BRITISH MARITIME LAW ASSOCIATION

NATIONAL BRANCH OF THE COMITÉ MARITIME INTERNATIONAL

THE BROADGATE TOWER,
20 PRIMROSE STREET, LONDON EC2A 2RS
Tel: 020 3116 3000 Fax: 020 3116 3999

CMI Questionnaire: UNMANNED SHIPS

1 NATIONAL LAW

1.1. Would a "cargo ship" in excess of 500 grt, without a master or crew onboard , which is either

1.1.1. controlled remotely by radio communication?

1.1.2. controlled autonomously by, inter alia, a computerised collision avoidance system, without any human supervision

constitute a "ship" under your national merchant shipping law?

The principal statute in this area is the Merchant Shipping Act 1995. Section 313(1) provides that *"unless the context otherwise requires … 'ship' includes every description of vessel used in navigation"*. The requirement for use in *"navigation"* has been the subject of important case law but there is no clear reason why a ship either remotely controlled or in autonomous operation may not fall with the MSA 1995 definition of *"ship"* purely because of its unmanned character (See e.g. *R v Goodwin* [2005] EWCA Crim 3184; [2006] 1 WLR 546).

1.2 Would an unmanned "ship" face difficulty under your national law in registering as such on account of its unmanned orientation?

Not obviously if the unmanned ship falls within the definition of *"ship"* under the MSA 1995, considered above. The unmanned operability of any such "ship" does not seem to present barriers to compliance with the specific UK requirements for ship registration.

1.3 Under your national law, is there a mechanism through which, e.g. a Government Secretary may declare a "structure" to be a "ship" when otherwise it would not constitute such under the ordinary rules?

A functional equivalent may be found in section 112(1) of the Railways and Transport Safety Act 2003. This gives the relevant Secretary of State the power to make order to:

> *"(a) provide for a shipping provision to apply (with or without modification) in relation to specified things which are used, navigated or situated wholly or partly in or on water; [and / or]*
> *(b) provide for a shipping provision not to apply in relation to specified things which are used, navigated or situated wholly or partly in or on water…"*

A *"shipping provision"* is defined in subsection (2) as one which is made by or by virtue of an Act and is expressed to apply in relation to ships, vessels or boats (or a specified class or

description of ship, vessel or boat). The term would, therefore, include, *inter alia,* the Merchant Shipping Act 1995.

1.4 Under your national merchant shipping law, could either of the following constitute the unmanned ship's "master"

1.4.1 The chief on-shore remote-controller

1.4.2 The chief pre-programmer of an autonomous ship

Another 'designated' person who is responsible on paper, but is not immediately involved with the operation of the ship

The *"master"* is defined in s.313 of the Merchant Shipping Act 1995 as including *"every person (except a pilot) having command or charge of a ship and, in relation to a fishing vessel, means the skipper"*. Arguably, a remote controller in real-time control of the unmanned ship's movements and signalling could theoretically be regarded as having *"charge"* charge of the relevant ship and thus constitute its *"master"*. Discharge of some of the traditional obligations of the master may, however, prove technically difficult should the role be transposed to the shore.

The s.313 definition is unlikely to cover pre-programmers of autonomous ships unless such persons retain the capability to assume remote control of the unmanned ship immediately, as necessary. The definition, without amendment, could not cover a person not immediately connected with the navigation or control of the unmanned ship.

1.5 Could other remote-controllers constitute the "crew" for the purposes of your national merchant shipping laws?

The Merchant Shipping Act 1995 does not define the term *"crew"*. In fact, the word crew is most often used in the 1995 Act as a collective term for "seamen" of the relevant ship. *"Seaman"*, by virtue of s.313(1) *"includes every person (except masters and pilots) employed or engaged in any capacity on board any ship"*. This would clearly not extend to shore-based controllers.

2. UNITED NATIONS CONVENTION ON THE LAW OF THE SEA

2.1 Do you foresee any problems in treating unmanned ships as "vessels" or "ships" under the Law of the Sea in your jurisdiction (i.e. that such ships would be subject to the same rights and duties such as freedom of navigation, rights of passage, rights of coastal and port states to intervene and duties of flag states) in the same way as corresponding manned ships are treated?

Unmanned operations are significant for the Flag State, Port State and/or coastal State dynamic. Ordinarily, port state inspectorates may satisfy themselves as to the safety credentials of a ship through, inter alia, assessment of the master and crew and the requisite on-board certification. Potentially none of these means may be available in the context of unmanned ships, although electronic equivalents may present themselves in due course. A lack of personnel on board means there are no persons on board to arrest in the event of defaults. The port state is, therefore, seemingly deprived of one of its foremost law enforcement mechanisms.

2.2 Paragraphs (3) and (4) of UNCLOS Article 94 include a number of obligations on flag states with respect to the manning of such ships. Do you think that it is possible to resolve potential inconsistencies between these provisions and the operation of unmanned ships without a crew on board through measures at IMO (under paragraph (5) of the same Article) or do you think other measures are necessary to ensure consistency with UNCLOS. If so, what measures?

Although Article 94 UNCLOS prescribes obligations on the flag state to ensure that its ships' crews are *"appropriate in qualifications and numbers for the type, size, machinery and equipment of the ship"*, this requirement is not prescriptive and arguably permits unmanned operation if the relevant ship's autonomous navigation system is sufficiently safe. The absence of clarity in UNCLOS in this respect means that the particularities of this international requirement fall to be determined by specific and detailed IMO regulations.

3. IMO CONVENTIONS – THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA (SOLAS) 1974 (AS AMENDED)

3.1. Does your national law implementing the safe manning requirement in Regulation 14 of Chapter V of SOLAS require at least a small number of on board personnel or does the relevant authority have the discretion to allow unmanned operation if satisfied as to its safety?

Section 47 of the Merchant Shipping Act 1995 gives the Secretary of State the power to make regulations:

> *"requiring ships to which this section applies to carry such number of qualified officers of any description, qualified doctors and qualified cooks and such number of other seamen or qualified seamen of any description as may be specified in the regulations.:*

These may be found in the Merchant Shipping (Standards of Training, Certification and Watchkeeping) Regulations 2015/782. Regulation 43(3) requires that a company applying for a safe manning document in respect of a United Kingdom ship must submit to the Secretary of State proposals as to the numbers and grade of seafarer it considers must be carried so that the ship is safely manned if it proceeded to sea on an intended voyage. There is no express requirement in any of the above provisions for at least one seafarer to be on board. Merchant Shipping Notice MSN 1868 (M) provides only non-prescriptive guidance on safe manning levels. It provides that when considering the appropriate manning level, consideration should be given to factors including the following:

(a) Frequency of port calls, length and nature of the voyage;
(b) Trading area(s), waters and type of operations in which the ship or vessel is involved and any special requirements of the trade or operation;
(c) Number, size (kW) and type of main propulsion units and auxiliaries;
(d) Size, type of ship, equipment and layout;
(e) Construction and technical equipment of the ship;
(f) Cargo to be carried or operational requirements;
(g) Method of maintenance;
(h) Extent to which training activities are conducted on board

The relevant authorities, therefore, seemingly have a broad discretion to permit unmanned operations if, considering the above factors and all the circumstances, they are persuaded that such operations may be conducted safely.

3.2. Regulation 15 of SOLAS Chapter V concerns principles relating to bridge design. It requires decisions on bridge design to be taken with the aim of, inter alia, "facilitating the tasks to be performed by the bridge team and the pilot in making full appraisal of the situation…". In the context of a remote controlled unmanned ship, could this requirement be satisfied by an equivalent shore-based facility with a visual and aural stream of the ship's vicinity?

The *"bridge"* in the context of SOLAS clearly refers to the bridge on board and not to some shore-based electronic equivalent. However, SOLAS Chapter V Regulation 3(2) grants the relevant maritime authorities the ability to prescribe exemptions from, and equivalence to, the Chapter V regulations to the extent the full application of such provisions is *"unreasonable or unnecessary"*. The onus is, thus, on the prospective unmanned ship's owner and/or ship operator to demonstrate to such authorities that the shore-based bridge renders the application of Regulation 15 unnecessary or unreasonable.

3.3. As interpreted under national law, could an unmanned ship, failing to proceed with all speed to the assistance of persons in distress at sea as required by Regulation 33 of SOLAS Chapter V, successfully invoke the lack of an on-board crew as the reason for omitting to do so (provided that the ship undertook other measures such as relaying distress signals etc.)?

The requirement to render assistance to persons in distress at sea under SOLAS Chapter V is an important but qualified international obligation. The obligation is channelled to the master of the relevant ship. Therefore, in an unmanned context it only finds application if and to the extent the relevant unmanned ship has a *"master"*. The relevant obligation applies to masters of ships *"in a position to be able to provide assistance"*. This qualification goes to both proximity and technical capability. Furthermore, the precise form or method of assistance is not specified. Therefore, the master of an unmanned ship will not be in breach of this obligation by virtue of the unmanned ship's inability to take persons on board, for instance. The obligation would probably require remote controllers of unmanned ship to inform appropriate authorities of persons discovered in distress at sea and in some cases to hold position to form a communications hub for oncoming search and rescue personnel.

4. THE INTERNATIONAL REGULATIONS FOR PREVENTING OF COLLISIONS AT SEA, 1972 (COLREGS)

4.1. Would the operation of an unmanned "ship" without any on board personnel, per se, be contrary to the duty / principle of "good seamanship" under the COLREGS, as interpreted nationally, regardless of the safety credentials of the remote control system?

Not necessarily. It would depend on the safety credentials of the remote control system. It also depends on whether the electronic equivalent of a ship's lookout satisfies the COLREG Rule 5 requirement, considered below. If the overall system, for instance, gives a qualified remote controller the ability to make informed nautical decisions and allows the ship act on the

controller's remote instructions in good time, there is no obvious reason in principle why the lack of a crew on board necessarily vitiates the seamanship standard.

4.2. Would the *autonomous* operation of a "ship", without any on-board personnel *or any human supervision*, be contrary to the duty / principle of "good seamanship", under the COLREGS, as interpreted nationally, regardless of the safety credentials of the autonomous control system?

Autonomous and unsupervised operation probably is inconsistent with the seamanship standard. An obvious parallel is with the use of heading or track control. Its use is permissible under SOLAS but only to the extent that a qualified helmsman is able to assume manual control of the ship's steering immediately. Many English cases hold that overreliance on such systems without keeping a proper lookout is contrary to good seamanship. By analogy, complete deference to autonomous navigation technology, although growing rapidly in sophistication, seems similarly at odds with the standard. The reason for this is made clear in Rule 2(b) of COLREG itself. It provides that:

> *"in construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger."*

In other words, a value judgment is needed in deciding when a COLREG manoeuvre is needed, or, on the other hand, the seamanship standard requires alternative unspecified action. Until autonomous navigation technology demonstrates artificial intelligence comparable to a trained seafarer, it seems that rule 2(b) would be complied with since algorithmic collision avoidance is not yet close to such sophistication.

4.3. As interpreted under national law, could the COLREG Rule 5 requirement to maintain a "proper lookout" be satisfied by camera and aural censoring equipment fixed to the ship transmitting the ship's vicinity to those "navigating" the ship from the shore?

This issue is yet to come before the court so there is no precedent to refer to. Similarly, Rule 5 itself only provides so much information. The Rule makes reference to "sight and hearing" which suggests that human perception is required but does not specify that this must be provided by persons on board the ship. The purpose of the rule would seem to be satisfied if the technology enabled shore-side controllers to assess the situation and make informed judgements with the same proficiency as conventional watchkeepers. Important factors in the propriety of the lookout will be the proficiency of the camera technology as well as the reliability and instantaneousness of such technology.

4.4. Would a ship navigating without an on-board crew constitute a "vessel not under command" for the purposes of COLREG Rule 3(f), read together with COLREG Rule 18, as interpreted under your national law?

Unmanned ships as understood in this context are unlikely to be considered as *"vessels not under command"*. Assistance may be gleaned from the definition of such vessels found in Rule 3(f) which provides

"The term "vessel not under command" means a vessel which through some exceptional circumstance is unable to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel."

The words *"extraordinary circumstance"*, suggests the rule involves contingencies over and above a ship's ordinary mode of operation. The rule has often been invoked in the case of vessels which have come into difficulty through engine failure, for example (The Puritan [1998] 2 Lloyd's Rep 16). Since an unmanned ship is inherently without an on board crew whom might otherwise be in command, the Rule does not appear apt to cover them generally.

The rule may, however, cover an unmanned ship that has lost its communications owing to loss of satellite coverage, for instance. This would be a contingency more in keeping with the drafting of the Rule and interpreting case law.

5. THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING CERTIFICATION AND WARCHKEEPING, 1978 (STCW CONVENTION)

5.1. The STCW Convention purports to apply to "seafarers serving on board seagoing ships". Would it therefore find no application to a remotely controlled unmanned ship?

Construed literally, the wording of Article III suggests that the SCTW Convention and, therefore, STCW Code finds no direct application in an unmanned ship context. Certainly, its provisions on training and competence would not apply to shore-based controllers and other personnel.

5.2. As interpreted under national law, can the STCW requirement that the watchkeeping officers are physically present on the bridge and engine room control room according to Part 4 of Section A-VIII/2 be satisfied where the ship is remotely controlled? Is the situation different with respect to ships with a significantly reduced manning (bearing in mind that the scope of the convention only applies to seafarers on board seagoing ships)?

The bridge, in the context of Part 4 of Chapter VIII of the STCW Code clearly refers to the on board bridge and not some equivalent shore-based facility. If these obligations are read as obligations of the seafarers serving on board the ship, there is technically no breach in the context of unmanned operation involving no seafarers. If the obligation is aimed at ships themselves, which would be inconsistent with Article III of the STCW Convention considered above, it would require amendment to facilitate unmanned operations.

6. LIABILITY

6.1. Suppose a "ship" was navigating autonomously i.e. through an entirely computerised navigation / collision avoidance system and the system malfunctions and this malfunction is the sole cause of collision damage – broadly, how might liability be apportioned between shipowner and the manufacturers of the autonomous system under your national law?

This will be very fact-specific. Whether a successful claim lay against the owner for fault under the 1910 Convention, or the manufacturer will depend on many factors, not least the latency of the defect in the computerised navigation system. At this stage, the maintenance requirements for

such systems are not standardised internationally. Much will also depend on causation and the extent to which the owner ought to have had a system in place to intervene in cases of foreseeable malfunction.

Nevertheless, third parties may have a claim against the manufacturers. They may do so in tort if negligence on the part of the manufacturers can be proved and if this can be shown to be causative of the damage. Third parties may also claim under Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products, without needing to prove negligence if the product does not provide the safety persons are reasonably entitled to expect and this defectiveness causes loss of life or personal injury or damage to private (but not commercial) property. Directive 85/374/EEC is transposed into English law by the Consumer Protection Act 1987.

6.2. Arts. 3 and 4 of the 1910 Collision Convention provide for liability in cases of fault. As interpreted under your national law, does the fact that the non-liability situations listed in Art. 2 are not conversely linked to no-fault, leave room for the introduction of a no-fault (i.e. strict) liability (for e.g. unmanned ships) at a national level?

The fault based liability regime in Art. 3 and 4 seems exhaustively to govern all collision cases to the extent that there is no potential for the introduction of strict liability of the owner in connection with collisions involving unmanned ships under the Convention.