSAR/Circ.32.	-EN 60945 (2002). Or, -IEC 60945 (2002).	[Rapid identification of serious problems]	

Equipment	Regulation SOLAS 74	Relevant regulations, resolutions and circulars of the IMO or ITU, as applicable	Testing standards	Current Functions and Future User Needs	Technical Constraints (bandwidth, frequency, etc.)
Distress alarm or alert panel	-Reg. IV/14, -Reg. X/3, -IMO Res. MSC.36(63)-(1994 HSC Code), -IMO Res. MSC.97(73) (2000 HSC Code).	-Reg. IV/6, -IMO Res.A.694(17), -IMO Res. MSC.36(63)-(1994 HSC Code), -IMO Res. MSC.97(73)-(2000 HSC Code), -IMO MSC/Circ.862, -IMO COMSAR/Circ.32.	-EN 60945 (2002). Or, -IEC 60945 (2002).	[Rapid identification of serious problems]	Too many alarms to manage
Ship security alert system	-Reg. XI-2/6	-IMO Res. A.694(17), -IMO Res. MSC.147(77), -IMO MSC/Circ.1072.	-EN 60945 (2002). Or, -IEC 60945 (2002).	[Transmitting signals for security alerting] Transmitting signals for locating † Transmit ship-to-shore distress alerts †	
9 GHz SAR transponder (SART)	-Reg. III/4, -Reg. IV/14, -Reg. V/18, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 13, -IMO Res. MSC.97(73) (2000 HSC Code) 13.	-Reg. III/6, -Reg. IV/7, -IMO Res. A.530(13), -IMO Res. A.802(19), -IMO Res. A.694(17), -IMO Res. MSC.36(63)-(1994 HSC Code) 8, 14, -IMO Res. MSC.97(73)-(2000 HSC Code) 8, 14, -ITU-R M.628-3(11/93).	-IEC 60945 (2002), -IEC 61097-1 (1992).	Transmitting signals for locating †	Limited range Ambiguous indication on radar Works with pulsed radar only
Universal automatic identification system equipment (AIS)	-Reg. V/18, -Reg. X/3, -IMO Res. MSC.36(63) (1994 HSC Code) 13, -IMO Res. MSC.97(73) (2000 HSC Code) 13.	-Reg. V/19, -IMO Res. A.694(17), -IMO Res. MSC.36(63)-(1994 HSC Code) 13, -IMO Res. MSC.74(69), -IMO Res. MSC.97(73)-(2000 HSC Code) 13, -ITU-R M. 1371-1(10/00).	-IEC 60945 (2002), -IEC 61162 Series, -IEC 61993-2 (2001).	Transmitting signals for locating † Receiving signals for locating † [Transmitting messages for maritime safety information] [Transmitting ship-to-shore distress signals(?)]	Limited bandwidth for messaging
AIS-SART	-Reg. III/4 -Reg. IV/14 -Reg. V/18 -Reg. X/3 -IMO Res. MSC.36(63)-(1994 HSC Code) 13 -IMO Res. MSC.97(73)-(2000 HSC Code) 13.	-IMO Res. MSC.246(83) -ITU-R M. 1371- 1(10/00).	-IEC 61097-14 –IEC 60945 (2002),	Transmitting signals for locating †	
Long Range Identification and Tracking	MSC.202(81) (SOLAS V reg 19-1)	-IMO Res. MSC.210(81) -IMO Res. MSC.211(81)	No specific standard - IEC 60945 (2002),	Transmitting signals for locating †	

Table 2: Table of possible future related communications equipment, performance standards and test standards

Future Equipment and Functionalities	Regulation SOLAS 74	Relevant regulations, resolutions and circulars of the IMO or ITU, as applicable	Testing standards	Current Functions and Future User Needs	Technical Constraints (bandwidth, frequency, etc.)
MF, HF, and VHF data systems under ITU development		-ITU-R M.1842-1 -ITU PDN report of 500 kHz data system -Pending RR Appendix 17 revisions		Transmit and receive general radio communications to and from shore-based radio systems or networks† Receive and receive maritime safety information †	
Integrated AIS-DSC-ECDIS (COMSAR 14/7)				Transmit ship-to-shore distress alerts† Receive shore-to-ship distress alerts† Transmit and receive ship-to-ship distress alerts† Transmit and receive search and rescue co-ordinating communications† Transmit and receive on-scene communications† Transmitting signals for locating† Receiving signals for locating† Transmit and receive general radio communications to and from shore-based radio systems or networks† Transmit and receive bridge-to-bridge communications† Improved ergonomics * Standard [user] interface * User-Selectable Presentation of Information Received via Communication Equipment * Marine Safety Information (MSI) Mariners	

Future Equipment and Functionalities	Regulation SOLAS 74	Relevant regulations, resolutions and circulars of the IMO or ITU, as applicable	Testing standards	Current Functions and Future User Needs	Technical Constraints (bandwidth, frequency, etc.)
				(Sort and display MSI, such as NAVTEX, SafetyNET more effectively) * [Navigational user needs]	
AIS and AIS-Sart detection by satellite				Transmitting signals for locating†	
WiFi and WiMax (point-to-multipoint or multihop mesh)				Transmit and receive general radio communications to and from shore-based radio systems or networks† Transmit and receive bridge-to-bridge communications†	Wi-Fi has security and range limitations WiMax operating in bands close to the operational bands of the S-band radar, GPS receivers, and Inmarsat might cause interference to the devices.
Future GMDSS satellite systems				Transmit ship-to-shore distress alerts† Receive shore-to-ship distress alerts† Transmit and receive ship-to-ship distress alerts† Transmit and receive search and rescue co-ordinating communications† Transmit maritime safety information† Transmit and receive general radio communications to and from shore-based radio systems or networks†	
				Improved ergonomics * Standard [user] interface * User-Selectable Presentation of Information Received via Communication Equipment * Marine Safety	

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ANNEX 6

STAKEHOLDER GAP ANALYSIS

User Need	**IMO Ref:**
Stakeholder	
Description of User Need:	

Context	Gap Identification	Additional Comments
Technical Hardware Software Equipment Links Data structure		
Regulations/Standards		
Operational Procedural		
Training Human Element		

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ANNEX 7

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 56 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 consider documents NAV 56/8, MSC 85/26 (annex 20, paragraph 9.7.2 and annex 21, paragraph 5) and NAV 56/WP.5, annex 1, and finalize the system architecture;

.2 consider documents NAV 53/13 (annex 3), NAV 56/INF.10 (Republic of Korea) and MSC 85/26 (annex 20, paragraph 9.7.3 and annex 21, paragraph 6), and progress the initial gap analyses focussing on technical, regulatory, operational and training aspects;

.3 submit a report to STW 42 (24 to 28 January 2011) raising specific questions, if required, that should be addressed by STW;

.4 submit a report to COMSAR 15 (7 to 11 March 2011) outlining an overall conceptual, functional and technical architecture and the progress made in the initial gap analyses focusing on communication and SAR issues;

.5 submit a consolidated progress report to NAV 57 (6 to 10 June 2011) outlining the further analyses for navigation and related shore-based services issues, the completed and ongoing work including a provisional outline/draft of the Strategy Implementation Plan and progress on the cost-benefit and risk analyses; and

.6 based on the requirements stipulated in the e-navigation strategy section 8 (MSC 85/26, annex 20) to identify and describe an enabling data framework to support user needs and ensure maximum interoperability.

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