

IACS Proposal on Structure of MASS Code

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1. MASS trials are being conducted all over the world, utilizing technology to carry out various ship functions such as:

✓ Navigation

✓ Propulsion

✓ Steering

✓ Control of Machinery

2. Focus is on ‘Navigation’

2. Result of RSE (MSC.1/Circ.1638)

- ✓ meaning of the terms master, crew or responsible person;
- ✓ remote control station/centre;
- ✓ remote operator designated as seafarer.
- ✓ Connectivity
- ✓ Cyber security
- ✓

3 Proposal on structure of MASS Code

Based on the structure of MASS Code provided by MASS CG Coordinator in Round 2, IACS proposes the MASS Code should focus on new technologies and functions emerging from MASS operation and common gaps and themes, such as:

- ✓ **Definitions and terminology;**
- ✓ **Remote control/operation center;**
- ✓ **Autonomous Navigation;**
- ✓ **Advance monitoring systems e.g. capable of fault detection, diagnostics**
- ✓ **Adaptive controls**

- ✓ **Connectivity**
- ✓ **MASS trial**
- ✓ **Cyber security**
- ✓ **Human Factors of remote control and autonomous navigation**

For MASS without seafarers on board:

- ✓ **systems and functions regulated by Base Regulations (SOLAS,ICLL,....)**
- ✓ **Operations required by MARPOL (recommended)**

4. Verification and validation of MASS code

- ✓ **IACS strongly recommends that MASS Code should be verified and validated.**
- ✓ **The draft IMO MASS Code should be preceded and guided by fundamental standards relevant to:**
 - **Terminology**
 - **Taxonomy**
 - **Ontology**
 - **Operational design domain**

- ✓ MASS Code should be developed to have a correct, complete and consistent set of requirements with the following categories:
 - 1.Functional requirements** – what the MASS should do, explicated down to its different systems, sub-systems, etc. but also allocated to different software (including AI) and hardware constituents.
 - 2.Performance requirements** – how well, under what conditions (e.g. time constraints, concurrent execution, etc.) the functions should be executed.
 - 3.Interface requirements** – how the hardware, software (including AI) constituents of the MASS, system, sub-system level, etc. will be linked (interfaced).

4. Communication requirements – how we expect the MASS to communicate with remote crew, other vessel(s) (other MASS, conventional vessels), but also of equal importance the methods and protocols of communication in the MASS hardware and software constituents at the systems (inter-system), sub-systems, equipment, etc, level.

5. Safety Requirements – what the MASS, systems, sub-systems, etc. and SW and HW constituents should never do. But also this should include mitigations and provisions relevant to monitoring and recovering from loss of functions, performance, etc.

6. Cyber Security Requirements – details the “what”, and “how”, of known vulnerabilities that exist in individual HW and SW constituents.

5. According to MASS trial, following challenges still exist from the technical point of view:

.1 all-weather situation awareness

.2 unified algorithm of collision avoidance

.3 connectivity and information exchange between MASS and conventional ships and other stakeholders

.4 defining safety requirements and proving MASS system compliance

- **The role of IACS is to create the requirements for the appropriate execution of MASS survey and inspections.**
- **IACS would like to contribute to develop the MASS Code by consideration of the technical requirements for survey and inspections based on the MASS Code.**

Thank you for your attention!