

Call for Nominations & Proposals for Fuzhou Events

Dear Officers and Presidents of IAIN Member Institutes,

I hope this E-mail finds you well.

I am writing to share important updates and to invite your active input on several matters relating to our technical standardisation work and the forthcoming events in Fuzhou.

1. Circular Letter No. TC-2026-01 and Consultation for Draft Terminology

The IAIN Technical Committee has issued Circular Letter No. TC-2026-01, which circulates IAIN's first technical document *Terminology for Ship Autonomous Navigation Technology--Draft, July 2026* for member and industry consultation. Please log in to the IAIN website (<https://iainav.org/category/news/>) to access the circular letter and its attachment. I would like to request you to review the attachment and submit your comments and suggestions to the Technical Committee no later than 15 September 2026 via the E-mail address president@iainav.org.

2. IAIN Meetings and Symposium in Fuzhou, China (15–16 October 2026)

The International Symposium on International Standards of Ship Autonomous Navigation Technology will be held in Fuzhou, China on the dates indicated:

- IAIN 2nd Officers' Meeting(2026)– 10:00 AM, 15 October 2026;
- IAIN Technical Committee First Meeting (expanded) – 2:00 PM, 15 October 2026;
- Opening Ceremony and Plenary Meeting of the World Maritime Equipment Conference 2026 – 9:00 AM, 16 October 2026;
- International Symposium on International Standards of Ship Autonomous Navigation Technology– 2:00 PM, 16 October 2026.

Formal invitations for in-person participation of the IAIN 2nd Officers' Meeting(2026) and IAIN Technical Committee First Meeting will be sent out in the coming days. The invitation for in-person participation will indicate who pay the travel and accommodation expenses, and also invite to the International symposium on international standards of ship autonomous navigation technology.

3. Call for Nominations, Proposals, and Speaker Recommendations

To facilitate the preparation of these meetings, we invite your contributions in the following areas:

(a) Symposium Speakers

The symposium will be held under the theme: Technical Standards-A Critical Enabler for Global MASS Application and Growth. We cordially invite you to recommend potential best speakers for the symposium. Please provide the candidate's name, CV, contact details, and a brief abstract of the proposed topic. Submissions should be sent to the IAIN president's E-mail: president@iainav.org by 15 August 2026. Selected speakers will be offered partial or full coverage of travel and accommodation expenses, and they will also be exempt from registration fees.

(b) Officers' Meeting Agenda Items, Technical Committee Rotating Member Nominations, and IAIN MASS Standards Project Proposals (2026-2029)

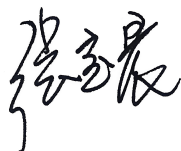
We also welcome your suggestions on:

- Agenda items for the Officers' Meeting – please send your suggestions to the Secretary-General (hesham.helal.iain@gmail.com) for coordination;
- Nominations for rotating members of the Technical Committee;
- Proposals for future IAIN MASS technical standards, including title, scope, lead institution, and lead expert.

Please send these to president@iainav.org by 5 September 2026.

We deeply appreciate your continued engagement and look forward to receiving your valuable feedback. Should you have any questions, please feel free to contact me, and the Secretary General Prof. Heshal Helal.

Yours sincerely,



ZHANG Baochen

President, International Association of Institute of Navigation

Vice President, China Institute of Navigation



To: All members and interested organizations and experts, Date: 31 July 2026

From: IAIN Technical Committee

Circular Letter No. TC-2026-01

In accordance with IAIN's constitutional aim "establishing technical committees or working groups to study specific problems and producing appropriate recommendations and standards", the terminology is hereby circulated for consultation.

With the official entry into force of the non-mandatory MASS CODE, the development and application of autonomous navigation technology will continue to accelerate. The industry urgently needs a set of general terminology systems that go beyond the scope of regulatory and cover R&D, engineering applications, and industry collaboration, so as to facilitate communication, reduce ambiguities and promote consensus building.

According to the decision of the IAIN Officers' Meeting held in Vienna on 27 April 2026, the Chairman of IAIN Technical Committee has organized experts to finalize the document of IAIN standard--Terminology for Ship Autonomous Navigation Technology--Draft, July 2026.

Since it will be raised to the first meeting of the IAIN Technical Committee in mid October this year for approval, the Technical Committee Secretariat (under preparation) has edited the draft, which is now circulated to all parties via IAIN website, and invite all IAIN Member Institutes and the industry to review the attached document and to submit comments and suggestions.

All comments and suggestions should be submitted to the following E-mail address no later than 15 September 2026.

E-mail: president@iainav.org

The Technical Committee greatly appreciates the continued support and contribution of all parties to the development of international navigation standards.

Thank you for your commitment and valuable contributions to the work of IAIN.



International Association of Institutes of Navigation

**Terminology for Ship Autonomous
Navigation Technology--Draft, July 2026**

IAIN Technical Committee

July 31, 2026

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Foreword

The International Association of Institutes of Navigation (IAIN) is a non-governmental, non-profit-making organisation with the object of uniting national and multi-national institutes and organisations which aim to foster human activities at sea, in the air, in space and on land, and which may benefit from the development of the science and practice of navigation and related information techniques. IAIN is an organization in consultative status with IMO and maintains close cooperation with IALA, IHO and other organizations in the maritime field.

This document was developed in accordance with Article 1 of the IAIN Constitution.

This document incorporates all the definitions contained in the International Code of Safety for Maritime Autonomous Surface Ships (MASS CODE) [Resolution MSC.595(111)] and independently sets out 57 terms closely related to the development and application of ship autonomous navigation technology. Existing relevant rules, standards and guidelines were consulted and taken into account in developing these terms.

Following extensive consultation with member institutes and industry, and taking into account the current stage of development of autonomous navigation technology and the frequency and importance of term usage, this document selects the terms to be included within its scope.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. IAIN shall not be held responsible for identifying any or all such patent rights. Similar expressions to certain commodity names may be used in this document, but they do not constitute an endorsement of any commodity.

This document was proposed by the IAIN Technical Committee, which is also responsible for its interpretation.

Introduction

In recent years, autonomous navigation technology for ships has developed rapidly worldwide and is seeing increasing application. The application of this technology can reduce crew workload and the risks associated with crew operations, improve shipping efficiency, reshape ship operation and control modes, and promote the transformation and upgrading of shipping business models and the modes and technologies used in ship design, construction, operation and maintenance, survey, and regulatory oversight.

With the official entry into force of the non - mandatory MASS CODE, the development and application of autonomous navigation technology will continue to accelerate. The industry urgently needs a set of general terminology systems that go beyond the scope of regulatory and cover R&D, engineering applications, and industry collaboration, so as to facilitate communication, reduce ambiguities and promote consensus building. The purpose of this document is to meet this increasingly urgent objective need.

1 Scope

This document collects all the terms defined in Chapter 4 of INTERNATIONAL CODE OF SAFETY FOR MARITIME AUTONOMOUS SURFACE SHIPS [Resolution MSC.595(111)], and provides and defines other terms related to the development of ship autonomous navigation technology and the design, construction, operation, maintenance, inspection and supervision of maritime autonomous surface ships.

2 Normative reference

This document has no normative reference documents.

3 Abbreviations

ANS	autonomous navigation system
ConOps	concept of operations
COLREG	International Regulations for Preventing Collisions at Sea, 1972
IMO	International Maritime Organization
MASS	maritime autonomous surface ship
ODD	operational design domain
OE	operational envelope
ROC	remote operations center

4 Terms and definitions

4.1 Generic

4.1.1

Autonomous means processes or equipment in a MASS system which are designed and verified to, under specified conditions, determine control action(s) without human intervention.

4.1.2

Autonomous navigation means a mode of operation in which, under specified conditions, autonomous processes or equipment determine control action(s) without human intervention.

4.1.3

Autonomous navigation system (ANS) means a system which, under specified conditions, is capable of the navigation of a MASS without human intervention.

4.1.4

Autonomous tug means a tug that performs tasks such as towing, escorting, in-port manoeuvring or berthing/unberthing support via autonomous or remote operation.

4.1.5

Degree of Autonomy (DoA) means the grading of the degree of autonomy for autonomous operation mode and remote operation mode.

4.1.6

Failure means the loss of the ability of an item to perform the specified function.

4.1.7

Hazards mean situations having the potential to threaten human life, health, property or the environment.

4.1.8

Human-centred design means an approach to system design and development that aims to make interactive systems more usable by focusing on the use of the system; applying human factors, ergonomics and usability knowledge and techniques.

4.1.9

Intelligent navigation means an operation mode in which control actions are determined by autonomous programs or equipment without human intervention on board the ship, as well as an intelligent navigational assistance mode that utilizes sensing technology, information fusion technology and autonomous navigation systems to provide situational assessment or decision-making recommendations for onboard crew, remote operators and other personnel.

4.1.10

Intolerable risk means a level of risk that would neither be negligible nor tolerable.

4.1.11

Maritime autonomous surface ship (MASS) means a ship which, to a varying degree, can operate independently of human interaction.

4.1.12

MASS function means a task or group of tasks, duties and responsibilities, as specified in the Code, necessary for the operation of the MASS.

4.1.13

Maintenance means establishing a planned maintenance system specifically addressing all shipboard equipment and software, with maintenance procedures tailored to autonomous or remote modes of operation.

4.1.14

Mitigation means a measure implemented to prevent unsafe conditions or modes from resulting in losses.

4.1.15

Monitoring means a process that, through an integrated technical system (including the ship, the shipowner and the remote control centre (ROC)), continuously observes and judges the operation and status of a MASS throughout its entire voyage and provides

safety warnings.

4.1.16

System means the combination of interacting elements organized to achieve one or more stated purpose.

4.1.17

Task means a set of actions taken to enable functions and the performance of operations.

4.1.18

Task station means a multifunction display with dedicated controls providing the possibility to display and operate any tasks. A task station is part of a control station.

4.1.19

Third parties mean persons or entities that are not involved in the operations of the MASS or an associated ROC but are engaging with it (e.g. vessel traffic services (VTS), ports, pilots or other persons on board or in the ROC for maintenance reasons, persons in distress, etc.).

4.1.20

Unsafe state means when a system is operating outside its Operational Envelope but not within a fallback state due to degraded performance (e.g. faults or failures), or is exceeding capabilities which, if left uncorrected or unmitigated, has the potential to directly cause an accident.

4.2 Sensing and perception

4.2.1

Cognition means a process of understanding, identifying and judging the states of own ship and relevant ships, the surrounding environment, equipment operating status, and their spatiotemporal relationships based on collected information, inferring the navigational situation, and forming a basis that can be used for autonomous navigation decision-making.

4.2.2

Data fusion means a dynamic process which, based on synchronized standardized multi-source data and through hierarchical integration, feature refinement and conflict optimization, elevates fragmented and heterogeneous raw data into complete, accurate and highly reliable navigational situation cognition information.

4.2.3

Data processing means a process of cleaning, verifying, synchronizing, compensating, calculating, extracting and converting data collected by an autonomous navigation system in accordance with a series of rules and methods, so as to form data that meet quality requirements, are temporally consistent, and can be used for monitoring, decision-making or control.

4.2.4

Data synchronization means a process that specifically addresses multi-source heterogeneous navigation data and, through continuous alignment, registration, normalization, verification and other processing, organizes disordered, misaligned and heterogeneous raw data into unified standard data.

4.2.5

Distributed perception means a perception method that uses multiple sensors distributed on ships, shore or at cooperative nodes to achieve multi-source information acquisition and, through time synchronization and information complementarity, produces more accurate cognitive results.

4.2.6

Environmental perception means a dynamic process of collecting information on ship's surrounding conditions and the natural environment in real time through sensors to obtain raw observation data.

4.2.7

Information fusion means a method of performing multistage and multilayer processing, including detection, synchronization, compensation, association and estimation, on multi-source information acquired by sensing equipment such as radar, AIS, GNSS and vision device.

4.2.8

Sensor means a component or device capable of sensing a specified measurand and converting it into usable output information. Measurands for autonomous navigation include the states of own ship and relevant ships, the surrounding environment, and equipment operating status, etc.

4.2.9

Situational awareness means the perception of surroundings and environmental elements in different modes of operation, the condition of all relevant systems and events with respect to time and space, the comprehension of their meaning, and the projection of their future status.

4.2.10

Vessel positioning accuracy means the dynamic error limit of the computed ship position relative to geodetic ground truth for a maritime autonomous surface ship (MASS) equipped with a multi-source position sensing system under operating conditions such as navigation, berthing and lock transit.

4.2.11

Timestamp means for the purpose of supporting temporal alignment of autonomous navigation data, event association and operational traceability, the time of data generation, collection, transmission, reception or processing identified according to a unified time reference.

4.3 Decision-making

4.3.1

Autonomous collision avoidance means a process in which the ANS, without human intervention, based on navigational situation cognition results and in accordance with the planned route, collision avoidance rules (COLREG), and feedback information from own ship's engine, rudder and other equipment, automatically generates and executes ship control commands such as course, speed, ahead/astern movement to eliminate the risk of collision.

4.3.2

Autonomous navigation decision means a process that, based on own-ship conditions, surrounding conditions and the natural environment, as well as their interrelationships and degrees of influence, without human intervention and in accordance with relevant rules and conditional constraints, automatically generates ship manoeuvring commands such as course alteration, speed change, ahead/astern movement to eliminate the risk of collision, allision and grounding.

4.3.3

Collision alert means a process in which an autonomous navigation system, based on own-ship motion state and real-time navigational situation cognition, predicts the risk of collision in advance and autonomously issues alert information.

4.3.4

Course control means a process of enabling a MASS to navigate on a predetermined course through automatic control of the rudder system or differential thrust.

4.3.5

Course deviation alert means an alert automatically triggered by the system when the actual course of the ship deviates from the preset planned course and the course deviation angle exceeds the preset safety threshold.

4.3.6

Grounding alert means a process in which an autonomous navigation system, based on notices to mariners, perception information and other information, autonomously issues alert information in advance when the calculated predicted track of own ship is about to enter dangerous waters with insufficient water depth.

4.3.7

Route planning means a process in which the autonomous navigation system (ANS), based on the navigation task, navigation environment, ship performance, navigation rules and the Operational Envelope(OE) of the MASS, automatically generates and continuously updates a route that meets safety, environmental protection and economic requirements.

4.3.8

Speed control means a process of automatically controlling the propulsion system to enable a MASS to navigate at a predetermined speed.

4.3.9

Track control means a process of using speed control and/or course control to enable a MASS to navigate along a predetermined route and bring its track back within acceptable limits.

4.3.10

Track deviation alert means an alert automatically triggered by the system when the actual track of the ship deviates from the preset planned route and the cross-track distance exceeds the preset safety threshold.

4.3.11

Weather routing means a process of making autonomous decisions on the route, speed and timing of navigation based on ship performance, the navigation task, and forecast information on meteorological, hydrological and sea conditions.

4.4 Execution

4.4.1

Agent means a human or software (computer or computer system(s)) responsible for performing or supervising control actions.

4.4.2

Control is purposeful action on or in a process, to meet specified objectives.

4.4.3

Control action means the acquisition of information, analysis of information, decision-making, or implementation of actions.

4.4.4

Control station means a single or multiple position(s), including all equipment, such as computers and communication terminals and furniture, from which functions or operations of a MASS can be controlled or monitored.

4.4.5

Intelligent Navigational Assistance means the process of delivering supporting services such as visual enhancement, comprehensive information display, navigation situation assessment, risk warning and navigation decision recommendations to onboard crew, remote operators and other personnel based on multi-source sensing information via data fusion and intelligent analysis.

4.4.6

Manual intervention means a process in which an operator intervenes in the ship's navigation decision-making process, without interrupting the system's autonomous mode of operation, by entering new high-level commands, modifying parameters or

confirming actions.

4.4.7

Manual takeover means an operator completely disengaging or bypassing the system's autonomous control mode and directly obtaining the highest level of control authority over the ship's low-level actuators (such as the steering gear and propulsion system).

4.4.8

Onboard crew means a master, officers or operational staff physically on board.

4.4.9

Override means to take over control of functions or systems that are under autonomous or remote operation.

4.4.10

Propulsion system means the combination of all machinery, equipment and relevant systems that generate thrust for the ship to overcome navigational resistance and deliver the specified speed. The propulsion system shall be capable of automatic operation in accordance with instructions from the ANS (including ROC), provide timely information feedback, and allow switching to manual operation at any time.

4.4.11

Redundant control means an integrated fault-tolerant control system established via multi-source perception, heterogeneous algorithms, multiple data links and graded take-over mechanisms. It is designed to eliminate single-point failures, resist common-cause failures and ensure that MASS can safely degrade to a safe state under fault conditions.

4.4.12

Remote operation is when functions and systems are operated from outside the MASS.

4.4.13

Remote operator means a qualified person who is employed or engaged to operate some or all of the functions of a MASS from a ROC.

4.4.14

Remote operations centre (ROC) means a location remote from the MASS and from which some or all of the functions of the MASS can be operated.

4.5 Connectivity

4.5.1

Communication link means a data exchange channel between shipboard network systems, ROC, cloud data platforms and related shore-based facilities, that supports the business logic of autonomous navigation systems, provides standardized data encapsulation capability and is subject to strict cybersecurity monitoring.

4.5.2

Communication redundancy means a communication network in which multiple data exchange channels that are physically heterogeneous, topologically decoupled and equipped with automatic link management (ALM) functions are configured between ship and shore, between ships, and within the ship network, ensuring that core data and control capabilities are not lost in the event of any single-point network failure, link blockage or cyberattack.

4.5.3

Connectivity means capabilities that allow appropriate and applicable MASS systems and the Remote Operations Centre(s) (ROC(s)), to connect to a communication network.

4.5.4

Cybersecurity means the protection, through technical, administrative and operational measures, of the confidentiality, integrity, availability and controllability of shipboard autonomous navigation systems, ROCs, communication networks and their data against damage, infringement, information leakage, unauthorized access and other threats, in order to maintain the functions and states required for safe navigation.

4.5.5

Quality of service means a network's ability to maintain acceptable connectivity in the intended Operational Envelope, achieve maximum bandwidth, and deal with other network performance elements.

4.5.6

Ship hybrid network means an integrated network architecture formed by the unified orchestration, at the logical layer through software-defined networking (SDN) and time-sensitive networking technologies, of multiple heterogeneous physical transmission media (such as satellite, cellular networks, local optical fibre and wireless sensor networks), communication protocols (IT and OT protocols) and network topologies, thereby enabling dynamic link optimization, deterministic transmission and end-to-end security isolation within a MASS and between the MASS and external systems.

4.5.7

Ship network means a digital nerve centre that connects all sensing nodes, control systems, actuators, edge-computing platforms and external communication gateways of a MASS, and has deterministic transmission latency, strict security isolation boundaries (zones and conduits) and a highly fault-tolerant physical topology.

4.5.8

Ship network isolation means a defence-in-depth mechanism that, in order to maintain the security, functional attributes and trust level of a MASS network system, divides a complex shipboard hybrid network into multiple independent security zones by physical or logical means, blocks the lateral movement of cyberthreats (such as viruses and ransomware), and ensures that the core operational technology (OT) network remains unaffected.

4.6 Operations

4.6.1

Automatic berthing and unberthing mean the process in which, in accordance with a predefined berthing and unberthing procedure and with human intervention, the automatic control system exercises coordinated control over propulsion devices, rudder propellers and other equipment, and automatically completes berthing or unberthing operations.

4.6.2

Autonomous berthing and unberthing mean the process in which, without human intervention, a MASS automatically generates and dynamically optimizes a berthing or unberthing plan and automatically completes the berthing or unberthing operation.

4.6.3

Concept of operations (ConOps) means a document describing the characteristics of a MASS.

4.6.4

Degraded state means a deviation in the normal operation or condition of the MASS which can potentially result in a fallback state.

4.6.5

Fallback response means the actions and procedures to enter into, safely stay within, and eventually recover from, a predefined fallback state.

4.6.6

Fallback state means a predefined state entered when it is not possible for the MASS to stay within the Operational Envelope (OE).

4.6.7

Fault means an abnormal condition that can cause an element or an item to fail.

4.6.8

Fault diagnosis means a process that, based on monitoring data, operational information, system models, or diagnostic algorithms and other relevant information, automatically identifies and analyses faults in relevant systems, equipment or components of a MASS, as well as their time of occurrence, location, type, cause and effects, and provides a diagnostic conclusion.

4.6.9

Fault tolerant means the ability of a functional unit to perform a required function in the presence of faults or errors.

4.6.10

Health assessment means a process in which, during the operation of a MASS, shipboard equipment and systems, their operating condition, degree of performance

degradation and functional level are comprehensively analysed based on real-time monitoring and historical data, fault diagnosis information, operating conditions and other relevant information to determine their health status.

4.6.11

Human-machine interface (HMI) means the part of a system with which an operator interacts. The interface is the aggregate of means by which the users interact with a machine, device, and system. The interface provides means for input, allowing the users to control the system and output, allowing the system to inform the users.

4.6.12

Modes of operation means the condition(s) under which the functions of a MASS are operated, i.e. autonomous or remotely-operated, with or without persons on board.

4.6.13

Monitoring means the use of measurements and analytical methods to understand the condition and any changes in the state of MASS including its systems and components.

4.6.14

Navigation data logging means a function by which a MASS, in accordance with specified requirements, continuously records and automatically stores operational and decision-making data of the entire process.

4.6.15

Normal operation means operations within the Operational Envelope of a MASS.

4.6.16

Operational design domain (ODD) means the design range in which a system can operate as intended. It includes both internal events, such as component or subsystem failure or degradation; and relevant external factors, such as available resources, geographical, or environmental situations.

4.6.17

Operational envelope (OE) means the description of the MASS's operational capabilities and limitations.

4.6.18

Remote crew means appropriately qualified persons who, at a ROC or other authorized location, perform duties including safety management, monitoring, operation, maintenance and support or emergency response for an autonomous ship.

4.6.19

Remote master means a member of the remote crew who has ultimate decision-making authority and assumes overall responsibility for the safety management of a MASS.

4.6.20

Systematic failure means an event that is the consequence of inadequate work

processes and may occur at any stage in the systems' lifecycle.

4.6.21

Systemic failure means an event which occurs not only by the malfunctions of a distinct component in the system but due to inherent deficiencies flaws or oversights in the system's structure, including unforeseen interactions or dependencies among other various constitutive elements of the system.

4.6.22

Ship shore collaboration means a process in which a MASS and shore, through reliable communication links and a unified information exchange mechanism, achieve information sharing, capability enhancement and coordination of actions in such areas as situational awareness, navigational decision-making, task execution, operational compliance, risk control and emergency response, etc.

4.6.23

System restart means a process of performing a controlled shutdown and subsequent restart of relevant systems, subsystems or equipment of a maritime MASS in accordance with prescribed procedures to restore their normal operating state and ensure that operational data, functional states and safety controls meet predetermined requirements.

4.6.24

Voice prompt means a form of human-machine interaction that provides crew members, remote operators or other relevant personnel with information such as equipment operating status, operational guidance and safety warnings through voice messages.

4.6.25

Voyage phase means the parts of the voyage typically characterized by a recognizable shift in where the MASS is located in terms of geographical surroundings, or the start and end of one or more operation.

4.7 Regulatory matters

4.7.1

Coastal State means a State in whose territory, including its territorial sea, a marine casualty or marine incident of MASS occurs, or any State in, or bordering on, an ocean, sea, or other major body of water.

4.7.2

Flag State means the State whose flag the MASS is entitled to fly.

4.7.3

Port State Control (PSC) means the inspection of foreign MASS in national ports to verify that the condition of the MASS and its equipment comply with the requirements of international regulations, and that MASS is manned and operated in compliance with these instruments; thereby ensuring maritime safety and security and preventing

pollution.

4.7.4

Recognized organization (RO) means an organization assessed and recognized by a flag State as complying with the RO Code, which is authorized to conduct statutory surveys, plan approval, certification and related technical services on behalf of the flag Administration of MASS in accordance with IMO instruments and national laws.

4.7.5

Regulatory model means a set of standardized paradigms established by regulatory authorities in accordance with laws, regulations and policy objectives, covering regulatory organizational structure, rule system, operational mechanisms, tools, and division of powers and responsibilities. The regulatory model for MASS addresses core questions including who conducts regulation, what to regulate, how to conduct regulation, and under what logic regulation is implemented. Specifically, it consists of mechanisms, systems, rules, procedures, methods and tools applicable to the whole-process regulation of MASS throughout design, construction, survey, trials, operation and maintenance.

4.7.6

Regulatory structure means the top-level institutional foundation for developing specific regulatory models for MASS. It mainly defines regulatory objectives, regulatory powers and responsibilities, regulatory boundaries and binding conditions to be observed by all types of entities, including laws, regulations, international conventions, technical standards, survey rules, regulatory systems, implementation mechanisms and tools applicable to MASS.

4.7.7

Safety management system(SMS) means a structured and documented system enabling personnel of the company and the ROC of a MASS to implement effectively the company safety and environmental protection policy.

4.7.8

Stress testing means a method of verifying the performance, stability, reliability, fault tolerance and recovery capability of the systems, equipment or functions of a MASS by subjecting it to load, communication, environmental or other operating conditions that exceed normal operating conditions or approach design limits.

4.7.9

Submitter is an entity seeking approval of a MASS from the Administration, and responsible for communicating with the Administration for the submission and follow up of the approval process.

4.7.10

Stakeholder means any organization, institution or individual that participates in the full-life-cycle activities of MASS, including design, construction, survey, certification,

operation, maintenance and regulatory, or whose rights and interests, safety, duties or business are affected by MASS and its operation.

4.7.11

Validation means the testing and evaluation to prove that a MASS and its systems, including hardware and software components, are effective, dependable and safe during real world operations and satisfy all the technical requirements representative of normal, abnormal and adverse operating conditions.

Acknowledgements

The drafting of this document is organized and implemented by the China Institute of Navigation.

Member institutes of IAIN, relevant industrial institutions and experts have provided all-round support for the formulation of this document.

Existing relevant codes, standards and guidance documents served as important references during the development of this document.

Grateful acknowledgements are hereby extended to all parties.

Annex—Index chart of terms

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4.1. Generic	Autonomous	Autonomous navigation	Autonomous navigation system	Autonomous tug	Degree of autonomy	Failure	Hazards	Human-centred design	Intelligent navigation	Intolerable risk	Maritime autonomous surface ship	MASS function
	Maintenance	Mitigation	Monitoring	System	Task	Task station	Third parties	Unsafe state				
4.2. Sensing and Perception	Cognition	Data fusion	Data processing	Data synchronization	Distributed perception	Environmental perception	Information fusion	Sensor	Situational awareness	Vessel positioning accuracy	Timestamp	
4.3. Decision-making	Autonomous collision avoidance	Autonomous navigation decision	Collision alert	Course control	Course deviation alert	Grounding alert	Route planning	Speed control	Track control	Track deviation alert	Weather routing	
4.4 Execution	Agent	Control	Control action	Control station	Intelligent navigational assistance	Manual intervention	Manual takeover	Onboard crew	Override	Propulsion system	Redundant control	Remote operation
	Remote operator	Remote Operations Centre										
4.5 Connectivity	Communication link	Communication redundancy	Connectivity	Cybersecurity	Quality of service	Ship hybrid network	Ship network	Ship network isolation				
4.6 Operation	Automatic berthing and unberthing	Autonomous berthing and unberthing	Concept of operations	Degraded state	Fallback response	Fallback state	Fault	Fault diagnosis	Fault tolerant	Health assessment	Human-machine interface	Modes of operation
	Monitoring	Navigation data logging	Normal operation	Operational design domain	Operational envelope	Remote crew	Remote master	Systematic failure	Systemic failure	Ship shore collaboration	System restart	Voice prompt
	Voyage phase											
4.7 Regulatory Matters	Coastal state	Flag state	Port state control	Recognized organization	Regulatory model	Regulatory structure	Safety management system	Stress testing	Submitter	Stakeholder	Validation	Verification

Note: Terms highlighted in green are derived from the MASS Code; all other terms are proposed and defined by this document.