

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 adaptions 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.

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?

Answer: The Answer is yes. Under Greek law, (Article 1 of the Code of Private Maritime Law) vessel is any craft of at least 10 net registered tones intended to navigate at sea by its own means of propulsion.

In accordance with Art. 1 of the Code of Public Maritime Law, a ship is defined as any craft intended to move at sea for the purposes of carriage of persons or goods, towage, salvage, fishing, pleasure, scientific or other purposes. The unmanned ships, in principle, can comply with both definitions under our national law.

As far as the International Conventions are concerned, most of which have been ratified by Greece, the wording of their definitions can be found as follows:

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According to the International Convention for the Safety of Life at Sea (SOLAS) the term "ship" is defined in Regulation 2, titled as definitions. In Hague-Visby rules "ship" means any vessel used for the carriage of goods by water, as provided in Article 1. The International Convention for the Prevention of Pollution from Ships - MARPOL in Article 2 defines the term "Ship" as a vessel of any type whatsoever operating in the marine environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft and fixed or floating platforms. As set out in Rule 3 of the International Regulations for Preventing Collisions at Sea – COLREGS, the word "vessel" includes every description of water craft, including non-displacement craft, WIG craft and seaplanes, used or capable of being used as a means of transportation on water. As provided in the Athens Convention relating to the Carriage of Passengers and their Luggage by Sea the term "ship" means only a seagoing vessel, excluding an air-cushion vehicle. In accordance with the International Convention on Civil Liability for Oil Pollution Damage "ship" means any sea-going vessel and any seaborn craft of any type whatsoever, actually carrying persistent oil in bulk as cargo. As defined in the Maritime Labour Convention, 2006, "ship" means a ship other than one which navigates exclusively in inland waters or waters within, or closely adjacent to, sheltered waters or areas where port regulations apply. Under UNCLOS the terms "ships" and "vessels" are used interchangeably but neither is defined. Under Article 91 of UNCLOS each State shall fix the conditions for the grant of its nationality to ships, which implies that the national law of the flag State will be critical for the definitions used. Thus, there really is no international definition of "ship", only an international mechanism for determining this question.

1.1.1/1.1.2. The above definition covers both paras. Under Greek law, there is no distinction on how a ship is controlled.

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

Answer: Under Greek law there is no provision prohibiting the registration of an unmanned ship. Practically, legislative solution should be given.

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?

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Answer: Under Greek law there is no such mechanism. The definition of the ship can be changed by law.

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

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

Answer: Under Greek law none of the above persons comply with the notion of Master. Greek law, requires the Master's physical presence on board the vessel under Article 43 of the Code of Private Maritime Law.

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

Answer: No, they cannot.

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

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

Answer: None of the persons mentioned above comply with the notion of the Master under Greek law.

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

Answer: Under Greek law other remote controllers do not constitute the crew.

2. UNITED NATIONS CONVENTION ON THE LAW OF THE SEA, 1982 (UNCLOS)

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?

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Answer: There are no obstacles in considering an unmanned craft as ship, since there is no uniform definition. A foreseeable problem may concern the port State jurisdiction of a coastal State (UNCLOS Art. 2 and 25 (2)), as a port State may refuse unmanned ships access to its ports or internal waters, provided that the refusal complies with certain more general criteria of reasonableness that exist in general international law, such as non – discrimination proportionality between the measure and its objective and that the prohibition does not constitute an abuse of right (Art. 300). Thus, it depends on the national law when exercising the port state jurisdiction. Moreover, under UNCLOS, each coastal State enjoys prescriptive and enforcement rights in its territorial sea and EEZ. If one coastal State has prohibited by law the operation of unmanned vessels, It may exercise its enforcement rights.

Independently of what law the coastal State has adopted, it may not “impose requirements on foreign ships which have the practical effect of denying or impairing the right of innocent passage” (Art. 24(1)(a)). The right of innocent passage extends to ships that may be deemed to pose a particular risk for the coastal State, such as tankers and nuclear-powered ships and ships carrying nuclear or other inherently dangerous or noxious substances (Art. 22(2) and 23). Therefore, the unmanned operability of such craft does not seem to pose a risk on a coastal State nor to hamper the right of innocent passage.

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?

Answer: In light of article 94 UNCLOS paragraphs (3) and (4) there is a series of duties falling under the responsibility of the flag State. Particularly, the aforementioned provision stipulates that every State needs to effectively exercise its jurisdiction and control in administrative, technical and social matters. Also, every state needs to take the necessary measures for ships flying its flag, to ensure safety at sea, with regard to inter alia “*the construction, equipment and seaworthiness of ships*” and “*the manning of ships, labour conditions and the training of crew, taking into account the applicable*

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international instruments". Another measure a State must take is "to ensure that each ship is in charge of a master and officers who possesses appropriate qualifications, in particular in seamanship, navigation, communications and marine engineering, and that the crew is appropriate in qualification and numbers for the type, size, machinery and equipment of the ship". These duties of the flag States were adopted in 1982 and designed for conventional vessels, with a master and his crew. These requirements could lead to some serious difficulties for unmanned ships. Undoubtedly, the interpretation of these provisions needs to be much broader to comply with the concept of unmanned ships. The Greek legislation does not provide for vessels without a crew. Consequently, legislative solution should be given.

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?

Answer: Greece is a Signatory state of SOLAS which has been adopted by the L. 1045/1980. According to this legislation, any relevant authority has to comply with the safe manning requirement as prescribed by Regulation 14 of Chapter V of SOLAS. Therefore, it is not upon the competent authority's discretion to decide whether or not an unmanned vessel may ensure effective "crew" performance as regards safety.

In any event, legislative solution should be given.

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 contest 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?

Answer: Under the provisions of Article 15 of SOLAS Chapter V, there is a regulatory requirement with regard to the navigational bridge in order to ensure the visibility when looking out from the vessel's bridge. Taking also into account that a remote-controlled unmanned ship will not have her own bridge crew anymore, there is no

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doubt that the visibility requirement loses its strength. However, a series of technical advancements, for instance advanced sensors and radars, will take over this task.

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.)?

When examining Article 33 of SOLAS Chapter V, one may come to the conclusion that the owner of an unmanned vessel could argue that she shall not be considered as a "*ship in a position to be able to provide assistance*" to any other ship and person being in distress at sea, simply because there is no crew on board. In any event, the unmanned vessel should provide the possibility of assisting at sea. Consequently, further legislative solution should be given.

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?

Answer: COLREGS in general do not refer to individuals when certain actions are described or required. Instead, reference is made to "the vessel". Thus, upon a plain reading of the text, neither the remotely controlled nor the autonomous operation of a "ship" in itself seems to be contrary to good seamanship. Instead, the decisive question will be whether the controlling person or, as the case may be, the autonomous program, respectively, is capable of operating and navigating the ship in a way that corresponds with the established principles of what is good seamanship.

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?

Answer: Greece has ratified COLREGS by the Legislative Decree 93/1974, without adopting any further definition or interpretation regarding the principle of "good

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seamanship". In view of the above, the autonomous operation of the ship would not be contrary to the duty/ principle of "good seamanship" under Greek law. It is worth mentioning as stated at the Article of Robert Veal and Michael Tsimplis "The integration of unmanned ships into the lex maritima [2017] LMCLQ 325, that there is a fundamental question whether the sole use of an automated system without any human supervision can be consistent with the duty of good seamanship. The difficulty is that knowing when the overarching duty of seamanship requires action contrary to the express direction of COLREGS is a process of high sophistication, reliant, in particular on nautical expertise and experience. This seems to be beyond the capabilities of the automated technology currently in use in fully autonomous unmanned craft. The difficulty is that knowing when good seamanship requires deviation from the Rules, and then subsequently what action is required, is not an equation that may be programmed in such fashion, not least because the latter action for obvious reasons cannot possibly be specified before the event. It is true that experienced seafarers may not be able to agree in every case exactly what seamanship dictates, but nonetheless they have been permitted and required to use their experience to make a judgement.

However, it is a technical matter whether the system of the autonomous ship will have the intelligence to deal with. It is noteworthy that in case of a collision between one autonomous and one conventional vessel, the liability for the collision damage can be problematic. The absence of persons on board the autonomous ship can expose her in danger since the communication between the two ships will not be conducted immediately via VHF and thus, the collision may not be avoided. In addition, the case can face more complexity since the operation of the autonomous vessel is fully computerized and as a result the system can easily be hacked. In the scenario of breach of cyber-security by hackers, further problems may arise, as the hackers might request ransom for the avoidance of the collision which can result to loss of life, pollution etc. The insurance cover in such a case is also questionable.

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?

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In accordance with COLREG Rule 5 "*Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and or the risk of collision*".

The requirement to 'maintain a proper lookout' includes:

- Looking and listening – maintain a continuous watch by sight and by hearing, both inside and outside the wheelhouse. Looking means looking out of the windows all the time.
- Monitoring sound signals – ensure you can hear what is going on, outside the wheelhouse.
- Be aware of the effect of keeping a closed wheelhouse and of distracting noises inside it.
- Using a depth indicator – frequently and systematically monitor the depth of water beneath your keel. The seabed is often the nearest point of danger.
- Avoid distractions such as wheelhouse and deck lights, other people, navigational records and routine paperwork, including chart corrections.
- Always remember that you are on bridge watch to keep the ship safe, as set out in Rule 2 on responsibility.
- To assess the risk of collision you must continuously ask yourself: Is a collision possible, because of the action (or inaction) of any vessel in the vicinity – including your own vessel? Is a collision probable? If so, the risk of collision is already here and you need to act urgently.

In view of the above, if they can comply with the COLREG Rule 5 requirement to maintain a "proper lookout" could not be satisfied by camera and aural censoring equipment fixed to the ship due to the fact that the physical presence of the Master on-board the vessel cannot be replaced by technical means by virtue of the COLREG Rule 5 and 2. In any event, legislative solution should be given.

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?

Answer: No. The term "vessel not under command" as defined in Rule 3(f) refers to a vessel which through some exceptional circumstance is unable to manoeuvre as

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required by these Rules and is therefore unable to keep out of the way of another vessel. Thus, the provisions do not seem to address a situation where the vessel operates without a crew. However, normally an unmanned vessel will not have the right of way as a “vessel not under command” as prescribed by Rule 18.

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?

Answer: The STCW Convention, applies only to ‘seafarers serving on board seagoing ships’. In addition, the Maritime Labour Convention defines the ‘seafarer’ as ‘any person who is employed or engaged or works in any capacity on board a ship to which this Convention applies’. The Guidelines on Fair Treatment and the IMO Casualty Investigation Code contain virtually identical definitions. Therefore, the STWC Convention applies only to “seafarers serving onboard seagoing ships”, finding no application to a remotely controlled unmanned ship.

Regardless of that, special rules are required for the training of the remote controller.

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)?

Answer: No. The STCW requires the watchkeeping officers to be physically present on the bridge and in the engine control room. According to Part 4 of Section A-VIII/2, the STWC requirements cannot be satisfied where the ship is remotely controlled.

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?

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Answer: To a great extent will depend on the contract. Assuming that we are talking about the responsibility of the manufacturer and the shipowner to third parties is joint and several depending on the seriousness of fault, contribution, contractual arrangements and the effect of fault, unless by the law has been established strict liability to them.

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?

Answer: We do not think that the present situation under Greek Law leaves room for the introduction of a strict liability. Possibly, should be made by several legislative solution.