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| From: e-NAV Committee | e-NAV11/output/10 |
| To: PAP  EEP Committee  ANM Committee  VTS Committee | 30 March 2012 |

Information Paper

Plan for AIS and VHF Data Communications in e-Navigation

# Introduction

This Plan for AIS and VHF Data Communications in e-Navigation describes the intention of the Committee to revise the communications content of the IALA e-Navigation Strategy, specifically the VHF communications content, and to revise the IALA Maritime Radio Communication (MRCP) accordingly.

The document builds on e-Nav10/output/18, “Three Essential Elements of e-Navigation Communications” document approved by IALA Council following e-Nav10, and indicates the way forward for AIS and for VHF data exchange, both of which are “essential elements”.

The Plan is at ANNEX A.

# Action requested

PAP and the EEP, ANM & VTS Committees are requested to review and comment on the Plan for AIS and VHF Data Communications in e-Navigation to the e-NAV Committee prior to e-NAV12 (24 - 28 September 2012).

Plan for AIS and VHF Data Communications in e-Navigation

Plan for AIS and VHF Data Communications in e-Navigation

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**-**Plan for AIS and VHF Data Communications in e-Navigation

# Summary

This document describes the intention of the Committee to revise the communications content of the IALA e-Navigation Strategy, specifically the VHF communications content, and to revise the IALA Maritime Radio Communication (MRCP) accordingly.

The document builds on e-Nav10/output/18, “Three Essential Elements of e-Navigation Communications” document approved by IALA Council following e-Nav10, and indicates the way forward for AIS and for VHF data exchange, both of which are “essential elements”.

## Purpose of the document

The purpose of this document is to inform Council and the other IALA Committees of the changes which will be made to the MRCP concerning the use of the VHF spectrum,

## Related documents

1. Liaison Note e-Nav10/output/18, “Three Essential Elements of e-Navigation Communications”.
2. IALA Maritime Radio Communication Plan edition 1 (MRCP)
3. IALA World Wide Radio Navigation Plan (WRNP)

# Background

## IALA e-Navigation strategy

This document describes intended revisions to the communications portion of the IALA e-Navigation strategy and draws on the work completed at e-Nav10 and at the combined AIS / Communications working groups inter-sessional meeting in San Francisco on March 5th to 9th 2012. It also takes into account decisions made at WRC2012.

## IMO CG report to COMSAR

Towards the end of Feburary 2012 the IMO CG on e-Navigation submitted input documents to the COMSAR meeting commencing 2012-03-12. These CG documents include a description of user requirements related to the implementation of e-Navigation. These user requirements assisted IALA to determine the functionality required of the VHF portion of IALA’s e-Navigation communications strategy. This document takes note of the relevant user requirements and develops functionality requirements and the consequent technical solutions.

## Result of COMSAR and IMO CG report to NAV

At the 16th session of COMSAR the Sub-Committe progressed the GAP-analysis and did not consider communication technologies. Allthough COMSAR 16 did not deeply consider the essential elements of e-Navigation communication, many papers submitted from member coutries showed that the essential elements of e-Navigation communication clearly required continuous technical consideration by IALA.

It is imperative that communication needs are considered in a coordinated manner, across the e-Navigation implementation and the review of the GMDSS.

## IALA e-Navigation Commitee WG3 and WG4 terms of reference

As as result of the revision in the VHF communications portion of the strategy, changes in the terms of reference for WG3, AIS Working Group, will be required, specifically “Monitor and contribute to the development of AIS, including the next generation of AIS“ will be changed to the following,“In coordination with WG4, monitor and contribute to the efficiency of AIS, and other means of VHF data exchange for e-Navigation.“

The Committee will consider the impact of the same revision in the VHF communications portion of the strategy and may need to revise the terms of reference of this WG also.

## AIS and VHF data communications

### Vision for a Future AIS for e-Navigation

Committee document e-NAV7-14-6 “A Vision for a Future AIS for e-Navigation” foresaw additional frequency channels for AIS and this vision was developed further from 2009 until IALA e-Nav10 in 2011. The need for the additional communications capacity was explained in this document.

### Three essential elements of e-Navigation communications

With WRC2012 about to commence, e-Nav10 created output document e-Nav10/output/18 “Three essential elements of e-Navigation communications”. Two of these elements were an expansion of the existing AIS and additional VHF channels for data exchange. This document was approved by IALA Council and provided to IALA members as part of the IALA briefing to them prior to WRC2012.

(The third of these essential elements is MF radio communications, near 500 kHz. It is not considered in this paper, which is restricted to VHF matters.)

It is important to note that all three of the essential elements are normally free-of-charge communications to the user.

The objective of this e-Nav10-output-18 document was to try to secure at WRC2012 additional AIS channels for satellite detection, and additional VHF channels to relieve the loading on AIS1 and AIS2 with the objective of optimizing the use of AIS1 and AIS2 for their original purpose.

# WRC 2012 outcome – available spectrum and future work

## Long range AIS

The WRC-12 has identified channels 75 and 76 (IALA has referred to them as AIS 3 and 4) for the reception of automatic identification system (AIS) emissions of long-range AIS broadcast messages (Message 27, defined in Recommendation ITU‑R M.1371).

## Digital channels identified by WRC-12

The WRC-12 has identified channels inside Appendix 18, which could be used for digital systems from 1 January 2017.

However the availability of these channels is not the same over all 3 ITU Regions, and all would be shared with fixed and mobile services.

The six following channels have been identified worldwide (IALA identified these channels for VHF data exchange, VDE): Channels 24, 84, 25, 85, 26 and 86 corresponding to the frequency bands 157.200-157.325 and 161.800-161.925 MHz which are designated for digitally modulated emissions in accordance with the Recommendation ITU‑R M.1842

Channels 80, 21, 81, 22, 82, 23 and 83 corresponding to the frequency bands 157.025‑157.175 MHz and 161.625-161.775 MHz are also available for digitally modulated emissions in accordance with Recommendation ITU‑R M.1842, except in Region 2.

## AIS experiments

WRC-12 identified the frequency 160.900 MHz for experimental use for future applications or systems (e.g. new AIS applications, man over board systems, etc.). If authorized by administrations for experimental use, the operation shall not cause harmful interference to, or claim protection from, stations operating in the fixed and mobile services.

WRC-12 has identified the channels 27, 28, 87, and 88 for possible testing of future AIS applications without causing harmful interference to, or claiming protection from, existing applications and stations operating in the fixed and mobile services. IALA could identify these channels for VHF data exchange (VDE).

## Future WRC Agenda Item

The WRC-12 has established a new Agenda item for the AIS for the WRC-15:

Agenda item 1.16 to consider regulatory provisions and spectrum allocations to enable possible new Automatic Identification System (AIS) technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution COM6/21 (WRC‑12);

More specifically this Resolution in its “resolves” portion quotes:

1 to consider, based on the results of ITU‑R studies, modifications to the Radio Regulations, including possible spectrum allocations, to enable new AIS terrestrial and satellite applications, while ensuring that these applications will not degrade the current AIS operations and other existing services;

2 to consider, based on the results of ITU‑R studies, additional or new applications for maritime radiocommunication within existing maritime mobile and mobile-satellite service allocations, and if necessary to take appropriate regulatory measures.

WRC-12 has also established a new Agenda Item for WRC-18 dealing with the modernization of the GMDSS and the e-navigation: **“**to consider regulatory actions, including spectrum allocations, to support GMDSS modernization and implementation of e-navigation in accordance with Resolution COM6/9 (WRC‑12);”

# User NEEDS

**The proposed VHF data exchange solution responds to a number of user requirements and identified gaps as per the IMO e-navigation Correspondence Group work approved by IMO/NAV56 and 57, and as reflected in Correspondence Group input to COMSAR16. The approach would look to address user needs through continued use of existing AIS channels (AIS1 and AIS2) with a focus on the current performance standard MSC.74(69) Annex 3, retaining backwards compatibilty with existing AIS equipment. Looking to the future, with additional capability made available following WRC 2012, the goal of the proposed VHF data exchange solution would be to provide seamless communications. The VHF data exchange will apply current and future proven technologies to provide additional services to address increasing user needs.**

**Noting the desire to harmonise navigational requirements with communication requirements, this activity will improve the efficiency of the current AIS approach. This will be accomplished in parallel with developing extended capability to support e-navigation communication protocols to make best use of the bandwidth available.**

**The details of the user needs, along with the reference to ‘Proposed practical e-navigation solutions to address identified gaps’ as presented in the input to COMSAR 16 (COMSAR16/11) has been referenced in Table 1 (overview format). Detailed tables are provided in Annex 1.**

**The approach should support a modular design for communication needs in the VHF band that enables scalability and interoperability for SOLAS as well as non-SOLAS vessels. The approach would support needs derived from the e-Navigation implementation as well as the review of the GMDSS.**

1. Summary table comparing IMO CG on e-Navigation “User Needs” document, Annex 1, with Identified Gaps and Proposed Solution to address gap (technical elements)

| Identifier | Identified Gaps[[1]](#footnote-1) | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms[[2]](#footnote-2) Method | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality[[3]](#footnote-3) | Sub functionality | AIS | e-Nav comms using AIS | e-Nav comms using ITU[[4]](#footnote-4) |
| 1##-YYY## | Shipboard User | Detailed as per Annex 1 tables 1a) i) - ii) | * *Safety of navigation* * *Maritime and inland distress and safety communications* * *long range AIS (i.e. satellite AIS)* * *Future SAR* * *Marine safety information* * *Marine Security information* * *General purpose information communication using existing AIS protocol* * *General purpose data exchange using ITU standard protocol* * *Short Safety Related Messages* * *Robust high speed data exchange* | * *Ship to ship collision avoidance* * *VTS* * *Tracking of ships* * *Locating in SAR (AIS SART)* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* * *Future distress alerting* * *Area warnings and advice* * *Meteorological and hydrological data* * *Traffic management* * *Ship-shore/ship-ship data exchange* * *VDL control (by Base Station)* * *Channel management* * *High message payload* |  |  |  |
| 2##-YYY## | Shorebased User | Detailed as per Annex 1 tables 1b) i) – v) |  |  |  |
| 3##-YYY## | Search and Rescue (SAR) User | Detailed as per Annex 1 tables 1c) i) – iii) |  |  |  |

**The reference document ‘Three Essential Elements of e-Navigation Communications’ provides the basis for the ‘function’ and ‘sub function’ references. While it is recognised that AIS is not part of GMDSS, there may be aspects of the proposed solution that could contribute to a future SAR element using AIS.**

* 1. **Ship-borne (Annex 1, Tables 1 a) i) – ii))**

**From a shipborne aspect, it is noted that the existing AIS technology addresses, or can address, many of the elements linked to ship reporting and basic data information exchange. The additional capability of an e-navigation communication methodology, using testing frequencies as agreed at WRC 2012 / working towards input to WRC 2015 and WRC 2018, enables the capability to test transmission of additional information. This approach enables testing using existing AIS protocols without impact on the current AIS VHF data link.**

**In addition, there is capability in the proposed solution to enhance data transfer using e-navigation communication protocols based on larger bandwidth capability. This additional message capability may make use of current AIS protocols.**

**The interaction proposed covers ship-ship / ship-shore / shore-ship VHF communications.**

* 1. **Shore (Annex 1, Tables 1 b) i) – v))**

**The shore aspect is similar to the ship aspect, making best use of current AIS technology. The interaction proposed covers ship-shore / shore-ship VHF communications. This approach does not address shore-shore communications, which would be covered through other technology solutions, including the development of common data formats.**

* 1. **Search and Rescue (Annex 1, Tables 1 c) i) – iii))**

**The approach proposed responds to some user requirements identified in SAR, however AIS (and AIS – like) communications must first be agreed as an element in SAR communications. This would be as part of any GMDSS review, should such a review be agreed.**

# ****Communications requirements to fulfil user NEEDS****

## VHF data communications

VHF data communications will provide robust high-speed data exchange between ships and between ship and shore. The AIS system is not capable of handling, nor is intended for, this high-speed data exchange.

Taking into account the channels identified by WRC-12 as described in 3.2 above, channels 24, 84, 25, 85, 26, and 86 will use the modulation technique described in ITU-R M.1842-1, and will be used for future VHF digital data, and ship-to-shore data exchange.

These may be used as discrete data communications channels, or a number may be combined into a single wide-bandwidth channel.

* + A typical scheme would be to allocate the four channels 25, 85, 26, and 86 for data exchange (in accordance with ITU-R M.1842 Annex 4) in areas such as ports and crowded waterways, with the other two channels (24 and 84) allocated to operation (in accordance with ITU-R M.1842, either Annex 1 or Annex 3) in coastline between these areas.
  + Where a number of the 25 kHz channels are combined, a typical scheme might have a 100 kHz bandwidth, allowing a much higher data throughput than a single 25 kHz channel.

## IALA “VHF Data Exchange” (VDE) plan

IALA plans to use six VHF data channels 24, 25, 84, 85, 26, and 86 plus channels 27 and 28 (which have been identified for “possible testing of future AIS applications”) for an international scheme to be known as “**VHF Data Exchange**” (VDE).

# Summary of the IALA VDE plan, and its relationship with AIS

## VDE and its relationship with AIS

To summarise the VDE plan, and its relationship with AIS:

* VHF Data Exchange (VDE)
* The duplex channels 27 and 28, which have been identified by WRC-12 for testing of future AIS applications, will be used for “radiocommunications involving, but not limited to, area warnings and meteorological and hydrographic data, as well as channel management of AIS, future VHF digital data, and ship-to-shore data exchange”
  + - These may use the same message structures and TDMA technology similar to AIS
    - This use for terrestrial data exchange will not prevent the use of these channels for satellite applications as referred in AI-1.16 of WRC-15
  + The four contiguous channels 25, 85, 26, 86 will be used for data exchange using the modulation technique described in ITU-R M.1842-1 Annex 4
    - These may be used as separate channels or combined into a single 100KHz broadband channel
  + The two contiguous channels 24 and 84 may also be used for data exchange along the coastlines and waterways using the modulation techniques described in ITU-R M.1842-1 Annex 1 or Annex 3.
* AIS
  + The existing AIS frequencies AIS-1 and AIS-2 (both are simplex channels) will be used exclusively for safety of navigation, primarily position reporting and identification, ship to ship and ship to shore
  + the simplex channels 75 and 76 will be used for satellite detection of AIS using AIS Message 27, long range AIS broadcast message

**Table 2 - ‘e-Navigation Communications – VHF elements only’ provides a summary of the technical assignment of various VHF channels for communication including protocol and types of messages to meet the functionality required by user needs.**

1. e-Navigation Communications – VHF elements only

| **Essential element of e-Navigation communications** | ***AIS*** | | ***e-Navigation VHF Data Exchange (VDE)***  ***(Toll free)*** | | ***GMDSS*** |
| --- | --- | --- | --- | --- | --- |
| **Sub-group** | ***AIS for safety of navigation*** | ***AIS long range (i.e. Sat-AIS)*** | ***using existing AIS protocol*** | ***using ITU standard protocol*** | ***Distress alerting, Selective calling*** |
| **Radio channels** | * *AIS-1 & AIS-2 (simplex)*   + *As now, no change* | * *Channels 75 and 76 (simplex)*    + *As per outcome from WRC 2012* | * *Channels 27B and 28B*    + *World-wide dedicated channels (WRC-15 target)* | * *Channels 24, 84, 25, 85, 26, 86* | * *Channel 70* |
| **Functionality** | * *Safety of navigation* * *Maritime and inland distress and safety communications* | * *Space detection of AIS* * *Future SAR* | * *Marine safety information* * *Marine security information* * *SSRMs* * *General purpose information communication* | * *General purpose data exchange* * *Robust high speed data exchange* | * *Maritime and inland distress and safety communications* |
| **Message types**  **for AIS protocol** | * *Vessel identification* * *Vessel dynamic data* * *Vessel static data* * *Voyage related data* * *Aids to Navigation* * *Base Station* | * *Space detection of AIS* * *Other messages for support of future SAR* | * *International application specific messages* * *Regional application specific messages* * *Base Station* |  |  |
| **Sub functionality** | * *Ship to ship collision avoidance* * *VTS* * *Tracking of ships* * *Locating in SAR* * *VDL control (by Base Station)* | * *Detection of vessels by coastal states beyond range of coastal AIS base stations* * *Locating in SAR* * *Future distress alerting if required by the GMDSS review* | * *Area warnings and advice* * *Meteorological and hydrological data* * *Traffic management* * *Ship-shore data exchange* * *Channel management* | * *High message payload* | * *Distress alerting* * *Selective calling (DSC)* * *AIS Channel Management ([[5]](#footnote-5))* |

# Internal IALA coordination

**Given the broad scope of VHF data exchange, the cooperation of other IALA Committees will be sought, to meet the goals of the IALA e-navigation strategy.**

## IALA e-NAV Committee

**Because of the closely related work on communications and data in WG3 and WG4, the Committee anticipates that further joint meetings of these two WGs will be needed, similar to that held in San Francisco in March 2012.**

**Some tasks should be executed in close collaboration with the other WGs of the Committee. This will be further detailed on specific issues in accordance with the roadmap to be developed. In general, this collaboration is reflected in Figure 1 below.**

## ****Other IALA Committees****

**Some of the work and proposals from WG3 and WG4, through the E-NAV Committee, will be liaised with other IALA Committees, especially the VTS Committee and the ANM Committee for review and comments, and where appropriate to PAP and LAP.**

# Input to and relationship with external bodies

**It is recognized that the work and activities of the e-NAV Committee (particularly WG3 and WG4) will have to respond to the IMO E-Navigation time schedule and developments, as well as the relevant time schedules and milestones of other international bodies, such as ITU, IEC, IHO, etc. Therefore, it is necessary that an overall timeframe for the work of WG 3 and WG 4 shall be connected to those relevant time schedules and milestones.**

**It is also recognized that the IMO is responsible for performance standards. For international work on e-Navigation, IALA is contributing to the development of functional standards and contributes, where appropriate, to the development of technical standards in close cooperation with ITU WP5B. ITU facilitates the implementation of e-Navigation communication systems with technical standards and spectrum allocation.**

**Once approved by Council, the results and proposals of the e-NAV Committee will need to be conveyed, in accordance with standard procedures, to the appropriate international bodies. In general, this process is reflected in Figure 1.**

## ****IMO****

**Results concerning the development and implementation of e-Navigation will be sent either to the IMO Correspondence Group on e-Navigation or as an information document on behalf of IALA to the relevant IMO Sub-committee (NAV/COMSAR/STW). Specific proposals may be submitted with the support of national administrations.**

## ****ITU****

**The IALA e-NAV Committee proposes liaison notes to ITU (e.g. WP5B) regarding development of e-Navigation communication systems, technical standards and spectrum allocation for approval by Council.**

## ****IEC****

**The activities and results of the work of IALA on e-Navigation will require continuing liaison and exchange with IEC to develop appropriate test standards.**

## ****IHO****

**It is recognized that some of the activities and results of WG 3 and WG 4 of the e-Nav Committee (including communications, information management, PNT, MSI etc.) may have a direct and indirect link to the development of services within the Maritime Services Portfolio (e.g. S-100 and ASMs) for which data modelling will be necessary. The output and proposals of the e-NAV Committee will be sent in accordance with the standard procedures via Council.**

****

1. IALA e-Navigation Committee internal and external relationships

# Milestones for Co-ordination with External Bodies

It is recognised that there will be a need to coordinate with a number of external bodies as work develops.

## ITU

### For WRC-2015

Generate timely liaison statements to ITU-R WP5B (meets twice a year)

* 1. Report on the results of studies concerning the use of channels 27 and 28 for extended AIS applications. Reports should be focused on:
     1. The feasibility of integrating these channels
     2. The essential need for these channels for efficiency and increased capacity
     3. Protection criteria for sharing these channels with non-maritime services
  2. Report on the need for revision and/or replacement of current standards:
     1. For AIS, Recommendation ITU-R M.1371
     2. For VHF Data Exchange, Recommendation ITU-R M.1842

### For WRC-2018

Coordinate with IMO Subcommittees; provide timely liaison statements to ITU-R WP5B

* 1. Report on the use of the channels 24, 84, 25, 85, 26 and 86 for VHF data exchange:
     1. GMDSS Modernization
     2. E-Navigation Communications
  2. Reports should include:
     1. The feasibility of using these channels for these purposes
     2. The essential need for these channels to meet user needs
     3. Protection criteria for sharing these channels with non-maritime services

## Co-ordination with other organisations

To be developed as co-ordination requirements, and time-lines for such co-ordination, are developed.

# ****ACtion planned by the committee****

The Committee intends to take the following action.

* Update the VHF portion of the MRCP in accordance with the content of this paper
* Conduct liaison as appropriate with other Committees, in particular VTS and ANM
* Consideration the potential need for addressing migration issues (including backward compatibility) in alignment with the IMO e-Navigation implementation plan
* At the appropriate times, initiate communications via IALA Council with the relevant external bodies concerning VHF communications for e-Navigation
* Propose to Council a revision of Task 14 for the e-NAV Committee

# ****RecommendationS****

The Committee invites the IALA Council to note its intentions concerning revision of the VHF portion of the MRCP.

The Committee requests IALA Council to approve a change in the wording of e-Navigation Committee Task 14

from:

*“ Monitor and contribute to development of AIS, including the next generation of AIS”*

to:

*“Monitor and contribute to development of AIS, the identification of opportunities and development of future VHF data exchange, as well as to contribute to the development of performance, functional and technical standards meeting user requirements for systems and applications to be developed ”.*

# ****References****

1. e-NAV7-14-6, “A Vision for a Future AIS for e-Navigation”
2. e-Nav10-output-18, “Three Essential Elements of e-Navigation Communications”
3. **IALA Maritime Radio Communications Plan**
4. IMO Correspondence Group on e-Navigation, report to COMSAR 16, with three **annexes**
5. **Input SF13 to joint meeting of WG3 and WG4, San Francisco, 2012-03-05 to 09, “Results of WRC12 affecting AIS”**

1. ANNEX 1 – Detailed mapping of IMO CG user needs to communications functionality
2. Annex 1, Table 1 a) i) Shipboard User – Effective and robust voice communications and data transfer

|  |  |
| --- | --- |
| <U03> Standardized and automated reporting  <U08> Improved Reliability  <U09> Effective and Robust Communications | <U09-1> Harmonized GMDSS equipment with integrated user interface  <U09-2> Communication method with high speed and wider bandwidth  <U12> Standard Interface |

| Identifier | Identified Gap[[6]](#footnote-6) | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms Method | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality[[7]](#footnote-7) | Sub functionality | AIS | | | VHF data exchange using AIS | | | VHF data exchange using ITU[[8]](#footnote-8) | |
| **120-Gte01** | User Needs : U08, U09  No reference to determine reliability of maritime communication  Insufficient reliability of data/voice communications (User require communication without interference, disruption and noise)  Lack of reliability standards for communication technology. | **(120-Gte01-Ste01)** Near coastal water data communication may be performed by means of VHF-data (to be developed and standardized). In areas beyond the coverage of existing satellite systems, HF-data should be developed covering the most necessary functions  ◦ **(120-Gte01-Ste02)** Automatic check or verifying procedure of reliability in system S/W(should be more than CRC checksum) | * *Safety of navigation* * *Short safety related messages* * *Marine safety information* * *Marine Security information* | * *Ship to ship collision avoidance* * *VTS* * *Tracking of ships* * *Locating in SAR (AIS SART)* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* * *Future(possible) distress alerting* * *VDL control (by Base Station)* | | X | X | | |  | | |
| **120-Gte01** | - CON’T- | - CON’T - | * *General purpose information communication using existing AIS protocol* * *General purpose data exchange using ITU standard protocol* * *Maritime and inland distress and safety communications* * *Marine safety information* * *Marine Security information* | * *Channel management* * *High message payload* * *Area warnings and advice* * *Meteorological and hydrological data* * *Ship-shore / shore-ship data exchange* * *Traffic management* | |  | X | | | X | | |
| **120-Gte02** | User Needs : U09  Possible lack of bandwidth and unclear assignment of adequate bandwidth for identified e-navigation communication needs. | ◦ **(120-Gte02-Ste01)** Changing of bandwidth of VHF channels from 25 kHz to 12,5 kHz may make available channels for e-navigation in the VHF-system. Regulatory issue, coordination between affected administrations required, according to ITU Rules.  ◦ **(120-Gte02-Ste02)** Satellite communication to be adjusted. Consider revision of the HF bands.  Status HF: WRC12, Agenda Item 1.9 All short wave bands are under revision to achieve broadband HF capabilities | * *Safety of navigation* * *Short safety related messages* * *Marine safety information* * *Marine Security information* | * *Ship to ship collision avoidance* * *VTS* * *Tracking of ships* * *Locating in SAR (AIS SART)* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* * *Future(possible) distress alerting* * *VDL control (by Base Station)* | | X | X | | |  | | |
|  |  | | |  | | |
| **120-Gte02** | - CON’T- | - CON’T - | * *General purpose information communication using existing AIS protocol* * *General purpose data exchange using ITU standard protocol* * *Maritime and inland distress and safety communications* * *Marine safety information* * *Marine Security information* | * *Channel management* * *High message payload* * *Area warnings and advice* * *Meteorological and hydrological data* * *Ship-shore / shore-ship data exchange* * *Traffic management* | |  | X | | | X | | |
| **120-Gte03** | User Needs : U09  Lack of systems for source and channel management for communication equipment.  Lack of seamless and communication mean dependent protocol for exchanging navigation information between ships | ◦ **(120-Gte03-Ste01)** In narrow sense, automatic VHF/MF/HF channel management function  ◦ **(120-Gte03-Ste02)** In wide sense, automatic 4S system channel management function | * *Safety of navigation* * *Short safety related messages* * *Marine safety information* * *Marine Security information* | * *Ship to ship collision avoidance* * *VTS* * *Tracking of ships* * *Locating in SAR (AIS SART)* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* * *Future(possible) distress alerting* * *VDL control (by Base Station* | | X | X | | |  | | |
| **120-Gte03** | Insufficient techniques and procedures for exchange of data between ship shore and on board.  Insufficient data protocols to support the exchange of reliability information describing data and system integrity | - CON’T - | * *General purpose information communication using existing AIS protocol* * *General purpose data exchange using ITU standard protocol* * *Maritime and inland distress and safety communications* * *Marine safety information* * *Marine Security information* | * *Channel management* * *High message payload* * *Area warnings and advice* * *Meteorological and hydrological data* * *Ship-shore / shore-ship data exchange* * *Traffic management* | |  | X | | | X | | |
| **120-Gte06** | User Needs : U09-2  Insufficient provision of short range but wider bandwidth communication means such as WiMAX. | ◦ **(120-Gte06-Ste02)** Automatic transition of communication channels between new technologies and current communication technologies of ship  ***(proposed solution will respond to VHF aspects only)*** | * *Safety of navigation* * *Short safety related messages* * *Marine safety information* * *Marine Security information* | * *Ship to ship collision avoidance* * *VTS* * *Tracking of ships* * *Locating in SAR (AIS SART)* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* * *Future(possible) distress alerting* * *VDL control (by Base Station* | | X | X | | |  | | |
| **120-Gte06** | - CON’T- | - CON’T - | * *General purpose information communication using existing AIS protocol* * *General purpose data exchange using ITU standard protocol* * *Maritime and inland distress and safety communications* * *Marine safety information* * *Marine Security information* | * *Channel management* * *High message payload* * *Area warnings and advice* * *Meteorological and hydrological data* * *Ship-shore / shore-ship data exchange* * *Traffic management* | |  | | | X | | | X | |

1. Annex 1, Table 1 a) ii) Shipboard User – Ship Reporting

<U03> Standardized and automated reporting

| Identifier | Identified Gap | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms Method | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality | Sub functionality | AIS | VHF data exchange using AIS | VHF data exchange using ITU |
| **140-Gte01** | User Needs : U03  With the exception of Polling, current system does not provide provision for automatic ship reporting. | **(140-Gte01-Ste01)** 1) Dynamic information (Position, Course and speed) provided into system by ship via suitable carriers offering validation of data. (AIS and AIS-S) **(140-Gte01-Ste02)** 2) Static data to be provided from source and indexed to the ships dynamic data by a data exchange system fit for purpose to provide all static parts. (International data exchange?)  ◦ **(140-Gte01-Ste03)** 3) Voyage data of AIS should be provided | * *Marine safety information* * *Marine Security information* * *long range AIS (i.e satellite AIS)* | * *VTS* * *Tracking of ships* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* | X | X |  |
| * *General purpose information communication using existing AIS protocol* | * *Traffic management* |  | X | X |
|  |  |  |
|  |  |  |
| **140-Gte03** | User Needs : U03  Single-window and/or automated and single entry for any required reporting information into the system for it to be shared by authorized authorities without further intervention by the ship during and/or before navigation, except it has any relevance for navigational purposes (VTS/PILOT/HARBOR/COLREG). | **(140-Gte03-Ste01)** International data exchange to enable shore authorities to index AIS report and ship ID to latest information on Cargo, Hull and Passenger. The IDE and SafeSeaNet are examples of relevant existing systems. When located, use e-mail or EDI to retrieve information. | * *Marine Security information*   *(note - use of MMSI / IMO number to cross reference provides capability to identify additional data )*   * *Marine safety information* * *Future SAR* | * *Tracking of ships* * *VTS* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* | X | X |  |
| * *Marine safety information* | * *Ship-shore / shore-ship data exchange* * *High message payload* |  | X | X |
| **140-Gte04** | User Needs : U03  Automated entry of internal ship data for reporting (including updates of information) is not available. | **(140-Gte04-Ste01)** 1) Link between Port competent authorities to ship for update of M5 automatically into the ships AIS. **(140-Gte04-Ste02)** 2) Change of ships name and MMSI information to be possible only by a representative of a competent authority.  **(140-Gte04-Ste03)** 3) Automate the process to install static information into ship reporting equipment such as message 5 of AIS. | * *Marine Security information* * *Marine safety information* | * *VTS* * *Ship to ship collision avoidance* * *Tracking of ships* | X | X |  |
| * *Marine safety information* | * *Ship-shore / shore-ship data exchange* * *High message payload* |  | X | X |
| **140-Gte05** | User Needs : U03  Insufficient means for ship reporting | **(140-Gte05-Ste01)** Stimulate ship reporting through automated means by providing the tools needed. | * *Marine safety information* * *Marine Security information* * *long range AIS (i.e satellite AIS)* | * *VTS* * *Tracking of ships* | X | X |  |
|  | - CON’T- | - CON’T - | * *Marine safety information* * *General purpose data exchange using ITU standard protocol* | * *Ship-shore / shore-ship data exchange* * *High message payload* * *Traffic management* |  | X | X |
| **140-Gop01** | User Needs : U03  Reporting procedures are not globally standardized. | **(140-Gop01-Ste01)** 1) Use AIS in VTS Port and coastal infrastructure vicinity, and AIS by satellite for remote coastal areas and deep sea. Will provide a globally standardized system for provision of ship information.  **(140-Gop01-Ste02)** 2) By indexing the ID of the ship through a global exchange would enable access for sourcing information on Hull, Cargo, passengers as required. | * *Marine safety information* * *Marine Security information* | * *VTS* * *Tracking of ships* | X | X |  |
| * *Marine safety information* * *Marine Security information* * *General purpose data exchange using ITU standard protocol*   *(note - use of MMSI / IMO number to cross reference provides capability to identify additional data )* | * *Ship-shore / shore-ship data exchange* * *High message payload* * *Traffic management* |  | X | X |
| **140-Gop02** | User Needs : U03  The needs to report, for safety, commercial and legislative reasons require time and effort. | **(140-Gop02-Ste02)** 2) Provide for automatically communicating this status to Flag and or coastal states. Provide interface to sensors, VDR or ship condition monitoring system. | * *Marine safety information* * *Marine Security information* | * *VTS* * *Tracking of ships* | X | X |  |
|  | - CON’T- | - CON’T - | * *Marine safety information* * *Marine Security information* * *General purpose data exchange using ITU standard protocol*   *(note – solution could provide communications link once sensors are interfaced )* | * *Ship-shore / shore-ship data exchange* * *High message payload* |  | X | X |

1. Annex 1, Table 1 b) i) Shorebased User – Information / Data Management

|  |  |
| --- | --- |
| <U09> Effective and Robust Communications <U50> Collection of information <U51> Provision of information to vessels | <U52> Shore-to-shore information exchange <U53> Management of information |

| Identifier | Identified Gap | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms Method | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality | Sub functionality | AIS | VHF data exchange using AIS | VHF data exchange using ITU |
| **211-Gte01** | User Needs : U50, U51, U52  Lack of a common maritime information/data structure harmonizing the policies for the security and use of data.  Insufficient identification of harmonization needs for standards, formats and protocols.  Lack of protocols, formats and data structure that enable shore based authorities to exchange information with other authorized shore based users.  No standardized format for data exchange between VTS centers and other e-Nav stakeholders. | ◦ **(211-Gte01-Ste01)** Develop the common maritime data structure to manage all required information and data  ◦ **(211-Gte01-Ste02)** Revise the software of shorebased system in order to use the developed CMDS for their intended functions | * *General purpose information - communication using existing AIS protocol* * *General purpose data exchange using ITU standard protocol* * *Robust high speed data exchange* | * *Traffic management* * *Ship-shore / shore-ship data exchange* * *High message payload* |  | X | X |

1. Annex 1, Table 1 b) ii) Shorebased User – Effective and robust voice communication and data transfer

<U09> Effective and robust communication

| Identifier | Identified Gap | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms Method | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality | Sub functionality | AIS | VHF data exchange using AIS | VHF data exchange using ITU |
| **220-Gtr01** | User Needs : U09  Lack of international guidance on security of data and its sharing | **(220-Gtr01-Ste01)** Issues may include, AIS data, single window, encryption etc  (Security of data sharing) | * *Marine safety information* * *Marine Security information* * *General purpose information - communication using existing AIS protocol* * *General purpose data exchange using ITU standard protocol* * *Robust high speed data exchange* | * *High message payload* * *Ship-shore / shore-ship data exchange* * *VDL control (by Base Station)* |  | X | X |

1. Annex 1, Table 1 b) iii) Shorebased User – Systems and equipment – presentation of information

<U51> Provision of information to vessels

<U53> Management of information

| Identifier | Identified Gap | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms Method | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality | Sub functionality | AIS | VHF data exchange using AIS | VHF data exchange using ITU |
| **235-Gte01** | User Needs :U51, U53  Insufficient delivery and presentation of maritime information that shore based authorities are required to provide to ships.  There are no standard data formats for on board capture and presentation that cover the entire scope of information provided by a VTS | **(235-Gte01-Ste01)** Both ship and shore systems will need to support the agreed common data structure and format for the exchange of e-navigation information. | * *Safety of navigation* * *Short safety related messages* * *Marine safety information* * *Marine Security information* | * *Ship to ship collision avoidance* * *VTS* * *Tracking of ships* * *Locating in SAR (AIS SART)* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* * *Future(possible) distress alerting* * *VDL control (by Base Station)* | X | X |  |
|  | - CON’T- | - CON’T - | * *General purpose information communication using existing AIS protocol* * *Maritime and inland distress and safety communications* * *Marine safety information* * *Marine Security information* * *General purpose data exchange using ITU standard protocol* | * *Channel management* * *High message payload* * *Area warnings and advice* * *Meteorological and hydrological data* * *Ship-shore / shore-ship data exchange* * *Traffic management* |  | X | X |
| **235-Gop01** | User Needs : U53  Lack of harmonized presentation of domain awareness to improve situational awareness for allied and other support services. | ◦ **(235-Gop01-Ste01)** Information structure or data format of domain awareness should be defined and developed | * *Safety of navigation* * *Short safety related messages* * *Marine safety information* * *Marine Security information* | * *Ship to ship collision avoidance* * *VTS* * *Tracking of ships* * *Locating in SAR (AIS SART)* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* * *Future(possible) distress alerting* * *VDL control (by Base Station)* | X | X |  |
|  |  |  | * *General purpose information communication using existing AIS protocol* * *Maritime and inland distress and safety communications* * *Marine safety information* * *Marine Security information* * *General purpose data exchange using ITU standard protocol* | * *Channel management* * *High message payload* * *Area warnings and advice* * *Meteorological and hydrological data* * *Ship-shore / shore-ship data exchange* * *Traffic management* |  | X | X |

1. Annex 1, Table 1 b) iv) Shorebased User – ship reporting

<U50> Collection of information  
<U53> Management of information  
<U52> Shore-to-shore information exchange

| Identifier | Identified Gap | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms Method | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality | Sub functionality | AIS | VHF data exchange using AIS | VHF data exchange using ITU |
| **240-Gop01** | User Needs :U53  *Management of report caused by* the needs to report, for safety, commercial and legislative reasons require time and effort. | ◦ **(240-Gop01-Ste01)** Digital format for report should be developed ◦ **(240-Gop01-Ste02)** Management system in S/W and H/W should be developed to handle various report from ship in type of digital format | * *General purpose information communication using existing AIS protocol* | * *VTS* * *Tracking of ships* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* | X |  |  |
| * *General purpose data exchange using ITU standard protocol* * *Robust high speed data exchange* | * *VTS  (fusion of primary and secondary VTS tasks)* * *Detection of vessels by coastal states beyond range of coastal AIS base stations* |  | X | X |

1. Annex 1, Table 1 b) v) Shorebased User – Traffic Monitoring

|  |  |
| --- | --- |
| <U09> Effective and robust communications  <U50> Collection of information  <U51> Provision of information to vessels | <U52> Shore to shore information exchange  <U53> Management of information  <U54> Quality assurance,  <U55> Manage Incidents & Emergency Management by a shorebased authority |

| Identifier | Identified Gap | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms Method | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality | Sub functionality | AIS | VHF data exchange using AIS | VHF data exchange using ITU |
| **260-Gte06** | User Needs : U09  Bandwidth limitations shore / ship.  Shortage of VHF marine frequencies  INMARSAT C is a “store and forward” system. Speed of data exchange and capacity varies. There can be unintended interference between ship transmissions (e.g. AIS) and shore based infrastructure. | **(260-Gte06-Ste01)** Evaluate new technologies (e.g. WiMAX, Voice over IP) to meet ship/shore operational requirements | * *Robust high speed data exchange* * *General purpose data exchange using ITU standard protocol*   *(bandwidth capacity as per outcomes of WRC 2012)* | * *High message payload* * *Ship-shore / shore-ship data exchange* |  |  | X |

1. Annex 1, Table 1 c) i) Search and Rescue User – Information Management

|  |  |
| --- | --- |
| <U80>Access to relevant information contained within the e-navigation domain for SAR activities  (Ex.1 passenger/crew list;,  .2 passenger tracking systems data;  .3 hazardous cargo;  .4 evacuation plans; | .5 ships plans;  .6 number of lifeboats/liferafts/life saving appliances (Survival suits);  .7 EPIRB/SART and AIS/SART data  .8 SAR- co-operation plan data for passenger ships; and  .9 ship's IMO number) |

| Identifier | Identified Gap | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms Method | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality | Sub functionality | AIS | VHF data exchange using AIS | VHF data exchange using ITU |
| **310-Gte01** | User Needs : U80  Lack of mechanisms to provide SAR (RCC) function with the full range of relevant e-navigation information in digital format.  Hardware: Resources and capability available for infrastructure can be lacking and therefore tools needed for accessing digital data may not be available. Lack of data in digital format. | ◦ **(310-Gte01-Ste02)** Develop the efficient way to use digital data via communication channel between SAR and ship | * *Future SAR* * *Robust high speed data exchange* | * *Locating in SAR (AIS SART)* * *Future distress alerting* * *Ship-shore / shore-ship data exchange (ship/ship)* * *High message payload* |  |  | X |
| **310-Gop01** | User Needs : U80  Insufficient access to and quality of information from ships in distress. | ◦ **(310-Gop01-Ste02)** AIS should have a message for exchange of SAR related information between ship and SAR authority | * *Future SAR* * *Marine safety information* | * *Locating in SAR (AIS SART)* * *Future distress alerting* | X | X |  |

1. Annex 1, Table 1 c) ii) Search and Rescue User – Effective and robust voice communication and data transfer

<U82>Effective Communication and information sharing  
<U83>Priority for distress communications

| Identifier | Identified Gap | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms Method | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality | Sub functionality | AIS | VHF data exchange using AIS | VHF data exchange using ITU |
| **320-Gte01** | User Needs : U82  Lack of an automated data network connecting all stakeholders in SAR intervention, including improved communication between RCC and shore-, land-, sea- and air-based entities.  Lack of access to the details of all relevant onboard communication and capabilities for SAR authorities.  Limited resources for communication infrastructure *in SAR operation* | ◦ **(320-Gte01-Ste01)** AIS(or DSC) can be a solution to share SAR information between all stakeholders in SAR place if we have additional AIS message format for it | * *Future SAR* * *Marine safety information* | * *Locating in SAR (AIS SART)* * *Future distress alerting* | X | X |  |
| **320-Gre01** | User Needs : U83  Lack of solutions for maintaining priority for distress communication.  Potential loss of priority for distress communication. | ◦ **(320-Gre01-Ste01)** Consider to allocate a VHF channel(not Ch. 16) only for SAR operation when the stakeholder engaged in SAR operation ◦ **(320-Gre01-Ste02)** Potential AIS message for SAR should have a parameter to assign SAR operation channel of VHF in a field of SAR activity ◦ **(320-Gre01-Ste03)** Develop the new interface sentence(IEC 61162) between AIS and VHF equipment | * *Future SAR* * *Marine safety information* | * *Locating in SAR (AIS SART)* * *Future distress alerting* | X | X |  |

1. Annex 1, Table 1 c) iii) Search and Rescue User – Systems and equipment

|  |  |
| --- | --- |
| <U84>Access to the details of all relevant onboard communication equipment and capabilities  <U85>Harmonization and integration way between non-GMDSS and GMDSS facilities (ex. non-GMDSS alerting including mobile technology and future developments) | <U86>Current functions of the present GMDSS need to be supported and enhanced: <U87>Development and promotion of standards for safe navigation to improve decision support and reduce human error |

| Identifier | Identified Gap | Proposed Solution to address gap  (ref - Technical element) | Proposed Solution to address gap - VHF data aspects | | Comms Method | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functionality | Sub functionality | AIS | VHF data exchange using AIS | VHF data exchange using ITU |
| **330-Gte01** | User Needs : U84, U86  Currently, collecting information pertaining to a distress situation consumes valuable time. | **(330-Gte01-Ste01)** Integrate a simplified GMDSS into the e-navigation concept | * *Future SAR* * *Marine safety information* | * *Locating in SAR (AIS SART)* * *Future distress alerting* | X | X |  |

1. reference – COMSAR16/11 Annex 1 [↑](#footnote-ref-1)
2. example of cross reference of functionality and sub functionality to communications method as appropriate, may reference more than one comms method [↑](#footnote-ref-2)
3. reference – adapted from e-NAV11/10/4 for Functionality and Sub Functionality . **It is understood that automatic identification of stations is a requirement for all communications.** [↑](#footnote-ref-3)
4. E-Navigation communication using ITU standard protocol (VHF data exchange) [↑](#footnote-ref-4)
5. With the protection of the AIS1 and AIS2 frequencies, AIS channel management via both AIS message 22 and DSC is considered unnecessary and undesirable. [↑](#footnote-ref-5)
6. **Footnotes valid for all tables**

   reference – COMSAR16/11 Annex 1 [↑](#footnote-ref-6)
7. reference – e-NAV11/10/4; COMSAR16/11 as appropriate

   3 VHF data exchange using ITU standard protocol (VHF data exchange) [↑](#footnote-ref-7)
8. [↑](#footnote-ref-8)