

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?

According to Article 136 of the Italian Code of Navigation, a ship is “whatever construction meant for transportation by water, also for the purpose of towage, fishing, leisure activity or other employments”.

The aforesaid definition of ship does not bear any limitations related to the gross tonnage of the vessel or to the way in which she is manned.

Therefore, any watercraft capable of undertaking navigation, irrespectively of its gross tonnage and of the particular intended use, would be considered to be a ship according to Italian national law, even if it is controlled remotely by radio communication or by a computerised collision avoidance system without any human supervision.

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

Article 146 of the Italian Code of Navigation distinguishes the requirements and procedures for registration in respect of seagoing ships (so-called *navi maggiori*) and vessels devoted to near-costal and inland navigation and/or to port services (*navi minori*).

Prerequisite for the registration of a vessel in any of those two registers is that the ship meets the requirements of identification and of nationality provided for at Articles 137 et seq. of the same Code of Navigation.

Although there is no rule of law that expressly requires to hold a crew on board the vessel in order to be eligible for registration, there are a number of provisions that seem to imply such requirement.

For instance, according to Article 303, *para 2*, of the Executive Regulation of the Code of Navigation, the shipowner, in order to obtain the registration of the vessel, must submit an application to the competent authority, to which he has to enclose the relevant documentation concerning the technical characteristics of the ship, the equipment and the lodgings reserved to the crew: it appears evident that such documentation requirements are unlikely to be satisfied in respect of a ship which is designed and built for unmanned operation.

Moreover, if the vessel is built abroad or is coming from a foreign flag/registry, in order to be registered in Italy, according to Article 315 of the Executive Regulation of the Code of Navigation, the Consular Authority must also send to the Ministry of Transports a certified copy of the provisional pass for the so called *navi maggiori (passavanti provvisorio)* or of the temporary license for the *navi minori (licenza provvisoria)*, issued as per Article 149 of the Code of Navigation. Pursuant to Articles 333 and 334 of the same Executive Regulation of the Code of Navigation, if the ship does not have a crew list, the provisional pass, and, in any case, the provisional license must contain the record of the seafarers, along with the indication of their respective employment contracts, as well as that of their professional titles, duties onboard and salaries. Under this regulation, it would therefore seem not possible for an unmanned ship built abroad or coming from a foreign register to obtain registration in Italy.

Finally, it must be considered that a ship that trades exclusively on international routes can be registered in the so-called International Register instituted by Law No. 30 of 27th February 1998. However, the same law, at Article 2, expressly establishes specific compulsory requisites that the ships enrolled in the International Register must have, in terms of minimum number of crew members, their qualifications and their functions and duties onboard. Being not able to meet such requirements, it is submitted that, as against this legal framework, an unmanned vessel would not be eligible for enrolment in such register.

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?

As outlined above, Article 136 of the Italian Code of Navigations bears a general legal definition of what a ship is. Such notion is based on the requirement of being technically fit to undertake navigation (i.e. being a floating craft autonomously propelled): any structure that does not satisfy these characteristics would not be considered to be a ship for the purposes of our domestic legal system.

In compliance with such legal definition, under Italian law, it is arguable that it would not be possible for a governmental body or authority to declare any “structure” to be a “ship” when it does not have these characteristics and it is not such by its own nature.

Only by virtue of an appropriate law provision, it might be possible to assimilate the former to the latter.

To this extent, for instance, it could be noted that, according to *para* 3 of Article 136 of the Italian Code of Navigation, absent any specific express provision to the contrary, the legal discipline regarding ships applies also to “mobile floating structures deputed to whatever service concerning the navigation as well as deep or inland water traffic”.

Another example of this kind of legal assimilation may be found at Article 9, *para* 1 of the Decree of the President of the Republic No. 886 of 24th May 1979, according to which auto-propulsive platforms during navigation are assimilated to ships and, as such, they are subjected to the Code of Navigation and to its Executive Regulation.

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?

A comprehensive response to these issues would require the previous identification of the notion of “master” in order to assess whether the above mentioned personnel that might be involved in the operation of an unmanned vessel can be considered as such according to Italian national law.

To this regard, it must however be noted that the Italian Code of Navigation does not bear a specific legal definition of “master”, whereas it envisages an extensive regulation of his powers, duties and obligations.

As against this legal background, the notion of “master” needs inevitably to be drawn from the actual content of the functions and duties that the law attributes to him, which are listed at Articles 292, et seqq., of the Code of Navigation. It is submitted that, since all such provisions were drafted on the assumption of the physical presence of the master on board the vessel at any stage during the navigation, they would be difficult to reconcile with the idea of any sort of land-based operator of an unmanned vessel vesting the role of ship’s master.

As the fundamental function of the master is the steering of the vessel during navigation, to this extent it might be possible to consider the on-shore remote-controller of the ship as such. On the contrary, this would not be possible in respect of the different figures listed above (i.e. the chief pre-programmer of an autonomous ship or any person who is responsible of the operation of the ship only on paper) as those persons would not be actually involved in the direction of the manoeuvre of the ship during navigation.

It must however be noted that, other than the steering of the vessel, there are a number of other key duties and prerogatives of the master envisaged and regulated by the provisions of the Code of Navigation that do not seem to be compatible with the position of an on-shore operator of an unmanned ship.

By way of mere example, the following can be considered:

- (i) the obligation borne by the master to personally check and ascertain, before sailing, that the vessel is seaworthy, fit for navigation and properly manned and equipped, as well as adequately loaded and stowed, provided for at Article 297 of the Italian Code of Navigation;
- (ii) the master’s duty to take care that, during the voyage, the prescribed documents related to the ship, crew, passengers and cargo are onboard and to secure that the logbooks are regularly held, as required by Article 299 of the Code of Navigation;
- (iii) the duty of the master to use his best endeavors in order to assure the safety of the marine adventure, also by way of taking the general average acts that might be necessary, as per Article 302 of the Code of Navigation.

Such essential duties and functions that the current legal discipline expressly imposes on the master imply the physical presence of the same on board the vessel, and, therefore, appear not to be extensible to shore-based personnel even if actually involved in operating an unmanned ship during navigation, as in the case of the chief on-shore remote-controller of the same.

Besides these aspects, it must also be considered that, in the current legal framework, the appointment of the ship’s master is linked to specific professional titles and career requirements that he must hold; such requisites, being related to the seafaring

experience of the same, would probably be inappropriate or insufficient in respect of the position of the remote-controller of an unmanned vessel. It is therefore suggested that the current rules of law dealing with the employment of the ship's master could constitute an obstacle in considering a remote-controller of an unmanned vessel as a proper ship's master, so that they would need to be appropriately amended/adapted in order to facilitate such equivalence to be drawn.

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

Similarly to what outlined in respect of the position of the master, in the response to the question at *para* 1.4 above, the Italian legal discipline concerning the crew of the ship (provided for at Articles 316, et seqq., of the Code of Navigation) is grounded on the assumption that the crew is located and operates on board the vessel.

In this context, only seafarers actually embarked on the ship would be considered to be members of the crew.

Therefore, the personnel based on-shore involved in the control operation of the unmanned vessel would not constitute the "crew" of the same for the purposes of Italian national law.

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?

UNCLOS was implemented into Italian law through the adoption of Law No. 689 of 2 December 1994, which also contained the Parliamentary authorization to the President of the Italian Republic to deposit with the United Nations the relevant instrument of ratification.

The individual provisions of UNCLOS, according to the so-called "special" method of adaptation of national law to international law, have not been recast. As a consequence, Italian courts will tend to look at UNCLOS itself directly when resolving law of the sea disputes governed by the Convention. A non-official translation into Italian of UNCLOS has been appended to Law No. 689/1994 to that effect.

Foreseeable problems in treating unmanned ships as "vessels" or "ships" under UNCLOS will therefore depend on two different factors: (a) the inherent (in)adequacy of UNCLOS itself to deal with the matter; (b) possible inconsistencies with the definition of "ships" to be found in Italian law.

The first scenario is discussed below, under 2.2., whilst the second concern is the subject of a separate answer to Question 1.

2.2. Paragraphs (3) and (4) of UNCCOS 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?

As a preliminary point, it has to be noted that UNCLOS does not provide any definition of "vessel" or "ships" and the two terms are, broadly speaking, used interchangeably.

The difficulties in applying vessel-related UNCLOS provisions to unmanned ships are made clear by the wording contained in Article 94, paras. (3) and (4) but also (2), UNCLOS, which refer, inter alia:

- to the duty of contracting States to "assume jurisdiction under its internal law over each ship flying its flag **and its master, officers and crew** in respect of administrative, technical and **social** matters concerning the ship" (para. 2);
- to the duty of contracting States to "take such measures for ships flying [their] flag as are necessary to ensure safety at sea with regard, inter alia, to ... (b) the **manning**

of ships, labour conditions and the training of crews" (para. 3);

- to the duty of contracting States "to ensure (a) that each ship ... has on board such charts, **nautical publications** and navigational equipment and instruments as are appropriate for the safe navigation of the ship; (b) that **each ship is in the charge of a master and officers who possess 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" (para. 4.).

Highlighted in bold are those elements of Article 94 which make it ill-suited to govern matters arising out of unmanned vessels, but similar conclusions can be drawn also on the basis of other UNCLOS provisions, including:

- Article 98, para. 1, which extensively refers to the role of the **master** of a ship in terms of safety obligations;
- Article 111 on hot pursuit, which refers to "**visual or auditory signal** to stop" to be "**heard by the foreign ship**".

Several possible interpretative approaches appear to be available in this respect:

(a) on the one hand, one could argue that its content makes it clear that UNCLOS implies a notion of vessel that excludes unmanned vessels.

(b) on the other hand, it could also be argued that a flexible/evolutionary interpretation method has to be preferred and that as a consequence the various duties set out above have to be construed in a way that takes into account the peculiarities of unmanned vessels. Thus, the master, officers and crew may, in these particular circumstances, be – for example – located on shore. To give another example, the relevant qualifications for the manning of a ... unmanned vessel will surely be different from those that are usually required.

For the sake of certainty, and given the peculiar challenges that unmanned vessels may pose in terms of, e.g., safety of navigation, security and environmental protection, it would be preferable to have the issue addressed by an adequate normative/regulatory intervention.

It can be argued that IMO measures would be the best option to go about that for a number of reasons, including: (i) IMO's expertise in the area and its mandate to deal with safety, security and environmental protection; (ii) the possibility to tackle the problem at a technical (rather than political) level; (iii) the relative promptness of IMO's action and the possibility for any measure adopted by it to become a term of reference for UNCLOS once it becomes "generally accepted"; (iv) the impact that this would have not only in the interpretation and application of UNCLOS but also in the interpretation and application of technical international conventions managed by the IMO.

The possible alternative of embarking into the negotiation of a new international treaty, to some extent supplemental to UNCLOS, to deal with unmanned vessels appears less attractive mainly because of the tiny chance of success that such endeavour would have.

To be sure, action at IMO level would in any event not solve all problems related to unmanned ships. To mention two examples only, the question of the definition of unmanned ships under international law in general would clearly fall outside the scope of the mandate of IMO as well as the use of unmanned ships for military purposes.

Addendum on European Union law

The matter has been also considered at a EU level, especially in the context of projects and policy papers.

The EU-funded MUNIN (*Maritime unmanned navigation through intelligence in networks*) Project, for example, has developed an analysis concerning the operation of unmanned merchant ships and assessed their technical, economic and legal feasibility.

As far as the legal point of view is concerned, it has been pointed out that unmanned ships do not pose an insurmountable obstacle and that the main issue will concern the attribution of the existing masters' duties to the relevant and adequate persons involved in the operation of an unmanned ship (namely the *Shore Control Centre*).

According to the Project's results, the overall architecture of International Law of the Sea concerning the respective roles of flag, coastal and port States should not need any relevant modifications to facilitate the operation of an unmanned ship and therefore the unmanned ship would be registered under a flag State, being capable of following the general rules of (traditional) International Law of the Sea. Anyway, a significant number of technical standards currently set out under existing conventions would have to be modified. For example, many of the equipment standards under SOLAS.

The automation in all waterborne operations, and in particular in short sea trades and in inland navigation, has been included in the Horizon 2020 Work Programme 2016-2017 with the declared aim of assessing the cost-benefits and the impact of automation on the transports carried out on water.

There is no general definition of "vessel" or "ship" under EU law; therefore the difficulties in applying the EU provisions to "unmanned vessels" will depend on the possibility to construe a definition of "vessel" and "ship" that may include the "unmanned ships" and the "unmanned vessel" save for some inevitable legal modifications considering the technical and manning peculiarities of such vessels. This approach seems preferred by the EU so far.

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?

In relation to the Regulation 14 of Chapter V of SOLAS as amended (implemented by Law 23 May 1980 No. 313), Italy issued domestic rules on the determination of minimum safe manning levels, which are in line with the required standards. They take also into account the IMO Resolution A. 890 (21) "*Principles of Safe Manning*" (1999) as amended.

The basic principles of Safe Manning are also enshrined in Article 201 of the Decree of the President of Republic (D.P.R.) 8 November 1991, no. 435 “(Regulation on Navigation and Human Safety at Sea) which, implementing Art. 317 of the Royal Decree No 327 of 30 March 1942“Codice della Navigazione” and the related Art. 426 of its Executive Regulation, state that the ship crew has to be qualitatively and quantitatively apt to deploy all the board activities.

Furthermore, more specific Guidelines are contained in the Ministry and Infrastructure Circular Letter dated 20.10.2010 on Minimum Safe Manning.

In line with the international rules, the Italian legislation sets standards on safe manning bearing in mind the type of the manned vessels only (being them the only existing at the time when it was issued).

So, at the time being, according to the applicable existing law, it seems hard to affirm that the relevant authority has the discretion to allow unmanned operation if satisfied as to its safety, in the light of the requirement related to safe manning.

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?

The principles on bridge design enshrined in Regulation 15 of SOLAS Chapter V are mainly aimed at minimizing the risk of human error and detecting such error if it occurs.

At the time being, manned vessels are becoming increasingly automated, so that the role of the watch officer is evolving. It is becoming more and more featured by monitoring functions only. Such automation of navigation diminishes the difference between an unmanned marine vehicle and a manned vessel with a monitoring watch officer.

So, due to the use of sensors and the contemporary technology, including programmed algorithms, manned and unmanned vehicles might be equally maneuverable. The role of the bridge team including the watch officer is consequently resized.

Anyway the relevant rules about manning are still requiring the human control of the ship aboard.

So, in the light of the existing legal framework, it seems that the role of the human element on board cannot be substituted by an automated system, so that in so far as a bridge team has to deploy some monitoring activities on board, the principles relating to bridge design have to be implemented.

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 Royal Decree No 327 of 30 March 1942 "Codice della Navigazione", preceding the SOLAS Convention, provides for the obligation to provide assistance and rescue persons in distress at sea (Art. 69 and 489-490).

An unmanned vehicle is unlikely to be able to provide assistance in the sense of the existing rules, as they require some human actions, such as those related to the rescue of the persons in distress at sea, arising also from the 1979 International Convention on Maritime Search and Rescue (implemented by Italy by Law no. 147 of 03.04.1989 and the related executive regulation Decree of the President of Republic (D.P.R.) no. 662/ 1994).

Nevertheless, as any ship cannot but be obliged within its capabilities, it might be possible to interpret the norm in the sense that an unmanned vehicle has to comply with the obligation arising by Regulation 33 of SOLAS Chapter V in so far as it can. The ship and the remote controller have to undertake all the possible measures to comply with such obligation and proceed with all speed to provide assistance.

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?

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?

As in unmanned ships, the Master, officers and crew members are replaced by a shore-based remote controller, we have to define the principle of "good seamanship". According to Italian case law, the "ordinary practice of seaman" requires the Master, his officers and crew to manage and oversee the marine adventure to the best of their ability.

As Master, the remote controller has to handle the ship in a proper way and in order to do so he should have a range of skills such as good judgement, problem solving capacity, good knowledge of IT in addition to be a qualified seafarer, i.e. possess the skills required by "the ordinary practice of seaman".

The issue of 'remote' raises the question of whether the controller, despite technology, will be in a position to respond in real time to unforeseen events and act accordingly.

The operation of an unmanned ship, without any on board personnel but with a shore-based vessel controller complies broadly with the principle of "good seamanship" although it has to be stressed that the controller under current technology will not have the advantages of physically being on board.

The conclusion changes in the case of unmanned ships without a remote controller, where clearly the human skills, responses and judgments intrinsic to the principle of "good seamanship" are totally absent. No one controls what happens during the navigation and therefore no one applies the nautical skills referred to above. The tasks usually carried out by Master and his officers are performed by software technology.

Therefore currently unmanned ships without any human supervision do not comply with the current interpretation of the principle of "good seamanship".

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?

The concept of look-out as envisaged in the Rule n. 5 of the COLREGs differs from the concept of proper look-out as set out in the above question: "proper look-out" in the COLREG is linked with the presence of a human factor as sight and hearing are intrinsic element of the performing of the look-out, whilst in the scenario envisaged in the above question the human element will be maintained only through the so called internet of things, i.e. via cameras and aural censoring connected remotely to

those navigating the ship. One can try to argue that sight and hearing through cameras and aural censoring might comply with the requirement of a proper look-out, at least in ordinary circumstances. However, the lack of human presence on board of a ship, especially in situations when additional or reinforced look-out is required, makes difficult to argue that a situation of a “proper look out” can be achieved in circumstances where no humans are carrying out the visual and hearing services on board of the ship. The question is: how can additional and/or reinforced measures of look-out can be immediately implemented in a ship without crew present on board?

Italian Courts have scarcely interpreted the requirement of a “proper look-out” contained in Rule 5 of the COLREGs. Most of the few precedents available refer to maritime casualties involving pleasure vessels whereby the look-out was totally missing, as those conducting the pleasure vessels did so through an automatic pilot, without implementing any measure of look-out.

The decision of the Labour Court of Genoa of first instance dated 29 April 2015, dealing with the dismissal of the captain of the vessel “Costa Concordia”, as a result of the famous maritime casualty happened in 2012, indicated that among the requirements foreseen by Rule 5 of the COLREGs, read together with Chapter VIII, Section a-VIII/2 Part 4 of STCW Code, the radar must not substitute the visual look-out and that look-out is to be reinforced where the scenario so requires (that case was particularly referring to navigation in coastal waters). Therefore, the interpretation provided by the Italian Courts of Rule 5 of the COLREGs is still strictly tied with the concept of humans physically performing the visual and aural look-out on board of vessels.

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?

The definition of vessel not under command cannot apply to an unmanned ship. An Italian decision of the Supreme Court dated 6 October 1955 n. 2849 (hence referring to a previous version of the COLREGs) listed, among the situations that might trigger the definition of vessel not under command, a steering breakdown, average to the engine, loss of sails. Therefore, it can be considered a vessel not under command a vessel which in the course of navigation is not under command as a result of an exceptional circumstance, which is affecting her possibility to be governed.

An unmanned ship *ex se* can be governed and will be under full command (although those governing the vessel will not be on board). Therefore, it seems that an unmanned ship cannot fall under the definition of vessel not under command as per Rule 3 of the COLREGs *ex se*, but only if some special circumstances arise, making her not under command anymore. A failure of the IT system could be considered an exceptional circumstance. However, in such a case, the vessel not under command might not be in the position to use the required lights and shapes, enabling to signal to the other ships her status of being not under command.

It could be envisaged that a new definition, specifically tailored for unmanned vessel, might be inserted in the definition of privileged vessel foreseen under rule 18 of the COLREGs.

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?

IMO STCW 1978/1995, as amended by 2010 Manila Conference, was implemented in Italy by means of law n. 739 on November 21, 1985, as lastly amended by means of Legislative Decree n. 71/2015. Italian law implemented STCW provisions accordingly to their proper word and meaning and therefore currently there are not Italian provisions that allowed the application of the STCW Convention also to a remotely controlled unmanned ship.

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)?

According to a literal interpretation under national law, the requirement provided for by STCW provisions that watchkeeping officers should be physically present on the bridge and engine room control cannot be considered satisfied if the ship is remotely controlled, since the seafarer is not physically located on board. However, it has to be

pointed out that the position of the shore-based vessel controller is very much comparable to that of the officer of the watch who must navigate on ships with a significantly reduced manning or in poor visibility: in the first case manpower reductions should be approached through the insertion of technology for automation and in the latter case the officer is reliant on the radar.

Therefore the functional difference between an unmanned marine vehicle and a manned vessel with a significantly reduced manning and a monitoring watch officer is starting to fade. Indeed many ships are already equipped with automated navigational systems and auto-steering devices. When the command post of the shore-based vessel controller is laid out in the same manner as the bridge of a ship, unmanned navigation seems to be not so different from the conditions of modern manned navigation.

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?

To answer question 6.1, I believe it is important to distinguish between whether the malfunction of the system is caused by a system-defect or by a "hacking attack".

According to the applicable legislation, neither the ship-owner nor the IT provider of a adequately protected system (i.e. security keys) is liable for collision damage arising from a malfunction of the collision avoidance system due to a hacking attack because such an attack may be considered as unforeseeable and unavoidable and so qualify as a fortuitous event.

However, to avoid a situation where the damaged party alone bears the economic costs of the consequences of a hacking-attack induced collision, in my opinion it would be necessary to introduce a specific insurance coverage for these risks.

Instead, the apportionment of liability between the parties differs considerably when the malfunction of the system is due only to its defect. In this case, the conditions foreseen by D.lgs 206/2005, which rules the producers' liability, appear to exist. Consequently, the IT manufacturer would be liable. In fact, according to Art. 104 of

D.lgs 206/2005, the producer should place on the market only goods that are safe, so he is liable for any damage caused by the defective products offered for sale. Manufacturer liability under Italian law does not require the demonstration of the “fault” of the producer but is based only on the causal relationship between the damage and the defect of the good. Consequently, the manufacturer of a collision avoidance system will have to indemnify the damaged party for the costs arising from the malfunction of the system.

In the light of the above, the key question is: will the damaged party be able to claim directly against the manufacturer or will only the ship-owner will be able to act against the manufacturer? According to Italian case law, anyone damaged by a faulty product, whether a direct user or inadvertent bystanders, may make claim damages from the manufacturer. For example, a pedestrian hit by a car owing to a malfunction of the car's braking system may act against the manufacturer of the braking system. In the same way the ship-owner and the owner of the cargo damaged as a result of the collision may act against the producer of the avoidance collision system to obtain a refund of the economic loss suffered. Nevertheless, it should be pointed out that as long as unmanned ships are in an experimental phase, the producer might be exempted from any liability according to Art. 118 letter E, D.lgs 206/2005, states that “the producer may be exempted from any liability if the knowledge status existing when the good was placed on the market did not allow the producer to consider the product defective”.

What about the owner? Currently, it is unclear whether the grounds exist for ship-owners' liability for damage arising from the collision given that according to the collision avoidance rules currently in force it is not possible to identify owners' responsibility for system malfunction.

Nevertheless, I believe that the owner/carrier will be liable towards the cargo owner according to the HVR Art 3 in the event their ships are unseaworthy due to the malfunction of the IT system. Clearly, the owners/carriers cannot be held liable for damage due to the malfunction of the IT system where they are able to show their due diligence in making the ship seaworthy according to Art. 4 of the HVR.

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?

ABSTRACT

1910 Brussels Collision Convention and the Italian art. 484 c. nav. provide for a principle of imputation of the liability to the ship in fault, so that any ship in fault must compensate the damage suffered by the other ship in proportion to the degree of its fault. Although the navigation code refers to the «ship in fault», the Italian case law has clarified that the fault is attributed to the master, to the crew or to the shipowner (*armatore*). The principle has an exception in the case that the event occurred by fortuitous event or by force majeure, or for doubtful cause, in which cases the damage is borne by the person who suffered it.

Similarly to the RPA, where the operator is identified to be responsible for its use, also in a ship, even if controlled from a remote station, we can still identify the shipowner - who should be present also in a unmanned ship - who assumes the exercise and the management of the ship (art. 265 c. nav.) and who designates a shore-based vessel controller, which, similarly to the master (Art. 273 c. nav.), has the conduction of the navigation (Art. 295 c. nav.).

It can be considered that the exercise and management of the ship is a component that does not even fail also in the hypothesis of an autonomous ship, since even in this case it is necessary to identify the person responsible for contracts, torts and obligations contracted with regard to the ship and the shipment (Art. 274 c. nav.).

Once the person responsible for acts and events of a non-contractual or tortious nature (such as the case of the collision against another ship) has been identified in the figure of the shipowner, the collision rules of the navigation code will be applied in accordance with the 1910 Brussels Convention. Also the subjective elements, such as the fault in a fault-based liability perspective, can be referred to the shipowner.

The criterion of fault-based liability cannot be excluded, to the extent that it's still possible to identify a person who has the exercise and the management of the ship. In addition, important European studies on tort law still assign a central role to the criterion of fault-based liability.

Even where the agent (shore-based remote controller/master) is replaced by an autonomous software we cannot dismiss the assumption of the management of the ship, at the hands of a subject, the shipowner, well identified in the Italian law.

Rather, in a *de jure condendo* perspective on tort liability, it will be possible to introduce onerous responsibilities in conducting unmanned ships gradually depending on the risk faced by the third party, up to a form of strict liability in the hypotheses that, according to predetermined parameters, the danger reveals to be maximum.

The concept would be in line with the latest prospects for amending RPA legislation, respectful of the latest European guidelines on tort liability for hazardous activity; it complies with the Italian liability regime on damage caused by foreign aircraft to third parties on the surface, where the strict liability is associated with the concept of risk for the exercise of a lawful activity and it is justified by the need to protect the third party who is not in a position to foresee the event and to be able to take suitable protective measures in relation to the danger, which is the foundation of the special regime outlined.

6.2.1. *The Italian legislative framework on collision liability*

Art. 3 and 4 of the International Convention for the Unification of Certain Rules of Law with respect to Collisions between Vessels, signed in Brussels in 1910 and entered into force in Italy in 1913 provide for the principle of the imputation of liability to the ship in fault, so that any ship in fault must compensate the damage suffered by the other ship in proportion to the degree of its fault (Art. 4 of Brussels Conv.) and to the extent of the relevant consequences (Art. 484 Italian c. nav.). Although the navigation code refers to the ship in fault, the Italian case law has clarified that the fault is ascribed to the master, to the crew and to the shipowner (*armatore*).

The principle has an exception in the case that the event occurred *by fortuitous event* or *by force majeure*, or for doubtful cause, in which cases the damage is borne by the person who suffered it.

The Italian legal system has implemented the Convention almost entirely. Art. 2, which conforms to the wording of Art. 482 c. nav., provides that if the collision is fortuitous, if it is due to a case of force majeure or if there is a doubt on the causes of it, the damage is borne by those who have suffered it.

Therefore, the system is based on the principle that the ship is liable only when it is proved the intentional or negligent act of the person to whom the obligation to pay compensation for liability in tort is assigned; except that the latter is able to prove the unforeseeable circumstances or force majeure, as events able to interrupt the causal link.

It is, ultimately, a question of liability in tort arising as a result of a negligent collision which is cause of an injury to the assets or to the life of a third party, according to a principle borrowed from Roman law, and truthfully never questioned in the subsequent legislation. The limit to indemnifiability of the above-mentioned damage is represented, as in ancient times, by the *vis maior cui resisti non potest*.

Fortuitous events and force majeure thus represent, in the tort liability system, an unforeseeable or unavoidable event which affect the attribution of liability itself, making it impossible to avoid the production of the damage.

6.2.2. *Comparison with the Italian tort liability system*

Broadly speaking, the rules on collision at issue are part of a system, the Italian one on civil liability, which can be described in similar terms in respect to the aforementioned rules on collision liability.

Indeed, our legal system presents a concept of tort liability, where the requirements of fraud or fault complete the assessment of unlawful conduct, since it is with regard to the presence of these requirements that the disvalue of the agent's behavior increase (art. 2043 c.c., according which any intentional or negligent act, which causes an unjust damage to others, obliges the one who committed it to pay damages).

However, it is also necessary to acknowledge the current trend of the Italian doctrine and jurisprudence to reduce the relevance of the criterion of fault as an exclusive criterion of accountability, and to comply with further criteria based on objective elements deriving from the civil code (art. 2050 c.c.: dangerous activity, 2049 c.c.: entrepreneurial risk and responsibility for servants, 2051, 2052, 2053 c.c.: property or detention of things productive of damages).

Alongside the general case of civil liability, based on the criterion of fault, further allocation criteria are noticeable in the current legislation, based on objectives factors such as the entrepreneurial risk, the dangerousness of the activity, the property or the proximity to the thing productive of damage.

In these code-based hypotheses of burdensome liability, it is emphasized the special relationship (custody, property, activity exerted) between the accountable subject and the thing or the activity that gave rise to the damaging event; liability is excluded by the fortuitous event, which looks like a further element, with the characteristics of unpredictability and inevitability.

On the qualification of the fortuitous event in juridical terms the doctrine is divided among those who accept the subjective conception of the fortuitous and the supporters of the objective theory.

According to the subjective conception of tort, fortuitous event and force majeure represent an example of absence of fault (*casus = non culpa*), as unpredictable and inevitable event.

According to a different objective conception, the fortuitous event is a factor that interrupts the causality between the subject and the damage and itself represents the cause of the damage.

Notwithstanding the above, the civil liability system in Italian law, despite all the erosion attempts of the principle of liability by fault, is still focused on civil offense as a violation of a general duty to respect the rights of third parties; however, particularly in the area of liability for damage arising from things in custody, the proponents of the theory of the objective nature of the fortuitous event, explain that the proof of the fortuitous event that the injured party should provide under art. 2051 c.c. does not exclude the fault but the causal link, without taking into account the breach of the obligation of the keeper to guard the thing.

In order to arrive at that conclusion, it is necessary to acknowledge that the conduct of the keeper is irrelevant and that his responsibility is based solely on the fact that the damage comes from the guarded thing. The aforesaid legal theory does not consider sufficiently that the keeper is bound to guard in the interests of the others, as the theorists of the subjective conception of the fortuitous event do.

The keeper liability, on the other hand, is for the latter, a fault-based liability, even aggravated, that arises from the breach of the legal duty to guard. The proof that the event was accidentally produced, means to prove the lack of fault of the person, who could not foresee the damage according to the degree of expertise required in relation to the kind of activity exercised or could not avoid it by employing the normally suitable precautions.

On the contrary, if we decide, as the theorists of the objective criterion of the fortuitous event, that this excludes the causal link between the thing and the damage then it is not clear why, in the hypothesis of strict liability for damage caused by aircraft to third parties on the surface (Art. 965 c. nav.) liability is not excluded by fortuitous event. In this case, indeed, the liability exemptions are the simple fact of the passage of the aircraft in the airspace (Art. 1.1), the damage as a direct consequence of an armed conflict or of civil motions (Art. 5 of the Rome Convention of 1952) and the fault of the injured party (Art. 6).

6.2.3. Developmental outlines on civil liability

The above mentioned general considerations on the Italian system of tort liability can be used in an analysis of liability for collision damage.

We can not deny that the remote control and management of the ship, or its total reliance on an automatic navigation system, can affect the risk allocation schemes today known.

On the other hand, the main European studies show that the criterion of liability by fault still characterize in perspective the system of civil liability.

According to the European Group on Tort Law who has drawn up the Principles of European Tort Law, «(1) A person to whom damage to another is legally attributed is

liable to compensate that damage. (2) Damage may be attributed in particular to the person a) whose conduct constituting fault has caused it» (Art. 1:101).

Strict liability is only provided in very high-risk hypotheses (*lett. b): abnormally dangerous activity*). Finally (Art. 7: 102) *«(1) Strict liability can be excluded or reduced if the injury was caused by an unforeseeable and irresistible a) force of nature (force majeure)».*

Also in the so called Von Bar project, book VI, the basic rule (1:101) provides a fault-based liability: *«(1) A person who suffers legally relevant damage has a right to reparation from a person who caused the damage intentionally or negligently or is otherwise accountable for the causation of the damage»*, unless special cases occur.

6.3.4. Comparison with the liability regime for damages arising from the RPA exercise

The reconstructive framework can then be completed by a comparison with the nearby remote or autonomous air navigation sector.

In this regard the European Parliament, in the resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)), associate in the notion of autonomous vehicle or autonomous transport *«all forms of remotely piloted, automated, connected and autonomous ways of road, rail, waterborne and air transport, including vehicles, trains, vessels, ferries, aircrafts, drones, as well as all future forms of developments and innovations in this sector» (point 24).*

With regard to the remotely piloted aircraft systems (RPAS), the European authorities have identified a system of accountability based on parameters assessing the degree of danger that the use of the vehicle involves (proportionate and risk-based), according to the characteristics presented, to the environment in which it operates and the activity for which it is used (EASA, Technical Opinion - Introduction of a regulatory frame work for the operation of unmanned aircraft, Related A-NPA: 2015-10, RMT.0230, del 18 December 2015, 7). Specifically, EASA defines three categories of operations with RPA, based on the risk of injury assumed in their execution: open, specified and certified.

The European legislator, in the perspective of changing the current legislation on RPAs, makes a choice by allowing the exercise of RPA in consideration of its economic significance and usefulness (*«Unmanned aircraft is a sector of aviation that is developing very fast and has a great potential for producing new jobs and growth»*: EASA, 'Prototype' Commission Regulation on Unmanned Aircraft Operations del 22 august 2016, 3), but at the same time assigning to the operator the obligation to pay compensation (EASA Prototype Commission Regulation on

Unmanned Aircraft Operations del 22 agosto 2016, art. 4, according which «*The operator of a UA shall be responsible for its safe operation. The operator shall comply with the requirements laid down in this Regulation and other applicable regulations, in particular those related to security, privacy, data protection, liability, insurance and environmental protection*»), on the basis of the criterion of danger allocation to the person who caused the danger of damage. In the Italian system on damage caused by foreign aircraft to third parties on the surface, the result is achieved by referring to the Rome 1952 Convention which, in fact, assigns the duty to pay for the consequent damage, under a system of strict liability, to the subject that exposes the third parties to a perceived danger, regardless of fault (art. 965 c. nav.). Otherwise, in the event of collision between RPAs in flight, the rules for the maritime collision apply.

6.2.5. Final remarks

The above observations clearly outline the relevance of the criterion of the risk or danger that the exercise of RPA involves, on which necessarily the responsibility of the party operating it must be parameterized, since the operator of a RPA system is responsible for its use, as also reported in the Riga Declaration of 6 March 2015 entitled *Defining the Future of Aviation*.

Similarly, also in a ship, even if controlled from a remote station, a master/shore-based vessel controller, designated by the shipowner (Art. 273 c. nav.) has the conduction of the navigation (Art. 295 c. nav.); furthermore, the shipowner is identified in the Italian law as the one who assumes the exercise and the management of the ship (Art. 265 c. nav.), whether he is the owner or not of the ship itself.

It can be considered that the exercise and management of the ship is a component that does not even fail also in the hypothesis of an autonomous ship, since even in this case it is necessary to identify the person responsible for the contracts, the torts and the obligations contracted with regard to the ship and the shipment (Art. 274 c. nav.).

Once the person responsible for acts and events of a non-contractual or tortious nature (such as the case of the collision against another ship) has been identified in the figure of the shipowner, the collision rules of the navigation code will be applied in accordance with the Brussels Convention of 1910.

It can be then considered that the criterion of fault-based liability cannot be excluded, to the extent that it's still possible to identify a person who has the exercise and the management of the ship.

In addition, as noted above, important European studies on tort law still assign a central role to the criterion of fault-based liability.

We can further consider that in the Italian law it's possible to identify a legal subject who assumes the management of the ship, and to which the activity of navigation performed by the master/shore-based remote controller is to be attributed (corresponding to the concept of operator for RPA).

The subjective elements, such as the fault in a fault-based liability perspective, can be referred to the shipowner.

According the aforementioned subjective conception of tort, more compliant with the regulatory provision, a fortuitous event represents a hypothesis of lack of fault, as an unforeseeable and unavoidable event. Indeed, the event giving rise to the damage has occurred in the context of an instrumental activity of the agent (in this case, in navigation), and the impossibility to avoid the damage must be related to the particular sphere of competence of the agent.

Even where the agent (shore-based remote controller/master) is replaced by an autonomous software we cannot dismiss the assumption of the management of the ship, at the hands of a subject, the shipowner, well identified in the Italian law.

Rather, in a *de jure condendo* perspective on tort liability, it will be possible to introduce onerous responsibilities in conducting unmanned ships gradually depending on the risk faced by the third party, up to a form of strict liability in the hypotheses that, according to predetermined parameters, the danger reveals to be maximum.

The concept would be in line with the latest prospects for amending RPA legislation, respectful of the latest European guidelines on tort liability for hazardous activity, and it complies with the Italian liability regime on damage caused by foreign aircraft to third parties on the surface, where the strict liability is associated with the concept of risk for the exercise of a lawful activity and it is justified by the need to protect the third party who is not in a position to foresee the event and to be able to take suitable protective measures in relation to the danger, which is the foundation of the special regime outlined.

ANIA

Dear all

Following comments / clarification received from IUMI and in line with the same, we believe that, at this stage and despite the questionnaire distributed by CMI being of a great relevance but not really fitting on an insurance perspective since it is aimed on legal aspects, for the time being we suggest ANIA indicates an interest in further discussions monitoring results of the AIDIM 'Unmanned Vessel' working group.

We would like to draw your attention on some of the marine insurance topics we believe should be approached from the beginning, as soon as legal aspects will be clarified.

Following the Italian 'Codice delle Assicurazioni' (Insurance Code) and/or international standard clauses, in respect of 'Unmanned vessel' risk scenario, we should focus on:

1. Perils covered

Does the 'marine risks' include risks like

- delay in data transmission/ communication
- loss of data link
- programming mistakes

2. Cyber Attack Exclusion Clause CL 380

Would be this clause still adequate?

3. Warranties

How to handle fault-requirements in the view of few (or even no) human involved in actual operation of the ship?

4. Seaworthiness

Would underwriters accept an unmanned ship as seaworthy only because a flag state has accepted certain technology as sufficient?

Waiting for your kind feedback, we remain at your full disposal for your considerations and any further clarification you may need.