

MARITIME SAFETY COMMITTEE
101st session
Agenda item 5

MSC 101/5/1
28 February 2019
Original: ENGLISH

**REGULATORY SCOPING EXERCISE FOR THE USE OF
MARITIME AUTONOMOUS SURFACE SHIPS (MASS)**

Comments and proposals for interim guidelines for MASS trials

Submitted by ITF

SUMMARY

Executive summary: This document provides comments on the provisional principles for interim guidelines for MASS trials, including proposals for the development of those guidelines

Strategic direction, if applicable: 2

Output: 2.7

Action to be taken: Paragraph 21

Related documents: MSC 99/22, paragraph 5.27.2; MSC 100/20, paragraph 5.31, MSC 100/WP.8, paragraph 23; NCSR 5/INF.15; resolution A.1047(27); MSC/Circ.566, MSC/Circ.867; STCW regulation I/13 and SOLAS regulation V/3

Introduction

1 MSC 100 noted the provisional principles for the development of interim guidelines on MASS trials (MSC 100/WP.8, paragraph 23) and invited interested parties to submit proposals with regard to draft guidelines to MSC 101 taking into account those principles. This document is submitted in response to that request.

Background

2 MASS proof of concept trials are currently taking place under controlled conditions in some national waters, and moving toward commercial operation under national regulation and oversight. It is anticipated that future trials will be conducted under dynamic real-world conditions in international waters under interim guidelines developed by IMO. It needs to be recognized in the guidelines that there are two different jurisdictions, national and international,

involving different timelines and levels of authority and control in very different operating environments.

3 As the activities within national waters are outside the purview of the Committee, the primary focus of the interim guidelines should be trials of large commercial ships on extended international voyages outside of national regulation in the time period before international regulations accommodating MASS come into effect. The interim guidelines may be viewed as a potential interim first step to new international regulations.

4 STCW regulation I/13 on Conduct of trials permits Administrations to authorize ships entitled to fly its flag to participate in trials of automated systems in order to evaluate alternative methods of performing specific duties. Ships may operate with such systems indefinitely as long as trials are conducted in accordance with guidelines adopted by the Organization. In effect, the guidelines become a "de facto" regulatory regime for MASS during the interim period.

5 Previous experience with provisional or interim guidelines for trials of a new technology to permit One Man Bridge Operation at Night (OMBON) adopted in 1991 by MSC/Circ.566 (Provisional guidelines on the conduct of trials in which the officer of the navigational watch acts as the sole look-out in periods of darkness) and discontinued in 1998 by MSC/Circ.867 (Officer of the navigational watch acts as the sole look-out in periods of darkness) indicates that the guidelines could potentially be in effect for a long period and may cover a large number of ships.

6 Under STCW regulation I/13, such trials are to be conducted in a manner that provides at least the same degree of safety, security and pollution prevention as provided by existing regulations. No goal-based procedures or standards exist for MASS to establish comparability. Existing regulations should not be bypassed or compromised with exemptions or equivalencies until the autonomous systems have operated for a period of time long enough to develop performance standards.

Discussion of principles

Principle – Guidelines should provide that MASS trials are in line with mandatory instruments

7 Compliance with current mandatory requirements serves a practical purpose. To have dual capability provides a backup in a case of failure of the system being trialed, as well as avoiding the risk of the ship becoming a stranded asset if not grandfathered in new regulations. Until a regulatory regime is in effect covering MASS, any autonomous remotely controlled ship built for commercial service in international trades should also comply with all mandatory regulations covering the operation and manning of conventional ships. This includes the mandatory provisions of SOLAS regulation V/14 on Ship's Manning, and the STCW Convention and Code on qualifications of seafarers to ensure the safe operation of the ship in the event of the failure of an autonomous system.

8 SOLAS regulation V/3 on *Exemptions and equivalents* permits individual Administrations to grant to individual ships exemptions or equivalents of a partial or conditional nature, when any such ship is engaged on a voyage where the maximum distance of the ship from the shore, the length and nature of the voyage, the absence of general navigational hazards, and other conditions affecting safety are such as to render the full application of this chapter unreasonable or unnecessary, provided that the Administration has taken into account the effect such exemptions and equivalents may have upon the safety of all other ships. The guidelines should make clear that it would be inappropriate for large ocean-going ships

undergoing trials on international voyages subject to general navigational hazards and interacting with conventional ship traffic to qualify for exemptions or equivalents under this provision.

9 The *Principles of Minimum Safe Manning* (resolution A.1047(27)) provide that levels of automation may be a relevant factor in establishing manning levels. But, autonomous systems lacking performance standards and undergoing trials should not be a relevant factor to be considered as a basis for reduced manning levels.

10 In autonomous systems where there is shore-based support in shipboard decisions or remote operation of the ship, the shore-based operators responsible for participating in the management of the ship should be STCW-certified at the management level for the class of ship under management or control. To ensure shore-based operators can maintain their STCW certificates, such service should be interpreted as seagoing service for renewal of certificates.

11 As the operation, maintenance and management of autonomous systems may require skill sets not presently required under the STCW Code, consideration should be given to whether the interim guidelines should provide for additional training and documentary evidence of such training for seafarers and shore-based operators responsible for managing autonomous ships and systems.

12 In considering additional training for autonomous ships the human element/machine interface and the appropriate balance in the relationship between the human operator and autonomous systems are critical issues. Part of the training should include protocols to be followed during trials and the management of risks inherent in reliance on sensor derived information. Australia submitted an excellent document on information presentation and how human information processing affects decision-making and the effects automation can have on human performance (NCSR 5/INF.15). This document also analyses how a ship's system, information displays and the human element can form a distributed cognition team. It should be taken into account in developing any interim training requirements for autonomous systems. This may be a matter best referred to the HTW Sub-Committee for consideration.

13 Of concern is that guidelines are now being developed outside the purview of IMO by individual or combinations of Member States, intergovernmental organizations, recognized organizations, NGOs and private Industry Codes of Practice with diverse agendas. They are proliferating and some organizations are advocating that they be accepted as equivalent to or as a replacement for a regulatory regime. This could lead to a derogation of IMO's role and a lack of uniformity in standards that is inconsistent with international shipping's need for clarity and certainty in international regulations.

14 The guidelines should make clear that IMO remains the only appropriate body to authorize international performance standards for equipment and the training and qualifications of the humans, both on board and ashore, that are part of the human element / technology team responsible for the safety of navigation of autonomous ships.

Principle – Guidelines should ensure the safe, secure and environmentally sound operation of MASS

15 If autonomous ships undergoing trials are in compliance with mandatory instruments regarding the performance standards of conventional navigation and engineering equipment and qualifications of personnel both on board and ashore, they will have a baseline performance standard equivalent to conventional ships. Any additional interim guidelines related to autonomous systems will not be critical to the safety of the ship, the environment or

other ships providing there is clear responsibility for onboard personnel to monitor both the conventional and the autonomous/remotely controlled systems and authority to intervene as needed during the trial period.

Principle – Guidelines should be generic, not too technical or prescriptive and goal based describing functions and goals to be achieved

16 If autonomous/remotely controlled ships undergoing trials are in compliance with mandatory instruments, the safety of the ship and other parties will not be dependent on the performance of the autonomous system. The guidelines may then be in very simple general terms describing the functions and goals to be achieved in order to measure the performance and reliability of the systems against the goals.

17 In the event that autonomous/remotely controlled ships undergoing trials are to be exempt from compliance with mandatory instruments, the guidelines would then need to provide for a level of performance equivalent to conventional ships. It would require a major work item to develop standalone interim guidelines with the scope and level of detail necessary to provide performance standards equivalent to conventional ships.

Principle – Guidelines should encourage information sharing

18 At the present time the information sharing is largely on the success of autonomous/remotely controlled trials that promote the commercial interests of those conducting the trials. If trials of new concepts and systems are to be of value in developing future reliable, robust and efficient systems there is a need for an emphasis on uncovering potential problems and errors or defects in their application under real-world conditions. Information sharing should include a description of the goal to be achieved and the results of the trial in achieving or not achieving that goal. A record should be provided of the nature of all interventions required during the trials. Even interventions of a minor nature should be logged, as they can cascade to larger problems if not corrected.

Principle – Guidelines should include reporting to the relevant coastal States on the trials to be conducted

19 This principle implies that a flag State may have the right to conduct trials of their ships in the coastal waters of another State. It should be recognized that STCW regulation I/13 provides that a ship shall not engage in trials while navigating in the waters of a coastal State which has communicated its objection to the Organization. It is assumed this would include the coastal State setting conditions that regulate the conduct of trials of foreign ships in their waters.

Proposals

20 In the development of interim guidelines for the trials of MASS, the Committee is invited to consider that:

- .1 MASS comply with all mandatory instruments including the provisions of UNCLOS, Article 94 on *Duties of flag State*, and SOLAS regulation V/14 on Ship's Manning, by STCW qualified seafarers capable of the safe operation of the ship undergoing trials in the event of the failure of an autonomous system.
- .2 Existing regulations should not be bypassed or compromised with exemptions or equivalencies until the autonomous systems have operated

- for a period of time long enough to develop approved performance standards.
- .3 Autonomous systems lacking performance standards and undergoing trials should not be a relevant factor to be considered as a basis for reducing manning levels under SOLAS regulation V/14.
 - .4 Shore-based operators responsible for participating in the management or control of the ship should be STCW certified at the management level for the class of ship under management or control.
 - .5 The interim guidelines should provide for training and documentary evidence of such training for seafarers and shore-based operators on trial protocols and the management of autonomous systems during trials.
 - .6 Information sharing should include a description of the goal to be achieved and the results of the trial in achieving that goal. A record should be provided of the nature of all interventions required during the trials to develop a comprehensive record of actual performance to identify potential problems that need to be addressed.

Action requested of the Committee

21 The Committee is invited to consider the comments above, in particular the proposals in paragraph 20, and take action, as appropriate.
