Maritime & Coastguard Agency

MARINE GUIDANCE NOTE 703

MGN 703

Information concerning the training and competence of Remote Operators working with Remotely Operated Unmanned Vessels (ROUVs), certified under the Workboat Code Edition 3

Notice to all designers, builders, owners, operators, employers, certifying authorities Masters and Remote Operators, working with ROUVs.

This information is provided for use by persons operating ROUVs, certified under The Workboat Code Edition 3.

This notice should be read in conjunction with The Workboat Code Edition 3.

Summary

This MGN sets out information concerning the training and competence of personnel operating a ROUV.

This MGN details interim information for an owner/operator of a ROUV, until a formal pathway for Remote Operator training and certification is established.

This document has been produced in conjunction with the Workboat Code Edition 3.

Stakeholders are encouraged to provide continuous feedback on this document to the Maritime and Coastguard Agency (MCA) via UK Seafarers Technical Delivery Team Branch (exams@mcga.gov.uk).

1. Background

1.1 This MGN provides information concerning the training and competence of personnel operating a ROUV certified under the Workboat Code Edition 3.

1.2 The information detailed in this MGN should be used by the owner/operator when determining the training and competence of Remote Operators engaged in the operation of a ROUV.

1.3 The MCA is currently working with UK stakeholders to establish national standards for the certification, training and competency requirements for Remote Operators.

1.4 This MGN only provides guidance for ROUVs, to which The Workboat Code Edition 3 applies.

2. Definitions

2.1 The Workboat Code Edition 3 outlines the following definitions:

i. A “control position” means a conning position which is manned whilst the vessel is underway.

ii. A “ROUV” means a vessel with no persons on board, that is operated from a location remote to the vessel.

iii. A “Remote Operation Centre (ROC)” means either a shore-based location which is permanent or mobile or a manned vessel from which a ROUV is operated.

iv. A “Remote Operator” means any person, including the Master, with recognised or certifiable experience who is engaged in the remote operation of a ROUV.

v. The “owner/operator” means the vessel owner, managing agent or person who operates the vessel.

2.2 As per the Merchant Shipping Act 1995, a “Master” includes every person (except a pilot) having command or charge of a ship and, in relation to a fishing vessel, means the skipper.

3. The Responsibility of Owners/Operators

3.1 It is the responsibility of the owner/operator of the ROUV to:

i. Ensure that Remote Operators undertaking watchkeeping duties are qualified as required by The Workboat Code Edition 3 and in accordance with the information set out in this MGN.

ii. Coordinate with the maritime Administration of the relevant coastal state with regards to the local qualification and competence requirements for ROUVs, if they are operating outside of UK waters.

iii. Ensure that an adequate number of competent and experienced personnel are provided to perform the duties that are identified as necessary to safely operate the ROUV and respond to emergencies.

iv. Allocate a sufficient number of Remote Operators to the ROUV to perform watchkeeping duties for the duration of the voyage, as required by the Workboat Code Edition 3.

3.2 When determining the minimum level of safe manning of a ROUV, the owner/operator should:

3.2.1 Identify and assess the function and tasks expected of personnel throughout the scope of operations as is necessary for:

i. The safe operation of the ROUV.

ii. The protection of the marine environment.

iii. The safety of life at sea.

iv. The safety and security of the ROC and ROUV.

v. Responding to emergency situations.

vi. Monitoring connectivity between the ROC and the ROUV.

3.2.2 Consider the following when structuring work shifts and watches:

i. The roles, responsibilities and duties that are to be undertaken by Remote Operators.

ii. The Remote Operator's qualifications and experience in vessel operations, including remote operations.

iii. The Remote Operator's ROC and vessel-specific training and familiarisation.

iv. The type of operations and the function of the Remote Operator in relation to those operations.

v. The minimum number of Remote Operators required to perform identified duties in all operating conditions, including emergencies.

vi. The common working language in and between ROCs.

vii. The use of English, including Standard Marine Communication Phrases.

viii. The area category of operation.

ix. The anticipated lighting conditions at the vessel's location and at the control position.

x. The scheduling of working shifts so that the Remote Operator is not impaired by fatigue and is able to remain focussed on their duties.

xi. The provision of sufficient periods of rest to avoid fatigue, including screen fatigue. These should ensure that precautionary measures, such as rest breaks that include periods of fresh air and natural light, are factored in throughout a watch.

xii. The scheduling of rest breaks and handovers, to not negatively impact the safe navigation or operation of the ROUV.

xiii. The provision of overlapping watches to ensure that a comprehensive handover between the outgoing and relieving Remote Operators is completed.

xiv. The allocation of tasks to prevent excessive workloads.

xv. The provision of a regular assessment of a Remote Operator's performance, to ensure that they are fit for duty and well rested.

xvi. The Master's responsibility to ensure that all Remote Operators are sufficiently rested and fit for duty, prior to undertaking watchkeeping duties.

xvii. A Remote Operator's personal responsibility to ensure that they are sufficiently rested and fit for duty, prior to undertaking watchkeeping duties.

xviii. The provision of work schedules to the Remote Operator that include shift patterns and hours of work and hours of rest.

3.2.3 Consider the following when structuring work shifts and watches:

i. MGN 505 (M) Amendment 1, which contains guidance on fatigue and fitness for duty.

ii. The Health and Safety at Work etc. Act 1974.

iii. The Working Time Regulations 1998, as amended.

iv. The Management of Health and Safety at Work Regulations 1999.

v. The Health and Safety (Display Screen Equipment) Regulations 1992.

vi. MGN 315 (M), as applicable, which sets out guidance on keeping a safe navigational watch.

vii. MSN 1868 (M) Amendment 1, as applicable, which sets out guidance on safe manning and watchkeeping.

viii. Guidance provided by the Health and Safety Executive on managing fatigue ashore (https://www.hse.gov.uk/humanfactors/topics/fatigue.htm).

3.3 The owner/operator must implement contingencies as set out in 4.14.

4. ROUV certification and manning

4.1 The minimum levels of safe manning and certification set out in The Workboat Code Edition 3 must be adhered to for the duration of the voyage.

4.2 The Workboat Edition 3, Annex 2, 7.2.4 sets out that the training and certification requirements for manned vessels are applicable to operators of Remotely Operated Unmanned Vessels.

4.3 Remote Operators must hold the certification as set out in The Workboat Code Edition 3, Appendix 5, as applicable to their role and function.

4.4 Remote Operators expected to operate GMDSS radiocommunication equipment must hold a GMDSS certificate, appropriate to the GMDSS Sea Area(s) that the vessel is expected to operate in.

4.5 At any given time, only one individual shall be designated as the Master in command of a ROUV.

4.6 The Master of the ROUV has the overriding authority and the responsibility to make decisions with respect to safety and pollution prevention and to request the Company's assistance as may be necessary.

4.7 The owner, operator, charterer, or any other person shall not prevent or restrict the Master of the ROUV from taking or executing any decision which, in the Master’s professional judgement, is necessary for safety of life at sea and protection of the marine environment.

4.8 Nothing contained within this document relieves the Master of the ROUV of their responsibility to take or execute any decision, which in their professional judgement, is necessary for the safety of life at sea and protection of the marine environment.

4.9 The Master shall assume responsibility for the ROUV for the duration of their duty, work shift or watch and must formally handover command to the relieving Master at the end of their duty, work shift or watch.

4.10 A Remote Operator responsible for undertaking watchkeeping duties must formally handover to a relieving Remote Operator at the end of their duty, work shift or watch.

4.11 The Master that holds the authority and responsibility for the ROUV must be physically present at a ROC and be readily available to take control of the vessel at a control position.

4.12 In the case that the Master is undertaking watchkeeping duties as a Remote Operator, the owner/operator should ensure that a sufficient number of qualified personnel are available to support the Master under all operating conditions, including assisting in navigational, administrative and engineering tasks.

4.13 In the case that the Remote Operator undertaking navigational watchkeeping duties in a ROC is not designated as the Master of the vessel, the Master should be readily available to assist the watchkeeper and take control of the ROUV as required.

4.14 In exceptional circumstances when the established minimum level of safe manning of a ROUV cannot be met, there should be procedures and contingencies in place to ensure that the vessel enters into a safe state until the minimum level of safe manning can be re-established.

4.15 The Master should continually assess the minimum levels of safe manning and take action as is required, so that manning levels are increased to ensure the safe operation of the vessel; protection of the marine environment; preservation of life at sea; and the ability to respond to emergency situations.

5. Remote Operator Training and Competence

5.1 The owner/operator must ensure that Remote Operators engaged in the remote control of a ROUV are trained and competent, prior to undertaking duties in a ROC.

5.2 Prior to undertaking watchkeeping duties in a ROC, Remote Operators must complete:

i. Training in remote operations.

ii. GMDSS training, appropriate to the GMDSS Sea Area(s).

iii. Maritime cyber security training.

iv. Company specific training, including SMS familiarisation, risk assessing and hazard management.

v. ROC and vessel-specific familiarisation and training.

vi. Training as required by the Management of Health and Safety at Work Regulations 1999.

vii. Training as required by the Health and Safety (Display Screen Equipment) Regulations 1992.

viii. Training as required by the Workboat Code Edition 3.

5.3 Annex A sets out generic items to be considered for the delivery of training in remote operations. This information should be considered, subject to its applicability to the vessel's operation.

5.4 The information provided in Annex A is to be considered supplementary training for individuals that hold maritime Certificates of Competency (CoC) set out in The Workboat Code Edition 3.

5.5 Taking into account Annex A and 5.2, the owner/operator should identify and address any shortfalls in underpinning knowledge, skills and experience, prior to a Remote Operator undertaking watchkeeping duties in a ROC.

5.6 It is recommended that training in remote operations is refreshed as required for the Remote Operator to maintain a level of competence, that is applicable and current to the ROUV's operation.

5.7 The Cyber Security Awareness Course for Seafarers syllabus provides guidance for maritime cyber security training. This may be completed in-house or by a Training Provider. This syllabus may also be used to guide Training Providers for the purpose of undertaking an MCA Short Course Approval process.

6. Record keeping

6.1 MCA will currently consider the role of the Remote Operator undertaking watchkeeping duties for the purpose of CoC revalidation. This can be undertaken in alignment with the process established in MSN 1861 (M) - Amendment 1.

6.2 To assist in this process, the owner/operator should maintain a record of:

i. Remote Operator training, familiarisation and drills.

ii. Company-specific and SMS training and familiarisation.

iii. Remote Operator certification and qualifications.

iv. Company letters issued to Remote Operators, as set out in MSN 1861 (M) Amendment 1.

v. Testimonials detailing the Remote Operator's record of service, for the purpose of CoC revalidation, including:

a. Personal details (Name, DOB, Nationality).

b. ROUV particulars and details.

c. Certificate of Competency details.

d. Seaman's Discharge Book details, as appropriate.

e. Details of service, including category area of operation and hours engaged in remote operations.

f. Details of watchkeeping duties.

g. The Remote Operator’s role and responsibilities during employment.

h. Master and company testimonial regarding the Remote Operator’s performance and conduct.

Annex A – Training in remote operations

1.0 The owner/operator should consider the items detailed in Table A in the delivery of training in remote operations.

2.0 The MCA undertake course approvals for Training Providers seeking to deliver recognised or approved maritime training and education. The MCA Short Course Approval process is set out in MIN 643 (M) and MSN 1865 (M) Amendment 1.

3.0 Table A may be used by prospective Training Providers seeking to undertake the MCA Short Course Approval process.

Table A	
ID	**Description**
1.00	**Introduction to Remote Operations**
1.01	Explain and use definitions and terminology pertinent to ROUVs
1.02	Identify and describe the different types of ROUVs currently in use
1.03	Identify and explain the roles and responsibilities of personnel and external stakeholders involved in the operation of a ROUV
1.04	Explain the function of the ROC in controlling the unmanned vessel
1.05	Identify the equipment, systems and infrastructure in use that enables the remote control of a ROUV
1.06	Identify and explain the application of international, national and local legislation, regulations and guidance pertinent to ROUVs
1.07	Implement compliance with international, national and local legislation, regulations and guidance pertinent to ROUVs
1.08	Monitor compliance with international, national and local legislation, regulations and guidance pertinent to ROUVs
1.09	Explain the legislative frameworks governing data communication systems
1.10	Identify documentation and certification requirements for ROUVs, including how they may be obtained and their periods of validity
1.11	Identify technical standards and industry guidance in use, pertinent to ROUVs
1.12	Explain the function and implementation of the Company's Safety Management System (SMS) to remote operations
1.13	Explain the liability and responsibility of a Master of a ROUV
1.14	Explain the liability and responsibility of the owner or operator of a ROUV
2.00	**Connectivity between a ROC and ROUV**
2.01	Identify the different types of data communication systems that enable connectivity between a ROC and vessel
2.02	Explain the operating principles, capabilities and limitations of the different types of data communication systems
2.03	Explain the effects that environmental and meteorological conditions may have on data communication systems and connectivity

2.04	Perform risk assessments on the availability, reliability and security of data communication systems and connectivity, including how it may impact vessel navigation and operations
2.05	Explain the principles of a robust data communications system
2.06	Explain the impact that bandwidth, latency and coverage may have on connectivity and the Remote Operator's ability to monitor and control vessel functions
2.07	Explain the licencing and permit framework of data communication systems, including how this may impact remote operations
2.08	Follow troubleshooting procedures for faults and failures of data communication systems
2.09	Explain the contingencies in place to mitigate the loss or degradation of connectivity between a ROC and vessel
2.10	Explain how forecasts and assessments may be incorporated into the risk assessing of data communication system use, including: i) Meteorological forecasts ii) Environmental forecasts iii) Security assessments iv) Assessments of coverage v) Assessments of geopolitical and commercial developments
2.11	Identify the most appropriate form of data communications system to be used in the prevailing circumstances and conditions
2.12	Establish connectivity between a ROC and vessel and verify remote control and monitoring functions
2.13	Coordinate a changeover between different data communication systems
2.14	Coordinate a changeover between data communication channels
2.15	Monitor connectivity between ROC and vessel
2.16	Explain the principle of data prioritisation
2.17	Explain how data prioritisation may impact vessel functions
2.18	Monitor connectivity for status and degradation
2.19	Monitor the impact of bandwidth and latency on remote control and monitoring functions
2.20	Prioritise vessel functions during conditions of degraded connectivity
2.21	Explain the contingencies in place to recover the vessel, following a sustained loss of connectivity between the ROC and vessel
3.00	**Sensory systems and equipment**
3.01	Explain how situational awareness is built and maintained in a ROC
3.02	Identify the different types of sensors and associated systems used to build and maintain situational awareness
3.03	Explain potential limitations to building and maintaining situational awareness in a ROC
3.04	Identify the different types of camera systems in use
3.05	Explain the capabilities and limitations of different types of camera systems

3.06	Explain how maintaining a lookout by the use of cameras and screens in a ROC may impact a Remote Operator's depth perception and ability to accurately judge distances
3.07	Set up and adjust different types of cameras, appropriate to prevailing circumstances and conditions
3.08	Operate camera systems and equipment: i) To maintain a lookout as required by the COLREGS ii) In conjunction with search lights to detect vessels, navigational hazards and objects at night iii) To monitor vessel spaces iv) To contribute to the maintenance of the vessel's security
3.09	Explain the capabilities and limitations of sound reception systems
3.10	Operate, monitor and adjust sound reception systems, appropriate to the prevailing circumstances and conditions
3.11	Assess and apply information obtained from surface and sub surface detection and ranging equipment
3.12	Explain the function of different types of inertial sensors and associated systems
3.13	Apply information obtained from inertial sensors to maintain a safe navigational watch
3.14	Operate and monitor meteorological and environmental sensors and associated systems
3.15	Apply information obtained from meteorological and environmental sensors in maintaining a safe navigational watch
3.16	Monitor digital interfaces displaying information obtained from vessel sensors
3.17	Monitor the integrity and degradation of sensors and associated systems
3.18	Explain the potential impacts that latency and bandwidth may have on the Remote Operator's ability to operate and monitor sensory systems
3.19	Prioritise sensory systems under varying conditions of bandwidth and latency
3.20	Explain how information obtained from sensors may impact human perception, attention, awareness and decision making
4.00	**Navigation**
4.01	Coordinate and verify voyage plans across departments
4.02	Explain additional considerations to be incorporated into the voyage planning process
4.03	Develop contingencies and abort points into the voyage plan
4.04	Implement contingencies and abort points during a voyage
4.05	Incorporate forecasts and assessments of data communication systems and connectivity into the voyage plan
4.06	Determine position by use of primary and secondary means of position fixing

4.07	Determine and allow for compass errors
4.08	Monitor compliance with the data communication system permit and licensing framework(s) throughout the voyage
4.09	Incorporate navigational information into the command decision making process, collision avoidance and managing the safe navigation of the vessel
4.10	Assess the reliability and accuracy of sensory and navigational information received in the ROC when building real-time situational awareness and maintaining a safe navigational watch
4.11	Take into account the effects of latency and bandwidth in watchkeeping, collision avoidance and navigation
4.12	Account for periods of varying latency, bandwidth and delays when plotting the vessel's position in real time.
4.13	Maintain a lookout as required by the COLREGS
4.14	Take appropriate action upon encountering restricted visibility
4.15	Operate and monitor sensors, including associated systems and equipment to detect draft and UKC
4.16	Monitor the accuracy and reliability of electronic navigational systems throughout the duration of the voyage
4.17	Operate and monitor vessel sensors, including associated systems and equipment to record local meteorological and environmental conditions
4.18	Assess the impact of environmental and meteorological conditions on the safe navigation of the vessel
4.19	Explain how meteorological and environmental factors may affect sensors including the impact that this may have on the Remote Operator's ability to maintain a safe navigational watch
4.20	Take appropriate action upon encountering adverse meteorological or environmental conditions
4.21	Identify and verify traffic and navigational hazards by use of electronic navigational aids and sensory systems
4.22	Explain the capabilities and limitations of electronic navigational aids, including performance standards, technical specifications and errors
4.23	Identify the elements of a control system that enable the remote navigation of the vessel
4.24	Explain the capabilities and limitations of teleoperation systems controlling the vessel's navigation
4.25	Set up, monitor and adjust systems controlling the vessel's navigation
4.26	Explain the capabilities and limitations of automated systems controlling the vessel's navigation
4.27	Explain the responsibility of the Remote Operator, with respect to intervening in automated systems controlling the vessel's navigation
4.28	Demonstrate the handover of the navigational watch between Remote Operators
4.29	Demonstrate the transfer of control of the vessel between control positions
4.30	Demonstrate the transfer of control of the vessel between ROCs
4.31	Demonstrate the transfer of control of the vessel to a back-up ROC.
4.32	Coordinate and conduct ROC and vessel pre-departure and pre-arrival checks

4.33	Verify the status of the vessel's navigational lights and shapes
4.44	Monitor the vessel's position and proximity to traffic and navigational hazards upon entering into a safe state
5.00	**Manoeuvring and operation of propulsion systems**
5.01	Explain how interfaces and display units in a ROC may affect the Remote Operator's ability to judge the vessel's motion during manoeuvres
5.02	Incorporate local meteorological and environmental conditions into the adjustment of optimal remote-control steering and propulsions settings and modes
5.03	Explain how different modes of remote-control steering and propulsion may impact the vessel's manoeuvring characteristics
5.04	Demonstrate a changeover between steering modes.
5.05	Explain the impact that latency and bandwidth may have on steering and propulsion systems
5.06	Assess the impact of varying latency and bandwidth, prior to and during vessel manoeuvres
5.07	Verify steering and propulsion systems are responding appropriately to remote control systems
5.08	Operate and monitor sensors and associated systems to determine the vessel's motion during manoeuvres
5.09	Explain the conditions under which a vessel is operating within visual line of sight
5.10	Explain precautions to be taken when manoeuvring the vessel within close proximity to other vessels, navigational hazards, offshore structures and in port
5.11	Operate remote control steering and propulsion systems in accordance with technical specifications and safe operating limits
5.12	Manoeuvre the vessel and maintain heading control at slow speed
5.13	Maintain heading control by use of relative bearings and terrestrial reference points
5.14	Manoeuvre the vessel within visual line of sight for the purpose of collision avoidance and maintaining a safe navigational watch
5.15	Manoeuvre the vessel beyond visual line of sight for the purpose of collision avoidance and maintaining a safe navigational watch
5.16	Manoeuvre the vessel in response to detecting persons in the water
5.17	Manoeuvre the vessel for the purpose of search and rescue operations
5.18	Manoeuvre the vessel alongside in port
5.19	Manoeuvre the vessel in preparation to be towed
5.20	Manoeuvre the vessel during anchoring operations
5.21	Manoeuvre the vessel for the purpose of an emergency stop manoeuvre
5.22	Demonstrate back-up steering and propulsion procedures
5.23	Manoeuvre the vessel by means of back-up steering and propulsion systems
5.24	Maintain communications with departments during manoeuvres
5.25	Follow power plant system startup and shut down procedures
5.26	Follow auxiliary power plant system procedures
5.27	Operate power plant and auxiliary systems in accordance with technical specifications and operating limitations

5.28	Follow emergency stop procedures for steering, propulsion and power plant systems
5.29	Coordinate pilotage in port approaches, restricted waterways, and narrow channels
6.00	**Vessel operations**
6.01	Monitor compliance with the Company SMS throughout vessel operations
6.02	Coordinate and conduct risk assessments and permits to work across teams
6.03	Conduct toolbox talks across teams
6.04	Conduct pre-operation checks on ROC and vessel systems and equipment
6.05	Verify the accuracy and reliability of draft, stability and trim information throughout the voyage, including prior to departure and arrival
6.06	Monitor the vessel's condition of stability, to ensure that the vessel proceeds to sea within safe and acceptable limits and that hull stresses and bending moments are kept to a minimum
6.07	Operate the vessel's stability and ballasting control system
6.08	Monitor any environmental or meteorological effects on the vessel's condition of stability and take action to maintain stability within safe and acceptable limits
6.09	Coordinate and monitor the safe planning, loading, stowage, securing, carriage and unloading of cargo
6.10	Explain the function of automated cargo handling, monitoring and emergency systems
6.11	Explain the precautions to be taken during survey operations
6.12	Explain precautions to be taken when working with winches and towed payload systems
6.13	Explain the impacts on manoeuvring during survey operations
6.14	Explain the relationship between the officer of the watch and payload operator
6.15	Coordinate mooring operations, in conjunction with local authorities, shoreside personnel, support vessels and VTS
6.16	Explain the considerations to be taken during mooring operations
6.17	Coordinate and monitor mooring operations
6.18	Take appropriate action upon detecting parted moorings
6.19	Explain considerations to be taken during anchoring operations
6.20	Coordinate and monitor anchoring operations
6.21	Take appropriate action upon detecting a dragging anchor
6.22	Coordinate and monitor safe access to and from the vessel as required
6.23	Monitor the location of, and maintain communications with, any persons physically on-board during periods of maintenance, inspections, pre-departure checks or in an emergency
6.24	Explain precautions to be taken during bunkering operations
6.25	Coordinate and monitor bunkering operations
6.23	Explain towing arrangements and operation
6.24	Maintain a watch in port, as required
6.25	Maintain communications across all relevant departments during vessel operations
6.26	Communicate information to the team located in the ROC and across departments, including consideration of the following:

	i) the reliability and accuracy of information to be communicated ii) the status of the ROC and vessel systems and equipment iii) the priority of information to be communicated iv) the limitations of verbal/non-verbal communications in remote operations
6.27	Explain the function(s) of automated radio communications equipment
6.28	Maintain a radio watch, as required
6.29	Send and receive signals, as required
6.30	Operate vessel speaker systems to communicate with persons on or in proximity to the vessel
6.31	Communicate with support vessels, VTS, other vessels, offshore installations and shore-side personnel, as applicable
7.00	**Information Technology (IT), Operational Technology (OT) and Cyber Security**
7.01	Explain terminology and definitions pertinent to the use of IT and OT systems in remote operations
7.02	Explain the difference between IT and OT systems
7.03	Explain the principle of computer networking
7.04	Identify and explain the elements of a ROC and vessel network
7.05	Explain the principle of cloud computing, including the applications to remote operations
7.06	Digitally lock and unlock workstations
7.07	Identify the systems in the ROC that control vessel functions
7.08	Ability to identify and map remote control, monitoring and sensory systems across ROC and vessel networks
7.09	Explain how network segmentation may impact the robustness of ROC and vessel systems and the remote operation
7.10	Ability to identify and map the segmentation of ROC and vessel computer networks
7.11	Identify and explain precautions to be taken during periods of IT/OT maintenance
7.12	Follow basic troubleshooting procedures
7.13	Coordinate the risk assessment, updating and maintenance of ROC and vessel software, firmware and hardware
7.14	Implement ROC and vessel software procedures
7.15	Implement software rollback procedures
7.16	Coordinate and monitor software configuration and version control
7.17	Test and verify ROC and vessel functions following a period of software maintenance
7.18	Explain relevant IT, OT and cyber security regulations and guidance
7.19	Explain ROC and vessel cyber security vulnerabilities and mitigating measures
7.20	Explain the management of physical access to IT and OT infrastructure, including the company’s access control policies

7.21	Explain how cyber security incidents may be detected in a ROC
7.22	Explain how cyber security incidents may impact vessel remote control functions
7.23	Explain basic principles and capabilities of a robust cyber security system, including its application in protecting the ROC and vessel
7.24	Explain procedures and contingencies in place in the case that a cyber incident is detected
7.25	Incorporate cyber security assessments into the remote operation risk assessing process
7.26	Coordinate the implementation, review and update of vessel cyber security policies and procedures
7.27	Communicate across departments and request assistance from engineers and technicians for IT, OT or cyber security support
8.00	**Maintenance and repair**
8.01	Explain the methods by which planned maintenance may be carried out on unmanned vessels
8.02	Explain ROC and vessel audits, surveys and schedules
8.03	Explain certification and documentation requirements, including how they may be obtained and their periods of validity
8.04	Coordinate and monitor the vessel's planned maintenance schedule with engineers and technicians
8.05	Coordinate, implement and monitor the isolation of ROC and vessel systems and equipment during periods of maintenance
8.06	Implement and monitor compliance with occupational health and safety legislation during periods of maintenance
9.00	**Failures of systems and equipment**
9.01	Identify equipment and technical systems, the failure of which may result in hazardous situations
9.02	Explain the use of Failure Mode Effect Analysis (FMEA)
9.03	Apply FMEA in response to failures of ROC and vessel systems and equipment
9.04	Correctly recognise and respond to navigational and engineering alarms and alerts
9.05	Inform engineers and technicians upon detecting failures in ROC or vessel systems or equipment
9.06	Coordinate, and monitor the isolation of vessel systems
9.07	Implement emergency stop procedures.
9.08	Take appropriate action upon detecting: i) A degradation or loss of connectivity between ROC and vessel ii) A degradation or loss of sensory systems or equipment iii) A failure of IT/OT systems iv) A failure of navigational equipment

	v) A failure of radio or GMDSS systems and equipment vi) A failure of steering or propulsion control systems vii) A failure of vessel power plant and auxiliary systems viii) A failure of stability or ballast control systems ix) A failure of power supply to the ROC
9.09	Coordinate an effective response across departments during failures of ROC or vessel systems and equipment
10.00	**Safety, security and environment**
10.01	Explain how emergency response, damage control and incident management are implemented on unmanned vessels
10.02	Implement SMS emergency procedures
10.03	Conduct dynamic risk assessments during emergencies
10.04	Maintain communications across departments during emergencies
10.05	Explain automated emergency response vessel functions
10.06	Explain the function of a safe state
10.07	Identify when the vessel has entered into a safe state
10.08	Enter the vessel into a safe state
10.09	Recover the vessel from a safe state
10.10	Transfer control to a back-up ROC during an emergency drill
10.11	Explain the function of a manned override
10.12	Monitor compliance with international, national and local marine pollution legislation and regulations
10.13	Explain counter-pollution policies, contingencies and procedures for unmanned vessels
10.14	Operate sensors, including associated systems and equipment to detect marine pollution
10.15	Operate and monitor sensory systems to detect and locate fires
10.16	Operate and monitor fire extinguishing systems
10.17	Detect the ingress of water into vessel spaces
10.18	Coordinate and monitor damage control responses
10.19	Explain the contingencies in place in the event of an emergency in the ROC and on the vessel
10.20	Take appropriate action in an emergency located at the ROC, including i) Loss of control ii) Fire iii) Medical emergency

	iv) Any other emergency that requires the evacuation from the workstation or ROC
10.21	Take appropriate action in an emergency located on the vessel, including: i) Loss of control ii) Fire iii) Detection of flooding or bilge alarm activation iv) Collision or allision v) Grounding vi) Detection of persons in the water/persons in distress vii) Pollution incident
10.22	Explain ROC and vessel security arrangements
10.23	Coordinate implement and monitor ROC and vessel security arrangements
10.24	Take appropriate action in the event of a security incident located at the ROC, including: i) physical attack on the ROC, ancillary equipment or associated facilities ii) cyber security incident iii) bomb threat iv) civil unrest v) trespass vi) any other security incident that requires evacuation from the workstation or ROC vii) any other incident that compromises the security of personnel
10.25	Take appropriate action in the event of a security incident located on board the vessel, including: i) piracy ii) cyber security incident iii) bomb threat iv) stow away

	v) spoofing or jamming of vessel systems and equipment
10.26	Explain the contingencies in place for the recovery of the vessel
10.27	Explain risk assessment, permit and toolbox talk procedures in place for vessel recovery operations
10.28	Coordinate and monitor the recovery or salvage of the vessel
10.29	Explain the reporting requirements of an ROUV
11.00	**Search and Rescue**
11.01	Explain how an unmanned vessel can render assistance to persons in distress at sea
11.02	Apply the International Aeronautical and Maritime Search and rescue (IAMSAR) manual
11.03	Coordinate and participate in Search and Rescue (SAR) operations, as required
11.04	Operate sensory systems and equipment during searches
11.05	Communicate with all relevant stakeholders during SAR operations
11.06	Take appropriate action upon receiving or detecting a distress signal
12.00	**ROC Management**
12.01	Monitor the safe working practices of personnel throughout the duration of operations
12.02	Explain the application of international, national and local legislation, regulations and guidance applicable to a ROC located on land
12.03	Monitor compliance with international, national and local legislation, regulations and guidance, applicable to an onshore ROC
12.04	Coordinate communication with internal and external parties
12.05	Contribute to the implementation, review and update of ROC risk assessments, policies and procedures as required
12.06	Implement and monitor hours of work and hours of rest
12.07	Effectively manage resources in the ROC, including: i) planning and coordination of operations ii) assignment of tasks iii) time and resource constraints iv) prioritisation of tasks
12.08	Implement a safety culture in the ROC and across all departments engaged in the remote operation of the vessel
12.09	Explain the causes and effects of fatigue, including screen fatigue, and outline mitigating measures to take to ensure alertness
12.10	Identify and explain human element factors to be considered during remote operations

12.11	Coordinate Remote Operator familiarisation
12.12	Coordinate emergency drills and training exercises
12.13	Coordinate the issue of night and standing orders, as applicable
12.14	Demonstrate a handover of command between Masters
12.15	Coordinate and monitor watchkeeping and work schedules of Remote Operators
12.16	Ensure Remote Operators are fit for duty, prior to undertaking watchkeeping duties
12.17	Coordinate ROC audit and inspection schedules, as applicable
12.18	Maintain logs and records, as required

More Information

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Please note that all addresses and telephone numbers are correct at the time of publishing.

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