

MARITIME SAFETY COMMITTEE  
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Agenda item 20

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## WORK PROGRAMME

### Maritime Autonomous Surface Ships Proposal for a regulatory scoping exercise

Submitted by Denmark, Estonia, Finland, Japan, the Netherlands,  
Norway, the Republic of Korea, the United Kingdom and the United States

#### SUMMARY

*Executive summary:* The use of Maritime Autonomous Surface Ships (MASS) creates the need for a regulatory framework for such ships and their interaction and co-existence with manned ships. This document invites the Committee to undertake a regulatory scoping exercise to establish the extent of the need to amend the regulatory framework to enable the safe, secure and environmental operation of MASS within the existing IMO instruments.

*Strategic direction:* 5.2 and 5.4

*High-level action:* 5.2.1, 5.2.2, 5.2.4 and 5.4.1

*Output:* No related provisions

*Action to be taken:* Paragraph 25

*Related document:* MSC 95/INF.20

1 This document is submitted in accordance with paragraphs 4.8 and 6.12.6 of MSC-MEPC.1/Circ.5 on *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies*, taking into account resolution A.1099(29) on *Application of the Strategic Plan and High-level Action Plan of the Organization*, and proposes a new output to undertake a regulatory scoping exercise to establish the extent of the need to amend the regulatory framework to enable the safe, secure and environmental operation of entirely or partly unmanned Maritime Autonomous Surface Ships (MASS) within the existing IMO instruments.

## Introduction

2 The maritime sector is witnessing an increased deployment of MASS to deliver safe, cost-effective and high quality results. In this context, MASS could include ships with different levels of automation, from partially automated systems that assist the human crew to fully autonomous systems which are able to undertake all aspects of a ships' operation without the need for human intervention. Significant academic and commercial research and development (R&D) is ongoing on all aspects of MASS, including remotely-controlled and autonomous navigation, vessel monitoring and collision avoidance systems.

3 Whilst technological solutions are being developed and deployed, the co-sponsors are of the view that there is a lack of clarity about the correct application of existing IMO instruments to MASS. The co-sponsors believe the IMO needs to ensure that MASS designers, builders, owners, and operators have access to a clear and consistent regulatory framework (guided by the principles of resolution A.1103(29)) in order to be able to demonstrate compliance with IMO instruments.

4 It is therefore proposed by the co-sponsors that a regulatory scoping exercise of IMO instruments should be undertaken with the aim of identifying:

- .1 IMO regulations which, as currently drafted, preclude unmanned operations;
- .2 IMO regulations that would have no application to unmanned operations (as they relate purely to a human presence on board); and
- .3 IMO regulations which do not preclude unmanned operations but may need to be amended in order to ensure that the construction and operation of MASS are carried out safely, securely, and in an environmentally sound manner.

5 It is the co-sponsors intention that this proposal will help IMO understand the full range of regulatory implications arising from MASS and plan appropriately for this important work stream. The overall aim is to ensure that safety, security, environmental protection and efficiency of shipping are maintained, and potentially improved, so that the flow of seaborne international trade continues to be smooth and efficient.

## IMO objectives

6 The proposed regulatory scoping exercise would allow IMO to respond proactively to the growth in the use of MASS in a timely manner and thereby continue to promote safe, secure, environmentally sound, efficient and sustainable shipping.

7 Within the scope of the responsibilities of the MSC, this proposal would relate to the Strategic Direction 5, and in particular High-level Action 5.2.1 "Keep under review the technical and operational safety aspects of all types of ships, including fishing vessels". As such, this proposal is deemed to be within the scope of the Strategic Plan and the related High-level Actions.

## Need

8 Technological advances have resulted in the introduction into service of a variety of MASS. The size of these MASS and geographical spread of their use are both growing.

9 Some Classification Societies have recognized this trend and have already published design criteria and guidelines for MASS. In addition, some States have established national guidelines for the operation of MASS within their jurisdiction (for example via the dissemination of Maritime Safety Information (MSI) to warn other shipping).

10 However, the co-sponsors are of the view that as the number, type and size of MASS increase, these arrangement may become unsustainable and potentially unsafe.

11 Moreover, the existence of different national regulatory frameworks may render the construction and operation of MASS unmanageable, and may hamper innovation and technological developments.

12 IMO in its role as the primary international forum for technical matters of all kinds affecting international shipping should therefore take a proactive role to ensure there is a harmonized international approach to MASS. The co-sponsors are also of the view that there are a number of IMO regulations that currently present a challenge to achieving this goal. This includes:

- .1 IMO regulations which, as currently drafted, preclude unmanned operations;
- .2 IMO regulations that would have no application to unmanned operations (as they relate purely to a human presence on board); and
- .3 IMO regulations which do not preclude unmanned operations but may need to be amended in order to ensure that the construction and operation of MASS are carried out safely, securely, and in an environmentally sound manner.

13 The co-sponsors, therefore, consider that there is a need to establish an output under the purview of the Maritime Safety Committee, to undertake regulatory scoping exercise so that there is a common understanding of the measures which would be necessary to enable the safe operation of MASS. This would be an initial step and it may also be necessary to undertake similar work under the other Committees.

### **Analysis of the issue**

14 To date, consideration of the construction and operation of MASS has not been undertaken by the international maritime community. Whilst the operation of the current MASS may be manageable in the short term, for the reasons set out above, the co-sponsors propose that the Organization should now begin to consider what steps might be needed to include MASS within the framework of existing IMO instruments.

### **Analysis of implications**

15 Given the current proposal is only to undertake a regulatory scoping exercise there would be no costs to the maritime industry or administrative requirements arising from this output in itself, and the Checklist for Identifying Administrative Requirements, as set out in annex 1, has been completed on this basis.

16 Following the scoping exercise, the Committee would have to consider how best to address any issues identified, and it is the intention that the scoping exercise would provide the basis for consideration of the implications at that stage.

17 However, the co-sponsors would note that the consequences of not undertaking the proposed scoping exercise could contribute to the proliferation of MASS in an unregulated manner which may lead to adverse impacts on maritime safety, security and the protection of the marine environment.

### **Benefits**

18 As the technology matures there will be an increasing number of maritime activities which could benefit from the deployment of MASS, and this regulatory scoping exercise would be the first step in ensuring the IMO regulatory framework was prepared for the full commercial utilization, which is likely to be realized within the next decade.

### **Do adequate industry standards exist?**

19 There are a number of relevant industry standards which are already being applied by the manufacturers and operators of MASS. While these may be adequate for the limited scale on which MASS are being operated at this stage, as has been noted above, they are unlikely to be adequate in the future if the trend towards increased size and geographical deployment continues. In addition, there would be advantages to ensuring harmonization of applicable standards through existing IMO instruments.

### **Output**

20 The proposed output would be:

Maritime Autonomous Surface Ships regulatory scoping exercise; identification of:

- .1 IMO regulations which, as currently drafted, preclude unmanned operations;
- .2 IMO regulations that would have no application to unmanned operations (as they relate purely to a human presence on board); and
- .3 IMO regulations which do not preclude unmanned operations but may need to be amended in order to ensure that the construction and operation of MASS are carried out safely, securely, and in an environmentally sound manner.

### **Human Element**

21 Given the current proposal is only to undertake a regulatory scoping exercise there would be no implications for the Human Element arising from this output in itself, and the Checklist for identifying human element issues, as set out in annex 2, has been completed on this basis. However, the co-sponsors are mindful that while the MASS would be unmanned many of the issues that need to be considered would relate to the interactions of between the MASS and humans, either on board other vessels or in shore based roles, and as such the Human Element would be an area of consideration within the proposed scoping exercise.

## **Urgency**

22 The Committee is considered to be the appropriate body to coordinate and complete this scoping exercise given it would cut across remit of the different subsidiary bodies, it is therefore envisaged that input from subsidiary bodies to the areas related to their technical expertise would also be needed. This would be an initial step and it may also be necessary to undertake similar work under other Committees, which would be put forward, as appropriate, by separate proposals to the relevant Committees.

23 Four sessions are estimated to be necessary to complete the work. Therefore, it is proposed that this proposal should be considered by the Organization for inclusion in the High-level Action Plan of the Organization for the 2018-2019 biennium (and in due course the 2020-2021 biennium). The co-sponsors consider that there is an urgency in starting the scoping exercise during the next biennium, given the time the exercise will take, and the need to follow up the exercise with any regulatory changes that are identified to ensure the IMO regulatory framework is prepared for the full commercial utilization, which is likely to be realized within the next decade.

## **Action required**

24 It is proposed that the Committee includes a new output on its work programme as suggested in paragraph 20 to undertake a regulatory scoping exercise in order to allow future sessions of the Committee to make informed decisions about the work required to accommodate MASS within the IMO's regulatory framework.

## **Action requested of the Committee**

25 The Committee is invited to consider the information provided above and agree to the request for a new output as proposed in paragraph 20.

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**ANNEX 1**

**CHECKLIST FOR IDENTIFYING ADMINISTRATIVE REQUIREMENTS**

This checklist should be used when preparing the analysis of implications, required for submissions of proposals for inclusion of outputs. For the purpose of this analysis, the terms "administrative requirements" is defined in resolution A.1043(27) i.e. administrative requirements are an obligation arising from future IMO mandatory instruments to provide or retain information or data.

**Instructions:**

(A) If the answer to any of the questions below is **YES**, the Member State proposing an output should provide supporting details on whether the burdens are likely to involve start-up and/or ongoing cost. The Member State should also give a brief description of the requirement and, if possible, provide recommendations for further work (e.g. would it be possible to combine the activity with an existing requirement?).

(B) If the proposal for the output does not contain such an activity, answer **NR** (Not required).

(C) For any administrative requirement, full consideration should be given to electronic means of fulfilling the requirement in order to alleviate administrative burdens.

1. Notification and reporting? Reporting certain events before or after the event has taken place, e.g. notification of voyage, statistical reporting for IMO Members, etc.	NR ✓	Yes Start-up Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes) As explained in paragraph 15 of paper, given the output is only for regulatory scoping exercise, no administrative requirements arise from it.		
2. Record keeping? Keeping statutory documents up to date, e.g. records of accidents, records of cargo, records of inspections, records of education, etc.	NR ✓	Yes Start-up Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes) See Q1.		
3. Publication and documentation? Producing documents for third parties, e.g. warning signs, registration displays, publication of results of testing, etc.	NR ✓	Yes Start-up Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes) See Q1.		
4. Permits or applications? Applying for and maintaining permission to operate, e.g. certificates, classification society costs, etc.	NR ✓	Yes Start-up Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes) See Q1.		
5. Other identified requirements?	NR ✓	Yes Start-up Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes) See Q1.		

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**ANNEX 2**

**CHECKLIST FOR CONSIDERING HUMAN ELEMENT ISSUES BY IMO BODIES**

<b>Instructions:</b> If the answer to any of the questions below is:  (A) YES, the preparing body should provide supporting details and/or recommendation for further work. (B) NO, the preparing body should make proper justification as to why human element issues were not considered. (C) NA (Not Applicable), the preparing body should make proper justification as to why human element issues were not considered applicable.			
<b>Subject Being Assessed:</b> (e.g. Resolution, Instrument, Circular being considered) MASS regulatory scoping exercise			
<b>Responsible Body:</b> (e.g. Committee, Sub-committee, Working Group, Correspondence Group, Member State) MSC			
1. Was the human element considered during development or amendment process related to this subject?	Yes	No	✓ NA
2. Has input from seafarers or their proxies been solicited?	Yes	No	✓ NA
3. Are the solutions proposed for the subject in agreement with existing instruments? (Identify instruments considered in comments section)	Yes	No	✓ NA
4. Have human element solutions been made as an alternative and/or in conjunction with technical solutions?	Yes	No	✓ NA
5. Has human element guidance on the application and/or implementation of the proposed solution been provided for the following:	Yes	No	✓ NA
• Administrations?	Yes	No	✓ NA
• Ship owners/managers?	Yes	No	✓ NA
• Seafarers?	Yes	No	✓ NA
• Surveyors?	Yes	No	✓ NA
6. At some point, before final adoption, has the solution been reviewed or considered by a relevant IMO body with relevant human element expertise?	Yes	No	✓ NA
7. Does the solution address safeguards to avoid single person errors?	Yes	No	✓ NA
8. Does the solution address safeguards to avoid organizational errors?	Yes	No	✓ NA
9. If the proposal is to be directed at seafarers, is the information in a form that can be presented to and is easily understood by the seafarer?	Yes	No	✓ NA

10. Have human element experts been consulted in development of the solution?	Yes	No	✓	NA
<b>11. HUMAN ELEMENT: Has the proposal been assessed against each of the factors below?</b>				
<input type="checkbox"/> CREWING. The number of qualified personnel required and available to safely operate, maintain, support, and provide training for system.	Yes	No	✓	NA
<input type="checkbox"/> PERSONNEL. The necessary knowledge, skills, abilities, and experience levels that are needed to properly perform job tasks.	Yes	No	✓	NA
<input type="checkbox"/> TRAINING. The process and tools by which personnel acquire or improve the necessary knowledge, skills, and abilities to achieve desired job/task performance	Yes	No	✓	NA
<input type="checkbox"/> OCCUPATIONAL HEALTH AND SAFETY. The management systems, programmes, procedures, policies, training, documentation, equipment, etc. to properly manage risks.	Yes	No	✓	NA
<input type="checkbox"/> WORKING ENVIRONMENT. Conditions that are necessary to sustain the safety, health, and comfort of those on working on board, such as noise, vibration, lighting, climate, and other factors that affect crew endurance, fatigue, alertness and morale.	Yes	No	✓	NA
<input type="checkbox"/> HUMAN SURVIVABILITY. System features that reduce the risk of illness, injury, or death in a catastrophic event such as fire, explosion, spill, collision, flooding, or intentional attack. The assessment should consider desired human performance in emergency situations for detection, response, evacuation, survival and rescue and the interface with emergency procedures, systems, facilities and equipment.	Yes	No	✓	NA
<input type="checkbox"/> HUMAN FACTORS ENGINEERING. Human-system interface to be consistent with the physical, cognitive, and sensory abilities of the user population.	Yes	No	✓	NA
<p><b>Comments:</b> As explained in paragraph 21 of the document given the current proposal is only to undertake a regulatory scoping exercise there would be no implications for the Human Element arising from this output in itself.</p> <p>However, the co-sponsors are mindful that while the MASS may be unmanned many of the issues that need to be considered would relate to the interactions of between the MASS and humans, either on board other vessels or in shore based roles. As such the Human Element would be an area of consideration within the proposed scoping exercise, and it could be the scoping exercise that provides some of the answers to the Human Element checklist when it is associated with any follow-up proposal for actually regulatory changes.</p>				