****

**Report**

**Joint Session between TG-1.2.5 ‘MASS’ and TG-1.4.3 ‘Future VTS’ at VTS52**

(09:30 -11:00 UTC, 6 April 2022)

**EXECUTIVE SUMMARY**

A joint meeting between TG1.2.5 *- Implications of MASS from a VTS Perspective* and TG1.4.3 *- Future VTS* was held to explore ‘operational requirements’ for managing ship traffic and the interaction between VTS, ships (both conventional and autonomous), allied services and RCCs through mix of traditional VHF voice, digital communications, and automated data exchange. For example:

* ‘Ships’ to provide reports and information required by a VTS.
* VTS to provide ‘ships**[[1]](#footnote-1)**’ with information on factors that may influence ship movements and assist ‘onboard decision-making**[[2]](#footnote-2)**’.
* VTS to issue advice, warnings, and instructions to achieve its purpose.
* Ensuring the intent of messages conveyed to actors, including allied services, is the same irrespective of the technology used to deliver it.

Thirty-four participants from the two task groups participated in the joint session. A list of the participants is at Annex 1.

**Highlights**

* A key principle in transitioning to a digital environment is ensuring the intent of messages conveyed to actors, including allied services, is the same, irrespective of the technology used to deliver it (e.g., voice/digital/automated data exchange).
* The principles of many of today’s reporting requirements / interactions will still be required (e.g., entry report, permission to proceed, route deviation) in transitioning, however the contents, details and method of delivery will evolve. The concepts of handshaking / confirmation associated with responsibilities / expectations will remain.
* There is a compelling need for a global standard for digital communications and automated data exchange to ensure a successful transition to a digital maritime world and managing ship traffic comprising both conventional and autonomous ships. Specifically, this includes structure, format syntax and the defined elements.
* The transition to digital communications and automated data exchange offers opportunities for more efficient interaction / transfer of information and data to minimise the burden on the entity responsible for the navigation of the ship in transiting VTS areas and between VTS areas.
* As the transition commences there is a compelling need to explore and adopt strategies to:
  + Ensure a global standard for digital communications and automated data exchange is achieved
  + Ensure the requirements to manage ship traffic in the changing environment are clearly and concisely articulated and communicated.
  + Consider and define automation at a VTS to enable the management of a mix of traditional VHF voice, digital communications, and automated data exchange between shore and ‘ship’, allied services, RCCs and other stakeholders.
  + Consider possible changes to the role / function for VTS and other services.
* As we transition from the traditional means of vessel navigation, management of ship traffic and communications, to more highly automated means of voyage planning, digital data exchange, and MASS, it is recognized that the role of human operators will change.
  + The success of future operations within this evolving marine ecosystem will require building trust between human operators and the new levels of automation. It will therefore be essential that new roles, tasking, and work process defined for human operators include methods for building trust during the development, testing and deployment of MASS and other highly automated systems.
* There is a rapidly emerging need for the VTS community and IALA to engage in the change process occurring and the development of the road map for MASS commencing at the IMO to communicate the functional / operation requirements to manage ship traffic and the interaction between VTS, ships (both conventional and autonomous), allied services and RCCs through mix of traditional VHF voice, digital communications, and automated data exchange.
* Operational considerations discussed with regards to managing a mix of traditional VHF voice, digital communications, and automated data exchange include:
  + - How advanced is the digital framework in the VTS and port (e.g., allied services) and what is the autonomous ability of VTS to deal with autonomous ships?
    - What information is required?
    - What data can be standardised?
    - What information needs interpretation / response?
    - What requires human analysis / interaction?
    - Tasking of VTSO / changes to work practices.
    - Operational / procedural changes associated with the above.

|  |
| --- |
| **Agenda**   1. **Introduction/Setting the scene** 2. **Session 1 -** Operational Requirements for‘Ships**1**’ to provide reports and information required by a VTS using an ‘*Entry Report’* as an example. 3. **Session 2 -** Operational Requirements for VTS to provide ‘ships’ with information on factors that may influence ship movements and assist ‘onboard decision-making**2**’ using ‘*Permission to Proceed*’ as an example. 4. **Where to from here?** |

‘ship’ – refers to conventional and autonomous

**2** ‘onboard decision-making’ refers to the “responsible entity” for the ‘ship’

# Introduction/Setting the scene

Neil Trainor welcomed participants to the joint session of the two task groups by:

* Providing a brief background to origins of the proposal for a joint session by highlighting:
* As the ‘MASS’ Task Group was completing its intersessional work between VTS51 and VTS52 it had become apparent that they were exploring some similar issues with regards to what will be required to manage ship traffic and the interactions between VTS, ships (both conventional and autonomous), allied services and RCCs through mix of traditional VHF voice, digital communications, and automated data exchange in the future as the ‘Future VTS’ Task Group:

|  |  |  |
| --- | --- | --- |
| **TG1.4.3 - Future VTS** | | **TG1.2.5 - MASS** |
| **(Emerging trends, technologies, and practices)** | **Section** | **Elements being consideration** |
| Maritime Autonomous Surface Ships (MASS) | 4.3.1 | Checkmark with solid fill |
| Digital technologies and communications | 4.3.2 | Checkmark with solid fill |
| Green House Gas Emissions / Just in Time Arrival | 4.3.3 |  |
| Advanced Decision Support Services | 4.3.4 | Checkmark with solid fill |
| Automated Data and Information Exchange | 4.3.5 | Checkmark with solid fill |
| Navigational Support / Assistance | 4.3.6 |  |
| Sea Traffic Management | 4.3.7 |  |
| Marine Spatial Planning | 4.3.8 |  |
| Interacting Objects | 4.3.9 |  |
| Digital situational awareness / Common Situational awareness | 4.3.10 | Checkmark with solid fill |
| Slot Management | 4.3.11 |  |
| New sensing technology for nearshore and port waters | 4.3.12 |  |
| Long-distance sensing technology | 4.3.13 |  |

* As a result, it was determined there would be benefits in hosting a joint session between the two groups at VTS52 to exchange ideas, ensure a consistent approach and facilitate development both groups progress the items were there was commonality.
* Introducing the scope for the joint session:

|  |
| --- |
| **Purpose**  To explore ‘operational requirements’ for managing ship traffic and the interactions between VTS, ships (both conventional and autonomous), allied services and RCCs through mix of traditional VHF voice, digital communications, and automated data exchange. For example:   * ‘Ships’[[3]](#footnote-3) to provide reports and information required by a VTS. * VTS to provide ‘ships’ with information on factors that may influence ship movements and assist ‘onboard decision-making’[[4]](#footnote-4). * VTS to issue advice, warnings, and instructions to achieve its purpose. * Ensuring the intent of messages conveyed to actors, including allied services, is the same irrespective of the technology used to deliver it.   **Assumptions**  As described in Section 3.3.2 of the ‘*Discussion Paper – Implications of MASS from a VTS Perspective’* consideration of the implications of MASS from a VTS perspective have been based on the following assumptions:   * MASS will be required to participate in VTS. That is, subject to the same:   + Regulatory reporting requirements, and   + Obligations with regards to the issue of advice, warnings, and instructions by a VTS. * MASS will be subject to COLREG, as amended. * MASS will be required to broadcast:   + Status as to who/what is in command at any time (e.g. Master/on-board DST, Remote Control Center).   + Autonomous state of the ship. * Proposed IMO Goal-Based Instrument for MASS will provide clarification on matters such as:   + meaning of the terms master, crew or responsible person   + remote control station/centre   + determination of the remote operator as a seafarer |

* Introducing the agenda for the joint session:

|  |
| --- |
| **Agenda**   1. **Introduction/Setting the scene** 2. **Session 1 -** Operational Requirements for‘Ships**1**’ to provide reports and information required by a VTS using an ‘*Entry Report’* as an example. 3. **Session 2 -** Operational Requirements for VTS to provide ‘ships’ with information on factors that may influence ship movements and assist ‘onboard decision-making**2**’ using ‘*Permission to Proceed*’ as an example. 4. **Where to from here?** |

‘ship’ – refers to conventional and autonomous

**2** ‘onboard decision-making’ refers to the “responsible entity” for the ‘ship’

# session 1 - Operational Requirements for ‘Ships’ to Provide Reports and Information Required by A VTS using an ‘Entry Report’ as an Example

Participants commenced Session 1 by considered the provision of an ‘Entry Report’ as it is currently provided by VHF voice and how it could be provided digitally using the following example:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | **Information required** | **VHF Voice** | **Digital Exchange** | | | --- | --- | --- | --- | | **E.g. Standard Reporting Format as described in IMO Res. A.851(20)** | **(E.g. using FAL)** | | **Message Type** |  | *Entry Report (e.g ER)* | **IMO0192**  Message type, coded  Format - an..3  Code List - EDIFACT codes (1001) | | **Ship name, call sign and IMO number** | Voice | *A/HAPPY SAILOR/ ABCD/1234567* | IMO0142  Ship name  Format - an..70  **IMO0136**  Ship call sign  Format - an..7  **IMO0140**  Ship IMO number  Format - an..7 | | **Date and time (UTC)** | Voice | *B/010200UTC* | **IMO0063**  Date and time of arrival – actual  an..35  **IMO0064**  Date and time of arrival – estimated  Format - an..35 | | **Current Position** | Voice | *C/1120S/14430E* |  | | **Speed**  **Ships planned average speed** | Voice | *F/13.5* |  | | **Last Port of Call/Port Departing from within the VTS area** | Voice | *G/Singapore* | **IMO0075**  Last port of call name  Format - an..256  **IMO0076**  Last port of call, coded  Format - an5  Code list UN/LOCODE | | **Date, time (UTC) and point of entry to VTS Area** | Voice | *Position?*  *Local name?* |  | | **etc** | **etc** | **etc** | **etc** | |

**Discussion / Conclusions:**

1. There are concerns there may be several ‘standards’ emerging for digital data/exchange with data elements and the associated structure / format / syntax for messaging. It is unclear whether the framework/systems being developed (e.g., FAL, S200, AIS/VDES) are synchonising this essential requirement.
2. A global standard with regards to a digital framework (structure, data elements, syntax, and format) for reporting requirements such as an ‘entry report’ are harmonised.
3. The concept of an ‘entry report’ will remain with the advent of MASS and digital data exchange for several reasons, including:
   * It provides a ’handshake’ to acknowledge / confirm entry into an area where there are respective responsibilities and obligations
   * Even with the digital exchange of passage plans / just-in-time arrival the last few hours (eg 3 hours) with regards to entering a port are difficult to predict and is often a dynamic environment. It is recognised the information exchanged etc may change but the concept will remain.
4. Key operational requirements / considerations for such a ‘report’ include:

* Simplification of reporting / reporting requirements – ease of reporting / negate the need for reporting the same information to multiple sources
* Data Structure / Syntax / Format - Framework for data elements
* Technology /Medium
* Level of digital automation at a VTS
* Human on the loop – automated process that does not requires human interaction but allows it - noting the advent of enhanced decision support systems, ‘big data’ and artificial intelligence concepts such as this should be explored.
* One report from a ‘ship’ to address multiple needs/users to minimise multiple reporting (e.g., information ‘shared’ to several VTSs / adjacent VTSs / RCCs / allied services as approprtiate.
* Receipt
  + Validation
  + VTSO awareness
  + Compliance/enforcement
* Managing a mix of traditional VHF voice, digital communications, and automated data exchange:
  + What information is required?
  + What data can be standardised?
  + What information needs interpretation / response?
  + What information requires human analysis / interaction?
* Tasking of VTSO / changes to work practices
* Operational / procedural changes associated with the above
* Acknowledgement to responsible entities ‘ship’, RCC, Multiple RCCs
* Assimilation - How VTS receives, assimilates, and processes data and information from MASS/RCC

# session 2 - Requirements for VTS ‘Approving permission to proceed’

Participants commenced Session 2 by considered the practices described in IALA *Guideline G1132 -VTS Voice Communications and Phraseology* for providing such interaction. This included:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **6.2. GENERIC COMMUNICATIONS**   |  |  | | --- | --- | | **Message Element** | **Message Intent** | | PERMISSION (to) | Permission for proposed action granted |   **6.4.3 PROCEEDING FROM OR TO AN ALONGSIDE BERTH OR ANCHORAGE**  **6.4.3.1. Approving permission to proceed**  Based on the information available, the VTS assesses that it is safe and gives approval for the ship to proceed from or to an alongside berth or anchorage, subject to the discretion of the Master.  Prior to, or immediately following, a request to proceed from an alongside berth or anchorage, the ship should be notified of the position and intentions of other traffic or any other conflict avoidance measures and, after approval has been given, other ships should be notified of the impending departure (see section on “Provision of Traffic Information”). See Table 20.   |  |  |  | | --- | --- | --- | | **Conventional (VHF Voice)** | | **Digital** | | **Message Element** | **Message Intent** |  | | PERMISSION  TO (enter / depart / proceed)  FROM/TO (berth/anchorage/ lock/creek)  [TO (location and/or subject to condition)] | Permission has been granted to proceed to undertake an activity (e.g., enter, depart, proceed)  From a location (e.g., berth, anchorage area, lock, creek, fairway, pilotage area) from (departure) or to (arrival) which permission has been granted. [Optional - Destination or other conditions may be included as appropriate] | **?** |     Example where a VTS provides permission to proceed from a location:   |  |  | | --- | --- | | **VTS** | (ship name) PERMISSION TO (depart / proceed) FROM  (berth/anchorage/lock/creek). [Subject to condition] |     Example where a VTS provides permission to proceed to a location:   |  |  | | --- | --- | | **VTS** | PERMISSION TO PROCEED TO (berth name/anchorage designator) | |

**Discussion / Conclusions**

1. There is a need for a global standard with regards to how a VTS provides such interaction digitally.
2. The concept of an ‘Permission to Proceed’ will remain with the advent of MASS and digital data exchange.
   * It provides a ’handshake’ to acknowledge / confirm permission to do something has been given.
   * It may involve entities / regulatory requirements for just VTS.
   * It is generally associated with a short spatial/temporal window that changes dynamically
3. Key operational requirements / considerations for such a ‘report’ include:

* Data Structure / Syntax / Format
* Technology /Medium
* How advanced is the digital framework in the port concerned
* How can data be shared / reused without requiring additional reports from ship
* How to ensure globally standardised reports (for all users)
* Recipient/s
* Managing a mix of traditional VHF voice, digital communications, and automated data exchange
* Managing multiple methods of interaction/simultaneous interactions for messages to be conveyed to actors, irrespective of whether it is by voice or digital means.
* Ensuring the intent of message conveyed to actors, including allied services, is the same irrespective of the technology used to deliver it (Voice/digital?)
* Interaction with multiple RCC’s.
* How does the VTS interact with the entity in control of the ship (Master/RCC/automated systems
* Receipt acknowledgement
* Acknowledgement to ‘ship’

# Where to from here?

1. Consideration to the challenges associated with the transition, including:

* Processes
* Common data set / Standards
* How systems evolve

1. How to achieve standards / particularly for all stakeholders / allied services
2. What do we need to get there?
3. What is the role for VTS in the future?

## Annex 1: Participants

| **Surname** | **First Name** | **Affiliation** | |
| --- | --- | --- | --- |
| Trainor | Neil | Australian Maritime Safety Authority | Australia |
| Guèvremont | Jean | Canadian Coast Guard | Canada |
| Ren | Yalei | Maritime Safety Administration | China |
| Chen | Justin | ?? | ?? |
| Li | Yuanhang | Maritime Safety Administration | China |
| Chen | Wang | Maritime Safety Administration | China |
| Jinkai | Liu | Maritime Safety Administration | China |
| Wang | Wei | Maritime Safety Administration | China |
| Chunhua | Ma | ?? | ?? |
| Li | Xiaohui | ?? | ?? |
| Bing | Wang | Maritime Safety Administration | China |
| Hansen | Dorte | Defence Command Denmark Naval Staff | Denmark |
| Bang | Jacob | Danish Maritime Authority | Denmark |
| Strandberg | Michael | Danish Maritime Authority | Denmark |
| Martikainen | Toumas | Finnish Transport Infrastructure Agency | Finland |
| Campagna | Arturo | Italian Navy | Italy |
| Lee | Ji Yeon | Korea Coast Guard | Korea |
| Byun | Junhyeok | Korea Coast Guard | Korea |
| Kim | Hye-jin | KRISO | Korea |
| Noguchi | Hideki | Japan Coast Guard | Japan |
| van Dorsser | Harmen | Port of Rotterdam Authority | Netherlands |
| van Omme | Hilbert | Dutch Pilots' Corporation | Netherlands |
| Drenth | Martijn | Dutch Pilots' Corporation | Netherlands |
| Rostopshin | Dmitry | Wartsila | Russia |
| Laixing | Du | Maritime and Port Authority of Singapore | Singapore |
| Gill | Arvinder | Maritime and Port Authority of Singapore | Singapore |
| Kern | Teo Tze | Maritime and Port Authority of Singapore | Singapore |
| Ahmad | Muhammad Kamal | Maritime and Port Authority of Singapore | Singapore |
| Matias | Fernando | SASEMAR | Spain |
| Karlsson | Fredrik | Swedish Maritime Administration | Sweden |
| Eade | Peter | VISSIM | UK |
| Trent | Michael | IHMA | USA |
| Cabos | Christian | ?? | ?? |

1. ‘ship’ – refers to conventional and autonomous [↑](#footnote-ref-1)
2. ‘onboard decision-making’ refers to the “responsible entity” for the ‘ship’ [↑](#footnote-ref-2)
3. ‘ship’ – refers to conventional and autonomous [↑](#footnote-ref-3)
4. ‘onboard decision-making’ refers to the “responsible entity” for the ‘ship’ [↑](#footnote-ref-4)