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| IALA Guideline |

Gnnnn

[Provision of VTS to Autonomous and Conventional Ships]

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Revisions to this document are to be noted in the table prior to the issue of a revised document.

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**ANNEX 1** - Working template to assist drafting Section 4

# document purpose

The purpose of this document is to assist VTS providers interact with vessel traffic, regardless of whether certain functions are remotely controlled or autonomously operated and respond to developing situations within a VTS area to improve safety and efficiency of navigation, contribute to the safety of life at sea and support the protection of the environment.

The document also provides a framework to assist VTS providers prepare for the ever-increasing use of automation in the operation of ships, along with the anticipated increase in the use of remote control and autonomous operation of key functions for ships and therefore adapt their systems and processes accordingly, recognizing.

* The introduction of digital data and information exchange between MASS, conventional ships, VTS and allied services.
* The role of VTS in contributing to the safety and efficiency of navigation and the protection of the environment through:
  + The provision of timely and relevant information on factors that may influence the ship's movements and assist on-board decision making.
  + The monitoring and management of ship traffic to ensure the safety and efficiency of ship movements.
  + Responding to developing unsafe situations.

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| This Guideline is associated with IALA Recommendation R0127 - VTS Operations a normative provision of IALA Standard 1040 Vessel Traffic Services.  To demonstrate compliance with the Recommendation the practices described in this Guideline should be taken into account.  *Note: With the evolution of MASS and adoption of the mandatory MASS Code in 2028 it is expected this guideline will be reviewed and updated regularly.* |

## Using this Guideline

This Guideline focuses on functional aspects to obtain safe and efficient ship movements with a mix of conventional ships and ships where certain functions are remotely controlled or autonomously operated. As such, it is based on the principles that:

* MASS will operate within the same framework and responsibilities of conventional ships. With regards to VTS, the functional requirements specified in the MASS Code will ensure MASS operates within IMO conventions and instruments to ensure achievement of a level of safety at least equivalent to that expected of a conventional ship.
* The guideline:
  + Is supplementary to other IALA standards recommendations and guidelines specifically related to the establishment and operation of VTS, and only addresses MASS issues insofar as they are not adequately or fully addressed in existing documents.
  + Recognizes the evolving nature of MASS and related IMO instruments related to MASS.
  + Takes into account that certain operational functions associated with a ship’s movement may be controlled from a location, or locations, remote from the MASS; and
  + Addresses necessary aspects of such remote operations centres/multiple remote centres.
* Guidance regarding technologies and standards for digital communications and data exchange are addressed in relevant IMO and IALA documents.

## Relationship to other documents

This Guideline should be read in conjunction with:

1. IALA Guidelines:

* Gnnnn - VTS Digital Communications
* Gnnnn - Developments and implications of maritime autonomous surface ships for coastal authorities
* G1089 – Provision of a VTS
* G1141 – Operational Procedures for Delivering VTS
* G1132 – VTS Voice Communications and Phraseology
* G1110 – Use of Decision Support Tools for VTS Personnel
* G1102 – VTS Interaction with Allied or Other Services
* G1130 – VTS information exchange with allied or other services

1. The IMO MASS Code and relevant conventions, as amended.

# Introduction

IALA standards, recommendations and guideline specifically related to the establishment and operation of VTS have historically been developed on the basis that participating ships have at least a minimum level of manning on board to interact with VTS personnel by VHF voice communications.

The ever-increasing use of automation in the operation of ships, along with the anticipated increase in the use of remote control and autonomous operation of key functions, will have significant implications for how VTS contributes to the safety of life at sea, safety and efficiency of navigation and the protection of the environment within VTS areas by interacting with conventional ships, autonomous ships, and control centres (remote and/or local) to mitigate the development of unsafe situations through:

* Providing timely and relevant information on factors that may influence the ship's movements and assist on board decision-making.
* Monitoring and managing ship traffic.
* Responding to developing unsafe situations.

It is recognized that some aspects associated with MASS may not be adequately or fully addressed in IALA Standards. Additional guidance may be required to achieve a level of safety in waterways with a mix of conventional ships, autonomous ships, and control centres (remote and/or local) that is at least equivalent to that expected with only conventional ships.

This Guideline focuses on functional aspects to obtain safe and efficient ship movements with a mix of conventional ships, autonomous ships, and control centres (remote and/or local) insofar as they may not be adequately or fully addressed in other IALA recommendations and guidelines with regards to.

* Managing ship traffic comprising both MASS and conventional ships
* Digital interaction with ships, RCCs and fully autonomous systems:
  + Receiving and Processing Reports and Information
  + Provision of advice, warning, and instruction
* Managing Interaction with multiple RCCs
* Operational and procedural changes associated with the above

# IMO regulatory framework for mass

Acknowledging the increasing use of automation in the operation of ships, the use of remote control and autonomous operation of key functions, the IMO concluded:

* That some aspects associated with MASS, may not be adequately or fully addressed in SOLAS or other IMO instruments; and
* Additional guidance is required on the design and operation of MASS to achieve a level of safety that is at least equivalent to that expected of a conventional ship.

To ensure the IMO regulatory framework for shipping keeps pace with rapidly evolving technological developments associated with MASS, the IMO is preparing a goal-based instrument (MASS Code). Specifically, the Code:

* Supplements other IMO instruments such as SOLAS.
* Provides a regulatory framework for the performance of remote control and autonomous operation of key functions, as applicable.
* Considers that certain operational functions may be controlled from a location, or locations, remote from the MASS and addresses necessary aspects of such remote operations centres.

The IMO aims to have a non-mandatory MASS Code finalized in the 2nd half of 2024, and the adoption of a mandatory Code at MSC 110 (spring session of 2025), with a view to entry into force on 1 January 2028.

Key milestones to achieving this include:

| **MSC 107**  **1st half 2023** | **MSC 108**  **1st half 2024** | **MSC 109**  **2nd half 2024** | **MSC 110**  **1st half 2025** | **1 July 2026** | **1 January 2028** |
| --- | --- | --- | --- | --- | --- |
| Continue the development of the non-mandatory MASS Code | Continue the development of the non-mandatory MASS Code  Finalize the non-mandatory MASS Code as annex to a draft MSC resolution | Finalization and adoption of the new non-mandatory MASS Code  Finalization and approval of amendments to existing instruments necessary for the entry into force of the new instrument | Adoption of a mandatory MASS Code and associated Convention(s) giving effect to the new MASS Code | Deadline for adoption for entry into force date of 1 January 2028 | Entry into force of Mandatory Code[[1]](#footnote-1) |

Specifically, the Code provides the framework for MASS to operate within the same framework and responsibilities of conventional ships. With regards to VTS, the functional requirements specified in the Code to ensure MASS operates within IMO conventions and instruments as would be expected of a conventional ship include:

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| Noting the MASS Code is evolving rapidly the TG agreed that this section:   * Be reviewed/updated at VTS54 (following MSC107), providing a high-level overview of the MASS Code functional requirements specifically related to VTS as being developed in:   + PART 2 - MAIN PRINCIPLES FOR MASS AND MASS FUNCTIONS.   + PART 3 - GOALS, FUNCTIONAL REQUIREMENTS AND PROVISIONS. * Be completed with finalisation of the non-mandatory code in the second half of 2024. |

# PROVISION OF VTS IN A MASS ENVIROnMENT

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| **NOTE:** The Task Group has agreed to use the template at Annex 1 to review and expand on the implications identified in the *Discussion Paper – Implications of Maritime Autonomous Surface Ships from a VTS Perspective* and describe the functional requirements to address these as a means to develop the guidance for his section. |

## Digital Communication / Interaction

### Capability to interact digitally

<to follow>

### Real time awareness of entity in command

<to follow>

### Receiving and processing reports or information

<to follow>

### Providing information

<to follow>

### Interaction with participating ships

<to follow>

## Core VTS System Capabilities

<to follow>

## Fulfilling the purpose of VTS

### Providing timely and relevant information

<to follow>

### Monitoring and managing ship traffic

<to follow>

### Responding to developing unsafe situations

<to follow>

### Issuing advice, warnings, and instructions

<to follow>

## Managing Communications / Interaction

Managing a mix of VHF voice, digital communications, and automated data exchange, including.

### Interacting with both conventional means and digital means with individual ships

<to follow>

### Interacting with an ROC.

<to follow>

### Managing interaction with multiple ROC’s.

<to follow>

### Integrating digital information and data with existing systems

<to follow>

## Special Circumstances

### A ship needs to be contained / controlled to mitigate a developing unsafe situation.

<to follow>

### Instructing an ROC to take control of a MASS 4 to mitigate a developing unsafe situation.

<to follow>

## Allied Services

### Pilotage

### Tug operators/linesmen

### Agents

### Other

|  |
| --- |
| **Assumptions**   1. MASS will be subject to existing IMO instruments, as amended, such as SOLAS. In addition, MASS will be subject to the MASS Code, which will address MASS issues not adequately or fully addressed in the applied base instruments. 2. MASS will be required to broadcast status as to who/what is in command at any time (Master/RCC/automated onboard command systems). 3. MASS will be required to participate in VTS in the same manner as conventional ships. That is, the same regulatory requirements to provide reports or information required by VTS and obligations with regards to the issue of advice, warnings and instructions as deemed necessary. 4. Standards for digital information and data exchange (technology/medium, data elements, format, syntax, etc) will be referenced in other IALA guidance being developed by the VTS Committee during the 2023-2028 work program, such as:    * *Task 1.1.3 - Develop guidance on VTS digital communications (operational aspects).*    * *Task 2.5.2 - Develop technical service specifications for digital data exchange between VTS and other entities - primarily ships.*    * *Task 2.8.1 - Develop a Product Specification S-212 under the S-100 framework for VTS.*    * *Task 2.82 - Review and update Recommendation R0145 (V-145) on the Inter-VTS Exchange Format (IVEF) Service (Output to be a revised Recommendation and associated Guideline including a technical service and/or product specification S-210).* 5. *This document will be compliment and contribute to the overarching IALA guideline Gnnnn - Developments and implications of maritime autonomous surface ships for coastal authorities being prepared by the ENAV Committee.*   ***Note -*** *It is expected that these assumptions will be addressed in the MASS Code as adopted [and amended IMO conventions and instruments] and will not be required in the final guidance document.* |

| **Implications for VTS** | **Consideration / s** |  | **Functional Requirements** |
| --- | --- | --- | --- |
| 1. **Digital Communication / Interaction** | | | |
| 1.1 Capability to interact digitally in a manner that achieves a level of effectiveness and timeliness at least equivalent to that expected with interacting by VHF voice. | Adoption of standards to harmonize interaction between VTS, ships and ROCs by digital means in a manner that:   * Ensures communication/interaction conveys the same meaning and intent, irrespective of whether it is provided by VHF voice or digitally. * Enables ships to meet their reporting requirements by digital means. * Enables VTS to interact with ships and manage ship traffic to ensure the safety and efficiency of ship movements by providing information or issuing advice, warnings and instructions as deemed necessary by digital means. | 1.1.1 | Standards for VTS digital communications  Digital interaction between VTS and ‘ships’ is provided through a standardized message structure (data elements, format, syntax) and phrases to:   * Facilitate clear, concise, and unambiguous interactions that are timely and effective. * Minimize misunderstanding of the intent of the interaction. * Ensure the intent of interaction is communicated the same as would be achieved through the practices described in *G1132 – VTS Voice Communications and Phraseology.*  |  | | --- | | ***Note*** *–* Guidance on VTS Digital communications (operational aspect) being prepared by Working Group 1 (Task 1.3.1) includes:   * The intent of messages * Message structure and delivery | |
| 1.1.2 | Technology / medium to communicate / interact with the [MASS Master] [Responsible Person] in ‘real time’. |
| 1.1.3 | Capability to interact seamlessly with individual ships at all times, either by traditional means (VHF voice), digitally or both. |
| 1.1.4 | Capability to broadcast to all participating ships simultaneously, either by traditional means (VHF voice), digitally or both. |
| 1.1.5 | Database and DST capabilities to accommodate the above (*Refer to 2. Core VTS System Capabilities below*) |
| * 1. Real time awareness of the: * Entity in command of a ship [MASS Master] [Responsible Person]. * Communications technology / medium to communicate/interact with entity in command of a ship [MASS Master] [Responsible Person] at any point in time. * Current MASS Status of participating ships. | Capability, processes, and procedures to maintain awareness of who/what is in command of a participating ship at all times. [MASS Master] [Responsible Person] | 1.2.1 | Processes and procedures to:   * Receipt and acknowledge communication of ‘responsible person’ and communications technology/medium for communicating/interacting * Update the DST as to the ‘Responsible person’ and associated communications means (voice / digital). |
|  | 1.2.2 | Database and DST capabilities to accommodate the above, specifically:   * ‘Responsible person’ / communications method always presented to VTS personnel |
| * 1. Receiving and processing reports or information required from participating ships by digital means. | How does a VTS receive and assimilate reports or information received digitally and process it | 1.3.1 | Receiving information and reports digitally  Systems, processes, and procedures to   * + Receive reports and information required by the VTS, as described in G1141 - Operational Procedures for Delivering VTS such as:     - Pre-arrival information (vessel identity, route information, vessel details, etc)     - Entering the VTS area     - Movements within the VTS area     - Requests for clearance   + Assimilate information and data into databases / DST.   + Information readily available / presented to VTS personnel  |  | | --- | | Technical Working Group be requested to:   * Review update *IALA Guideline G1111 - Producing Requirements for the Core VTS system* to reflect receiving, processing, displaying data received digitally seamlessly with manually entered data * Provide advice as to whether an updated G1111 is sufficient or specific requirements should be included in this Guideline | |
| 1.3.3 | Processing / Quality  Capability to process and verify information and reports received and, where necessary, interact with the sender to clarify / confirm. |
| 1.3.4 | Systems and Technologies  Database, DST capabilities and network connectivity to accommodate the above |
| * 1. Acknowledging information and data received digitally | How does a VTS acknowledge information and data received digitally | 1.4.1 | Acknowledgement of information and reports  Reports and information provided digitally are acknowledged to the sender by the VTS  Processes and procedures to acknowledge data received digitally:   * Verification (automatic, operator, independent) * Keeping human in the loop (database/DST) * Automatic acknowledgement |
| * 1. Interaction to confirm / acknowledge information and data received digitally   Information exchange, such as:   * Reporting requirements * Provide relevant traffic information * Provide navigational / fairway information * Vessel defects or deficiencies, such as navigation or manoeuvring equipment failure * Updating information with allied services |  | 1.5.1 | Interaction received digitally from a ‘ship’ is responded to as would be by voice   |  | | --- | | ***Note*** *–* Guidance on VTS Digital communications (operational aspect) being prepared by Working Group 1 (Task 1.3.1) includes operational descriptions and use cases for the potential technical services identified in the description for Maritime Service for VTS such as:   * Voyage Information Service - The service supports exchange of voyage plans, text messages and area messages * Route Information Service - The service provides route recommendations and/or route validation for ships. * Traffic clearance Service - The service provides vessels with permission to proceed, impose conditions or deny clearance.   S 100 product specifications | |
| 1. **Core VTS System Capabilities (Database, DST and network)** | | | |
| * 1. Integrating digital information and data with existing systems in a manner consistent with receiving this verbally | How to assimilate and integrate digital information into the core VTS systems  Compilation of replay data for incident / event occurring  IALA *Guideline G1111-1 - Producing Requirements for the Core VTS system* | 2.1.1 | Database / DST applications have the capability to assimilate and integrate information and data regardless of the source.  MASS status / Entity in command always displayed to VTS personnel |
| * 1. Ability to interact / communicate with participating ships digitally in a manner consistent with using VHF voice for: * Functions as described in 3.1, 3.2, 3,3 and 3.4 below * General interaction to confirm data provided, intentions etc | How to interact outwardly | 2.2.1 | Database / DST applications have the capability to identify the communications medium for individual ships in real time and present this to VTS personnel.  MASS status / Entity in command always displayed to VTS personnel |
| 1. **Fulfilling the purpose of VTS through:** | | | |
| Mitigating the development of unsafe situations through: | IMO Resolution A.1158(32)  *3.1 The purpose of VTS is to contribute to the safety of life at sea, improve the safety and efficiency of navigation and support the protection of the environment within a VTS area by mitigating the development of unsafe situations through:* |  |  |
| * 1. Providing timely and relevant information on factors that may influence ship movements and assist onboard decision-making |  | 3.1.1 | Processes and procedures to interact with the ‘responsible person’ to provide timely and relevant information, irrespective of whether the ship is conventional, or MASS which may include:  *.1 position, identity, intention and movements of ships*  *.2 maritime safety information*  *.3 limitations of ships in the VTS area that may impose restrictions on the navigation of other ships (e.g. manoeuvrability), or any other potential hindrances*  *.4 other information such as reporting formalities and International Ship and Port Facility Security Code (ISPS Code) details*  *.5 support for, and cooperation with, allied services* |
| * 1. Monitoring and managing ship traffic to ensure the safety and efficiency of ship movements. |  | 3.2.1 | Processes and procedures to interact with the ‘responsible person’ to manage ship traffic, irrespective of whether the ship is conventional, or MASS, which may include:  *.1 planning ship movements in advance*  *.2 organizing ships under way*  *.3 organizing space allocation*  *.4 establishing a system of traffic clearances*  *.5 establishing a system of voyage or passage plans*  *.6 providing route advice*  *.7 ensuring compliance with and enforcement of regulatory provisions for which they are empowered* |
| * 1. Responding to developing unsafe situations, |  | 3.3.1 | Respond to developing unsafe situations irrespective of whether the ship /ships involved are conventional or MASS, which may include:  *.1 a ship unsure of its route or position*  *.2 a ship deviating from the route*  *.3 a ship requiring guidance to an anchoring position*  *.4 a ship that has defects or deficiencies, such as navigation or manoeuvring equipment failure*  *.5 severe meteorological conditions (e.g. low visibility, strong winds)*  *.6 a ship at risk of grounding or collision*  *.7 emergency response or support for emergency services* |
| * 1. Issuing advice, warnings, and instructions | IMO Resolution A.1158(32)  *3.2 To achieve their purpose, VTS should provide information or issue advice, warnings and instructions, as deemed necessary.* | 3.4.1 | Processes and procedures to issue advice, warnings, and instructions to the ‘responsible person’, irrespective of whether the ship is conventional. |
| 1. **Managing Communications / Interaction** | | | |
| Managing a mix of VHF voice, digital communications, and automated data exchange, including: |  |  | |  | | --- | | ***Note*** *–* Guidance on VTS Digital communications (operational aspect) being prepared by Working Group 1 (refer Task 1.3.1) includes:   * Managing a Mix of Traditional VHF Voice, Digital Communications, and Automated Data Exchange | |
| * 1. Interacting by both conventional means and digital means with individual ships |  |  | <to follow> |
| * 1. Managing interaction with multiple ROC’s. |  |  | <to follow> |
| 1. **Special Circumstances** | | | |
| * 1. A ship needs to be contained / controlled to mitigate a developing unsafe situation. |  |  | <to follow> |
| * 1. Instructing an ROC to take control of a MASS 4 to mitigate a developing unsafe situation |  |  | <to follow> |
| **6. Allied services** | | | |
| 6.1 How VTS maintains communications with allied services where information is received from ships digitally. |  |  |  |
| * Pilotage |  |  | <to follow> |
| * Tug operators/linesmen |  |  | <to follow> |
| * Agents |  |  | <to follow> |
| * Other |  |  | <to follow> |

1. [↑](#footnote-ref-1)