# European Maritime Policies and the Dynamic of Autonomous Vessels

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***Abstract***

*Maritime transport is an intensively and rapidly developing sector of a particularly international dimension. European shipping plays a key role in the development of the maritime industry in European Union as it strengthens its economy, strategy and negotiating power. The European Commission, to achieve this objective, seeks to promote a common maritime policy and create a regulatory framework. Technological development has historically challenged contemporary shipping laws. This paper pursues to provide an approach of the legal dimension of autonomous ships. The dogmatic legal method is followed, assisted by the socio-economic approach method. Firstly, the role of European Maritime Policy and its objectives are discussed. Secondly, regulatory and legislative initiatives of the use of autonomous ships worldwide are analysed. Due to the particular nature of maritime law, special attention is given to the issues of liability arising from the use of autonomous vessels. The article intends to offer an original contribution by examining the aspects of new technologies such as Autonomous Vessels and the challenges they raise in the global and European community. It concludes that the integration and regulation of Unmanned Ships by the European Maritime Policy would promote a high level of safety and development in maritime transports.*

***Keywords****: autonomous vessels, European maritime policy*.

***JEL Classification:*** K33

## 1. Introduction

Maritime transport is an intensively and rapidly developing sector of a particularly international dimension. European shipping plays a key role in the development of the maritime industry in European Union as it strengthens its economy, strategy and negotiating power. The European Commission, to achieve this objective, seeks to promote a common maritime policy and create a regulatory framework. Technological development has historically challenged contemporary shipping laws.

The so-called "unmanned-autonomous vessels" (or Maritime Autonomous Surface Ships, MASS)[2] are already a reality[3] and represent a new potential market in which significant investments are expected[4], having already given rise to international

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[2] See analytically the documents available online at https://transport.ec.europa.eu/transport-modes/maritime/maritime-autonomous-ships-and-shipping_en, accessed on 1 November 2023, see the document available online at https://ucl-autonomous-shipping.org/2022/06/27/autonomous-ships-and-their-legal-implications/, accessed on 1 November 2023.

[3] E. g. ASV Global's C-Worker 7, Self Defense Test Ship, MV YARA Birkeland, Rolls Royce Advanced Autonomous Waterborne Applications (AAWA), Mayflower etc. See more at https://www.rolls-royce.com/media/press-releases/2018/03-12-2018-rr-and-finferries-demonstrate-worlds-first-fully-autonomous-ferry.aspx, https://www.autoship-project.eu/the-project/, accessed on 1st November 2023, https://www.yara.com/news-and-media/media-library/press-kits/yara-birkeland-press-kit/, accessed on 1 November 2023.

[4] The International Chamber of Shipping (ICS) released an interesting study conducted by the HSBA "Seafarers and digital disruption - The effect of autonomous ships on the work at sea, the role of seafarers and the shipping industry", 2018.

scientific dialogue[5].

The question of whether the navigational negligence exception should be continued following the full transition to autonomous ships is a complex policy and legal issue. This paper pursues to provide an approach of the legal dimension of autonomous ships and their significance for the European maritime policy and to examine the legal standing of Autonomous vessels in relation to European Union's and International legal framework. The dogmatic legal method is followed, assisted by the socio-economic approach method. In addition, legal research methods include evaluative (testing the logical consistency of legal concepts and elements with elements outside the legal system, e.g. technical approaches to defining terms and Conditions used in law) comparative method (research and comparison of laws of different legal orders), as well as predictive method (the use of Autonomous Vessels and prediction of their possible consequences in law).

Firstly, in part 1, the role of European Maritime Policy and its objectives are discussed. Secondly, in part 2, the regulatory and legislative initiatives of the use of autonomous ships worldwide are analysed. Due to the particular nature of maritime law, special attention is given to the issues of liability arising from the use of autonomous vessels.

The article intends to offer an original contribution by examining the aspects of new technologies such as Autonomous Vessels and the challenges they raise in the global and European community. It concludes that the integration and regulation of Unmanned Ships by the European Maritime Policy would promote a high level of safety and development in maritime transports.

## 2. European Maritime Policy and its objectives

***The role of European Maritime Policy in global shipping.*** Europe is one of the most important and powerful shipping centers in the world.[6] Counting 329 major ports along the European Union's coastline, Europe manages more than a third of all maritime transport. Considering that around 80% of the volume of World Trade and more than 70% of the value of World Trade is transported by sea it is understood that European shipping plays an important role not only in global maritime transport but also in worldwide trade and economy. The European Union (EU) has a strong presence in global short distance shipping[7] and promotes an efficient transport system.[8]

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[5] See Robert Veal & Henrik Ringbom, *Unmanned ships and the international regulatory framework*, Journal of International Maritime Law, 2017, 23:2, p. 100-118; Baris Soyer, Andrew Tettenborn, *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century*, (Routledge, 2020), Eric Von Hooydonk, *The law of unmanned merchant shipping - an exploration*, The Journal of International Maritime Law (JIML), 20, 2014, p. 403-423.

[6] Maritime industry in the European Union (EU) - statistics & facts, the document is available online at https://www.statista.com/topics/9606/maritime-industry-in-the-eu/#topicOverview, accessed on 1 November 2023.

[7] Van den Bos, G., Wiegmans, B., *Short Sea shipping: a statistical analysis of influencing factors on SSS in European countries*. Journal of Shipping and Trade 3, 6 (2018), https://doi. org/10. 1186/s41 072-018-0032-3.

[8] See analytically the document available online at https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1483?fbclid=IwAR16GuwbGfL1IUE9KaTgBNekX46FcMUEXhMBUtfMyXgybB86pYrcas7oL44, accessed on 2 November 2023.

***Objectives of the maritime policy of the European Union.*** Maritime transport has always been a driving force of the European economy. At the same time, shipping provides a large number of well-paid jobs for European citizens. The share of the European fleet in global shipping is 41% (based on capacity). Of course, the continuous upgrading of the European fleet to approach global standards is also noteworthy.

Thus, the objectives of European maritime policy[9] should focus both on maintaining and strengthening the strong position of European shipping in the global maritime sector and on addressing the risks that threaten it.

***Maintaining a global playing field.*** A very important objective for European shipping is compliance with competition rules. It is an attractive and qualitative framework covering the provision of integrated and excellent shipping services, including Human Resources, Environmental Protection and enhancing the competitiveness of European shipping clusters.

***Improving environmental performance.*** The European Union (EU) is working hard to maximise the use of all available means of Environmental Protection in maritime transport. An important aspect of the environmental regulatory framework is the Prevention of accidents and the prediction of the factors leading to accidents. This is, of course, a long-term goal that requires sustained efforts and regulation to achieve zero waste and zero emissions.

***Methods of preserving the marine environment.*** A series of major maritime accidents prompted the Commission to decide to take action by promoting a maritime safety policy framework since 1993 in the following four areas:

1. Compliance and implementation of international regulations by member states.

2. Uniform way of monitoring the implementation of international regulations, which requires action by all member states.

3. Strengthening the development of Shipping, modernization of shipping, training of human resources in the implementation of the corresponding regulations.

4. Significant contribution of the European Union to the formation of the required international regulations.

***Key objectives of Maritime Security Policy.*** These objectives are:

1. Containment of substandard ships that do not follow international standards security.

2. Upgrading of passenger and crew protection measures.

3. Improving the transport efficiency of ships.

4. Ensure the implementation of international safety standards by shipowners.

5. Promote the global competitiveness of European shipping.

6. Complete adaptation and compliance with the international conventions of the European Union.

7. Reducing marine pollution.

Achieving a strong and high-quality shipping industry requires a continuous review of existing regulations and the adoption of new policies. The European Union and the European Commission must continually improve its institutional framework,

[9] See European Maritime Safety Agency, EMSA's 5 years strategy (2020-2024), the document is available at available at https://www.emsa.europa.eu/strategy.html, accessed on 1 November 2023.

recognise the important role of shipping and adapt to new technology, such as Autonomous Ships[10].

## 3. Autonomous ships, legal issues and European maritime initiatives

### 3.1. Introduction to autonomous ships

The importance of Maritime Transport for the functioning of the national and now global economy has not prevented states and companies from using scientific and technological breakthroughs[11] to improve maritime transport conditions and secure maritime Investment, respectively. Thus, there has been a continuous evolution and development from wooden sailboats to the first steamships, from the birth of the internal combustion engine to ships equipped with auxiliary navigation, positioning and communication systems. The common denominator in all this was the man, who not only made decisions on board the ship regarding the route, the speed and duration of the voyage, how to load and unload the cargo, how to safely anchor in the port and how to refuel, but also faced the elements of nature and took as many risks as possible during the voyage. In recent years, however, the demand for the use of existing information and communication technologies to build and use autonomous ships is growing, so the human role will be quite different from the current one, depending on the degree of autonomy of the ship. According to a study conducted by the World Maritime University (2019)[12], autonomous ships under human supervision are expected to make up 11-17% of the global merchant fleet by 2040. This argument seems to have started with a long delay compared to the related autonomous applications in the air and land transport sectors[13].

### 3.2. The necessity of autonomous ships

Advances in information and Communication Technology have made it possible to transmit and transfer large amounts of real-time data over land areas[14]. The new capabilities offered at the hardware and software level are also being exploited in industrial production, with digital transformation efforts and the use of tools such as big data analysis (BDA), artificial intelligence (AI) and the increased computing power

[10] At European Union level, from 2012 to 2015 MUNIN (Maritime Unmanned Navigation through Intelligence in Networks) 25, the first research project large scale in relation to autonomous ships. MUNIN's successor is the current AUTOSHIP (Autonomous Shipping for European Waters) 26, which it is so far the largest such initiative of E. E. It is funded by The Horizon 2020 programme for the years 2014-2020, after which and already from 2021 et seq. The Horizon Europe programme will follow.

[11] See analytically Tafsir Johansson, *International Standards for Hull Inspection and Maintenance of Robotics and Autonomous Systems*. In James Kraska & Young Kil Park (Eds.), *Emerging Technology and the Law of the Sea* (Cambridge University Press, 2022).

[12] Transport 2040: Autonomous ships: A new paradigm for Norwegian shipping - Technology and transformation Norwegian shipping - Technology and transformation, 2019, the document is available online at https://commons.wmu.se/lib_reports/59/, accessed on 2 November 2023.

[13] See Eric Van Hooydonk, op. cit., p. 405.

[14] Igor Vio & Mate Brdar, *Maritime autonomous surface ships – international and national legal framework.* Annals of maritime studies / Pomorski Zbornik, 2022, 62 (1), p. 141-155.

of modern computers now referred to as the "Fourth Industrial Revolution"[15]. As defined by the EU High-Level Expert Group[16], AI systems collect data from the environment to optimise the achievement of human-set goals. It is a software system that processes data based on the information previously provided for decision making. AI systems operate based on rules, models and machine learning techniques to achieve results. Machine learning is a tool to adapt algorithms to the data provided and can detect flags, light signals and unfamiliar objects in water via sensors.[17] Thus, artificial intelligence allows humans to make safer decisions in less time by focuses on complex data. However, the conclusions reached by the system cannot be considered absolute (disadvantages of artificial intelligence include system complexity and uncertainty)[18]. In fact, the international community has recognised the important role of artificial intelligence in science and has developed best practice rules and guidelines for making the system safer[19].

Modern ships already use systems such as radar equipment, maneuvering AIS, Automatic Identification Systems and global satellite navigation systems to help the master and crew avoid collisions at sea in accordance with established international rules (COLREG)[20]. However, both data obtained from support systems and the content of international navigation rules are often interpreted by people operating ships under difficult external conditions, resulting in associated human judgment, poor ship handling, fatigue and communication errors that can lead to negative consequences[21]. The use of artificial intelligence to draw conclusions based on the data collected by the system from the environment could be one of the most important benefits of increasing the degree of autonomy of ships[22], as it could reduce the possibility of maritime accidents.

### 3.3. Possible negative aspects of using autonomous ships

In case of extreme weather conditions, the nonlinear course of the ship is not

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[15] Sang-Chul Park, *The Fourth Industrial Revolution and implications for innovative cluster policies*, AI & Society (2018) 33:433–445.

[16] See *A Definition of AI: Main Capabilities and Disciplines*, Definition developed for the purpose of the AI HLEG's deliverables, European Commission, Brussels, 2019.

[17] Characteristically see Sarang Thombre, S., Zheng Zhao, Henrik Ramm-Schmidt, Jose M. Vallet Garcia, et al., *Sensors and AI Techniques for Situational Awareness in Autonomous Ships: A Review.* IEEE Transactions on Intelligent Transportation Systems, vol. 23, No. 1, January 2022, p. 1–20, doi:10.1109 /tits.2020.3023957.

[18] Agarwal, A., Hall, P., Jordan, S. & Leong, B., *Five things lawyers need to know about AI*, BNH.AI – Future of privacy forum, 2021.

[19] UNESCO (2021), *Recommendation on the Ethics of Artificial Intelligence*, Paris: United Nations Educational, Scientific, and Cultural Organization, the document is available online at https://unesdoc. unesco.org/ark:/48223/pf0000380455, accessed on 1 November 2023.

[20] See at https://www.marineinsight.com/marine-navigation/automatic-identification-system-ais-integrating-and-identifying-marine-communication-channels/.

[21] Li, Stefen & Fung, K. S. *Maritime autonomous surface ships (MASS): implementation and legal issues*, Maritime Business Review, 4 (4), 2019, pp. 330-339.

[22] MSC 99 had established the following four degrees of autonomy for the purpose of the Committee's scoping exercise, whereas The European Commission splits this emerging industry into three parts, namely "Remote Ship", "Automated Ship" and "Autonomous Ship" while Lloyd's Register has developed a classification of 6 levels of autonomous ships, AL 1 to AL 6.

certain that it could be parameterised by the algorithmic system or that the system will be able to recognize the sound signals used in shipping. Even if all systems are programmed in the correct way, there are weaknesses in the technical parts of the system that may not be overcome[23]. In addition, artificial intelligence systems may misidentify an object or condition on the horizon, due to the high degree of uncertainty of predicting obstacle motion, collision trajectory etc.[24]

### 3.4. Legislative framework for autonomous ships

Autonomous ships bring a new reality to shipping, but they must not be uncontrolled and must be strictly regulated to operate harmoniously and efficiently. Undeniably, the legal regime for autonomous ships identifies new challenges. The legal and institutional framework for the operation of autonomous ships is determined by different types of rules and regulations depending on the type of ship, the location of the shipping company or ship owner and the sea route operated.

In general, maritime regulations are divided into two main categories. The first is the rules of the law of the sea, which define the rights and obligations of states to regulate and act against foreign ships in various maritime areas. These are mainly contained in the 1982 United Nations Convention on the Law of the Sea (UNCLOS). Second, more detailed technical requirements covering safety, navigation, personnel and monitoring standards are set out in various conventions, which are usually adopted by the International Maritime Organization (IMO). These international regulations are then implemented and, in some cases, supplemented by national regulations (National regulations govern local businesses and regulate local maritime matters.)[25]

In addition, European Union (EU) regulations also regulate Maritime Safety and other matters of maritime law. European Commission encourages a maritime future which includes Autonomous and Sustainable Ships and Shipping.[26]

However, existing EU regulations do not impose restrictions on the operation of autonomous ships like IMO regulations, as they do not provide for technical standards for safety of navigation or construction. Therefore, there is little need for EU-wide rule changes, but for certain categories of ships, such as domestic passenger ships, some existing EU rules may need to be amended to cover autonomous passenger ships. EU rules also have a potentially supportive role, particularly in the area of data and information exchange.[27] In general, autonomous ships must comply with the

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[23] Callum O Brien, *Key advantages and disadvantages of ship autonomy*, available at https://safety4sea.com/key-advantages-and-disadvantages-of-ship-autonomy/, accessed on 2 November 2023. The fact that the performance of the cameras acting as sensors of the system will be low during rain or snowfall, the radars depending on their frequency may not detect smaller objects or have poor quality resolution, etc.

[24] Of course, projects such as the MUNIN (Maritime unmanned ships through intelligence in networks) try to overcome the difficulties. See analytically Ø.J. Rødseth, H.-C. Burmeister, *Risk Assessment for an Unmanned Merchant Ship*, the International Journal on Marine Navigation and Safety of Sea Transportation, Volume 9, Number 3, September 2015, p. 357-364.

[25] See Robert Veal & Henrik Ringbom, *op. cit.*, p. 100-118, Ringbom H., *Regulating autonomous ships-concepts, challenges and precedents*, Ocean Development and International Law, 2019, 50, p. 141.

[26] Characteristically, the EU Operational Guidelines on trials of Maritime Autonomous Surface Ships the document is available at https://transport.ec.europa.eu/news-events/news/european-commission-encourages-maritime-future-which-includes-autonomous-and-sustainable-ships-and-2020-11-30_en.

[27] Robert Veal & Henrik Ringbom, *op. cit*., p. 100-118.

general legislation relating to the specific type of ship.[28] As such, each autonomous ship is subject to the general rules applicable to passenger ships, cargo ships, bulk carriers and oil tankers[29]. As for the legal rules for autonomous ships in the testing phase, they are almost identical to the rules to be followed by companies operating autonomous ships. Therefore, even putting into service should be subject to the general rules, with certain exceptions specified specifically for putting into service.

### 3.5. European and International legislative maritime initiatives

In recent years, the shipping sector has seen a significant movement towards the use of ships with increased autonomy. This issue has been officially included in the strategic goals of the International Maritime Organization since 2017.[30]

The 105th Safety Committee of the International Maritime Organization (IMO), meeting in April 2022,[31] decided to draft a non-binding code for autonomous ships to be adopted by the end of 2024 (IMO hopes to collect sufficient data from the implementation of the non-binding code to be able to publish the first mandatory code for autonomous ships on 1 January 2028. In addition, in September 2022, under the auspices of the IMO, a conference of researchers, academics, entrepreneurs and government officials will be held on "developing a regulatory framework for maritime autonomous surface ships (MASS)" to discuss existing gaps in national legislation and universally applicable ones related to autonomous ships. The aim was to discuss the need to approximate the different legal systems through a code.

On the EU side, as usual, a high-level Expert Group was set up and additional testing guidelines (compared to those of the Imo) were published in 2020 with the support of the European Maritime Safety Agency (EMSA). The EMSA aims, inter alia, to represent the EU at IMO meetings on autonomous ships, to set a common minimum level of safety for autonomous ships and to ensure that the EU meets IMO requirements. In particular, the first study, which was completed in March 2020, aimed to identify ways to control and address potential risks arising from their use.

Undeniably, the lack of EU technical standards for maritime safety or ship-building would not in principle prevent autonomous ships from sailing in European waters, but the specific rules for the navigation of passenger ships, for example, would have to be amended, albeit on a small scale. Similar working groups have been set up in other countries around the world, such as Norway, Finland, China and the USA,[32] while a non-binding code of basic principles and guidelines for the navigation of

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[28] See analytically the Danish Maritime Authority, *Regulation and Reports on Maritime Technology*, the document is available at https://dma.dk/growth-and-framework-conditions/maritime-digitalization/regulation-and-reports-about-maritime-technology, accessed on 3 November 2023.

[29] Ringbom H., *op. cit.*, p. 141.

[30] Outcome of the Regulatory Scoping Exercise for the Use of Maritime Autonomous Surface Ships (MASS), MSC.1/Circ.1638 3 June 2021, the document is available online at https://www.imo.org/en/MediaCentre/PressBriefings/pages/MASSRSE2021.aspx, accessed on 3 November 2023.

[31] Maritime Safety Committee (MSC 105), 20-29 April 2022 the document is available online at https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MSC-105th-session.aspx, accessed on 3 November 2023.

[32] IMO Assembly Resolution A.1110(30), Strategic Plan 2018-2023 (and specifically Strategic Direction (SD) 2, Integrate new and advancing technologies in the regulatory framework).

autonomous vessels under 24 meters has been published in the UK.[33]

In this context, the first trials of autonomous ships have already taken place through cooperation between companies and research institutions.

### 3.6. Legal liability issues

Individual liability issues relating to autonomous vessels and persons responsible for them under the contract of carriage of goods, liability for collision, marine pollution caused by oil, seaworthiness, salvage obligation and cyber security are addressed.

***Liability of the algorithm***. Autonomous systems are characterized by the fact that they do not execute pre-formulated commands, but have the ability to interact with their environment and self-improve, so that it is sometimes impossible to analyze all the elements that led to the final decision and connect them with a legal subject, such as the programmer. This phenomenon is likened by researchers to a black box, whose content is unknown even to its creators[34]. In the maritime sector, the difficulty of identifying the exact cause of injury is already known for conventional ships, due to the number of parameters that the injured party often has to consider proving the causation[35].

One issue that has concerned the theory since the introduction of robotic systems and autonomous road vehicles into traffic was whether it is conceivable to attribute responsibility to the autonomous system that made the decision that led to the damage. In this regard, the European Parliament[36] in its resolution referred to the commission the issue of drafting a legislative proposal on civil law issues for robots, asking the Commission to consider the need to create a specific legal regime to recognise advanced autonomous robots as electronic persons with an obligation to make good any damage caused by them. The above proposal was abandoned in 2020 with the resolution of the European Parliament of 14.01.2020[37], having first encountered strong opposition regarding the ease of complete disengagement of manufacturers, developers, owners or users, who, citing the status of electronic persons, would release themselves from any obligation to compensate the victim by referring to the "responsible" autonomous robot, which lacks as an inanimate object not only the imputation capacity, but also the required legal capacity for acquiring property-guarantee funds.

This chapter will address the persons of the shipping undertaking, the main

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[33] See document available online at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1184593/fot-regulatory-review-maritime-autonomy-and-remote-operations-final-impact-assessement.pdf, accessed on 4 November 2023.

[34] See analytically Fellix Collin, *Unmanned Ships and fault as the basis of shipowner' s liability,* in Ringbom, H., Røsæg, E., & Solvang, T. (Eds.). (2020). *Autonomous Ships and the Law* (1st ed.). Routledge. https://doi.org/10.4324/9781003056560.

[35] Characteristic it is the case *The Zaglebie Dabrowskie* (No. 2) [1978] 1 Lloyd's Rep 573, see Simon Baughen, *Shipping Law*, (Ed. Routledge 6th Edition, 2015), p. 274.

[36] For more details see the document is available online at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017IP0051&rid=9, accessed on 2 November 2023.

[37] See analytically the document is available online at https://eur-lex.europa.eu/resource.html?uri=cellar:b82780d8-3771-11ea-ba6e-01aa75ed71a1.0003.02/DOC_1&format=PDF, accessed on 1 November 2023.

auxiliary persons and the persons who are to play an important role in the construction, planning and control of autonomous vessels. The analysis excludes secondary auxiliary persons (Navigator, agent), as well as the operator, because it is considered that their role, although important, will not be significantly different from the current ones for conventional ships.

***Manufacturer.*** The manufacturer of the autonomous ship - in case he is not at the same time a programmer of the system-in which case the following shall apply to the programmer - is essentially responsible for the construction of the ship. Under the shipbuilding contract between the shipbuilder and the owner of the ship being built, its construction begins from the stage of carrying out the relevant studies and design to the installation of the engines and the launching of the ship.

In Europe, all the EU countries are subjected to the Product Liability Directive 1985. It is also a strict product liability scheme to ensure that damage can be recovered from the producer of the defective goods.

As a manufacturer, he is personally liable to injured parties for the defects of the vessel in accordance with Directive 85/374/EEC on defective products[38].

The European Parliament, in a resolution of 16.2.2017, asked the European Commission to consider the need to create a guaranteed compensation fund, funded by robot manufacturers and owners and limiting the liability of contributors to it. As it is clear from the "High Level Expert Group on Artificial Intelligence"[39] in conjunction with the resolution of 12.2.2019 of the European Parliament[40], the position on the existence of objective responsibility of artificial intelligence manufacturers, individuals and companies, which according to paragraph 133 of the resolution "..AI engineers or the companies employing them should remain accountable for the social, environmental and human health impacts that AI systems or robotics may have on present and future generations".

***Developer.*** The programmer is the person who encodes the algorithm either at the initial stage of its development or during subsequent interventions in the algorithm to change some parameter or to determine in the case of a fully autonomous ship the destination and general voyage course. Part of the theory suggested that the programmer of the autonomous system could possibly be equated with the master, since the master of the vessel cannot be considered the autonomous system and the programmer is the natural person who trained the system to make decisions[41]. As Rokas and Theocharidis[42] note the operator is liable for the acts of the persons to whom he has delegated duties even if, in the absence of technical knowledge, he cannot exercise effective control over them.

***Chief operator.*** The remote control center chief operator is responsible for

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[38] 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.

[39] https://digital-strategy.ec.europa.eu/en/policies/expert-group-ai, accessed on 3rd November 2023.

[40] See European Parliament resolution of 12 February 2019 on a comprehensive European industrial policy on artificial intelligence and robotics (2018/2088(INI)) the document is available online at https://www.europarl.europa.eu/doceo/document/TA-8-2019-0081_EN.pdf, accessed 5 November 2023.

[41] See analytically Joel Coito, *Maritime Autonomous Surface Ships: New Possibilities and Challenges*, Ocean Law and Policy, International Law Studies, 97 (259), p. 259-306.

[42] Ioannis Rokas & Georgios Theocharidis, (2021) *Maritime Law*. Fourth edition. Athens Thessaloniki: Sakkoula Publications, p. 123.

coordinating the ships remote control project and he is in charge of the ship's remote operators. His responsibilities depend on the degree of autonomy of the ship, so he supervises either by governing the ship as if he were a master at sea or by controlling its systems or by supervising the course determined by the artificial intelligence system.[43] Due to the provision of the relevant services by land, the master can only be assimilated to the master in terms of responsibilities, not in terms of status as he is not a seafarer. Thus, according to Coito[44] he could be held responsible for the ship, the persons and the goods on board, as well as for the enforcement of the laws of the flag state, with whatever difficulty this may entail due to his absence from the ship. Consequently, his responsibilities include the control of navigation systems, the protection of the environment, safety at sea, the maintenance of the necessary documents (e.g. sailing log, communication with public authorities, conclusion of contracts, issuance of electronic bills of lading, etc).

***Collision.*** The international regulations for the Prevention of collisions at sea (COLREGs), as established by the London Convention of 1972, provided that every ship should have uninterrupted visual and auditory observation in order to detect and avoid the risk of collision of the ship. Although sight and hearing refer to human senses, the International Maritime Organization has never interpreted the above Rule 5 strictly literally including in it any human-assisted means[45]. However, according to Vio and Brdar the concept of "common sense seafarer", which is required under Rule 2[46] to evaluate the data and make a decision in cases where the rules do not explicitly provide for the appropriate course of action, could hardly be considered to include the decision of an algorithm, thus making it impossible at this stage to use fully autonomous ships without prior amendment of the rule.[47]

The International Convention of 1992[48] concerns the pollution caused to the marine environment during the commercial transport of fuel by oil tankers, while the International Convention of 2001[49] concerns the pollution caused by the fuel material carried by all kinds of ships for the needs of the voyage[50]. The network of the above legislative texts gives rise to the objective responsibility of the entity of the shipping company and its agents, regardless of the existence of a fault of the above, unless it is proven that force majeure occurred (e.g. war, natural phenomenon, third party's fault).

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[43] See analytically Alice Kennard, Pengfei Zhang, *Technology and training: How will deck officers transition to operating autonomous and remote-controlled vessels?* Marine Policy, Volume 146, December 2022, 105326.

[44] See Joel Coito, *op. cit.*, p. 259-306.

[45] EMSA (2019), *Framework for generic risk assessment tool for MASS concepts – Report 1 of 2*, Lisbon: European Maritime Safety Agency.

[46] COLREG 1972, Rule 2.

[47] Igor Vio, Mate Brdar, *op. cit.*, p. 141-155.

[48] International Convention on Civil Liability for Oil Pollution Damage, 1992, (1992 Liability Convention) (BGBl. 1996 II S. 671; BGBl. 2002 II 943).

[49] The International Convention on Civil Liability for Bunker Oil Pollution Damage was adopted in March 2001, the document is available online at https://assets.publishing.service.gov.uk/media/5a7b927240f0b645ba3c52f8/8489.pdf, accessed on 3rd November 2023.

[50] See Korotzis Ioannis, *Maritime Law*, volume II, Ed. Ant. Sakkoulas, 2005, p. 16.

## 4. Conclusions

The current regulatory means can be applied to the unmanned vessels that transfer the role of Master and crew to the carrier on land. However, the same cannot be said for fully automated ships. In conclusion, he noted that it will take years for the shipping industry to transition to automation. What is definitely ahead of us is remote access and in the long run the way will also open for fully automated ships.

In addition, legal issues that may affect the unmanned ship are still a matter of concern. Areas relating to navigation, manning, construction standards, ship design and equipment need immediate regulation. At the same time, in terms of responsibility, the biggest issue relates to the allocation of liabilities to the persons involved in the operation of an unmanned ship. It is unclear whether this legal role should be divided between shipowners, control centre operators and equipment manufacturers, or legally awarded to a single entity. The question whether the regulators should hold the shipowners strictly liable for accidents caused by autonomous vessels leads to a complex answer taking into account the aspects of tort law. This is an issue that should be investigated further. But as long as there is a reasonable probability that the unmanned ship can be at least as safe as the manned ship in all its functions, there is no reason to believe that the legal framework could not be adapted.

Recognising the key role played by European shipping in the European and global economy, the achievement of strong and quality shipping requires a continuous review of the current regulations as well as the adoption of new policies, especially in the face of the challenges of new technologies. The European Union and the European Commission must continually improve its institutional framework, recognise the important role of shipping, safeguard its competitive policy and ensure the development in the shipping industry.

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