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| IALA GUIDELINE |

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Guideline on the implications of maritime autonomous surface ships from a VTS perspective

Edition 1.0

XX 2021

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

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| Date | Page / Section Revised | Requirement for Revision |
| XX XXX 2021 | First edition |  |
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|  |  |  |
|  |  |  |

1. DOCUMENT PURPOSE 4

2. INTRODUCTION 4

3. OVERVIEW 4

4. IMPLICATIONS FOR VTS 4

4.1. PERSONNEL 5

4.2. EQUIPMENT 5

4.3. OPERATING PROCEDURES 5

4.4. COMMUNICATIONS 5

4.5. REPORTING REQUIREMENTS 5

4.6. INSTRUMENTS 5

4.7. NETWORK SECURITY 5

4.8. OTHER 5

5. Methods of scoping VTS documents 5

6. FUTURE development of VTS 6

6.1. training 6

6.2. Application of new technologies 6

6.3. VTS communication 6

6.4. Operation procedures 6

6.5. OTHER 6

7. Acronyms 6

8. references 6

ANNEX A FRAMEWORK FOR SCOPING EXERCISE ON THE IMPLICATIONS OF MASS ON VTS DOCUMENTS 8

1. ObjectiveS 8

2. Methodology 8

2.1. degree of autonomy: 8

2.2. Gaps Analysis 8

2.3. Solutions 9

3. SCOPING RESULTS 9

ANNEX B Summary of VTS documents scoping results 11

# DOCUMENT PURPOSE

The purpose of the guideline is to assist authorities interact with all ships and contribute to the safety and efficiency of ship movements in the VTS area, recognising:

* The advent of MASS within VTS areas and their interaction with conventional ships.
* The 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; and
  + Responding to developing unsafe situations.

# INTRODUCTION

To achieve its purpose a VTS must have the capability to maintain a comprehensive overview of the traffic in its service area, interact with traffic and respond to traffic situations developing in its area to mitigate the development of unsafe situations.

The level of safety and efficiency in the movement of maritime traffic within an area covered by a VTS is dependent upon close cooperation between those operating the VTS and participating ships and the delivery of precise and unambiguous VTS operations in accordance with internationally approved guidelines.

IALA Standard 1040 Vessel Traffic Services specifies the practices associated with the delivery of VTS operations in *Recommendation 0127 – VTS Operations*. R0127 and its associated Guidelines should be read in conjunction with this guideline.

# OVERVIEW

The advent of MASS is progressing rapidly with many ‘test beds’ being conducted world-wide.

Safety and efficiency is a primary concern for VTS authorities and it will be necessary to achieve a balance in maintaining high safety standards as well as keeping up with rapid technological developments.

VTS will undoubtedly have a key role to play with MASS and the preparation of such guidance will assist authorities contribute to the safety and efficiency of vessel movements in the VTS area with the advent of MASS.

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From a VTS perspective, the advent of MASS will have a significant implications for how VTS interacts with traffic, both conventional ships and MASS, and responds to traffic situations developing in its area to mitigate the development of unsafe situations.

It is anticipated that this will have implications for most, if not all, of IALA Recommendations and Guidelines relating to VTS.

# IMPLICATIONS FOR VTS

The main work of VTS is to provide traffic service for ships in the VTS area. Therefore, in order to enable VTS to better support the development of MASS, the impact of MASS on VTS should be refined to provide a reference for the future development of VTS.

## PERSONNEL

It has been explained that VTS personnel and deck officers is a cooperative relationship in *Guideline 1149 on VTS Training for Deck Officers (Ed.1.0)*. The introduction of MASS may break this relationship. Therefore, VTS personnel need to form a new relationship with MASS to achieve to protect navigation safety.

Future VTS personnel training should consider the understanding navigation characteristics of MASS, including new equipment of MASS, and specific emergency response procedures.

## EQUIPMENT

Within the VTS area, the information transmission between MASS, VTS centre, and traditional vessels, only by VHF, AIS, VDES and other traditional visual and auditory communication and interaction, may not reach the current safety level. Therefore, new equipment is needed that can provide reliable means of information exchange to meet the needs of information and data exchange between the VTS and MASS or Shore-based Control Center (SCC).

## OPERATING PROCEDURES

The operating procedures affected by MASS include emergency procedures, internal procedures and external procedures, such as the content and manner of the report of MASS, the transmission of transportation organization, and their role in emergency response.

## COMMUNICATIONS

## REPORTING REQUIREMENTS

## INSTRUMENTS

According to *IALA Standards S1040 (edition 1.1)*, there are 4 standards, 15 recommendations and 34 guidelines related to VTS at present. The contents of these documents are all for traditional vessels and traditional VTS. Some provisions do not meet the requirements of MASS and future VTS. Therefore, these documents need to be reviewed, and the content do not meet the requirements should be revised. Refer to IMO documents scoping method, considering the characteristics of the VTS document, this guideline provided scoping method in annex A, and listed IALA - VTS documents affected by the MASS and summarizes the result in annex B.

## NETWORK SECURITY

Considering the increasing frequency of hacker attacks on ships and shipping companies in recent years, and the technical characteristics of MASS, the interaction between VTS and MASS or MASS remote control stations will be completely exposed to cyber hackers. Once it is successfully attacked by hackers, it will pose a major threat to maritime traffic safety and marine environmental protection in the VTS area. Therefore, network security must be paid enough attention.

## OTHER

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# Methods of scoping VTS documents

The purpose of this section is to evaluate the possible impact of MASS on the existing IALA-VTS documents and provide reference for competent authorities.

This Method sorts out four different degrees of autonomous ships, which is divided into two steps (Refer to Annex A for specific operation process).

The first step is to scope the relevant VTS documents of IALA and analyse the potential gaps;

The second step is to analyse the existing gap and determine the appropriate solution.

# FUTURE development of VTS

Considering the influence of MASS, this guideline analyses the future development of VTS from personnel, equipment, communication and operational procedure.

## training

Considering the characteristics of MASS, special training courses should be supplemented, including the use of new equipment, the improvement of network security awareness, the familiarity with the characteristics of MASS and take effective countermeasures.

## Application of new technologies

* VTS intelligence, big data and more advanced technologies will be used in the future VTS.
* The development of MASS has put forward higher requirements for network reliability of VTS.

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## VTS communication

VTS digital transmission, unified data exchange mode and data format, seamless connection with MASS.

## Operation procedures

VTS service should support the development of intelligent ships, and continue to play the core role of navigational safety，including internal procedures, external management and service procedures, emergency procedures.

## OTHER

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# Acronyms

AIS Automatic Identification System

MASS Maritime Autonomous Surface Ships

SCC Shore-based Control Center

VDES VHF Data Exchange System

VTS Vessel Traffic Services

# references

1. China MSA. (2020). Scoping exercise on the implications of MASS on VTS documents (VTS48-8-2.6).
2. NL Paper on the impact of MASS on VTS (VTS49-3.1.2).
3. IALA. (2019d). VTS COMMITTEE TASK REGISTER FOR 2018 – 2022.
4. IALA Standards S1040
5. IALA Guideline 1141
6. IMO. (2019). MSC.1/Circ.1604
7. IMO. (2018). MSC 100/20/add.1
8. IMO. (2017). MSC 98/20/2
9. FRAMEWORK FOR SCOPING EXERCISE ON THE IMPLICATIONS OF MASS ON VTS DOCUMENTS

# ObjectiveS

There are two steps to determine impacts of mass on VTS documents. The first step is to analyse and research gaps on the relating VTS documents, and the second step is to propose solutions.

# Methodology

## degree of autonomy:

|  |  |
| --- | --- |
| **Degree of autonomy** | **contents** |
| Degree 1 | Ship with automated processes and decision support |
| Degree 2 | Remotely controlled ship with seafarers on board |
| Degree 3 | Remotely controlled ship without seafarers on board |
| Degree 4 | Fully autonomous ship |

In order to unify the understanding of the degrees of autonomy, the following hypotheses were formulated during the initial scoping for facilitating the process:

.1 MASS of degree one is considered as a conventional ship with some additional functions to support human decision making. The specific automated process and decision support are not considered due to their diversities.

.2 No matter if MASS can be operated from another location, seafarers on board are assumed to be able to meet all the operation and control requirements (For degrees one and two).

.3 For degree of autonomy four, it is assumed there will be no seafarer on board.

## Gaps Analysis

A apply to MASS and do not impede the function of VTS on MASS, but may need to be amended or clarified, or

B apply to MASS and do not impede the function of VTS on MASS, and require no actions; or

C do not apply to MASS and impede the function of VTS on MASS.

The identification process can be presented in the following flow chart:



## Solutions

The most appropriate method classification to solve the impact of MASS:

1. equivalences as provided for by the instruments or developing interpretations; and/or
2. amending existing documents; and/or
3. developing new documents; or
4. none of the above as a result of the analysis.

# SCOPING RESULTS

**TALBE 1 GAPS ANALYSIS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Provisions** | **Degree of autonmy** | **MASS application** | **Comments/remarks** |
|  | DEGREE ONE |  |  |
| DEGREE TWO |  |  |
| DEGREE THREE |  |  |
| DEGREE FOUR |  |  |

**TABLE2 ANALYSIS OF SOLUTIONS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Degree of autonomy** | **the most appropriate way of addressing MASS implications**  **(I, II, III, IV)** | **Reasons** | **Themes/ potential gaps that require addressing** |
| DEGREE ONE |  |  |  |
| DEGREE TWO |  |  |  |
| DEGREE THREE |  |  |  |
| DEGREE FOUR |  |  |  |

1. Summary of VTS documents scoping results

**1.** **LIST OF DOCUMENTS NEED TO BE SCOPED**

|  |  |
| --- | --- |
| **Ref.** | **Title** |
| R0127 (V-127) | Operational Procedures for Vessel Traffic Services |
| G1089 | Provision of VTS Services (INS, TOS & NAS) (Dec 2012) (updating) |
| G1110 | Use of Decision Support Tools for VTS Personnel (Dec 2014)(updating) |
| G1131 | Setting and Measuring VTS Objectives (Dec 2017) |
| G1045 | Staffing Levels at VTS Centres (Dec 2018) |
| G1141 | Operational Procedures for Vessel Traffic Services (Dec 2018) |
| R0125 (V-125) | The use and presentation of symbology at a VTS centre |
| R1014 | Portrayal of VTS information and data（reviewing and updating） |
| R1012 | VTS Communications |
| R0128( V-128) | Operational and Technical Performance of VTS Systems |
| G1105 | Shore side Portrayal(updating) |
| G1132 | VTS VHF Voice Communication (Dec 2017) |
| G1111 | Preparation of Operational and Technical Performance Requirements for VTS Systems (May 2015) (reviewing and updating) |
| G1101 | Auditing and Assessing VTS (Dec 2013) |
| G1115 | Preparing for an IMO Member State Audit Scheme (IMSAS) on Vessel Traffic Services (Dec 2015) |
| G1102 | VTS Interaction with Allied or Other Services (Dec 2013) |
| G1130 | Technical Aspects of Information Exchange Between VTS and Allied or Other Services (Dec 2017) |
| … |  |

**2．SUMMARY OF SCOPING RESULTS**

Each document should fill in the results in Table 1 and 2 in Annex A.