

# CMI QUESTIONNAIRE ON UNMANNED SHIPS

## INTRODUCTION

*Unmanned ships are those which are capable of controlled movement on the water in the absence of any onboard crew. Control is performed in essentially two ways. It can be performed by remote-control, whereby a shore-based remote controller uses a computer and joystick to control the unmanned ship's movement and signalling using radio and satellite communications. In doing so the controller is aided by the streaming of the ship's vicinity effected by cameras and aural sensors affixed to the ship's hull / chassis. There is a small delay in the transmission of information to and from the ship, like with all forms of satellite communication. On the other hand, the ship may be "controlled" autonomously. This involves the ship being pre-programmed before deployment, and, thereafter, performs a predetermined nautical course without any human interaction. This control, as well as a degree of collision avoidance capability, is affected with the use of highly sophisticated software technology, control algorithms and sonar radar.*

*Whereas unmanned ships in operation today are small in size (<20m in length) and essentially used for marine scientific research and military purposes their number has risen exponentially in recent years and so has the number of research projects aimed at developing the first unmanned merchant ships of 500 grt or more.*

*In order to ensure that the required regulations are in place once these ships become a technical reality, CMI Executive Council has set up an International Working Group (IWG) to study the current international legal framework and consider what amendments and/or adaptations and/or clarifications may be required in relation to unmanned ships.*

*In answering the questions below please assume that they are made in relation to an unmanned ship of 500 grt or more.*

<b>1. NATIONAL LAW</b>
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?
<i>Answer: Yes. Although there is no definition of a "ship" in Japanese merchant shipping laws, a "ship" is generally understood as being a vessel capable to navigate on the water and the lack of human crews on board in itself would not automatically disqualify from a vessel as being a "ship".</i>
1.2. Would an unmanned "ship" face difficulty under your national law in registering as such on account of its unmanned operation?
<i>Answer: Japanese Ship Law (Law No.46 of 1899) and Ship Registration Regulations (Regulation by Ministry of Legal Affairs No.27 of 2005) does not exclude the possibility of a registration of unmanned "ship".</i>
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?
<i>Answer: No</i>
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

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<p>1.4.3. Another 'designated' person who is responsible on paper, but is not immediately involved with the operation of the ship</p>
<p><i>Answer: Many Japanese statutes presuppose that the master should be a person on the ship. For example, Art.10 of the Mariners Act (No. 100 of 1947) requires that the master should command the crew on board when a ship is in danger and Art.11 provides the master's duty to remain on board. Ship Officers Act (No. 149 of 1951) requires the minimum number and qualification of ship officers on board the ship (Art.18) and provides the shipowner's duty to take crews on board. These statutes are not supposed to be applied to unmanned ships. For the purpose of these statutes, persons referred to in 1.4.1 to 1.4.3 cannot be the master.</i></p>
<p>1.5. Could other remote-controllers constitute the "crew" for the purposes of your national merchant shipping laws?</p>
<p><i>Answer: They cannot be the "crew" under Mariners Act and Ship Officers Act. See the answer to 1.4 above.</i></p>
<p>1.6. Under your national merchant shipping law, could either of the following constitute the unmanned ship's "master"</p> <p>1.6.1. The chief on-shore remote-controller  1.6.2. The chief pre-programmer of an autonomous ship  1.6.3. Another 'designated' person who is responsible on paper, but is not immediately involved with the operation of the ship</p>
<p><i>Answer: See, 1.4 above.</i></p>
<p>1.7. Could other remote-controllers constitute the "crew" for the purposes of your national merchant shipping laws?</p>
<p><i>Answer: See, 1.5 above.</i></p>
<p>2. UNITED NATIONS CONVENTION ON THE LAW OF THE SEA, 1982 (UNCLOS)</p>
<p>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?</p>
<p><i>Answer:  The Act concerning Navigation of Foreign Ships in Territorial Waters (No. 64 of 1945) seems to presuppose that a master should be on foreign ships. For example, Art.4 prohibits the master of foreign ship from staying, anchoring or strolling in territorial waters. There are also other provisions which refer to the "master" of a foreign ship who are on board.</i></p>
<p>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?</p>
<p><i>Answer: It would be most feasible to establish "generally accepted international regulations, procedures and practices" (UNCLOS Art. 94(5)) for unmanned ships through measures at IMO and thereby to resolve possible inconsistencies between the provisions in UNCLOS and the operation of</i></p>

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<i>unmanned ships without a crew on board.</i>
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?
<i>Answer: There is some uncertainty on this issue. Although Ship Officers Act (No. 149 of 1951) provides for the minimum number of on board personnel (Art.18), Art. 20 explicitly provides that Minister of Land, Infrastructure and Transport and Tourism can, upon the request of a shipowner, permit that the ordinary standards do not apply to when a ship has a special structure or in other cases specified in the law as far as the safety of the ship's navigation a the ship is ensured. However, the statute does not presuppose the existence of unmanned ships and it should be examined whether the minimum number can be zero under the exception under Art. 20.</i>
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?
<i>Answer: It depends on the level of technology developed for the bridge design, shore-based facility and their equipment and security.</i>
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.)?
<i>Answer: The lack of an on-board crew can be a reason for not providing assistance of persons in distress at sea because the provision imposes the duty on the "master" of a ship. Regulation 33 of SOLAS Chapter V is provided on the assumption that the master is aboard the ship. Mariners Act Art. 14 and its Regulation Art 3 (1)-3 which implements SOLAS exempts the ship's master from pursuing the rescue action where she could not go to the rescue site with excusable reasons or in a special circumstances when it is not appropriate for her to go the rescue site or it is not necessary to do so.</i>
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?
<i>Answer: No. "Good seamanship" in the context of collision avoidance depends much on the level of the technological developments. If the remote control system can ensure the same level of safety as the traditional ships, it would not be contrary to the principle under COLREGS. It may, however, be desirable to revise COLREGS in order to clarify the point because the principle of the "good seamanship" under the COLREGS may be interpreted as if requiring on-board personnel.</i>
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

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<p>COLREGS, as interpreted nationally, regardless of the safety credentials of the autonomous control system?</p>
<p><i>Answer: "Good seamanship" in the context of collision avoidance depends much on the level of the technological developments. If the autonomous control system can ensure the same level of safety as the traditional ships, it would not be contrary to the principle under COLREGS. It may, however, be desirable to revise COLREGS in order to clarify the point because the principle of the "good seamanship" under the COLREGS may be interpreted as if requiring the on board personnel.</i></p>
<p>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?</p>
<p><i>Answer: Yes. Again, it depends on the level of technological developments. It may, however, be desirable to revise COLREGS in order to clarify the point because the "a proper lookout by sight and hearing" in Rule 5 of the COLREGS may be interpreted as if requiring the on board personnel.</i></p>
<p>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?</p>
<p><i>Answer: No. A ship navigating without an on-board crew does not constitute a "vessel not under command" as far as it is effectively controlled remotely or autonomously.</i></p>
<p><b>5. THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING CERTIFICATION AND WATCHKEEPING, 1978 (STCW CONVENTION)</b></p>
<p>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?</p>
<p><i>Answer: Yes. The Convention, generally speaking, does not apply to a remotely controlled unmanned ship. However, some rules under STCW such as the requirement of the watchkeeping officers being physically present may arguably be interpreted as prohibiting the use of unmanned ship and, to that extent, are applicable to unmanned ship. See, 5.2.</i></p>
<p>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)?</p>
<p><i>Answer: As far as the STCW applies to unmanned ship, the requirement of the watchkeeping officers being physically present on the bridge etc. according to Part 4 of Section A-VIII/2 is not satisfied when the ship is remotely controlled without any personnel on board.</i></p>
<p><b>6. LIABILITY</b></p>
<p>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?</p>
<p><i>Answer: The answer is not clear because there are many elements to be taken into account for the possible liability of the shipowner and the manufacturers when malfunction of the system caused the damage. The nature and the scope of the shipowner's fault may change as the level of autonomous navigation advances.</i></p>
<p>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</p>

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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?

*Answer: As far as the unmanned ships constitute a "vessel" for the purpose of the 1910 Collision Convention, it is quite questionable whether a contracting state can introduce no-fault (i.e. strict) liability (for e.g. unmanned ships) at a national level.*