

# Unmanned Vessels and Civil Liability in the Field of Maritime Traffic

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SUMMARY: 1. Introduction. – 2. Defining an “unmanned vessel”. – 3. Liability of unmanned vessels and compensation for collision damage. – 4. Liability of remotely operated vessels. – 5. Liability for autonomous vessels.

## 1. Introduction

The increasing intensification of maritime trade, the definition of new trade routes such as the new Maritime Silk Road and the growing technological development also applied to maritime transport<sup>1</sup> have increased maritime security risks.

In this context, the aim of this paper is to analyze one of the most important problems arising, that of the “liability of unmanned vessels” with a specific focus on the Italian legislation.

Technological progress has influenced and changed not only admiralty law, but also shipping. Indeed, there is a particular focus on autonomous vessels in terms of civil liability and compensation for loss or damage during transport. Hence the on-going debate about the use of artificial intelligence (AI) within the maritime sector, on unmanned vessels and unmanned ships.<sup>2</sup>

Before we talk about civil liability concerning autonomous ships, it is important to determinate which vessels belong to this category.

Unmanned ships are broad category that includes both remote controlled ships and autonomous ones. Both can be identified by the fact that there are no personnel on board. However, the former is remotely controlled by an operator in a shore-based control station; while the latter has been programmed by an operator before sailing.<sup>3</sup>

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<sup>1</sup> The growing importance of the technology has also been affirmed by the Chinese government in the launch of the “Vision for Maritime Cooperation under the Belt and Road Initiative” calling States to intensify cooperation in the field of unmanned vessels, <[http://www.xinhuanet.com/english/2017-06/20/c\\_136380414.htm](http://www.xinhuanet.com/english/2017-06/20/c_136380414.htm)>.

<sup>2</sup> P. Zampella, ‘Navi autonome e navi pilotate da remoto: spunti per una riflessione’ (2019) *Diritto dei trasporti* 584; A. Caligiuri, ‘A New International Legal Framework for Unmanned Maritime Veichles?’ in A. Caligiuri, *Legal Technology Transformation a Practical Assessment* (Editoriale Scientifica 2020), 99.

<sup>3</sup> The IMO Maritime Safety Committee (MSC) considered varying degrees of autonomy defining four categories: 1) crewed ships with automated processes and decision support, in which there is seafarers on aboard ready to operate and control the system and functions that could be automatized; 2) a remotely controlled ship with seafarers on board in which the ship is controlled remotely; 3) a remotely controlled ship without seafarers on board in which the ship is controlled remotely but without seafarers on board;

European Parliament Resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics,<sup>4</sup> at para. 24, stresses “that autonomous transport encompasses 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”.

The use of autonomous vehicles is rapidly increasing, especially in the maritime sector, more specifically autonomous cargo ships rather than the carrying passengers.

Autonomous cargo ships have obvious advantages in the field of maritime transport.<sup>5</sup> The use of autonomous ships is expected to significantly reduce incidents at sea that would otherwise be caused by human error, reduce pollution as there are no seafarers on board, and reduce costs. In the event of piracy at sea, the absence of seafarers on board can be an added benefit, as it prevents hostage-taking. In addition, unmanned ships are suitable for use in dangerous and complex situations, as their use increases emergency response eliminates any danger for the crew.<sup>6</sup>

Some scholars believe that vehicles with advance technology systems can also be used extensively on cruise ships as seafarers can limit their activities to checking the operation of machinery and other on-board equipment, verifying the absence of alarm signals, and monitoring the correct functioning of automatic control systems.<sup>7</sup>

On the other hand, there are others<sup>8</sup> who express concern about the possibility of using unmanned ships, particularly remotely controlled ships for transportation. Article 1679 Italian Civil Code states that when passengers are transported, there is a duty to take them from one place to another and to supervise their safety.<sup>9</sup> These duties are the sole responsibility of the ship’s captain and cannot be transferred to the operator, who controls the ship remotely<sup>10</sup>.

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4) fully autonomous ships, in which the ship operative system is programmed to be completely autonomous with every single decision or action to take thanks to the software (<<https://www.imo.org/en/MediaCentre/PressBriefings/Pages/08-MSC-99-MASS-scoping.aspx>>).

<sup>4</sup> European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)) <<https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52017IP0051&from=IT>>.

<sup>5</sup> Zampella (n 2) 588; V. Corona, ‘Le obbligazioni del vettore nel trasporto di cose con navi autonome o pilotate da remoto’ (2019) *Diritto dei trasporti* 520

<sup>6</sup> L. Ancis, ‘Navi pilotate da remoto e profili di sicurezza della navigazione nel trasporto di passeggeri’ (2019) *Diritto dei trasporti* 435.

<sup>7</sup> *Ibid* 428.

<sup>8</sup> R. Tranquilli Leali, ‘La tutela della sicurezza dei passeggeri nel trasporto marittimo tra comandante della nave e pilota da remoto’ (2019) *Diritto dei trasporti* 467.

<sup>9</sup> S. Pollastrelli, ‘La sicurezza delle navi passeggeri’ in M.P. Rizzo and C. Ingratoci (eds), *Sicurezza e libertà nell’esercizio della navigazione* (Giuffrè 2014), 113.

<sup>10</sup> Tranquilli Leali (n 8) 468, that states: “It is difficult to qualify someone as captain, when is not able to acquire all the obligations because is not physically present in the who are assigned to the captain, in his dual capacity as head of the traveling community and head of the expedition and resides in his ability and capacity to command”.

## 2. Defining an “unmanned vessel”

The question of liability for loss or damage caused by unmanned vessels cannot be analysed before until it is established that the so-called unmanned vessels or unmanned ships can be defined as vessels.

Art. 136(1) Italian Navigation Code states: “a ship is any seagoing vessel and seaborne craft built or adapted for use of means of transport, for towing, fishing, for recreation or for any other purpose”.

The MARPOL Convention has a definition for ship as “a vessel of any type whatsoever operating in the marine environment”.<sup>11</sup> International Collision Regulations (COLREGs) defines a “vessel” as “every description of watercraft, including non-displacement craft, wing-in-ground (WIG) craft and seaplanes, used or capable of being used as a means of transportation on water”.<sup>12</sup> Also in the UN Convention on Conditions for Registration of Ships, a “ship” is defined as “any self-propelled sea going vessel used in international seaborne trade for the transport of goods, passengers, or both”.<sup>13</sup> In the Hague Rules, “ship” is defined as “any vessel used for the carriage of goods by sea”.<sup>14</sup> In the SUA Convention a ship is “a vessel of any type whatsoever not permanently attached to the sea-bed”.<sup>15</sup> Also in the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention), the definition of “vessel” is “any waterborne or airborne craft of any type whatsoever and that includes air cushioned craft and floating craft, whether self-propelled or not”.<sup>16</sup>

With all these definitions, it can be said that the national legislation, as well as the international one, offers a rather broad definition of the term ship, which includes unmanned vessels as well.<sup>17</sup>

## 3. Liability of unmanned vessels and compensation for collision damage

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<sup>11</sup> International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), Article 2(4).

<sup>12</sup> Convention on the International Regulations for Preventing Collisions at Sea of 1972 and following amendments, Rule 3(a).

<sup>13</sup> UN Convention on Conditions for Registration of Ships, 7 February 1986, Article 1.

<sup>14</sup> International Convention for the Unification of Certain Rules of Law relating to Bills of Lading (“Hague Rules”), 25 August 1924, Article 1(d).

<sup>15</sup> Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation, 10 March 1988, Article 1.

<sup>16</sup> Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention), 13 November 1972, Article III(2).

<sup>17</sup> R. Lobianco, ‘Navi senza equipaggio e profili di responsabilità’ *Responsabilità civile e previdenza* (2021) 759; Zampella (n 2) 597; Corona (n 5) 525.

One of the complex issues related to unmanned vessels is civil liability for loss or damage<sup>18</sup>.

The subject of collisions between vessels<sup>19</sup> is an international one and is described in the Brussels Collision Convention of 1910, which was implemented by Italian Law No. 606 of 12 June 1913, which came into force on 2 July 1913.<sup>20</sup> The national legislation, through the Navigation Rules, has transposed the international rules of Law on Collisions between Vessels in Articles 482-488 Italian Navigation Code.<sup>21</sup>

In any case the rules of the Brussels Convention can be applied to collision between vessels and inland waterway vessels as long as they are from different countries regardless of the place where the collision happened.<sup>22</sup>

Proportional liability in maritime collisions at sea is found in Italian Navigation Code as follows<sup>23</sup>:

Art. 482: “If the collision is accidental, if it is caused by force majeure, or if the cause of the collision is left in doubt, the damages are borne by those who have suffered them.”

Article 483: “If the collision is caused by the fault of one of the vessels, liability to make good the damages attaches to the one which has committed the fault”. Lastly, Article 484 Italian Navigation Code states “If two or more vessels are in fault the liability of each vessel is in proportion to the degree of the faults respectively committed. Provided that if, having regard to the circumstances, it is not possible to establish the degree of the respective faults, or if it appears that the faults are equal, the liability is apportioned equally. In respect of damage caused by death or personal injury, the vessels in fault are jointly liable as well as severally liable to third parties.”

As mentioned before, the national legislation is guided by the Convention for the Unification of Certain Rules of Law with respect to Collisions between Vessels of 1910.<sup>24</sup>

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<sup>18</sup> A. Xerri, ‘Riflessioni in tema di responsabilità nel contesto dell’automazione navale’ (2019) *Diritto dei trasporti* 554.

<sup>19</sup> See S. Pollastrelli, ‘L’urto di navi’ in A. Antonini (ed.) *Trattato breve di diritto marittimo*, vol. III (Giuffrè Editore 2010) 233; G. Romanelli-G. Silingardi, ‘Urto di navi o aeromobili’ in *Enciclopedia del diritto*, vol. XLV (Giuffrè Editore 1992) 906; G. Righetti, ‘Urto di navi’ in *Digesto delle discipline privatistiche – Sezione commerciale*, vol. XVI (UTET 1999) 324; G. Righetti, ‘Urto di nave e di aeromobile’ in *Novissimo digesto italiano*, vol. XX (UTET 1975) 190; E. Spasiano, ‘Urto di navi e di aeromobili’ in *Enciclopedia giuridica*, vol. XXXII (Istituto della Enciclopedia Italiana 1994) 1; F. Berlingieri, *Le convenzioni internazionali di diritto marittimo e il codice della navigazione* (Giuffrè Editore 2009) 391.

<sup>20</sup> S. Pollastrelli, ‘La Convenzione di Bruxelles del 1910 in materia di urto di navi. Legge applicabile e competenza giurisdizionale’ in *Scritti in onore di Francesco Berlingieri*, (2010) *Il Diritto marittimo* 799.

<sup>21</sup> *Ibid.*

<sup>22</sup> *Ibid.* 802, in accordance with the following provisions, in whatever waters the collision takes place.

<sup>23</sup> Pollastrelli (n 20) 234.

<sup>24</sup> Convention for the Unification of Certain Rules of Law with respect to Collisions between Vessels (Brussels Collision Convention), 23 September 1910; see Articles 2 (“If the collision is accidental, if it

In other words, the presumption of liability for damages caused by collision between vessels is based on subjective elements, intent or negligence which is the main point in which the non-contractual liability is based.

Having examined the elements that constitute the liability for damage caused by collisions between vessels, it is necessary to examine whether they can be also applied to unmanned ships. It is important to distinguish between two possible categories for unmanned ships: a remotely controlled ship without seafarers on board and fully autonomous vessels, in which the vessel's operating system is programmed so that thanks to the software, it takes each decision or action fully autonomously.<sup>25</sup>

#### 4. Liability of remotely operated vessels

Remote controlled ships are the ones without seafarers on board where the control of said ship is carried out by a third party that is not on board but keeps the ship in check by means of modern remote transmission systems.

The doctrine argues that unmanned ships without seafarers on board, but which are remotely controlled, are equivalent to ships with a crew on board.<sup>26</sup> Therefore, it can be said that the ship remote operator differs from regular ships only in that the person commanding the ships is not on board, but at a control station on shore. Due to constant human activity present during the voyage, the international and national legislation on liability in case of accidents at sea can be applied to remotely controlled ships.

In this sense, strict liability cannot be applied to remotely controlled vessels, since the person piloting the vessel, to whom harmful events must also be attributed, can be clearly identified. The captain of the ship is the person who remotely controls it and is therefore responsible for the accidents that occurred during the voyage.

There are other opinions that argue that the remote operator cannot be considered the captain of the ship.<sup>27</sup> Precisely because he is not physically on the ship, he is not able

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is caused by *force majeure*, or if the cause of the collision is left in doubt, the damages are borne by those who have suffered them. / This provision is applicable notwithstanding the fact that the vessels, or any one of them, may be at anchor (or otherwise made fast) at the time of the casualty.”) 3 (“If the collision is caused by the fault of one of the vessels, liability to make good the damages attaches to the one which has committed the fault”) and 4 (“If two or more vessels are in fault the liability of each vessel is in proportion to the degree of the faults respectively committed. Provided that if, having regard to the circumstances, it is not possible to establish the degree of the respective faults, or if it appears that the faults are equal, the liability is apportioned equally. [...]”).

<sup>25</sup> R. Veal and M. Tsimplis, ‘The integration of unmanned ships into the lex maritima’ (2017) *Lloyd’s Maritime and Commercial Law Quarterly* 313.

<sup>26</sup> Lobianco (n 17) 763; C. Severoni, ‘Prime osservazioni in tema di responsabilità derivante da urto con navi senza equipaggio’ (2018) *Diritto dei trasporti* 95.

<sup>27</sup> Tranquilli Leali (n 7) 468; Corona (n 5) 532; U. La Torre, *Comando e comandante nell’esercizio della navigazione*, Napoli, 1997; U. La Torre, ‘Navi senza equipaggio e shore control operator’ (2019) *Diritto dei trasporti* 487.

to assume all the duties as a captain; for instance, the ship organization and its passengers.

## 5. Liability for autonomous vessels

Reference has been made<sup>28</sup> to the variety of accidents that can happen on autonomous vessels (fully autonomous vessels with an operational system programmed by a human operator from the beginning of the voyage). In this case, the collision could be caused by software or hardware malfunction. A software malfunction is when the program gives the wrong instructions despite the correct data, resulting into a collision. While malfunction in the ship's structure, e.g. sensors or mechanical parts, are caused by the hardware.

Any time an accident is caused by an autonomous vessel, the question is whether or how a person can be held responsible for the loss or damage.

One could impose strict liability on the ship owner for the damage caused by the ship, i.e., provide for liability of the ships themselves by attributing responsibility to those who developed the software or hardware.

Some authors<sup>29</sup> claim that even in the case of completely autonomous ships, where there is no remote operator to take over the duties of a captain and the ship is therefore entirely controlled by software, it is possible to hold the ship owner responsible for the damage caused by the ship.

Others argue that even attempting to name the ship owner as the responsible is difficult because the ship's malfunctions are beyond his control.<sup>30</sup> But the current legislation does not allow the ship to be given a legal status.

It seems that liability must be borne by the manufacturer and/or the software programmer, although the doctrine<sup>31</sup> does not hesitate to point out that it is difficult to apply civil liability in the case of accidents involving autonomous vessels. The International Convention for the Safety of Life at Sea, in particular Rule 2 of COLREGs mentions the rules for a good maritime practice, and it seems that these cannot be applied to autonomous vessels controlled by artificial intelligence; "ship manoeuvring and directional control cannot not be understood as a purely technical fact that can also be performed by a remote operator in the face of danger or challenge at sea. Ship manoeuvring and directional control require a symbiosis between man and ship, i.e. an actual human presence on board, with the appropriate technical-professional competence, able to evaluate with their own eyes each and every element with a complete vision, and to assess on the spot the security measures to be taken in

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<sup>28</sup> Lobianco (n 17) 763

<sup>29</sup> Severoni (n 26) 97.

<sup>30</sup> Lobianco (n 17) 764.

<sup>31</sup> Lobianco (n 17) 765; Tranquilli Leali (n 7) 474.

order to protect everyone on board as well as the cargo”.<sup>32</sup> It is still believed that all these activities can be only carried out by the captain and certainly not by a remote operator or a software. Article 295(1) Italian Navigation Code<sup>33</sup> only gives the captain of the vessel the ability to manoeuvre the vessels and determine its direction.

The software manufacturer/programmer can only be held liable for damage caused by a defective product on the basis of legislation, and this was first introduced by Directive 85/374/EEC (Product Liability Directive).<sup>34</sup>

However, doctrine has established that the legislation on liability for defective products is not capable of protecting the plaintiff, since it is up to him to prove the existence of a defect in the product, the damage cause by it and the connection between the two.<sup>35</sup> It is clear that it is difficult for the person affected by an accident caused by autonomous vessels to prove a fault, given the high technology behind the product.<sup>36</sup>

EU law has warned about the difficulty of proving civil liability in the case of use of artificial intelligence. For this reason, on 2 October 2020, the European Parliament adopted a Resolution with recommendations to the Commission on a civil liability regime for artificial intelligence,<sup>37</sup> where its para. 8 refers to the Product Liability Directive by name as damage caused by a defective product. Nevertheless, it should be revised to adapt it to the digital world and to address the challenges posed by emerging digital technologies, so as to ensure a high level of effective consumer protection as well as legal certainty for consumers. The compensation protection service of anyone who is affected by the use of AI should take place in accordance with said Resolution through the modification of existing Civil liability regimes. As far as the damages caused by high-risk AI-system<sup>38</sup> such as autonomous ships driven by software, in the European Parliament and the Commission Rules, Article 4 on civil liability regime for artificial intelligence, it is intended the introduction of strict liability. In Article 4(1) the operator of a high-risk AI-system shall be strictly liable for any harm or damage that was caused by a physical or virtual activity, device or process driven by that AI-system. Additionally, Article 4(3) establishes: “Operators of high-risk AI-systems shall not be able to exonerate themselves from liability by arguing that they acted with due

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<sup>32</sup> Tranquilli Leali (n 7) 475.

<sup>33</sup> Tranquilli Leali (n 7) 475.

<sup>34</sup> Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products, <<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31985L0374>>.

<sup>35</sup> Lobianco (n 18) 764.

<sup>36</sup> S. Bevilacqua, ‘Porti e automazione: spunti in materia di responsabilità delle imprese di sbarco’ (2019) *Diritto dei trasporti* 557.

<sup>37</sup> European Parliament resolution of 20 October 2020 with recommendations to the Commission on a civil liability regime for artificial intelligence (2020/2014(INL)), <[https://www.europarl.europa.eu/doceo/document/TA-9-2020-0276\\_EN.html](https://www.europarl.europa.eu/doceo/document/TA-9-2020-0276_EN.html)>.

<sup>38</sup> For the purpose of the Regulation. Article 3(a) AI-system’ means a system that is either software-based or embedded in hardware devices, and that displays behaviour simulating intelligence by, inter alia, collecting and processing data, analysing and interpreting its environment, and by taking action, with some degree of autonomy, to achieve specific goals.

diligence or that the harm or damage was caused by an autonomous activity, device or process driven by their AI-system. Operators shall not be held liable if the harm or damage was caused by force majeure”.

The starting point for compensation for damages caused by autonomous vessels should be the Product Liability Directive, as this act has proven to be an effective means of getting compensation for harm triggered by a defective product for over 30 years. This directive should, in the view of the European Parliament, continue to be used for civil liability claims against the manufacturer of a defective AI-system.

Pending the envisaged civil liability regime for AI, it must be considered that hardware or software malfunctioning in an autonomous vessel constitutes a case of fault with liability of the manufacturer.

In order to ensure compensation for damage caused by collision with software controlled autonomous vessels, we believe it would be desirable to introduce a liability system similar to that provided for by Article 2054(4) Italian Civil Code, which may lead to a liability to compensate the ship owner and the driver for damage caused by design or production defects of the vehicle, including defects and any possible malfunctions of the software, with the possibility for them to seek recourse against the ship and/or software manufacturer if they prove that the manufacturing defect was the actual direct cause of the damage.