

CMI International Working Group

Unmanned Ships - Questionnaire

Response of the Maritime Law Association of Australia and New Zealand (MLAANZ)

In answering the questions below, we have assumed 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 on board, 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?

Australia

It is uncertain whether, under the Australian national merchant shipping law, an unmanned cargo ship would be a “vessel” for the purposes of the relevant legislation.¹ An unmanned ship controlled remotely by radio communication may constitute a “vessel” for the purposes of Australian law; but it is somewhat less likely that a wholly autonomous vessel would do so.

The Australian “national merchant shipping law” for these purposes consists of (i) the *Navigation Act 2012 (Cth)* and (ii) Sch 1 of the *Marine Safety (Domestic Commercial Vessel) National Law Act 2012 (Cth)* which enacts the *Marine Safety (Domestic Commercial Vessel) National Law* (“*National Law*”). Both pieces of legislation are directed to a “vessel” rather than a “ship” (cf *Shipping Registration Act 1981 (Cth)* dealt with under 1.2 below), and both are directed to different types of “vessel”.

National Law

The *National Law* applies to a “domestic commercial vessel”, being “a vessel that is for use in connection with a commercial, governmental or research activity”² and does not apply to a vessel that voyages outside of Australia’s exclusive economic zone.³

Section 8(1) of the *National Law* defines a “vessel” expansively as a “craft for use, or that is capable of being use in navigation by water, however propelled or moved, and includes an air-cushion vehicle, a barge, a lighter, a submersible, a ferry in chains and a wing-in-ground effect craft.”⁴ Aircraft and certain offshore facilities are excluded from the definition of a vessel.⁵

¹ The Australian legislation uses the term “vessel”.

² *National Law* s 7(1).

³ *National Law* s 7(3). Such a vessel will generally be regulated by the *Navigation Act 2012 (Cth)*.

⁴ *National Law* s 8(1).

⁵ *National Law* s 8(3).

It should also be noted (and see 1.3 below) that there is provision for a specified thing or thing in a specified class to be declared to be or not to be a “domestic commercial vessel”⁶ or a “vessel”.⁷

Navigation Act

The *Navigation Act* is primarily directed to a “regulated Australian vessel”.

By s 15, a vessel is a regulated Australian vessel if:

- a) the vessel is registered, required to be registered or exempt from registration under the *Shipping Registration Act 1981* (Cth);
- b) is not a recreational vessel; and
- c) is proceeding on an overseas voyage or for use on an overseas voyage;⁸ or a certificate issued under the *Navigation Act* is in force for the vessel (other than non-Tonnage certificate or a certificate prescribed by the regulations); or an opt-in declaration⁹ is in force for the vessel.

Thus, the definition in s 15 requires a ship to be a “ship” for the purposes of the *Shipping Registration Act 1981* (Cth) (see response to 1.2 below) as well as a “vessel” under the *Navigation Act* in order to be a “regulated Australian vessel”.

“Vessel” is defined in s 14 in a cognate way to in the *National Law* as: “any kind of vessel used in navigation by water, however propelled or moved, and including a barge, lighter or other floating craft or an air-cushion vehicle, other similar craft, used wholly or primarily in navigation by water”.

Application to unmanned vessels

The definition of a “vessel” in both the *National Law* and *Navigation Act* is critical to whether an unmanned ship would be considered as such for the purposes of Australian merchant shipping laws.

The definition is expansive, and is not directed to the structure of the vessel nor its method of propulsion. The critical requirement in the case of an unmanned vessel would appear to be that it must be one “for use, or that is capable of being used, in navigation”¹⁰ or “used in navigation by water”.¹¹

There is no Australian case law considering the scope of these definitions, though traditionally “navigation” has been said to involve “planned or ordered movement from one place to another” that requires a navigator to determine a ship’s position and determine its course.¹² This implies some level of human agency or decision-making capability, though such case law was decided at a time prior to the development of unmanned ships. The difficulties in determining whether an unmanned ship is within the definition do not arise from whether it is unmanned *per se* but rather due to its capacity to navigate.

⁶ *National Law* s 7(5).

⁷ *National Law* s 8(3).

⁸ As defined in s 16 of the *Navigation Act 2012* (Cth): essentially, if the voyage involves going outside Australia’s exclusive economic zone.

⁹ See *Navigation Act 2012* (Cth) Pt 5.

¹⁰ *National Law* s 8.

¹¹ *Navigation Act 2012* (Cth) s 14.

¹² *Steedman v Scofield* [1992] 2 Lloyd’s Rep 163 (EW Adm) at 166.

On this view, a remotely controlled vessel is arguably quite likely to fall within the definition of “vessel” under the *National Law* and the *Navigation Act* as it still has a human operator that is control of it and so it could be said to be used for navigation.

In the case of a wholly autonomous vessel, the position is less certain. The answer will depend upon the sophistication of the vessel’s artificial intelligence and whether it is sophisticated enough exercise a process of navigation and judgment that is similar to that engaged in by a human navigator. The answer will depend upon the craft in question, although it is arguable that autonomous technology is not yet at this point.

Therefore, there is a strong argument that a remotely operated vessel would be a “vessel” for the purpose of the *National Law* and *Navigation Act*, however, there is substantially less clarity in respect of an autonomous vessel operating without human supervision.

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

Australia

The *Shipping Registration Act 1981* (Cth) governs the eligibility of a vessel to be registered as Australian flagged.¹³

To be registered, the vessel must be a “ship” within the meaning of the *Shipping Registration Act*.

Section 3 defines a “ship” as:

“any kind of vessel capable of navigating the high seas and includes:

- a) a barge, lighter or other floating vessel;
- b) a structure that is able to float or be floated and is able to move or be moved as an entity from one place to another;
- c) an air-cushion vehicle, or other similar craft, used wholly or primary in navigation by water;

but does not include a vessel, structure, vehicle or craft declared by the regulations not to be a ship for the purposes of this definition.”

“Vessel” is not expressly defined in the *Shipping Registration Act*. In a similar manner to the *National Law* and *Navigation Act* the definition is not directed to the structural design or means of propulsion of the vessel. Rather, it is directed to the vessel’s capability to “navigate” the high seas.

This raises the same uncertainties as discussed in the response to 1.1 above. A remote controlled unmanned vessel may be able to satisfy the definitional requirement under s 3 of the *Shipping Registration Act*. In respect of a wholly autonomous vessel, the application of the Act would depend upon the sophistication of the vessel’s artificial intelligence to navigate and engage in planned and ordered movement although it is thought to be substantially less likely on the current state of technology.

¹³ There is an obligation to register an Australian owned ship that is more than 24 m in tonnage length: *Shipping Registration Act 1981* (Cth) ss 12, 13.

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?

Australia

Under the *National Law*, regulations may provide that “a specified thing, or a thing included in a specified class” is or is not a “vessel”¹⁴ or is or is not a “domestic commercial vessel”.¹⁵ Such regulations have been made.¹⁶ This broad regulatory power could conceivably be applied to unmanned ships to remove any uncertainty and bring them within the scope of the *National Law*.

The *Navigation Act* lacks any broad power to declare a craft to be a “regulated Australian vessel”. There is a power in s 25 for the Australian Maritime Safety Authority (AMSA) to declare a vessel to be a “regulated Australian vessel”. However, this requires AMSA to be satisfied the vessel is registered under the *Shipping Registration Act* and that necessarily requires the vessel to be a “ship” for the purposes of that Act.¹⁷ As noted in the response to 1.2, there is uncertainty as to the types of unmanned ships that may come within that definition.

Under the *Shipping Registration Act 1981* (Cth) there is only capacity to declare by regulation that a thing is not a ship.¹⁸

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

Australia

It is possible that the chief on-shore remote controller could be considered to be an unmanned ship’s “master” for the purposes of Australian law, though there is uncertainty.

For “domestic commercial vessels”, s 6 of the *National Law* states that “master of a vessel means the person who has command or charge of the vessel, but does not include a pilot”. Section 14 of the *Navigation Act* is in the same terms, in respect of vessels governed by it.

The uncertainty is whether “command or charge of the vessel” requires presence on board. Traditionally, presence on board would be considered be so, however, this is because up until recently technology was not sufficiently developed for vessels to be operated without crew on board (see the response to 4.1 below about crew being on

¹⁴ *National Law* s 8(3).

¹⁵ *National Law* s 7(5).

¹⁶ *Marine Safety (Domestic Commercial Vessels) Regulations 2013* (Cth) rr 9, 10, 11, 12. The regulations are primarily concerned with declaring certain small craft (eg. a canoe, dinghy, dragon boat or “tinnie”) to be “vessel” (see r 9) or declaring other things such as items used in watersports (eg. a “boogie board”, inner tube, paddleboard) or structures moored to the shore (eg a “floating structure permanently connected to shore”) to not be a “vessel” (see r 10). These regulations declaring certain things to be vessels are not concerned with their autonomous operation but rather the size or structure of these craft. They all require a human operator. Regulations 11 and 12 declare particular types of “vessels” to be “domestic commercial vessels” based on their reason for use or ownership and so are not particular relevant for the purposes of this questionnaire.

¹⁷ *Navigation Act 2012* (Cth) s 25(2).

¹⁸ *Shipping Registration Act 1981* (Cth) s 3.

board as an aspect of “good seamanship”). However, “command” is more properly considered to relate to control of the vessel, its navigation and operations. If the remote control technology was sophisticated enough to give the remote controller control over the unmanned ship similarly to if he or she were on board, then arguably a chief on-shore remote controller could be considered the unmanned ship’s “master”.¹⁹

1.4.2 the chief pre-programmer of an autonomous ship

Australia

The chief pre-programmer of an autonomous ship would not be considered its “master” within the meaning of the legislation.

An autonomous ship is, by definition, autonomous in the sense that it will navigate and make decisions by means of its own artificial intelligence. Although the pre-programmer will set the parameters for that operation, that person could not be said to have “command or charge” of the vessel where active control and decision-making capacity rests with the artificial intelligence directing its autonomous operation.

1.4.3 another ‘designated’ person who is responsible on paper, but is not immediately involved with the operation of the ship

Australia

A “designated person” with paper responsibility for operation of the ship would not be considered its “master”.

Such a person could not have “command or charge” of the vessel, as that person does not have any involvement with its operation.

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

Australia

No, under Australian law other remote controllers could not constitute the “crew” of a remote controlled unmanned vessel.

Section 6 of the *National Law* defines “crew” to mean “individuals employed or engaged in any capacity on board the vessel on the business of the vessel, other than the master of the vessel or a pilot”. The crew must be “on board”. Thus, for the purposes of “domestic commercial vessels” governed by the *National Law*, other remote controllers could not constitute the “crew” as they will not be “on board” an unmanned ship.

The *Navigation Act* does not define the term “crew”. However, the *Navigation Act* refers to “seafarers”.²⁰ Section 14 defines a “seafarer” to mean “any person who is employed or works in any capacity (including that of master) on board a vessel on the business of the vessel” other than a pilot and other specified person. Relevantly, and similarly to the *National Law*, the definition in s 14 requires a seafarer to be “on board” the vessel. Thus, for the purposes of “regulated Australian vessels” and other vessels

¹⁹ Though note the definition discussed in the response to 1.5 below of “crew” which expressly states that crew will be “on board” the vessel. This is not stated expressly in respect of the master though it may suggest that the *National Law* assumes that the master will be on board.

²⁰ See, eg. *Navigation Act 2012* (Cth) Ch 2, which is entitled “Seafarers”.

to which the *Navigation Act* applies, other remote controllers could not constitute the “crew” (or “seafarers” as described in the Act) as they will not be “on board” an unmanned ship.

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?

Australia

Whether a craft is a “ship” or “vessel” for the purposes of the law of the sea is determined by the law of the flag State.²¹

Whether an unmanned ship would be considered a ship for law of the sea purposes under Australian law would depend primarily upon whether it satisfied the definition of “ship” in the *Shipping Registration Act 1981*. In a regulatory sense, it would depend on whether it satisfied the definition of “vessel” under the *National Law* or *Navigation Act* (see section 1 above).

If the requirements under these Acts are met, there is unlikely to be an issue, under an Australian appreciation of the law of the sea, to treating unmanned ships in the same way as conventionally operated vessels. It should be noted though that there may be practical issues which arise: for example, there would have to be some capacity for AMSA or other authorities to interdict and detain an unmanned vessel, which may prove problematic in respect of a wholly autonomous vessel.

There may also be a difficulty in that Australian law presently provides for compulsory pilotage,²² which arguably could not be complied with by an unmanned vessel whether remotely controlled or autonomous. AMSA does have power to grant an exemption from the compulsory pilotage requirement, however.²³

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?

Australia

UNCLOS is a framework convention (sometimes described as a “constitution for the oceans”) and under Art 94(5) States are to take steps to conform to international instruments such as the IMO Conventions.

²¹ UNCLOS Art 91.

²² *Navigation Act 2012* (Cth) Ch 6 Pt 2 and see the obligation in s 166.

²³ *Navigation Act 2012* (Cth) s 172.

UNCLOS Art 94(3) and (4) impose obligations on flag States to ensure the manning of vessels flying their flag is in accordance with the applicable international instruments and to ensure that a vessel in the charge of a master and officers, together with appropriate crew. Given that the focus in Art 94(3) and (4) is on compliance with international instruments, potential inconsistency will only arise if the IMO and other conventions do not permit the operation of an unmanned vessel.

As discussed in the remainder of this response, under Australian law it is likely that a remotely operated unmanned ship could comply with these instruments particularly with respect to navigational requirements. Compliance is less clear in terms of engineering, safety and watchkeeping requirements. If such tasks could adequately be performed remotely, then there is no inconsistency.

However, there is likely to be more difficulty in terms of the compliance in respect of a wholly autonomous unmanned vessel. Both Art 94 and the other conventions are directed toward a ship having a “master” in command with “crew” in control of the vessel. It would depend on the sophistication of the artificial intelligence, but it appears unlikely that an autonomous vessel would satisfy the requirements.

In terms of resolving any inconsistency that does arise, given the focus of Art 94 on compliance with international instruments, it would appear that any inconsistency with UNCLOS could best be resolved through modification by the IMO of other international instruments, or the taking of measures at IMO to resolve any specific inconsistency in respect of unmanned ships.

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 authority?

Australia

Yes, it would appear that the relevant provisions of both the *National Law* and the *Navigation Act* require at least the presence of a small number of crew on board; however, there may be scope for AMSA to issue exemptions as described below.

National Law

Part 4 Division 3 of the *National Law* requires “domestic commercial vessels” to have a “certificate of operation” issued by AMSA.

Such certificate may include conditions as to “the number of crew required to be on board while the relevant vessel or vessels are being operated”.²⁴

Issue of certificates of operation under the *National Law* is governed by *Marine Order 504 (Certificates of operation – national law) 2013* (Cth). They require a cargo vessel to comply with Part E of the *National Standard for Commercial Vessels*.²⁵ Section 2.3

²⁴ *National Law* s 49(5)(a).

²⁵ *Marine Order 504* rr 10, 11.

of Part E of the National Standard states that “a vessel must carry sufficient competent and trained crew at all times when operating so that:

- a) the vessel can safely navigate, berth and unberth; and
- b) the vessel systems essential to safety can be effectively operated and monitored; and
- c) immediate and appropriate emergency action can be taken when there is a failure of an essential system;
- d) the risk associated with the nature of activity conducted the vessel is reduced to the extent that is reasonably practicable; and
- e) a measured response to emergencies of risks that may threaten the vessel or persons on board during normal or abnormal conditions, when considering all facets of the vessel’s operation, can be provided; and
- f) rapid and safe evacuation of all persons on board the vessel can be facilitated.”

While a number of these activities may be able to be undertaken without crew on board (eg. navigation and monitoring of essential systems, subject to technological requirements), it is arguable that other requirements such as c) and e) (relating to emergency responses) cannot. In order to meet these requirements, it would appear that the Standard would require a vessel to carry at least some crew on board, given that it is a mandatory requirement to “carry” such crew.

Furthermore, s 6(5) of sch 2 of Part E of the National Standard requires the vessel’s owner to “determine the appropriate crew for each type of operation of the vessel...”. While, conceivably, this could be stated to be zero, that cannot be less than the “core complement” unless AMSA approves an “equivalent means of compliance”.²⁶ The minimum “core complement”, which varies depending on the size of the vessel, is always one crew member.²⁷ A vessel must operate with the appropriate crew or core complement, unless AMSA has approved an equivalent means of compliance.²⁸

Thus, although there is capacity for AMSA to potentially approve an equivalent means of compliance in terms of the appropriate crew or core complement requirements, it is unlikely that a “crew” with no persons on board would comply with s 2.3 of Part E; for having no on board crew would likely mean the vessel could not satisfy all of the requirements of that section.

However, there is capacity for AMSA under s 143 of the *National Law* to grant both specific and general exemptions from the *National Law* and to impose conditions on such exemptions. This may be a means through which unmanned vessels could be permitted to operate without any on board crew.

Navigation Act

The *Navigation Act 2012* (Cth) imposes manning requirements²⁹ for “Australian regulated vessels”.³⁰

²⁶ *National Standard for Commercial Vessels* Pt E sch 2 s 6(7).

²⁷ *National Standard for Commercial Vessels* Pt E sch 2 s 6(9).

²⁸ *National Standard for Commercial Vessels* Pt E sch 2 s 6(11).

²⁹ See *Navigation Act 2012* (Cth) Ch 2 Pt 4.

³⁰ *Navigation Act 2012* (Cth) s 50.

Section 51 is entitled “Minimum complement of seafarers on vessels”. It provides, in s 51(1), that “AMSA may determine in writing that a vessel or a vessel included in a class of vessels, must carry:

- a) a master who holds a specified seafarer certificate; and
- b) not less than:
 - i) a specified number of officers who hold specified seafarer certificates; and
 - ii) a specified number of seafarers who hold specified seafarer certificates.”

Section 51(2) requires AMSA to have regard to any matters prescribed by the regulations in making a determination under s 51(1).

Although s 51 is directed to giving AMSA a power to make a determination, it appears to contemplate that there is a “minimum complement” of seafarers for a vessel. AMSA has a discretion to specify the number of officers and crew, but states that the determination is to state that the vessel “must carry” as master, at least. While there appears to be scope in s 51(1) to specify that there can be no officers or crew at all, the provision is expressed as if there must be a master.

It is conceivable that AMSA could not make a determination in respect of an unmanned vessel. The offence for operating a vessel other than in accordance with a determination as to the minimum complement only arises if one is in force.³¹ However, s 51(2) could also allow AMSA to develop regulations relating to determinations for unmanned vessels and to issue determination on that basis.

Thus, it is possible that AMSA has capacity under the *Navigation Act*, or at least when supported by appropriate regulations, to determine in respect of an unmanned ship that it does not have to have any seafarers actually on board.

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 control 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?

Australia

It is possible that an equivalent shore-based facility, if appropriately designed, could satisfy the requirements of Chapter V of Regulation 15 of SOLAS as implemented in Australian law, although the current regulatory framework is not so directed and instead contemplates the bridge being physically situated on board, with crew also on board.

National Law

Bridge design is dealt with through the requirement for a domestic commercial vessel to be surveyed and to have a certificate of survey.³² Under s 38, AMSA may issue a

³¹ *Navigation Act 2012* (Cth) s 52.

³² *National Law Pt 4 Div 2* and see ss 43-46.

certificate of survey if satisfied that the vessel has been surveyed in accordance with the regulations.

Marine Order 503 (Certificates of survey – national law) 2013 (Cth) requires a new vessel to comply with certain standards in order for a certificate of survey to be issued, including the *National Standard for Commercial Vessels*.³³ Section 1 of Part C of the National Standard provides in Ch 2 for certain “required outcomes” for “operating stations” which are described as “minimum requirements”.

These are:³⁴

- Perception and situational awareness:
 - A vessel must be arranged to ensure that the person operating the vessel has sufficient information to identify navigational hazards, assess the risks and take appropriate measures to control the risks in both normal and abnormal conditions of operation.
- Compliance with COLREGS:
 - A vessel must be arranged to enable the person operating the vessel to comply at all times with the person’s obligations under COLREGS.
- Human factors:
 - A vessel must be arranged to eliminate or reduce to acceptable levels the risk of operator error or fatigue arising due to the design and arrangement of the operating station.

The National Standard also requires a vessel to have “at least 1 operating station” that complies with specified criteria relating to the view from, and of, the vessel, from that station.³⁵

The entirety of the National Standard is centred around crew being on board the vessel and the bridge being designed so that it is located on the vessel itself. However, it is possible that the “required outcomes”, and lookout specifications, could be achieved through a remote shore based station provided that technology was effective to allow sufficient situational awareness and compliance with the COLREGS (see section 4 below). The National Standard provides a number of detailed specifications and appropriate design of a remotely operated bridge could potentially meet these requirements.

It should also be noted that AMSA’s power to grant exemptions under s 143 of the *National Law* may also be relevant here.

Navigation Act

³³ See *Marine Order 503 (Certificates of survey – national law) 2013* (Cth) r 8.

³⁴ *National Standard for Commercial Vessels* Pt C Section 1 Ch 2 cll 2.3-2.5.

³⁵ *National Standard for Commercial Vessels* Pt C Section 1 Ch 2 cl 2.11.

Marine Order 31 (Vessel surveys and certification) 2015 (Cth), made under the *Navigation Act*, requires an Australian regulated vessel to hold various “SOLAS certificates”³⁶ if they are a vessel to which SOLAS applies.³⁷

The criteria for issue of these certificates require compliance with SOLAS,³⁸ and require a vessel to be surveyed for compliance with SOLAS. This would include compliance with Regulation 15 of Chapter V.

The same analysis as in the discussion of the *National Law* would apply. It is clear that the Regulation contemplates design of a bridge for use by crew on board the vessel. However, it is likely possible that technology could allow for an onshore bridge for remote controllers that was consistent with the visual and situational awareness requirements prescribed by Regulation 15 of Chapter V of SOLAS.

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)?

Australia

It is possible that a remote controlled unmanned ship could use the fact that it has no on board crew as an excuse for not complying with the obligation to render assistance as enacted in Australian law. The obligation is unlikely to apply under Australian law to a wholly autonomous unmanned ship.

Both the *Navigation Act* and *National Law* impose obligations to render assistance upon masters of vessels.³⁹

Under s 85 of the *National Law*, a master of a domestic commercial vessel commits an offence if:

- a) The master is in any waters; and
- b) The master has reason to believe that one or more persons are in distress on a vessel or in any waters; and
- c) The master does not both:
 - i) cause his or her vessel to proceed as fast as practicable to the assistance of the person or persons; and
 - ii) inform the person or persons that the master is doing so.

Section 181 of the *Navigation Act* is in effectively the same terms for the purposes of this questionnaire:

- a) The master is at sea; and

³⁶ *Marine Order 31 (Vessel surveys and certification) 2015* (Cth). These apply to a regulated Australian vessel or certain foreign vessels: O 6 and Div 2.

³⁷ *Marine Order 31 (Vessel surveys and certification) 2015* (Cth) sch 3 provides a separate survey regime for vessels that are non-SOLAS vessels.

³⁸ *Marine Order 31 (Vessel surveys and certification) 2015* (Cth) O 15 and sch 1.

³⁹ Provisions dealing with the obligation to render assistance are contained in Ch 6 Pt 4 Div 2 of the *Navigation Act 2012* (Cth) (in respect of regulated Australian vessels, foreign vessels and domestic commercial vessels to the extent that the *National Law* does not apply) and Pt 5 of the *National Law* (in respect of domestic commercial vessels).

- b) The master has reason to believe that one or more persons are in distress on a vessel at sea; and
- c) The master does not both:
 - i) cause his or her vessel to proceed as fast as practicable to the assistance of the person or persons; and
 - ii) inform the person or persons that the master is doing so.

The master commits an offence if he or she contravenes these sections.⁴⁰

Both s 85 of the *National Law* and s 181 of the *Navigation Act* provide that the master does not breach the obligation to render assistance if:⁴¹

- a) the master is unable to comply;
- b) in the special circumstances of the case, it is unreasonable or unnecessary for the master to do so;
- c) the master of the vessel is informed by the person or persons in distress, or by the master of another vessel, that assistance is no longer necessary; or
- d) the master is informed that another vessel has been requisitioned and is complying with the requisition.

There are several threshold issues for determining whether an unmanned ship could invoke the lack of an on board crew as a reason for failing to provide assistance. First, the unmanned ship must be a vessel to which the *National Law* or *Navigation Act* applies (see response to 1.1 above). Secondly, the obligations are directed to the “master” of the vessel. As noted in the response to 1.4 above, there are uncertainties as to who is the master of an unmanned ship. However, it would appear that the remote controller of a remote controlled unmanned ship could be considered to be its master. In the case of a wholly autonomous unmanned ship, the obligations under s 85 or s 181 likely do not arise as there is no “master” within the meaning of the legislation.

If the obligations do apply, which is most likely in respect of a remote controlled vessel, the unmanned ship may be excused from the obligation as it does not apply if the master is unable to comply or, if in the special circumstances of the case, it is unnecessary or unreasonable for the master to render assistance. These exemptions could apply in the case of a remote controlled unmanned ship as the vessel would, conceivably, not be able to render assistance. Similarly, it could be said that it would be unnecessary or unreasonable to impose a requirement for the vessel to be directed to proceed as fast as practicable to the persons in distress as an unmanned ship could not actually render assistance once there.

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

Australia

Under the *Navigation Act*,⁴² r 9 of *Marine Order 30 (Prevention of Collisions) 2016* applies the text of the COLREGs under Australian law and requires their observance.

Section 175 of the *Navigation Act* applies the COLREGs to both regulated Australian vessels and domestic commercial vessels. However, s 12 of the *Navigation Act 2012*

⁴⁰ *National Law* s 85(1); *Navigation Act 2012* (Cth) s 181(3).

⁴¹ *National Law* s 85(2); *Navigation Act 2012* (Cth) s 181(2).

⁴² *Navigation Act 2012* (Cth) ss 175, 176 and 340.

(Cth) has the effect that in States or Territories of Australia that have their own enactment of the COLREGs then that legislation may apply to domestic commercial vessels that are located up to 3nm or 12nm from the coast (depending on the particular State or Territory legislation). For the purposes of this questionnaire, the Commonwealth provisions will be relied upon.

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?

Australia

Although uncertain, it is possible that it would not be contrary to the principle of good seamanship merely to operate an unmanned ship by remote control. Whether the principle would be contravened would appear to depend upon the sophistication of the remote control system.

Rule 2(a) of the COLREGS requires the text of the COLREGS to yield to the “ordinary practice of seamen or “the special circumstances of the case” or any “special circumstances” while Rule 2(b) states that “due shall be had to ... any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger”.

There is English case law (which is likely to be followed in Australia) indicating that this principle of “good seamanship” requires sufficient crew to be present on board the vessel,⁴³ with the officer in charge on deck.⁴⁴ This would appear to suggest an unmanned ship that is remotely controlled would be inconsistent with the principle, though this case law did develop before the existence of any unmanned vessels.

It is arguable that the principle of “good seamanship” could be satisfied if a remote controller of an unmanned ship had sufficient ability to keep a lookout and take action to navigate the vessel as if he or she were actually on board the ship. It would depend on the level of control provided over the vessel and the situational awareness provided by the remote control system.

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?

Australia

It is likely that autonomous operation of an unmanned ship without any on-board personnel or any human supervision would be contrary to the principle of “good seamanship” under Rule 2 of the COLREGS.

The principle of “good seamanship” emphasises the importance of human experience and judgment in the operation of a vessel, and the adaptability of response provided by good seamanship. Whether an autonomous vessel would be able to reach this level of

⁴³ See, eg. *The Murdoch* [1953] 2 Lloyd’s Rep 433(EW Adm) at 440.

⁴⁴ *The Arthur Gordon, The Independence* (1861) Lush 270 (EW Adm); *The Voorwarts and Khedive* (1880) App Cas 876 (UKHL).

adaptive judgment would depend on the sophistication of its artificial intelligence. It seems unlikely, given the present state of knowledge, that such a vessel would be capable of reaching that level of 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 sensing equipment fixed to the ship transmitting the ship’s vicinity to those “navigating” the ship from the shore?

Australia

It is possible, though there is uncertainty, that a remote controlled unmanned ship could satisfy the requirements of COLREG Rule 5. However, it is highly unlikely that a wholly autonomous unmanned ship would satisfy Rule 5.

The requirement to keep a “proper lookout” includes keeping a visual and aural lookout⁴⁵ and the use of radar.⁴⁶ This aspect of Rule 5 could likely be satisfied by appropriately sophisticated sensing and transmitting equipment in respect of a remote controlled unmanned ship.

However, a proper lookout also requires those in command of the vessel to be able to have “an appreciation of what is taking place” and the situation the vessel and vessels around it are placed in, based on the visual and other readings.⁴⁷ The lookout required depends on the circumstances.⁴⁸

Rule 5 may be satisfied in respect of a remote controlled vessel, if the sensing and transmission equipment was sufficient to enable an appraisal of the information received in a similar manner to that available if the controller was on board. This will depend on the individual remote control system.

However, it is unlikely that a wholly autonomous unmanned ship could comply with Rule 5. It would depend on the sophistication of its artificial intelligence, although the technology is unlikely at present to provide as equivalent spatial awareness and appreciation of the vessel’s position as that of a human actor on board.

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?

Australia

An unmanned ship is unlikely to constitute a “vessel not under command” for the purposes of COLREG Rule 3(f) and Rule 18.

COLREG Rule 3(f) provides that a “vessel not under command” is “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”. Rule 18

⁴⁵ *The Esso Wandsworth* [1970] 2 Lloyd’s Rep 303 (EW Adm); *The Arietta* and *The Anneliese* [1970] 1 Lloyd’s Rep 355 (EWCA); *The Miguel de Larrinaga* [1956] 2 Lloyd’s Rep 530 (EW Adm).

⁴⁶ See, eg. *The Antares II and Victory* [1996] 2 Lloyd’s Rep 482 (EW Adm).

⁴⁷ *The Santander* [1966] 2 Lloyd’s Rep 77 (EW Adm); *The Golden Polydinos* [1993] 2 Lloyd’s Rep 464 (EW Adm); *The Queen Mary* [1996] 2 Lloyd’s Rep 482 (EW Adm).

⁴⁸ *The Century Dawn and Asian Energy* [1994] 1 Lloyd’s Rep 138 (EW Adm).

provides for the responsibilities of other vessels when dealing with a “vessel not under command”.

The phrase “not under command” refers to a vessel that is not able to navigate, steer or move in its proper manner of operation,⁴⁹ and, as the text of Rule 3(f) indicates, requires “some exceptional circumstance”. It is directed to vessels that, due to some fault, are unable to navigate.

Thus, it appears unlikely that an unmanned ship would be a “vessel not under command” solely by virtue of being unmanned. A remote controlled vessel would likely be able to navigate sufficiently to be outside Rule 3(f). Whether an autonomous would be able to manoeuvre sufficiently would depend on the sophistication of its artificial intelligence, and so there is some more uncertainty there.

However, as Rule 3(f) requires the vessel to be unable to manoeuvre “by some exceptional circumstance”, this would suggest unmanned ships would not be within Rule 3(f). It contemplates some sort of fault to the vessel, not an aspect of its design as in the case of an unmanned ship.

5 THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING, 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?

Australia

There is significant doubt about whether the STCW Convention would apply to a remotely controlled unmanned ship.

Art III of the STCW Convention states that it applies to “seafarers serving on board seagoing ships entitled to fly the flag of a Party”.⁵⁰ As it is stated to apply to “seafarers serving on board”, this suggests that it does not apply in relation to a vessel with no crew on board.

Secondly, the seafarers must be on “seagoing ships entitled to fly the flag of a Party”. This means that it must also be established that the vessel is one which would be entitled to registration under domestic law.⁵¹ This would require compliance with the *Shipping Registration Act 1981* definition of a “ship” (see 1.2 above).

This direct issue of applicability of the STCW Convention aside, many aspects of the STCW Convention and STCW Code are applied by Australian law (for example, the watchkeeping requirements discussed in the response to 5.2 below). Section 340 of the *Navigation Act 2012* (Cth) and r 5 of *Marine Order 28 (Operations standards and procedures) 2015* (Cth) apply these to regulated Australian vessels and certain foreign vessels in an Australian port, entering or leaving an Australian port, in the internal waters of Australia or in the territorial sea of Australia. Thus, in the Australian domestic

⁴⁹ See discussion in *Marsden and Gault, Collisions at Sea* (Sweet & Maxwell 2016) at [5-150]-[5-156], citing, inter alia, *The P Caland* [1893] AC 207 (UKHL); *SS Mendip Range v Radcliffe* [1921] 1 AC 556 (UKHL). Again, it is likely that such decisions would be followed in Australia.

⁵⁰ STCW Convention Art III.

⁵¹ See E Brown and NJJ Gaskell, *The Operation of Autonomous Underwater Vehicles*, Vol 2: Report on the Law (Society of Underwater Technology, 2002) at 122.

context whether the remotely controlled unmanned ship is a “regulated Australian vessel” or “foreign vessel” under the *Navigation Act* (see 1.1 above) would be critical to whether the obligations under the STCW Convention apply as a matter of Australian law.

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?)

Australia

No, it seems that the STCW requirement that the watchkeeping officers are physically present on the bridge and in the engine control room cannot be satisfied where the ship is remotely controlled. There are several reason for This.

Australian law provides that the master, chief engineer or “any other person involved in watchkeeping duties” on a vessel (being a regulated Australian vessel or certain foreign vessels)⁵² “must comply with each requirement of Section A-VIII/2 of the STCW Code that applies to the person ...”.⁵³

The first issue in terms of a remotely controlled unmanned vessel is that a remote controller may not be considered the master under Australian law, though it is possible (see 1.4 above). A similar issue may exist with the definition of “chief engineer”. The definition in r 4 of *Marine Order 28 (Operations standards and procedures)* adopts the definition in Regulation I/1 of the STCW Convention which refers to “...the senior engineer officer, responsible for the mechanical propulsion of the ship”. This wording might be less likely to require that the chief officer must be physically present on board.

However, the STCW watchkeeping obligations themselves, if they do apply, are likely to require the presence of these officers on board. It would not appear that, if these obligations are applicable, they could be satisfied, on their current text, by a remotely controlled vessel.

If there was a vessel with significantly reduced manning, then there is no doubt that the STCW watchkeeping requirements would apply as there would be seafarers on board. Whether the requirements could be met would depend on the detail of those requirements, and the number of crew actually on board.

The STCW Watchkeeping requirements are not addressed by the *National Law*.

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?

⁵² See *Marine Order 28 (Operations standards and procedures) 2015 (Cth)* r 5.

⁵³ *Marine Order 28 (Operations standards and procedures) 2015 (Cth)* r 17(1).

Australia

The ship owner would likely be liable to those harmed by the damage. The ship owner may then be able to make a claim against the manufacturers of the autonomous system under general tort or contract law principles. It is possible that the victims may also be able to bring a claim in tort against the manufacturer of the autonomous system.

Fault on the part of the manufacturer, or breach of contract, would generally need to be established under the general law.

A manufacturer of a computerised navigation system may also be strictly liable (that is, liable without proof of fault) under the *Australian Consumer Law*.⁵⁴ where a “safety defect” in that system causes injury.⁵⁵ “This product liability provision applies to “goods” supplied in “trade or commerce”. A computerised system could be “goods” within the meaning of the provision.⁵⁶ “Goods” include “ships” and include “any component part of, or accessory to, goods”.⁵⁷ Computer software is also expressly included in the definition of “goods” and so it appears that a computerised navigation system could be considered “goods”. A “safety defect” if the safety of goods is “not such as persons generally are entitled to expect”.⁵⁸ It is possible that a problem in an autonomous system could lead to a situation that would be considered a “safety defect”. This action is not restricted to consumers or consumer products and so could potentially apply to an unmanned commercial vessel. Thus, in respect of personal injury, strict liability may apply against a manufacturer of a computerised navigation system. In certain circumstances, an action may also be brought against an importer, person who holds themselves out as the manufacturer, or a person who allows their branding or name to be applied to the goods.⁵⁹ However, this regime would not apply to a ship owner, as it would not appear to be a “manufacturer” though it may be possible a ship owner could be considered as such if it collaborated on the design of the software or imported the autonomous system.⁶⁰

In respect of property damage or economic loss under the general law, it is possible that proportionate liability may apply under legislation enacted in many Australian jurisdictions.⁶¹

By way of example, under s 34(2) of the *Civil Liability Act 2002* (NSW), where there are concurrent wrongdoers whose acts or omissions have independently or jointly caused loss then s 35 provides that the liability of “a defendant who is a concurrent

⁵⁴ Part 3-5 Div 1 of the *Australian Consumer Law* is “Actions against manufacturers for goods with safety defects”. The *Australian Consumer Law* is Sch 2 to the *Competition and Consumer Act 2010* (Cth).

⁵⁵ *Australian Consumer Law* s 138.

⁵⁶ “Goods” include “ships” and include “any component part of, or accessory to, goods”. Computer software is also expressly included in the definition of “goods”: *Australian Consumer Law* s 2.

⁵⁷ *Australian Consumer Law* s 2.

⁵⁸ *Australian Consumer Law* s 9(1),

⁵⁹ See *Australian Consumer Law* s 7.

⁶⁰ See *Australian Consumer Law* s 7.

⁶¹ See, eg. *Civil Liability Act 2002* (NSW) Pt 4, esp s 34(1)(a): a claim arising out of personal injury is excluded and so proportionate liability would only apply for property or economic loss. The applicability of particular State proportionate liability legislation would depend upon the geographical location of the collision. This regime is distinct from that under the *Navigation Act 2012* (Cth) and the *Navigation Regulations 2013* (Cth) rr 14, 15 which applies a system of proportionate liability to collisions between vessels (based on the Collision Convention 1910). Such provisions may be applicable to determining the proportion of liability between ship owners, but would not apply to the liability of the manufacturer of an autonomous system.

wrongdoer in relation to that claim is limited to an amount reflecting that proportion of the damage or loss claimed that the court considers just having regard to the extent of the defendant's responsibility for the damage or loss ...”

It is conceivable that a ship owner and manufacturer of an autonomous system could be considered to be concurrent wrongdoers where the system has led to the collision. This would allow the court to apportion liability between ship owner and manufacturer to an amount it considers just, having regard to the extent of the manufacturer’s responsibility.

Otherwise, liability under the general law would be joint and several, with a potential capability for the ship owner to claim against the manufacturer. Liability under Part 3-5 Div 1 of the *Australian Consumer Law* for manufacturers is also joint and several.

It should also be noted that the shipowner would likely be able to limit its liability for any damage caused under the LLMC 1996 as applied in Australia.⁶²

6.2 Arts 3 and 4 of the 1910 Collision Convention provided 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 non-fault (i.e. strict) liability (for e.g. unmanned ships) at a national level?

Australia

No, liability for a collision under Australia law is fault based.⁶³ Breach of the COLREGS is not conclusive proof of negligence for civil liability purposes under Australian law.⁶⁴ A judgment must be made regarding the vessel’s conduct as against the standard of a reasonable seafarer, taking into account the COLREGS as a consideration but noting that they do not set the standard of conduct.⁶⁵

Imposition of strict liability for unmanned ships would almost certainly require specific legislative intervention.

⁶² See *Limitation of Liability for Maritime Claims Act 1989* (Cth).

⁶³ See eg *Podmore v Aquatours Pty Ltd* [1984] 1 NSWLR 111.

⁶⁴ Though contravention of the COLREGS is an offence: see *Navigation Act 2012* (Cth) ss 177, 178.

⁶⁵ See *Podmore v Aquatours Pty Ltd* [1984] 1 NSWLR 111.