

Input paper: ARM-n.n.n

Input paper for the following Committee(s):

☒ ARM

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☐ Information

Agenda item

n.n

Technical domain/ Task number

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Proposal for MASS Requirements and Gap Analysis within IALA

1. SUMMARY

This proposal emphasizes the need for a comprehensive requirements and gap analysis related to Maritime Autonomous Surface Ships (MASS) within IALA. The primary objective is to identify the requirements of existing AtoN (Aids to Navigation) and VTS (Vessel Traffic Services) systems to effectively accommodate MASS, and to conduct a thorough analysis of the gaps in current systems. These efforts will support IALA's ongoing work in addressing the challenges brought about by the emergence of MASS.

To achieve this, it is proposed that either an existing working group within IALA be tasked with these activities, or that a new group be specifically established for this purpose. This approach will ensure that MASS can operate safely and efficiently, making use of both current and future marine AtoN systems, while aligning IALA's standards with the evolving needs of autonomous vessels.

2. BACKGROUND

IALA has been proactively responding to the advent of MASS, with the MASS Task Force leading efforts to review IALA recommendations, guidelines, and model courses that may need revision to accommodate MASS. This work, in collaboration with IALA's committees, aims to develop the necessary guidelines for MASS and lay the groundwork for their safe future operation.

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To further enhance these ongoing efforts, a comprehensive requirements and gap analysis would provide valuable insights, ensuring that both existing and MASS oriented systems are well-positioned to support the evolving needs of autonomous vessels. This approach would complement IALA's current initiatives, reinforcing its commitment to maintaining the highest standards of safety and efficiency in maritime navigation.

3. IHO MASS PROJECT TEAM • WORKING GROUP OVERVIEW

3.1. IHO MASS PROJECT TEAM ACTIVITIES AND GAP ANALYSIS

Since 2021, the International Hydrographic Organization (IHO) has been operating the Maritime Autonomous Surface Ships (MASS) Navigation Project Team (PT) with the aim of identifying operational requirements for autonomous ships through gap analysis. The team's objectives include conducting impact assessments on current hydrographic standards and services and developing recommendations through existing working groups.

3.1.1. BACKGROUND

The IHO MASS PT was formed in response to the growing need for specific data required for the operation of autonomous ships. It was recognized that there is an absence of key regulations, rules, and standards essential for autonomous vessels, highlighting the urgency to address these challenges.

3.1.2. OBJECTIVE

- Identify operational requirements for autonomous ships through a comprehensive gap analysis.
- Assess the impact of current hydrographic standards and services.
- Develop a series of recommendations and issues to be addressed by existing working groups.

3.1.3. MASS PT ACTIVITIES

The MASS PT has conducted multiple sessions since its formation, including meetings in December 2021, February 2022, May 2022, October 2022, January 2023, March 2024, and July 2024. Through these ongoing activities, the team has highlighted several key findings and areas requiring further work:

- The MASS industry is still in its infancy and new requirements will emerge as it matures.
- A number of requirements currently fall outside the scope of the S-100 standards landscape.
- More regional representation is required from members states to address gaps from regional MASS activity.

- Closer MASS industry and academic collaboration is required to further develop standards as the MASS industry grows and matures.
- Complimentary work is required in adjacent bodies such as IALA and WMO to ensure interoperability and machine readability of the wider S-100 family standards.
- Data quality needs to be ensured from data providers to ensure fit for purpose data is provided for MASS.

3.1.4. FUTURE ACTIONS

In order to address the points above, the following activities is required.

- Expand membership to achieve greater global coverage and ensure that regional activities are adequately captured.
- Invite representatives from industry and academia to continually gather evolving requirements as the industry progresses.
- Conduct the discovery and analysis exercise on an annual or biennial basis to stay informed of emerging needs.
- Collaborate closely with the S-100 Working Groups, Project Teams, and the Data Quality Working Group to ensure that product specifications and data standards align with MASS requirements. This collaboration will provide valuable feedback to groups and data providers, encouraging them to meet evolving standards.
- Work with complementary organizations such as IALA and WMO to ensure their data standards support the navigation and operational needs of MASS.

Over the past 3-4 years, the IHO MASS Project Team (PT) has identified a total of 45 items through the S-100 Gap Analysis. These items are categorized into two groups: those that can be addressed through amendments and enhancements to the existing IHO S-100 series standards, and those that necessitate the development of entirely new standards to support the integration of autonomous ships. A summary of some of these items is provided below.

Items requiring enhancement of existing Standards
Fairways / Canal Locks / Port Areas / Limits / Ability to Exchange Route Information Between Vessels / VTS Areas / Dynamic Data on Surface Currents / Ice Conditions / Wind Information / Wave Information / Machine Readable Data / Spatial Analysis / Historic Marine Accidents / Real-Time Updates / Ferry Routes / Full Bathymetric / Harbour Infrastructure / Conspicuous Seabed Features / Certainty of Seabed / Edge Matching on Charts / Shipping Lanes / Tidal and Surface Currents / Photographic Imagery / Geographical Polygons (e.g., Speed Limits Area) / Polygons for Navigation Information Such as Channel or Other Zone / Real-Time Data / TSS / Reporting Point / Wrecks

Table 1 Items requiring enhancement of existing Standards

Items requiring new Standards
3D Models or Digital Twins / Traffic Information / Acoustic Qualities of the Water / More Visually and Radar Conspicuous Items

Table 2 Items requiring new Standards

3.2. ENDORSEMENT OF THE MASS WORKING GROUP AND FUTURE ACTIVITIES

The IHO MASS Project Team (PT) has requested endorsement for the establishment of a permanent MASS Working Group at the 16th HSSC meeting held from 27-31 May 2024. Formal endorsement is anticipated at the 8th IHO Council meeting in October 2024. In preparation, the 7th MASS PT meeting was held in July 2024, during which a Chair, Vice-Chair, and Secretary were elected. Following the expected formal endorsement, the group will transition into a permanent Working Group with a mandate to address MASS-related issues within IHO over the next five years.

The objectives of the MASS Navigation Working Group are as follows:

- Collaborate with the S-100 Working Groups, Project Teams, and other relevant IHO groups to ensure that product specifications and data standards are aligned with the requirements of MASS.
- Invite representatives from industry and academia to join the Working Group, and engage with all relevant stakeholders to ensure that the requirements for navigational data in the context of MASS are properly understood and effectively communicated to the relevant Product Specification Working Groups.
- Liaise and work with other international organizations, such as IMO, IALA, and WMO, to ensure consistency in the development, activities, and regulations within the autonomous maritime domain.

Furthermore, the key elements of the five-year plan currently under consideration by the MASS Working Group are outlined below.

- Raise the profile of the MASS domain and promote MASS navigation issues within the IHO community.
- Engage with industry, academia, and other MASS interest groups to increase awareness of the challenges associated with integrating MASS navigation with conventional navigation products and services.
- Serve as a focal point to provide coherence for MASS-related matters across the IHO domain.
- Support and evaluate trials of MASS navigation to assess the applicability and interoperability of IHO standards.
- Wider S-100 Interoperability
- Synthetic Environments
- Artificial Intelligence & Machine Learning

The IHO, through the MASS Navigation Working Group, will prioritize the necessary preparations for hydrographic information to support the evolving MASS industry. Additionally, the IHO aims to collaborate closely with other international organizations, including IMO, IALA, and WMO, to ensure a coordinated and comprehensive approach to addressing the challenges and requirements of MASS.

4. PROPOSAL

- Discuss the need for conducting the requirements and gap analysis as outlined in this report.
- If the need is recognized, evaluate how this analysis can be conducted in coordination with the ongoing efforts of the ARM Committee's MASS guideline development and the activities of the IALA MASS Task Force.
- Determine whether these tasks should be carried out by an existing group or if a new group should be specifically formed for this purpose.
- The designated group responsible for these activities should operate for a duration deemed appropriate and will be required to report its findings to IALA. The results should be disseminated to relevant committees and shared with other pertinent organizations, such as IMO and IHO.

5. ACTION REQUESTED OF THE COMMITTEE

The Committee is invited to consider the proposal of **Requirements and Gap Analysis**, and take action as appropriate.