UK Initiatives for the Practical Implementation of MASS

– Training of Remote Operators –

1. Introduction

On 1 July 2026, the non-mandatory Maritime Autonomous Surface Ships Code (MASS Code) of the International Maritime Organization (IMO) entered into force. [1]

The MASS Code was adopted as Resolution MSC.595(111) at the 111th session of the Maritime Safety Committee (MSC 111) in May 2026. It applies to cargo ships subject to the SOLAS Convention and establishes a common international safety framework covering design, construction, operation, remote operation, communications, cyber security, safety management and the human element. [2] Rather than prescribing specific technical solutions, the Code is goal-based: it sets out the goals to be achieved and the corresponding functional requirements, while leaving States and operators to determine how those requirements are met. [1]

The Code is currently non-mandatory. States, ship operators and technology developers are expected to use it to build practical experience through trials and operations, with the lessons learned informing the development of a future mandatory Code, which is targeted to enter into force on 1 January 2032. [3]

Alongside these international developments, the United Kingdom has contributed to the drafting of the MASS Code while advancing domestic trials, regulatory

arrangements and the training of Remote Operators. [4]

Against this background, the London Representative Office visited SeaBot Maritime and BMT on 23 July 2026 and exchanged views with their representatives. The issues surrounding the practical implementation of MASS are wide-ranging. This report therefore focuses on the training and competence assessment of personnel engaged in remote operation, drawing on information confirmed during the visit to provide an overview of the UK's approach.

2. Development of the UK's MASS Regulatory Framework

(1) Framework for Authorising MASS Operations

In the UK, the Maritime and Coastguard Agency (MCA) has led the development of domestic arrangements for MASS operations in parallel with the IMO's development of the MASS Code. [4] Traditionally, safe ship operation has been assured by verifying a range of elements, including compliance of the hull, machinery and equipment with applicable standards, together with seafarer qualifications and safety-management arrangements.

With MASS, however, some operational judgements and actions traditionally undertaken by seafarers on board are transferred to autonomous systems or shore-based personnel. This creates additional questions beyond the conventional safety framework: who should perform those judgements and actions, what competence they should possess, and how coordination among the parties involved should be assessed. Where remote control is used, shore-based personnel participate in operations from a Remote Operations Centre (ROC). This report focuses on the training and competence assessment of those personnel. [5]

The UK provides several routes through which MASS may be certified. Vessels incorporating innovative technology may undergo case-by-case assessment under the procedure set out in MGN 664. [6] Small Remotely Operated Unmanned Vessels (ROUVs) of less than 24 metres may, meanwhile, be surveyed and certificated under Workboat Code Edition 3. [4] A central feature of these routes is that the operator must demonstrate the safety of the proposed operation. Operators are required to describe their intended operating method, operational environment, and human and technical arrangements in a Concept of Operations (CONOPS), and to

demonstrate safety through risk assessment and related measures. For ROUVs in particular, safe operation depends not only on the safety of the vessel itself but also on the Remote Operator possessing the necessary knowledge, skills and experience. This raises a central question: what competence should Remote Operators possess, and how should it be developed and assessed?

(2) Initiatives on Remote Operator Competence

The non-mandatory MASS Code includes provisions on manning, training and watchkeeping. However, specific qualification requirements and training standards for Remote Operators remain to be considered as part of the development of the future mandatory MASS Code, and no mandatory international standards for Remote Operators have yet been established. [2]

At national level, the UK has issued MGN 703, which provides guidance on the knowledge, skills and experience expected of Remote Operators, together with a voluntary MCA recognition scheme for training aligned with that guidance. The framework is intended for ROUVs and similar vessels within the scope of Workboat Code Edition 3; it does not apply generally to large merchant ships. [5]

The scheme does not create a new stand-alone qualification for Remote Operators. The MCA assumes that a Remote Operator already holds the underlying qualifications and competence that would be required to operate the vessel if it were crewed, such as a certificate of competency under the STCW Convention, a small-craft qualification issued by the Royal Yachting Association, or an equivalent recognised qualification. Remote Operator training should therefore be understood not as a replacement for existing qualifications, but as additional training that builds on an established maritime qualification and develops the competence required for remote operation.

In parallel, the Maritime Autonomous Systems Regulatory Working Group (MASRWG) has been developing an industry code of practice covering the design and operation of autonomous systems and associated skills and competence. Although the code has no legal status, it is updated continuously with participation from industry and relevant authorities, including the MCA. At a time when the regulatory framework remains under development, it helps establish a shared

practical understanding across the sector. [7]

A common feature of these initiatives is that, even before detailed international standards have been finalised, competence requirements are not being defined by the authorities alone. Instead, voluntary recognition of private-sector training and industry-developed codes of practice are being used to translate lessons from real-world operations and training into progressively more concrete competence requirements.

In Japan, institutional arrangements covering areas such as safety standards and seafarer education and training are also under consideration, including within the Study Group on Autonomous Ships established by the Maritime Bureau of the Ministry of Land, Infrastructure, Transport and Tourism. On the basis of publicly available information, however, no stand-alone framework equivalent to MGN 703 and the UK's voluntary recognition scheme, one that specifically defines the competence required of Remote Operators and recognises corresponding training, has been identified at present. [8]

3. Visit to SeaBot Maritime and BMT

(1) Overview of the Visit

On 23 July 2026, to gain a better understanding of how MASS and remote operation are being implemented in the UK, the author visited BMT's simulation centre. Representatives of SeaBot Maritime and BMT provided briefings and exchanged views on remote operation using an ROC, training for Remote Operators and ROC Supervisors, simulation-based competence assessment, and approaches to demonstrating safety. Participants included Mr Gordon Meadow (Founder & CEO) and Mr Henry Duffy (AI and Cyber Security) of SeaBot Maritime, and Mr Jesse Loynes (Autonomous Systems Consultant) of BMT Limited.

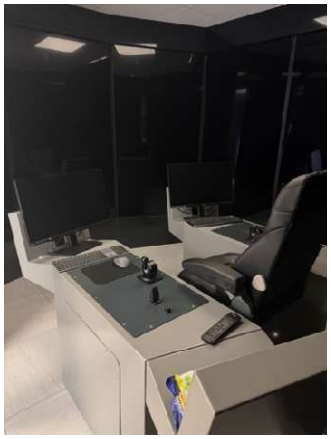
SeaBot Maritime's principal activities include personnel development for remote and autonomous operations. It defines the knowledge, skills, behaviours and decision-making capabilities required of Remote Operators and ROC Supervisors and trains and assesses personnel against those requirements. During the visit, SeaBot Maritime explained how it uses BMT's ROC simulation environment to train and assess Remote Operators and ROC teams.

The visit began with a tour of the simulation facilities, including the ROC simulation environment, where vessels can be operated remotely by integrating data on position, course and speed with video feeds and information from multiple sensors.

This was followed by a demonstration of ROC Supervisor training. Scenarios cover normal operations as well as communications failures, sensor malfunctions and collision risks. Through a live demonstration, SeaBot Maritime showed how Remote Operators and ROC teams are trained and assessed on their ability to maintain situational awareness, exercise judgement and take appropriate action.

Subsequent discussions addressed the relationship between Remote Operator competence and traditional seafarer competence, workload when supervising multiple vessels, collaboration with AI, responses to loss of communications, and cyber security.

(2) Training and Development of ROC Personnel



Before delivering training, SeaBot Maritime identifies the knowledge, skills, behaviours and decision-making capabilities required of Remote Operators and ROC Supervisors and organises them into a structured competence framework. It then assesses the gap between those requirements and the competence already held by trainees, and designs training accordingly.

SeaBot Maritime's MASS Remote Operator training was developed with reference to the UK regulatory framework and is delivered with voluntary recognition from the MCA. The original recognition pre-dated the publication of MGN 703; the training has since been reassessed against that guidance. [9]

The training framework is designed to build competence progressively, beginning with the core knowledge and skills common to remote operation, moving through

the operation of individual systems and performance of specific tasks, and extending to supervisory duties within the ROC and management of the overall operation.

The syllabus covers remote operation, communications, sensors, navigation, regulations, safety management, human factors, AI and cyber security. Training also addresses abnormal situations, including loss of communications, sensor malfunctions and collision risks.

During the discussions, SeaBot Maritime explained that, particularly for the remote operation of large merchant ships, the navigational and ship-handling knowledge and skills of traditional masters and deck officers will remain important. At the same time, work in an ROC requires capabilities that differ from those used on board, including building situational awareness from multiple displays and sensors, responding to loss of communications, working effectively with AI, managing cyber security risks, and controlling workload when supervising multiple vessels.

SeaBot Maritime therefore builds on the existing competence of traditional seafarers and adds capabilities specific to remote operation. It also provides reskilling and cross-training for operators of unmanned vessels, enabling seafarers and marine engineers to transition into ROC roles.

BMT explained that MASS safety should be assessed not only in terms of technical elements such as the vessel and communications equipment, but as an integrated system encompassing the Remote Operator, the ROC Supervisor, operating procedures and the operating organisation. Simulation is used to examine interactions between technology, people and operations and to support safety verification.

SeaBot Maritime also indicated its willingness to cooperate in future on MASS personnel development and Remote Operator competence in Japan.

(3) Personnel Development in Anticipation of the IMO MASS Code

According to SeaBot Maritime, its training and competence-assessment framework has been designed not only to meet current UK regulatory requirements but also to accommodate the future development of the IMO MASS Code. As international standards are further elaborated, the company intends to update its Remote Operator competence requirements and training content in line with both the

practical experience being gained in the UK and future IMO deliberations.

One particularly important issue is how the role of the Remote Operator changes as levels of autonomy increase. Remote Operators must be able not only to control a vessel remotely, but also to understand the capabilities and limitations of autonomous systems, monitor their performance and intervene appropriately when necessary.

Accordingly, future MASS personnel development will need to address not only the knowledge and skills of Remote Operators, but also the division of roles between humans and autonomous systems: when human judgement or intervention is required, how far decision-making may be delegated to autonomous systems, and how responsibility and authority should be allocated.

MGN 703 is interim guidance intended primarily for the small ROUVs covered by Workboat Code Edition 3. During the discussions, SeaBot Maritime stated that the MCA is considering a future framework for the qualifications and competence of Remote Operators that could extend to larger autonomous vessels.

The importance of these issues will vary according to the operational configuration of the MASS concerned. Where some or all operational decision-making rests with a shore-based Remote Operator, the allocation of roles between humans and autonomous systems, and the authority to intervene, become particularly important. Where seafarers on board retain ultimate decision-making authority, the competence required and the allocation of responsibility will necessarily be framed differently.

4. Regulation and Implementation in the United Kingdom

As illustrated by the voluntary recognition of training under MGN 703 and the development of the MASRWG industry code of practice, regulatory development and practical implementation in the UK are progressing in close interaction.

Public authorities such as the MCA establish safety standards and the regulatory framework, while also providing pathways, including case-by-case assessment under MGN 664 and voluntary recognition of Remote Operator training, through which operators can demonstrate new technologies and progress towards operational deployment while confirming regulatory compliance.

Private-sector organisations such as SeaBot Maritime and BMT translate regulatory requirements into practical technological, personnel and operational capability through ROCs, simulation, Remote Operator training and competence assessment, and safety verification.

SeaBot Maritime delivers training with voluntary recognition from the MCA and participates in the MASRWG, where its CEO, Mr Gordon Meadow, chairs the People, Skills and Ethics Committee. [10] Its role therefore extends beyond delivering training in response to established regulations. The company also translates emerging operational concepts and regulatory requirements into specific competence requirements, training programmes and assessment methods, and feeds the resulting industry experience back into future discussions on skills and competence standards.

Taken together, these arrangements illustrate how the UK is advancing the practical implementation of MASS through a combination of government-led regulatory frameworks, industry-led development of technology, personnel and operational capability, and continuing dialogue between the two.

5. Conclusion

The MASS Code establishes a common international framework for the safety of autonomous ships. Because the Code is not legally binding, however, its principles and requirements will be translated into practice through the regulatory arrangements and operational experience of individual States.

The UK's approach provides one example of how such a framework can be implemented. While no international qualification standards have yet been established, interim guidance defines the competencies expected of Remote Operators, private-sector training aligned with that guidance may receive voluntary recognition, and industry-developed codes of practice complement the regulatory framework. In Japan, consideration is proceeding within the existing framework of the Seafarers Act and maritime certificates of competency, including in relation to manning arrangements and education and training. The most appropriate institutional design may differ according to each country's maritime-industry structure, the vessels concerned and the operational configuration.

The future mandatory MASS Code is to be developed in the light of operational experience accumulated under the non-mandatory Code. Experience gained through national regulatory practice and trials will therefore provide important input into future international standards. The UK's current experience relates mainly to unmanned workboats and differs in scope from the SOLAS ships primarily envisaged by the MASS Code. Nevertheless, the institutional challenge of defining Remote Operator competence and linking it to training, assessment and recognition may also arise for larger vessels.

As work on the mandatory MASS Code progresses, key issues are likely to include the extent to which competence requirements for Remote Operators and related personnel should be harmonised internationally, and how those requirements should relate to existing certificates of competency under the STCW Convention and to national seafarer regimes. The UK initiatives examined in this report provide an early practical example of how competence requirements, training and recognition can be developed through operational experience ahead of future international standards.

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View of the River Thames from the rooftop of St Paul's Cathedral

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