

MARITIME SAFETY COMMITTEE
100th session
Agenda item 5

MSC 100/5/3
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**REGULATORY SCOPING EXERCISE FOR THE USE OF
MARITIME AUTONOMOUS SURFACE SHIPS (MASS)**

**Proposals for the development of interim guidelines for Maritime
Autonomous Surface Ships (MASS) trials**

Submitted by Republic of Korea

SUMMARY

Executive summary: This document proposes relevant elements that should be considered during the development of the interim guidelines for Maritime Autonomous Surface Ships (MASS) trials

Strategic direction, if applicable: 2

Output: 2.7

Action to be taken: Paragraph 8

Related documents: MSC 98/20/2, MSC 98/20/13, MSC 98/23; MSC 99/22 and MSC 100/INF.3

Background

1 The Maritime Safety Committee, at its ninety-ninth session, invited interested Member States and international organizations to submit proposals to MSC 100 related to the development of interim guidelines for MASS trials (MSC 99/22, paragraph 5.27.2).

2 While current regulations for conventional ships may have limited flexibility in the application of technologies under development for new ships, new technologies that are not covered by current regulations could pose potential risks to ship safety and the marine environment. Therefore, when developing the interim guidelines for MASS trials, there is a need to consider, as a priority, the level of MASS that can be developed with the current state of technologies.

Introduction

3 The most up-to-date ships in operation still need to be constantly monitored by humans, and require intervention in case of emergency. At the moment, autonomous systems that do not need human monitoring under certain operating circumstances are being developed, as well as technologies for shore-based remote control and management systems which will enable efficient ship operations.

4 Therefore, at the present stage of technological advances and in order to comply with current regulations, the interim guidelines for MASS trials could be developed for trials of autonomous and remote controlled ships with qualified seafarers on board.

5 The Republic of Korea hereby proposes key elements that should be considered during the development of interim guidelines for autonomous and remote controlled ships with qualified seafarers on board to comply with current regulations and apply new technologies related to MASS.

Consideration of key elements

6 IT equipment on board ships, communications technologies and infrastructure in their current state are advanced enough for remote-control and operation of ships. In addition, many ship sensors may provide data necessary for machine learning. Taking into account that MASS's decision-making systems work by analysing large amount of data, it may be necessary to consider how to effectively acquire, collect and share this data.

7 As ships are equipped with more IT equipment, seafarers should be able to operate this equipment and manage cybersecurity technologies. Moreover, the role and responsibility of shore-based remote control centres should be clarified. Additionally, the new interface between autonomous systems and seafarers should be able to analyse the current situation and communicate the reasoning for judgment so that quick judgment can be made.

Action requested of the Committee

8 The Committee is invited to consider the proposal set out in the annex related to the development of interim guidelines for MASS trials and decide, as appropriate.

ANNEX

**KEY ELEMENTS TO BE CONSIDERED DURING THE DEVELOPMENT OF INTERIM GUIDELINES
FOR MARITIME AUTONOMOUS SURFACE SHIPS (MASS) TRIALS**

The following table presents seven key elements that should be considered during the development of interim guidelines for MASS trials.

Key element (major category)	Details (sub-division)	Major elements for review (sub-class)
1. General	Purpose and application of the guidelines	<ul style="list-style-type: none"> - Definition - Application - Scope - Applicable exclusions
2. Design safety factor	System design	<ul style="list-style-type: none"> - System design - System integration and modularization - Redundancy design - Minimum Risk Condition (MRC) - Risk based analysis and safety assessment - Strategy for ensuring stability
	Autonomous and remote control	<ul style="list-style-type: none"> - Decision Making System (route plan, collision avoidance, etc.) - Operational Design Domain (ODD) - Technical description of the operating environment - Environmental conditions for autonomous and remote control - Technical conditions for autonomous and remote control (Communication, Vessel status, etc.)
	Human and machine interface	<ul style="list-style-type: none"> - Seafarers – machine interaction technology - Convert visual, voice and tactile information into digital information - User interface - Technology to control-override between seafarers, operator on shore and machine

Key element (major category)	Details (sub-division)	Major elements for review (sub-class)
	Situation awareness and collision avoidance	<ul style="list-style-type: none"> - Route interference and risk awareness system module - Safety navigation and collision avoidance strategy within complex navigational situation - Collision scenario development - Validation of autonomous avoidance capability
	Software engineering and test	<ul style="list-style-type: none"> - Software qualification plan - System technical requirements and test procedures - Validation and verification(simulation, test-tracking, on board test)
3. Data	On board	<ul style="list-style-type: none"> - Composition of IoT equipment on board - Important data on board - Data processing (logging, analysis, visualization, etc.) - Data quality
	On shore	<ul style="list-style-type: none"> - Important data to be received or supplied from the vessel - Data processing (logging, analysis, visualization, etc.) - Data sharing
4. Communication systems and remote control	Ship and onshore communication system	<ul style="list-style-type: none"> - Communication quality (bandwidth, delay, etc.) - Data priority identification software - Communication frequency
	Remote control	<ul style="list-style-type: none"> - Communication quality - Receiving information (video information, audio information, ship condition, etc.) equivalent to seafarers on board - Remote control operation procedure
5. Cybersecurity	Cybersecurity management	<ul style="list-style-type: none"> - Prevention and detection of cyberthreats - Cybersecurity assessment and risk reduction (on-board, the data link and remote control centre) - Cybersecurity certification by third parties

Key element (major category)	Details (sub-division)	Major elements for review (sub-class)
6. Seafarers on board and operators on shore	Seafarers on board	<ul style="list-style-type: none"> - Assessment of ship operational capability - IT capability - Cybersecurity management ability
	Operators in remote control centre on shore	<ul style="list-style-type: none"> - Operator's role and qualifications - Situation awareness of near-ship environment - Ship condition monitoring and analysis - Evaluation of information implementation ability
7. Trial operation	Operation procedure	<ul style="list-style-type: none"> - Purpose and scope of trial operation - Level of autonomy and system configuration - Operational conditions for trial operation - Control-override procedure and remote control operation method - Condition monitoring - Operator's role and responsibilities
	Onshore infrastructure (remote control centre)	<ul style="list-style-type: none"> - Composition of onshore infrastructure - Operation strategy for autonomous and remote control from onshore - Procedures for search and rescue in case of emergency
