

**UNIVERSITÀ DI GENOVA
SCUOLA DI SCIENZE SOCIALI
DIPARTIMENTO DI ECONOMIA**



Tesi di laurea magistrale in
Economia e Management Marittimo-Portuale (EMMP)

Autonomous Shipping: Legal Issues

Relatore: Professor Giovanni Marchiafava

Candidato: Federico Marcone

Anno accademico 2022/2023

Index

Abstract (ENG)	4
Abstract (ITA)	5
Chapter I – General Aspects	6
I.1 Unmanned Vessels: an introduction	6
I.2 Definition of Autonomous vessel	7
International conventions	9
National Law	10
I.3 Future scenario: a techno-economic aspect	12
Why autonomous vessels? An economic perspective.....	12
The state of art: a technical perspective	13
The MUNIN Project.....	14
Yara Birkeland	15
The AAWA Project.....	16
Chapter II - Maritime law: can autonomous vessels be fit in?	17
II.1 Who regulates autonomous shipping at National, European, and International level.	18
Italy	18
The United Kingdom.....	19
The United States of America	20
European Union	21
International bodies	24
II.2 Focus: SOLAS.....	33
II.3 Focus: COLREGs.....	40
II.4 Focus: MARPOL.....	44

Chapter III – Cybersecurity: how cybercrimes can threaten maritime automated vessels.....	51
Current situation.....	51
International Conventions	60
Budapest Convention 2001	69
The United Nation Resolution on cybercrime	70
National and European measures	71
Cybersecurity in autonomous shipping.....	77
Chapter IV – How the industry is shaping to unmanned vessels.	80
IV. 1 Maritime Practice and Charterparties	80
GENCON 1994	83
NYPE 1946	86
Seaworthiness.....	87
Safe berths	87
IV.2 Liabilities, policies, and P&I Clubs	90
Liability	90
Liability of goods’ Carriage	98
IV.3 Insurance and P&I Clubs	102
IV. 4 Insurance and Cybersecurity	106
Northstandard club	106
West P&I.....	107
Gard.....	109
Chapter V – FOCUS: AUTOSHIPMAN by BIMCO	114
Ship Management.....	114
AUTOSHIPMAN.....	115
Services (Section 2).....	115

Obligations (Section 3)	120
Insurance, Budgets, Income, Expenses and Fees (Section 4)	122
Legal, General and Duration of the Agreement (Section 5)	125
Bibliography	136
Sitography	139
Acknowledgements.....	146

Abstract (ENG)

The intent of this paper is to investigate how the introduction of self-driving ships in the shipping market influences and will influence current national and international regulations. It also examines how the market is reacting to this innovation, which will certainly change the shipping business significantly. From a regulatory point of view, it is analysed how national, supranational, international public and private bodies are updating their understanding of these new types of ships. The starting point is the current legislation and its potential application to these types of ships, as legislation in this direction is still premature. On the other hand, an analysis was made of how the various institutions are moving, both in terms of forms and insurance. Emphasis was placed on the constant threat of cyber-attacks, which increasingly threaten shipping and will be crucial and dangerous in the future. Finally, thanks to the generosity of BIMCO, it was possible to analyse the version of the AUTOSHIPMAN form, which is expected to come into force in the coming months. This form concerns the ship management of self-driving ships.

Abstract (ITA)

L'intento di questo elaborato è quello di analizzare come l'introduzione delle navi a guida autonoma nel mercato del trasporto marittimo influenzi e influenzerà le attuali normative nazionali e internazionali. Si è esaminato, inoltre, come il mercato stia reagendo a questa innovazione, che certamente cambierà in modo significativo il settore del trasporto marittimo. Da un punto di vista normativo, si è effettuata un'analisi di come gli enti pubblici e privati nazionali, sovranazionali e internazionali stiano aggiornando la loro comprensione di questi nuovi tipi di navi. Il punto di partenza è la legislazione attuale e la sua potenziale applicazione a questi tipi di navi, poiché la normativa in questa direzione è ancora prematura. Si è poi analizzato come si stanno muovendo le varie istituzioni, sia in termini di formulari che di assicurazioni. È stato sottolineato il costante pericolo di attacchi informatici, che minacciano sempre più la navigazione e che saranno cruciali e pericolosi in futuro. Infine, grazie alla generosità del BIMCO, è stato possibile analizzare la versione del formulario AUTOSHIPMAN, che dovrebbe entrare in vigore nei prossimi mesi. Questo formulario riguarda la gestione delle navi a guida autonoma.

Chapter I – General Aspects

I.1 Unmanned Vessels: an introduction

Since the history of human beings began, humans tried to create artefacts to let them move easily. Nowadays, that we created a huge variety of transport systems, there are new challenges rising: automation. In some industries, automation is already used, and it is currently available in everyday life. In many sectors self-moving vehicles are still widely used and are re-shaping factories, warehouses, and ports.

The use of autonomous driving vehicles, or Automated Vehicles (AVs) has increased productivity in those industries that have introduced them. This is because these types of vehicles do not require human labour and can work continuously without ceasing operations. Moreover, the absence of human interaction significantly reduces the probability of error and accidents as well, making this technology the basis for the development of whole industries in the future. The peculiarity of these vehicles, even if today they are only used for specific purposes, allows them to be extremely versatile, especially for those uses where human presence would pose a risk to health and safety. Autonomous and intelligent robots are increasingly central to economic and social development, providing better and more reliable performance than humans. As far as vehicles are concerned, their development is still limited to a few fields that are mostly extremely controlled and with minimal motion paths. To the present day, passenger transportation is the one that arouses the most attention and concern as performance must be guaranteed to ensure the safety not only of passengers but also of all users surrounding the vehicle. Automated vehicles are beginning to be used in metro systems, such as some lines of the Paris or Milan undergrounds, even if they are remotely controlled vehicles. Much further behind, because they are much more complicated, is the development of land, air and naval autonomous guided vehicles. The current state of the art sees these vehicles widely used in military operations. This stems from the fact that in this context, the safety that needs to be guaranteed is less, given the absence, as a rule, of civilians in the circumstances. In any case, technologies developed at a military level, with the

necessary precautions and with much nobler aims, can be developed for civil transport¹. This kind of new technologies can be defined as disruptive because they completely change sectors and legal systems. Technology development is running fast, while legislators are way slower to adapt current law to these changes. A lot of scientific research is going on about automated vessels and it is clear that one day these new transport systems will be prevailing.²

I.2 Definition of Autonomous vessel

The IMO (International Maritime Organization) during the 103rd session of the MSC (Maritime Safety Council) in 2021, has outlined a preliminary legal framework of what an autonomous vessel is. The wording used is “Maritime Automated Surface Ships” (MASS) which encompasses all self-driving maritime surface vehicles, effectively excluding all autonomous submarines widely used for military purposes. According to the MSC, a MASS “refers to a ship which, to a varying degree, can operate independent of human interaction. Degrees of automation have been distinguished as follows:

- Degree 1: Ship with automated processes and decision support: Seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated and at times be unsupervised but with seafarers on board ready to take control.
- Degree 2: Remotely controlled ship with seafarers on board: The ship is controlled and operated from another location. Seafarers are available on board to take control and to operate the shipboard systems and functions.
- Degree 3: Remotely controlled ship without seafarers on board: The ship is controlled and operated from another location. There are no seafarers on board.

¹ These types of vehicles are much more used for military than civil purposes. Their development is due to research in the military sphere by the governments of large nations such as the United States and Japan. The legal and technical issues of the military usage of self-driving vehicles, however topical and relevant, are not dealt with here. For more on this topic, please refer to B. Gogarty, M. Hagger, 2008, “The Laws of Man over Vehicles Unmanned: The Legal Response to Robotic Revolution on Sea, Land and Air”, *Journal of Law, Information and Science*, Vol.19

² E. Van Hooydonk, 2014, “The law of unmanned merchant shipping – an exploration”, in “the journal of international maritime law” Vol. 20, pp. 403-406

- Degree 4: Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself.”³

As for the first two degrees, automation is partial. In fact, not only some of the processes are automated but there is even a crew on board. In these two cases, it is not possible to speak of unmanned vessels. In "Degree 2", the ship is remotely controlled but there is provision for transport and crew on board. In "Degrees 3 and 4", on the other hand, there is expressly no crew on board. In "Degree 3", the ship is remotely controlled while in "Degree 4" the ship is fully intelligent and is able to move autonomously to its destination. Regarding the last two completely automated vessels (Degree 3 and Degree 4 ships), two different types of vessels can be defined as Unmanned Sea Vessels (USVs): remote control vessels and autonomous vessels. In the first case there is an operator ashore that technically control the vessel and they guide it through the sea travel. The vessel is linked to a "Shore Coast Control", a control room where data, information are collected. This information is elaborated by Coastal operators, who give commands to the vessel, steering her to destination. But the actual navigation is performed automatically by the ship herself, human contribution is just about inputs. Autonomous vessels are, instead, completely autonomous. An operator will be able to add a final destination without any human control. Onboard computers will command engines, cargo, and every issue of the journey. Of course, the ship will be monitored by a commander centre that could be able to send new information to the ship to let her sail safely. That is possible through the employment of AI. Vessels, using different sensors, collect data that are constantly processed by onboard computers. The output generated by these computers are sent to engines and other equipment. Today USVs have both systems. The main issue of these types of vessels are that, ideally, no one human being needs to be boarded. The absence of the Master and crews creates many issues related to the application of the current law and international conventions.⁴

³ MSC 1 – Circular 1638, 3rd June 2021, "Outcome of the regulatory scoping exercise for the use of maritime autonomous surface ships (MASS)". This document contains the first regulatory framework regarding Autonomous vessels. As of today, the document has no legal status.

⁴ H.Ringbom, 2019, "Regulating autonomous ships – concepts, challenges and precedents", Ocean Development & International Law, Vol. 50, pp. 148-149.

Notwithstanding the definition of an autonomous ship in the IMO's 'Outcome of the regulatory scoping exercise for the use of maritime autonomous surface ships (MASS)'⁵, it is necessary to look at whether, under current law, self-driving ships can be defined as vessels. This is an important element to clarify before anything else because it is necessary to understand whether in some way the current law also applies to autonomous ships or whether *ad hoc* legislation specifically for this type of vessel is needed. In general, there is not a unique definition of “ship” or “vessel” within international conventions nor national laws. It would be theoretically appropriate to examine all international conventions and national laws to make sure that existing regulations also cover self-driving ships. But for the sake of brevity, we will analyse the main conventions and relevant laws of five countries: Italy, Spain, United States of America, United Kingdom and China.

International conventions

One of the most important conventions in place is the UNCLOS Convention on the Law of the Sea. It contains, *'inter alia'*, shipping rights and the basic duties of ships. However, it does not contain a specific definition of vessel and what makes up a ship. This absence of a proper definition of “ship” has led the doctrine to hold that autonomous ships could also be defined as ships and that therefore the UNCLOS also applies for them. That means that unmanned ships can benefit the same rights, duties, and must comply with the standards laid down by UNCLOS. Other conventions could be directly applied to unmanned vessels according to their definition of ship. For instance, MARPOL convention 1978, on Prevention of Pollution from Ships, Article 2, Clause 4, defines vessels as “*a vessel of any type whatsoever, operating in the marine environment and includes hydrofoil boat, air cushion vehicles, submersibles, floating platforms.*”⁶ Another broad definition is stated within COLREGs Regulation (International Regulations for Preventing Collisions at Sea 1972), Section 3(a): “*every description of water craft including non-displacement craft, WIG craft and seaplanes, used or capable of being*

⁵ MSC 1 – Circular 1638, 3rd June 2021, “Outcome of the regulatory scoping exercise for the use of maritime autonomous surface ships (MASS)”. This document contains the first regulatory framework regarding Autonomous vessels. As of today, the document has no legal status

⁶ International Convention for the Prevention of Pollution from Ships, 1973/78, Article 2, Clause 4; <http://www.marpoltraining.com/MMSKOREAN/MARPOL/intro/a2.htm>

used as a mean or transportation on water”⁷. Or International Convention for the Unification of Certain Rules of Law relating to Bills of Lading’s Article 1d: “*any vessel used for the carriage of goods by sea*”⁸. While the major convention does not use specific definition of vessels and do not include words such as “crew” or “master”, it is clear how they can be referred to unmanned ships. They describe ships merely as a mean of transport by water in order to refer to as many watercrafts as possible. Furthermore, these conventions were written back in time when the presence of people on board the ships was taken for granted. That could be another why there is no reference to human presence in any definition. This lack turns out to be extremely useful today.⁹

National Law

Every country has a Navigational Code or a Commercial Code that defines regulations on shipping matter. Five national laws will be taken in consideration: Italy, Spain, the United States of America, the United Kingdom, and China.

Italian Navigation Code (*Codice della Navigazione*), Article 136, defines ships as: “*Per nave s’intende qualsiasi costruzione destinata al trasporto per acqua, anche a scopo di rimorchio, di pesca, di diporto, o ad altro scopo.*”¹⁰ (Ship means any construction intended for transport by water, including for towing, fishing, recreational or other purposes.¹¹). Of the five definitions examined, the Italian one appears to be the most precise although it remains extremely vague. To be a ship, it must be a construction that is capable of sailing. This implies that any vessel capable of floating and moving in water can be defined as a ship. No reference is made to either the term 'crew' or the term 'master'. This implies that, according to the Italian navigation code, self-driven vessels, as long as they can navigate and carry goods, can be classified as ships.

According to 2011 “Ley de Puertos del Estado y Marina Mercante”, article 9.2 and 9.3 “2. *Se entiende por buque civil cualquier embarcación, plataforma o artefacto*

⁷ International Regulations for Preventing Collisions at Sea 1972, Section 3(a)

⁸ International Convention for the Unification of Certain Rules of Law relating to Bills of Ladings (The Hauge Rules), Article 1 d 1924

⁹ J.P. Rodriguez Delgado, 2018, “The Legal Challenges of Unmanned Ships in the Private Maritime Law: What Laws Would You Change?”, *Maritime, Port and Transport Law between Legacies of the Past and Modernization*, vol. 5, *Diritto marittimo – Quaderni*, pp. 498-500.

¹⁰ Italian Navigation Code, Article 136

¹¹ Literally translation of Italian Navigation Coda, Article 136

flotante, con o sin desplazamiento, apto para la navegación y no afecto al servicio de la defensa nacional.

3. *Se entiende por buque mercante todo buque civil utilizado para la navegación con un propósito mercantil, excluidos los dedicados a la pesca*¹² (“A civil vessel is defined as any vessel, platform or floating craft, with or without displacement, suitable for navigation and not assigned to the service of national defence. Merchant's vessel means any civil vessel used for navigation for a commercial purpose, excluding those engaged in fishing.”)¹³. The Spanish definition also emphasises the minimum requirement for an artefact to be defined as a ship: i.e., that it can sail and therefore float. Again, there is no reference to the presence or absence of people, crew, or master, on board. Hence it can be assumed that the presence of personnel on board the ship does not imply a fundamental requirement for it to be defined as such.

In UK's Merchant Shipping Act of 1995, a ship is considered as “*any ship or boat, or any other description of vessel used in navigation*”¹⁴. The English definition is the most generic of the five under exam. Explicit reference is made to the uses of the industry using the words “any other description of vessel used in navigation”.

While according to the United States Rules of Construction, Chapter 1, § 3, “*The word “vessel” includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water.*”¹⁵ The American one is the closest to the Italian definition because she is meant as a mean of transport by water.

Maritime Code of the People's Republic of China, Chapter 1, Article 3, refers at “*“Ship” as referred to in this Code means sea-going ships and other mobile units, but does not include ships or craft to be used for military or public service purposes, nor small ships of less than 20 tons gross tonnage*”¹⁶.

¹²Real Decreto Legislativo 2/2011, de 5 de septiembre, por el que se aprueba el Texto Refundido de la Ley de Puertos del Estado y de la Marina Mercante, article 9.2 and 9.3 <https://www.boe.es/buscar/act.php?id=BOE-A-2011-16467>.

¹³ Literally translation of Ley de Puertos del Estado y de la Marina Mercante, article 9.2 and 9.3

¹⁴ Merchant Shipping Act, 1995, Article 313 “Definitions”

¹⁵ Rules of Construction, Chapter 1, § 3. <https://www.law.cornell.edu/uscode/text/1/3>

¹⁶ According to Maritime Code of the People's Republic of China, available in English at https://english.www.gov.cn/services/doingbusiness/202102/24/content_WS6035f42dc6d0719374af97b9.html. This translation is provided directly by the Chinese Government. This document was adopted at the 28th Meeting of the Standing Committee of the Seventh National People's Congress on November 7, 1992 and promulgated by Order No.64 of the President of the People's Republic of China on November 7, 1992.

Five different legal systems were considered, some of them very different from each other. Common law and civil law systems have in common the presence of vague definitions. Italian, Spanish and Chinese legal systems provide more accurate descriptions than common law systems, such as English and American law, which refer to navigational customs. However, none of the five mentions the presence of persons on board the ship as an essential element to define a ship as such. This makes it possible to extend the definition of a self-driven or remotely operated vessel within the broader category of a ship.

I.3 Future scenario: a techno-economic aspect

Why autonomous vessels? An economic perspective

The development of this technology brings with it several direct benefits. The most important is the economic one. In fact, the absence of crew on board allows the shipowner to save on all crew costs, which are significant in the cost structure of a maritime company. The lack of personnel will also allow a significant reduction in the number of maritime accidents: it is estimated that 95-75%¹⁷ of sea accidents are directly attributable to human error. Furthermore, unmanned crafts allow a complete reduction on crew accident number, even completely zero it. No people on board results the ship as a place with no accidents and no safety features must be built. In addition, the ship will have additional space on board for storing goods that today are instead dedicated to the ship's crew. In fact, a relatively vast space today is dedicated to facilities for the Master and the Crew. This space could be used for the storage of the cargo allowing the shipowner to transport more goods. That could help reducing freights needed for a specific route. Additionally, the number of navigational days could be freely reduced or increased according to the specific time period in which that transport is done. Slow steaming, i.e., the reduction of the usual speed to travel a particular route, can be taken to extremes thanks to the possibility of being able to travel without any necessary stops for the crew. The normal speed of a cargo

¹⁷ “Allianz: Human error behind 75 percent of marine casualties” <https://safety4sea.com/allianz-human-error-behind-75-percent-of-marine-casualties/>

vessel is between 20 and 24 knots¹⁸ but using this procedure the speed is slowed to 12-19 knots¹⁹ depending on the specificities of the vessel or of the travel. In such a case, the only operational constraint would only become the need for refuelling and hence the capacity of the tanks. Since bunker costs are the most relevant on a daily basis, slow steaming is one of the most used techniques to reduce them during low freight periods. Slow steaming means more days of travel, the speed must be set to the amount of food on board. The absence of the crew, therefore, removes this problem.

Another advantage is the more efficiency in fuel consumption on board. Nowadays vessels have an engine and several generators that are required for the life onboard. So, it is obvious that less fuel will be consumed thanks to the absence of personnel aboard.

The insurance premium calculations will be affected by these new types of ships: the absence of personnel on board and therefore a lower risk of accidents not only of the ship itself but also the removal of the accident risk and deaths at work will lead to a significant reduction in premiums. Safer shipping due to safer ships that are not subject to human error reduces the likelihood of maritime accidents. To implement strategies aimed at mitigating operating costs by shipowners, this type of unmanned, safer, and more easily slow steaming ship will allow owners not only to greatly reduce their costs but also to be operationally more competitive and increase overall freight traffic.

The state of art: a technical perspective

As the fledgling market for self-driving ships are still uncommon and niche, the number of such vehicles amounts to only a few units worldwide, among the few ships that have been produced or are in production, we can find small ships that are used for operations either in ports or offshore. In any case, these are highly technologically advanced vessels also from an environmental point of view. Technological development goes hand in hand with environmental sustainability since most are powered by electricity

¹⁸ “How Slow Steaming Impacts Shippers and Carriers” <https://www.containerxchange.com/blog/slow-steaming/>, 2019

¹⁹ “How Slow Steaming Impacts Shippers and Carriers” <https://www.containerxchange.com/blog/slow-steaming/>, 2019

or renewable sources. It is recent news that the Italian shipyard, Fincantieri, will produce six 85 metres self-driving ships in Vard Vung Tau yards in Vietnam²⁰. These ships will be remotely piloted from shore and will also be powered by green ammonia, one of the possible alternative fuels that are being developed and could soon supplant traditional fuels.

The research and development of technologies implementing waterborne vehicle autonomous driving are still behind other sectors, such as land transport. Substantial research is underway to arrive at ships capable of navigating safely. The challenge is to create systems that enable these ships to navigate, make decisions and relate correctly to their surroundings, especially in port areas. It is necessary to implement sensors and satellite navigation systems capable of calculating the best possible route, even based on traffic. The development of these means poses legal and technical questions, e.g. how can these harnesses communicate with other ships, perhaps not self-driving ones? How can they interact with harbour masters? How can the safety of all subjects and objects actively interacting in the maritime environment be ensured?

Many projects are being researched. Since this paper aims to investigate the possible legal implications of the development of such technology, the leading projects currently underway will be reported on without any details but for purely informative purposes. For further information please refer to the references in the footnote.

The MUNIN Project.

The MUNIN project (Marine Unmanned Navigation through Intelligence in Networks) was a European Union co-funded project. With other industrial partners, funds were set aside for the development of a remotely controlled autonomous guided ship. This 3-year project was active between 2012 and 2015. This plan was divided into ten work tranches:

- *“develop a feasible and useful IT architecture for autonomous operation,*
- *analyse the tasks performed on today’s bridge and derive a concept for an autonomous bridge,*

²⁰“FINCANTIERI TO BUILD 6 MARINE ROBOTIC VESSELS FOR OCEAN INFINITY”, February 2022, <https://www.fincantieri.com/en/media/press-releases/2022/fincantieri-to-build-6-marine-robotic-vessels-for-ocean-infinity/>

- *examine the tasks in relation with a vessel's technical system and develop a concept for autonomous operation of the engine room,*
- *define the processes in a shore side operation centre required to enable a remote control of the vessel,*
- *validate the feasibility of the developed solutions combined into the concept of an autonomous and unmanned vessel and*
- *identify and investigate legal and liability barriers for unmanned vessels.”²¹*

This project involved the development of anti-collision radar (ARPA) and automatic identification systems (AIS). Through this implementation, it is possible to detect even minor objects. These sensors can also implement search and rescue, especially in low visibility and rough seas. As the ship is autonomous, it was envisaged that all electrical devices and single components would be designed to be durable, i.e. robustly constructed so as to minimise human intervention and in any case limit it to port calls during the ship's voyage. In addition, a thorough study was planned to improve communication between the ship and shore-based personnel and their coordination. This project aimed to reduce the operational expenses of a voyage, reduce the environmental impact through the extensive use of slow steaming, and make the industry more attractive to shipping professionals through a more comfortable and less itinerant working environment.²²

Yara Birkeland

Another recently concluded project is the Yara Birkeland, a self-driving Motor Vessel built by Marin Teknikk and Kongsberg Maritime and owned by Yara International, a company owned by the government of Norway. The Yara Birkeland is one of the first

²¹ As mentioned in the official MUNIN Project website <http://www.unmanned-ship.org/munin/about/>

²² This project has lot of literature about it, since is one of the first research about autonomous vessel. Being co-financed by the European Union, the MUNIN Project can be considered one of the most important works in this direction. There is many literatures about this project and an official website with all detailed information. The main sources used by the author are: <http://www.unmanned-ship.org/munin/> ; S. N. Trowers, 2020, “Smooth Sailing or a Risky Expedition: A Critical Exploitation into the Innovation of Unmanned Maritime Vehicles and Its Potential Legal and Regulatory Impacts on the Insurance Sector”, in *InsuerTech: A legal and Regulatory View*, Vol. 1, pp. 366-367; H.C. Burmeister, W. Bruhn, Ø. J. Rødseth, T. Porathe, 2014, “Autonomous Unmanned Merchant Vessel and its Contribution towards the e-Navigation Implementation: The MUNIN Perspective”, *International Journal of e-Navigation and Maritime Economy*, 1, pp. 1-13; and H.C. Burmeister, W. Bruhn; Ø. J. Rødseth, T. Porathe, 2014, “Can unmanned ships improve navigational safety?”, *Transport Research Aren*

ships to be environmentally friendly as it is electrically powered, fully self-driving, and remotely controlled. According to Yara International, the Yara Birkerland is able to take 40,000 trucks off the road and reduce CO₂ and Nitrogen Oxide (NO_x) emissions from the atmosphere. It was launched last spring, 2022, in the port of Porsgrunn in Norway²³. The self-driving ship is about 80 metres long and 15 metres wide, with a capacity of almost 120 TEUs²⁴. Costing USD 25 million, the Yara Birkeland is worth almost three times as much as a normal freighter. The parent company, however, claims that it will pay for itself within a short period of time, thanks to operating costs that have been reduced by 90%. Until 2024, Yara Birkeland will be in an experimental phase and will not be allowed to sail more than 12 nautical miles from the coast, constantly monitored by the surveillance authorities. Being battery-powered, the ship's range is limited by the volume of batteries. This prototype could be used for cabotage or short-haul routes.

The AAWA Project²⁵

Another current research project to develop autonomous vessels is the Rolls Royce Advanced Autonomous Waterborne Applications (AAWA) project. This is a project led by Rolls Royce but funded by the Finnish agency TEKES. The goals of the project are very similar to those of the MUNIN project. It aimed to create autonomous ships by 2020 through the concept of “dynamic autonomy”. The idea behind dynamic autonomy is that different aspects of maritime operations have different degrees or levels of autonomy. These technologies include autonomous navigation systems that include collision avoidance, route planning and situational awareness

²³ For more information about this vessel, visit: <https://www.yara.com/news-and-media/media-library/press-kits/yara-birkeland-press-kit/>

²⁴ TEU, twenty-equivalent unit, is a unit of measurement to indicate the capacity of a ship. A TEU represents a 20-foot container or the 20-foot equivalent of the container in question there are different container sizes on the market and in circulation. For example, the popular 40-foot container is equivalent to 2 TEUs.

²⁵ 2016, “Autonomous ships The next step” <https://www.rolls-royce.com/~media/Files/R/Rolls-Royce/documents/%20customers/marine/ship-intel/rr-ship-intel-aawa-8pg.pdf>

Chapter II - Maritime law: can autonomous vessels be fit in?

Shipping is one of the sectors most affected by international and supranational laws worldwide. Having a global dimension, it is affected by every decision taken at a national level. For this reason, to harmonise the rules for proper and safer navigation without restrictions, the various countries with a great maritime tradition have decided over the years to create entities and conventions that are recognised and recognisable throughout the world that could standardise regulations. This has made sea travel easier and safer. Legislation that standardised documents and procedures on a supranational level allowed maritime transport to prosper and to increase the global GDP and that of countries that have made international trade one of the main assets for their economies development. To date, no country is exempt from international trade, as a result of globalisation 90% of all goods produced globally are transported by sea and it can be said that almost all production chains have, at least at one stage, downstream or upstream raw materials or finished products that are transported by ship. Nevertheless, legislation adopted by large countries can directly influence the implementation of such rules internationally even in those nations that do not adopt such a law. Major players that have such wide power, given their international relevance and centrality in the maritime trades are, for example, the European Union and the United States of America. One example is Port State Control¹, born in Europe and then spread worldwide, and which has drastically reduced the phenomenon of sea wrecks and increased safety in international shipping. For this reason, it is important to look at those organisations that are involved in regulating the maritime sector and how these organisations impact on this sector, at national, European, and international level. It is also essential to examine how legislation can be adapted to self-driving ships, whether some of it is already applicable, which parts can be changed, and where regulatory gaps need to be filled. Finally, three conventions, SOLAS, COLREGS,

¹ The PSC is a practice adopted at the EU level by the Commission to counter the phenomenon of ships sailing without the minimum safety requirements. In 1978, a group of European countries decided to set up a system to control the minimum safety requirements for ships under the ILO (International Labour Organisation) rules. Periodic checks are carried out in the ports of call, which if not successfully passed, depending on the seriousness of the non-compliance, can lead to the ship being detained or banned from the waters of the countries adhering to the MoU. The success of this policy, made law through the Paris Memorandum of Understanding (or Paris MoU) in 1982, has prompted other countries around the world to adopt similar MoUs modelled on the European one. <https://www.parismou.org/about-us/history>

and MARPOL, will be analysed exploring how they can be affected by the fledging unmanned and drone ships sector.

II.1 Who regulates autonomous shipping at National, European, and International level.

One of the main issues for self-driving vehicles is regulatory compliance. For self-driving land vehicles, it is necessary to amend the traffic codes, which are a national competence and whose amendment is the responsibility of the Ministry of Infrastructure. Updating national regulations is an extremely slow political exercise that governments of countries around the world are required to do. In this respect, the process is very slow, also since the civil market does not yet possess such vehicles. If the path is still long for more advanced technologies and research, it will be even longer and more difficult for the maritime industry. This is where international conventions come into play. From a national point of view, it will be necessary to amend the navigation codes that regulate navigation in territorial waters, port laws, laws on the civil liability of autonomous vessels, and all other regulations within national jurisdiction. This will have to be taken care of by government bodies, such as ministries of transport and, where they exist, ministries of the sea. Each country has sectoral institutes that help and assist the legislative bodies to keep abreast of the latest developments in the sector and can help with regulatory updates. As already mentioned, it would be necessary to study all the legal systems, but for the sake of brevity, three countries will be analysed: Italy, the United Kingdom and the United States of America.

Italy

The Italian legislation on self-driving ships is, as in the rest of the countries, still behind the technological and market developments already in place. At national level, the responsibility for regulating maritime transport lies with MIT (*Ministero delle Infrastrutture e Trasporti*)² and the Port Authority with water safety responsibilities emanating from the Ministry of Defence. To date, there are no reported technical or working tables at the Italian level regarding self-driving ships. In fact, regulations must

² “In the maritime transport sector, the Ministry provides for the updating of national, Community and international regulations on maritime navigation, including the promotion of short sea shipping. It takes care, through a dedicated Directorate General, of the administrative regime for ships and manages subsidised services connecting islands [...]” <https://www.mit.gov.it/temi/trasporti/trasporto-marittimo>

certainly adapt not only to the international conventions to which Italy has adhered and ratified but also to the decisions being taken at the European Community level. In fact, the Italian Republic, as well as the other 26 countries that are members of the European Union, must transpose Regulations and Directives coming from the European Commission and other EU governing bodies. For this reason, the possibility of manoeuvre for Italy is relatively limited and it may be convenient to wait for European and international regulatory adjustments before legislating these kinds of matters.

The United Kingdom

The UK's Department of Transport in September 2021 published its Advice on the "Future of Transport Regulation: Marine Autonomy, Navy and Remote Operations"³. The main objective of the consultation was to examine whether current UK maritime law adequately addresses the safety of operations involving unmanned and automated vessels. Four main proposals were included in the consultation aimed at addressing several issues and clarifying several aspects of the Merchant Shipping Act 1995⁴. Firstly, and as a result of the IMO scoping exercise, they identified the need to define key definitions and roles in the operation of autonomous and self-contained ships in basic and secondary law, including the identification of an entity or person responsible for operations, or in the event of an emergency or accident. To refer to autonomous and remotely operated vessels, they propose to apply the MASS definition used by the IMO⁵. They also give definitions for 'Mass Master', 'Remote Operator' and 'Remote Operations Centre'. The other three proposals deal with the regulation of MASS vessels and remote-control centres and the authority given to the Maritime Coast Guard to regulate them for health, safety and the environment. The way the Department of Transport proposes to implement its changes is to amend the existing legal framework, in particular the primary legislation, to regulate all MASS activities, or in the absence of a new law, the Coastguard will continue to use the exemptions available under the Load Line Regulations 1998, which allow autonomous vessels to operate in UK waters and under the flag of the UK. If the latter option is selected, MASS will still be subject to all other applicable regulations and the

³ Future of transport regulatory review: maritime autonomy and remote operations <https://www.gov.uk/government/consultations/future-of-transport-regulatory-review-maritime-autonomy-and-remote-operations/future-of-transport-regulatory-review-maritime-autonomy-and-remote-operations>

⁴ The UK's Merchant Shipping Act 1995 contains the British legislation about maritime sector. <https://www.legislation.gov.uk/ukpga/1995/21/contents?view=plain>

⁵ For the IMO definition of MASS, please refer to previous chapter I.2

Workers' Boat Code - a code of conduct for small commercial workboats and all pilot boats - will be updated to include vessels within twenty-four metres of managed areas.⁶ The consultation ran from 28 September to 22 November 2022 and the comments received are still being considered by the government. In November last year, Maritime UK published the fifth edition of the MASS UK Code of Practice⁷, which aims to guide the design, construction and safe operation of MASS and semi-autonomous vehicles. However, a more detailed regulatory framework is and will be developed under the Merchant Shipping Act 1995, as indicated.

The United States of America

Such as in other countries, the USA is not yet moving in the direction of a law regulating this type of vessel. The USDoT⁸ (United States Department of Transportation) is currently working on documents and guidelines for self-driving land vehicles⁹ as this is the most developed technology available on the market. Since the US has ratified several conventions and is a member of the IMO, the writer assumes that the US is waiting for the international bodies before taking steps towards such legislation. Generally, two government bodies deal with maritime transport: the United States Department of Transport (USDoT) and the Federal Maritime Commission (FCM)¹⁰. The United States Coast Guard (USCG) aims to regulate vessel activities in United States waters. The USCG has carried out eleven missions, including port security, drug interdiction, navigation support, search and rescue operations, marine environmental protection, and others. The Coast Guard possesses broad powers to regulate safety, environmental compliance, and adherence to international standards for US vessels. The existing regulations are detailed and specific regarding vessel operations in the United States. The introduction of autonomous ships gives rise to the urgent need for a revision of the Coast Guard regulations. Its authority over vessels and maritime commerce is defined by a complex set of laws that also encompass the use of autonomous vessels. However, the

⁶ Future of transport regulatory review: maritime autonomy and remote operations
<https://www.gov.uk/government/consultations/future-of-transport-regulatory-review-maritime-autonomy-and-remote-operations/future-of-transport-regulatory-review-maritime-autonomy-and-remote-operations>

⁷ *ibid*

⁸ <https://www.transportation.gov/>

⁹ <https://www.transportation.gov/AV>

¹⁰ <https://www.fmc.gov/>

regulatory system in the United States remains fragmented among different agencies, and the approach to autonomous vessels will primarily be led by the Coast Guard¹¹.

European Union

At European level, there are several bodies dealing with shipping and maritime safety. Besides the European Commission, which is the executive arm of the Union, the Council of the European Union and the European Parliament, which have legislative power with a more political vocation, there are other more technical and specific entities such as the European Maritime Safety Agency (EMSA)¹², or CINEA (European Climate, Infrastructure and Environment Executive Agency)¹³. EMSA's mission is to serve the EU's maritime interests for a safe, secure, green and competitive maritime sector, and to act as a trusted and respected reference point in the shipping sector in Europe and worldwide. It works on maritime safety, security, climate, environment and single market issues and missions, first as a service provider to Member States and the Commission, but also as a partner and knowledge hub for the European maritime cluster. EMSA in 2020 concluded a study¹⁴, the “SAFEMASS project” on the safety issues that may arise with the adoption of self-driving ships. Without prejudice to the fact that safety issues vary according to the degree of automation of the vehicle, the study covers a wide range of issues from the more technical and engineering ones to the more strictly legal ones and the gaps in international laws, which are the subject of the next chapters. It is necessary to emphasise that the high degree of internationality of this sector combined with the technical-legal innovation of self-driving ships means that not only European but also international and national bodies are slow to adapt to this technology. However, the European Union is beginning to get moving in order to study the subject in greater depth. In November 2019, guidelines for sea trials of self-driving ships were issued to help

¹¹ A. Berret, “US Perspectives on Regulating Maritime Autonomy”, 2022, in “Autonomous Vessels in Maritime Affairs, Law and Governance Implications”, Palgrave Macmillan

¹² EMSA is the European Union body designated to regulate and control navigation, safety, and security in European waters. <https://emsa.europa.eu/>

¹³ https://cinea.ec.europa.eu/index_en

¹⁴ S. Øie, 2020, “Study of the risks and regulatory issues of specific cases of MASS”. This project is divided into Part 1 and Part 2. Part 1 discusses the emerging risks associated with lower levels of maneuver and longer duration with unmanned ships on three different types of vessels designed to operate with different degrees of autonomy and control. together. Part 2 discusses the emerging risks associated with the design and remote operation of three similar unmanned ships. Both studies included hazard identification, fault tree analysis, and a set of recommended risk control measures and options. Part 1 also includes a review of upcoming legal challenges.

member states in testing such vessels¹⁵. These Guidelines introduce a harmonised regulation on the subject, which can be transposed by Member States, defining the roles of the actors involved and providing useful guidance for risk assessment when dealing with sea trials on autonomous ships. In particular, the Guidelines provide that a National Authority defined as a "Relevant Administration"¹⁶ is appointed for each Member State, which has the duty to establish safe zones for carrying out tests and which is responsible for issuing authorisations for carrying out tests in a given area to the applicants. The latter, on the other hand, are defined as "Applicants"¹⁷ and are stakeholders who formally request the Relevant Administration to carry out sea trials on autonomous ships by submitting all the necessary information requested to the competent authority. Specifically, the Applicant must make known to the competent authority the degree of autonomy of the ship with a list of functions normally performed by the crew that are replaced by technology during the tests; furthermore, it must provide a list with a description of the type of technologies used by the ship for communication and control, and must establish whether the test is performed within sight of the ship's command position or beyond it. The Guidelines also require the Applicant to ensure that the personnel involved in the on-board and remote tests are duly qualified and that the Applicant provides contingency plans for cases of sudden adverse marine weather conditions or for the case of breakdown of operational systems. The Applicant is also required to draw up and provide the competent administrative authority with a plan with dates and times of execution of the tests and a "cyber risk management plan" functional to demonstrate an adequate level of security of the on-board technological systems, such as to prevent cyber-attacks and able to avoid the interruption of planned operations. Finally, the Applicant must take care of the definition of a rescue plan to be submitted to

¹⁵ "EU OPERATIONAL GUIDELINES FOR SAFE, SECURE AND SUSTAINABLE TRIALS OF MARITIME AUTONOMOUS SURFACE SHIPS (MASS)" https://transport.ec.europa.eu/system/files/2020-11/guidelines_for_safe_mass.pdf

¹⁶ According to "EU OPERATIONAL GUIDELINES FOR SAFE, SECURE AND SUSTAINABLE TRIALS OF MARITIME AUTONOMOUS SURFACE SHIPS (MASS)" Relevant Administration is defined as "the organisation(s) (such as Competent Authority / National authority with responsibilities as flag, port and/or coastal State) responsible for designation of test area(s)/ship safety zone(s) and authorisations or approvals of trials within such areas or zones" Chapter 4, "Terms and definitions", page 5.

¹⁷ According to "EU OPERATIONAL GUIDELINES FOR SAFE, SECURE AND SUSTAINABLE TRIALS OF MARITIME AUTONOMOUS SURFACE SHIPS (MASS)", Applicant is defined as "the relevant stakeholder(s) formally applying for the trial and assuming responsibility and liability for the trials and submitting all the necessary information to the relevant Administration", Chapter 4, "Terms and definitions", page 5.

the competent authority that specifies the operational process to rescue the autonomous ship in case of imminent danger, to repair it and eventually allow it to be refloated and - if present - to secure the crew. The Applicant, as the party responsible for the tests performed, is obliged to take out an adequate insurance policy or an equivalent financial guarantee as required by Directive No. 20 of 2009¹⁸ on the insurance of shipowners for maritime claims. Furthermore, the Applicant, at the time of application, is made aware that it will be held liable for any pollution damage caused during testing by the authorised autonomous ship. In harmony with the above, Annex 1¹⁹ to the Guidelines contains an example of a form to be made available to the Applicant by the Relevant State Authority, to be filled in with all the information required by the Relevant Administration to assess the possibility of carrying out the tests at sea. Once the Applicant has provided all the required information to the Relevant Administration Authority, the latter will have to deal with the risk assessment for carrying out the tests. In particular, the Relevant Administration will have to establish a 'safety zone' - i.e., a delimited area of sea dedicated to the execution of the tests in safety - taking into account the technical characteristics of the autonomous ship concerned, the geographical area in which the tests are to be conducted, their duration, the usual maritime traffic in the area of reference and the communication infrastructures present. Once this risk assessment has been made considering all the available data, the Relevant Administration, before authorising the tests, is entitled to carry out an on-site inspection to assess their feasibility. Lastly, once all the aforementioned checks have been carried out, the Relevant Authority may then decide whether or not to authorise the Applicant and, if so, it may determine whether the safety zone duly established for this purpose may be used by one or more Applicants to carry out the tests in safety. In light of the publication of these Guidelines, it is now up to the Member States to take action as soon as possible to set up ad hoc national authorities and in the internal organisation of the agreed procedures so that it will be concretely

¹⁸ DIRECTIVE 2009/20/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the insurance of shipowners for maritime claims
<https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:131:0128:0131:EN:PDF>

¹⁹“This Annex provides an example for developing comprehensive and relevant documentation when applying for MASS trials. The section may set out aspects of intended operations, authorisations, liabilities and responsibilities, reporting and safety cases.” “EU OPERATIONAL GUIDELINES FOR SAFE, SECURE AND SUSTAINABLE TRIALS OF MARITIME AUTONOMOUS SURFACE SHIPS (MASS)” page 19-21

possible to carry out tests on autonomous ships in safety, enabling their best possible technological development and their official entry into the shipping world.²⁰

International bodies

At international level there are many actors playing an important role regulating shipping. There are many entities that are trying to adapt to the changing market so as to be prepared when these new technologies will enter the market on a massive scale. These entities are moving to adopt regulations on the public side and customs on the private side. There are a large number of companies in the world dealing specifically with shipping from a certification point of view, i.e., companies that certify the class, seaworthiness and many other safety and technical parameters of the ship. There are also companies that deal with maritime contracts and in their own way intervene in adapting maritime practice to the new changes brought about by the market by following the demands and needs coming from shipowners and all players in the global shipping market. But let's now proceed in order. As far as the certification of ships is concerned, i.e. the certification by internationally recognised companies of all the requirements needed to be able to navigate the ship and register it in the appropriate shipping registers of the various nations around the world, the main ones include: RINA Services, the American Bureau of Shipping, Bureau Veritas Marine & Offshore, Nippon Kaiji Kyokai (ClassNK) (日本海事協会), China Classification Society (中国船级社), DNV, Korean Register, and Lloyd's Register of Shipping. The above-mentioned companies began to deal with the subject of self-driving navigation for civil ships. RINA (*Registro Italiano di Navigazione*)²¹ recently issued a class certificate to the first of 20 self-driving ships capable of operating up to 200 nautical miles from the coast. These 12-metre-long vessels will be used to collect bacteria load data at sea and will be operated remotely from a control room located in the

²⁰ “EU OPERATIONAL GUIDELINES FOR SAFE, SECURE AND SUSTAINABLE TRIALS OF MARITIME AUTONOMOUS SURFACE SHIPS (MASS)”
https://transport.ec.europa.eu/system/files/2020-11/guidelines_for_safe_mass.pdf

²¹ RINA is the Italian certifying body, founded in Genoa in 1861 in its 162 years of history it is still one of the reference points of nautical and classification not only in Italy but worldwide. Today in its portfolio of activities it offers both classification services for ships and consulting services in maritime, energy and infrastructure sectors. <https://www.rina.org/en>

Netherlands²². Even Lloyd's Register²³, the oldest of the surveyed companies founded in 1768 in the UK, has initiated programmes for the certification of self-driving ships. In June 2022, it signed with Samsung a Memorandum of Understanding (MoU) for the realisation of self-driving ships with the aim of supporting digitalisation in the maritime field and meeting the increasing demand for automation in the industry²⁴. Bureau Veritas²⁵ and the American Bureau of Shipping (ABS)²⁶ went one step further by issuing guidelines for autonomously guided vessels. In October 2019, Bureau Veritas released the NI641 R01 'Guidelines for autonomous shipping'²⁷, and in June 2022, the NR681 R00 'Unmanned Surface Vessels (USV)'²⁸ guidelines for the classification of surface vessels without any crew on board. Similarly, the American Bureau of Shipping in February 2022 released a whitepaper for the classification of autonomously guided vessels, 'Autonomous Vessels'. This shows that the industry is equipping itself with rules, which are not yet uniform, but which are able to identify fixed points with which to tackle this great innovation that is and will be automated maritime transport.

At international level, there are other bodies that are actively involved in the regulation of international shipping both legally and contractually. These two aspects are crucial considering the very high internationalization of the industry and the need to make rules and contracts uniform throughout the world to facilitate faster and easier international transportation. From a legal point of view, the countless international conventions that are active to date leap out. These conventions are drafted by delegates from numerous international countries which regulate various aspects of maritime

²² "RC Dock Receives Class Approval from RINA for New Remotely Controlled Unmanned Workboat" 23rd March 2023, <https://www.rina.org/en/media/press/2023/03/29/workboat-rc-dock>

²³ Lloyd's Register, founded in London in 1768, is one of the oldest certification institutes in the maritime sector. As other certification bodies have expanded its business as in marine, maritime, energy and infrastructure consultancy. <https://www.lr.org/en/>

²⁴ "LR and Samsung Heavy Industries pen MOU for Samsung Autonomous Ship." 7 June 2022, <https://www.lr.org/en/latest-news/lr-samsung-heavy-industries-pen-mou-samsung-autonomous-ship/>

²⁵ Bureau Veritas is a French company founded in 1826 with the aim of certifying ships before they are put to sea. Today, after more than 190 years of history, it is one of the global leaders in certification, but has also expanded its business into other sectors such as automotive, construction and energy. <https://group.bureauveritas.com/>

²⁶ The American Bureau of Shipping (ABS) is the USA shipping certification institute. Founded in 1862, ABS is a global leader in providing classification services for marine and offshore assets. <https://ww2.eagle.org/en.html>

²⁷ "Guidelines for autonomous shipping", October 2019; <https://marine-offshore.bureauveritas.com/ni641-guidelines-autonomous-shipping>

²⁸ "Unmanned surface vessels", June 2022; <https://marine-offshore.bureauveritas.com/nr681-unmanned-surface-vessels-usv>

transport. The body that oversees the decisions and drafting of international conventions is the IMO²⁹, the International Maritime Organization, a branch of the United Nations specific to maritime and inland waterway transport. The IMO is the entity that encompasses all the major international conventions and supports the updating of existing conventions and the study of what new challenges the industry will be up against in the near future. Indeed, it is IMO, as mentioned above, that has drafted the definitions of autonomous surface maritime transport (MASS)³⁰, thus giving an important frame to this new technology.

The IMO is closely following the development of self-driving ships so as to be ready for this technology and to help the industry with the introduction of this innovation that is set to revolutionise the current concept of shipping. This endeavour involves a delicate balancing act that encompasses maximizing the advantages presented by emerging technologies while diligently addressing concerns related to safety, security, environmental impact, international trade facilitation, industry costs, and the welfare of both on-board and shore-based personnel. The overarching goal is to ensure that the regulatory framework governing Maritime Autonomous Surface Ships (MASS) remains in lockstep with the rapidly evolving technological landscape. In the year 2021, IMO embarked upon an extensive regulatory scoping exercise with a specific focus on Maritime Autonomous Surface Ships. The primary objective was to meticulously assess the relevance of existing IMO protocols to vessels operating with varying degrees of automation. The outcomes of this regulatory scoping exercise for safety treaties were finalized during the 103rd Session of the Maritime Safety Committee (MSC) in May 2021. Simultaneously, for treaties falling within the purview of the Legal Committee, the finalization occurred during its 108th session in July 2021. Further endorsement of the

²⁹ “It has always been recognized that the best way of improving safety at sea is by developing international regulations that are followed by all shipping nations and from the mid-19th century onwards a number of such treaties were adopted. Several countries proposed that a permanent international body should be established to promote maritime safety more effectively, but it was not until the establishment of the United Nations itself that these hopes were realized. In 1948 an international conference in Geneva adopted a convention formally establishing IMO (the original name was the Inter-Governmental Maritime Consultative Organization, or IMCO, but the name was changed in 1982 to IMO)” IMO history website <https://www.imo.org/en/About/HistoryOfIMO/Pages/Default.aspx>

For more visit: <https://www.imo.org/en>

³⁰ MSC 1 – Circular 1638, 3rd June 2021, “Outcome of the regulatory scoping exercise for the use of maritime autonomous surface ships (MASS)”. This document contains the first regulatory framework regarding Autonomous vessels. As of today, the document has no legal status.

results of the regulatory scoping exercise for treaties under the Facilitation Committee's jurisdiction was achieved at FAL 46 in May 2022. Building upon the insights gleaned from the scoping exercise, additional strides were made during the MSC's 106th session in November 2022. These advancements centered around the development of a goal-oriented instrument designed to regulate the operations of maritime autonomous surface ships. The ultimate aim is to introduce a non-compulsory goal-based MASS Code, anticipated to take effect in 2025. This code will serve as the foundational framework for a mandatory goal-based MASS Code slated to come into force on January 1, 2028. To facilitate collaboration and tackle common challenges arising from the regulatory scoping exercises conducted by the three committees—MSC, Legal Committee, and Facilitation Committee—a Joint MSC/LEG/FAL Working Group has been established. This cross-functional mechanism is geared towards addressing shared issues. During MSC 106, updates pertaining to the inaugural meeting held in September 2022 of the Joint MSC/LEG/FAL Working Group on MASS were communicated. Additionally, the Committee endorsed the work plan of the Group and green-lighted the scheduling of two additional meetings in 2022 and 2023. Furthermore, the Maritime Safety Committee's 101st session in June 2019 saw the approval of Interim guidelines for Maritime Autonomous Surface Ships (MASS) trials (MSC.1-Circ.1604). These guidelines stipulate that MASS trials must adhere to safety, security, and environmental protection standards equivalent to those mandated by relevant instruments. Comprehensive risk identification and mitigation measures, geared towards minimizing risks to the lowest reasonably practicable and acceptable levels, must be implemented during trial activities. It is imperative that all individuals involved in MASS trials, whether remote operators or on board, possess suitable qualifications and experience to conduct these trials safely. Rigorous cyber risk³¹ management for the systems and infrastructure employed during MASS trials is also of paramount importance. The regulatory scoping exercise encompassed a broad spectrum of topics, including the human element, safety, security, liability, compensation for damage, port interactions, pilotage, incident response, and the protection of the marine environment. This extensive evaluation involved a meticulous assessment of numerous IMO treaty instruments, categorizing them based on their applicability to MASS operations, and identifying the need for amendments or

³¹ Cyber risks and cyber security will be analysed later on in the following chapters (3 and 4),

clarifications where warranted. The results of the scoping exercise underscored several high-priority issues that spanned multiple instruments. These matters require policy-level consideration for future action. Key areas of focus include the development of standardized terminology and definitions for MASS, including an internationally accepted definition of MASS and clarification of terms such as "master," "crew," or "responsible person," particularly in the context of Degree Three (remotely controlled ship) and Degree Four (fully autonomous ship). Additionally, significant attention is directed toward addressing the functional and operational requisites of remote-control stations/centers and the possible designation of a remote operator as a seafarer. Moreover, common potential gaps and themes surfaced across various safety treaties, pertaining to provisions governing manual operations and alarms on the bridge, personnel actions (e.g., firefighting, cargo handling, maintenance), watchkeeping, implications for search and rescue, and the necessary onboard information for safe operations. The motivation behind the IMO's examination of autonomous ship regulations is rooted in its Strategic Plan (2018-2023)³², which includes a strategic direction to integrate emerging technologies into the regulatory framework. Due to the multifaceted nature of commercial operations involving autonomous ships, three IMO committees (FAL, LEG and MSC) are engaged in ensuring that IMO instruments remain suitable for purpose and adaptable to rapid technological advancements. While autonomous and remote-controlled ships are undergoing trials in specific sea areas, the prevailing consensus is that these operations will primarily pertain to short voyages, such as those between specific ports over relatively short distances.

³² The IMO Assembly, convening every two years, adopts the Revised Strategic Plan for the Organization covering 2018-2023. This plan emphasizes IMO's mission to promote safe, secure, environmentally friendly, efficient, and sustainable shipping through international cooperation and high safety, security, and pollution control standards.

The vision is to maintain IMO's role as a global shipping regulator, recognizing the sector's importance, while addressing technological advancements, global trade, and the 2030 Sustainable Development Agenda. Key principles, including implementation improvement and engagement with climate change, are central.

Strategic Directions (SD) guide the plan, such as integrating emerging technologies, addressing climate change, enhancing trade facilitation and security, focusing on the human element, and ensuring organizational and regulatory effectiveness. Performance indicators measure progress, and planned outputs align with the strategy and budget.

For more information please visit: <https://www.imo.org/en/About/Strategy/Pages/Default.aspx>

In May 2023, IMO hosted a symposium titled "Making headway on the IMO MASS Code,"³³ aimed at exploring the latest developments in autonomous shipping. The symposium aimed to contribute to the development of the MASS Code and establish a network for international cooperation. Details of the event can be found in the provided summary. In 2021, the IMO organized a seminar focused on the Development of a Regulatory Framework for Maritime Autonomous Surface Ships (MASS). This event brought together thought leaders from research, academia, business, and government to discuss the challenges and innovative approaches required for the development of a MASS Code. Presentations on autonomous shipping from a special session during the 100th session of IMO's Maritime Safety Committee in 2018 are also available for reference. The regulatory scoping exercise considered a range of treaties within the jurisdiction of various IMO committees: For the Maritime Safety Committee (MSC), the instruments covered included those related to safety and maritime security (SOLAS)³⁴, collision regulations (COLREG)³⁵, loading and stability (Load Lines)³⁶, training of

³³ The "Making Headway on the IMO MASS Code" symposium, hosted in IMO headquarter in London on May 30th 2023, explored developments in autonomous shipping, focusing on technological advancements, commercialization, and port adaptation. It preceded IMO's Maritime Safety Committee's 107th session with the aim of contributing to the development of the MASS Code and fostering international cooperation. Key points from the symposium include the Republic of Korea's NEMO intelligent navigation system, Korean Register's condition-based maintenance technology, the UK's efforts to identify regulatory challenges, and Norway's pursuit of sustainable MASS with human operator backup. The symposium also discussed the impact of innovation on the MASS Code, highlighting simulations from Korean companies, and emphasized the role of autonomous shipping in reducing human errors, improving efficiency, and creating jobs. Digitalization of ports and their connection to MASS was explored, with examples from Incheon Port and Busan Port Authority. The symposium provided valuable insights for developing a legal framework for safe Maritime Autonomous Surface Ship operations.

For more information please visit: <https://www.imo.org/en/About/Strategy/Pages/Default.aspx> and <https://www.imo.org/en/About/Events/Pages/IMO-MASS-Code-Symposium.aspx>

³⁴ See Chapter II.2 for more details.

³⁵ See Chapter II.3 for more details.

³⁶ The Convention discusses the significance of load lines in ensuring ship safety by limiting a ship's draught. These lines, known as freeboards, are a primary focus of the Convention, alongside weathertight and watertight integrity. The 1966 Load Lines convention by IMO introduced regulations for determining freeboard based on subdivision and damage stability calculations, considering different hazards in various zones and seasons. The technical annex added safety measures for hull watertight integrity below the freeboard deck. Load lines are marked on each side of a ship amidships, along with the deck line. Ships carrying timber deck cargo have lower freeboards due to cargo protection from waves. The Convention includes three annexes: General, Conditions of assignment of freeboard, Freeboards, and Special requirements for timber cargo ships. Zones, areas, and seasonal periods are covered in Annex II, while Annex III deals with certificates, including the International Load Line Certificate. Amendments were made in 1971, 1975, 1979, and 1983 but required two-thirds party acceptance and never took effect. The 1988 Protocol, which entered into force in 2000, harmonized survey and certification requirements with SOLAS and MARPOL conventions. It also introduced the tacit amendment procedure, where amendments adopted become effective unless rejected by one-third of Parties, usually within two years of adoption.

For more information visit: <https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Load-Lines.aspx>

seafarers and fishers (STCW, STCW-F)³⁷, search and rescue (SAR)³⁸, tonnage measurement (Tonnage Convention)³⁹, Safe Containers (CSC)⁴⁰, and special trade passenger ship instruments (SPACE STP, STP)⁴¹.

³⁷ The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978” has undergone multiple amendments in 1991, 1994, 1995, 1997, 1998, 2004, 2006, 2010, 2014, 2015, 2016, and 2018. These amendments cover a wide range of topics, including global maritime distress and safety systems, special training requirements for tanker personnel, medical standards, hours of work and rest, fraud prevention, cargo handling, ship security officers, and modern technology training. Part A of the STCW Code contains mandatory provisions, while Part B offers recommended guidance for implementing the Convention. The amendments have introduced numerous changes to enhance safety and competence in the maritime industry, including refresher training modules, security training, and polar waters and dynamic positioning system training. The convention also covers the reporting and evaluation process for STCW compliance by Parties, with regular circulars and revisions published by the Maritime Safety Committee. The chapters of the STCW Convention cover general provisions, master and deck departments, engine departments, radiocommunication, special training requirements, emergency procedures, alternative certification, and watchkeeping. For more information visit: <https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Convention.aspx>

³⁸ The 1979 Convention on Search and Rescue (SAR) aimed to establish an international plan for coordinating rescue operations at sea, ensuring that regardless of where an accident occurred, SAR organizations would coordinate rescue efforts. Before the SAR Convention, there was no comprehensive international system for SAR operations, and some areas lacked any organized assistance. The Convention's technical requirements are detailed in an Annex, consisting of five chapters. Parties to the Convention must provide adequate SAR services in their coastal waters and are encouraged to form SAR agreements with neighboring states, create rescue coordination centers, and expedite the entry of rescue units from other Parties into their territorial waters. The Convention also outlines preparatory measures, operating procedures for emergencies, ship reporting systems, and cooperation between states for efficient SAR operations. It established ship reporting systems and divided the world's oceans into 13 search and rescue areas. In 1998, amendments to the SAR Convention were made to clarify responsibilities, emphasize regional coordination, and harmonize SAR provisions with the International Civil Aviation Organization (ICAO). These amendments focused on terms and definitions, organization and coordination, cooperation between states, operating procedures, and ship reporting systems. Furthermore, in 2004, amendments addressed the treatment of persons rescued at sea and emphasized delivering them to a place of safety. Guidelines for the treatment of rescued persons were also adopted during this period.

For more information visit: <https://www.imo.org/en/OurWork/Safety/Pages/SARConvention.aspx>

³⁹ The Convention, adopted by IMO in 1969, established a universal tonnage measurement system to replace various, differing methods previously used to calculate the tonnage of merchant ships. It introduced rules for both gross and net tonnages, calculated independently. The Convention applied to ships built after July 18, 1982, while those built before that date were allowed to retain their existing tonnage until July 18, 1994, to provide economic safeguards. The goal was to minimize differences between the new system's gross and net tonnages and those calculated using previous methods. This transition also led to the replacement of terms like gross register tons (grt) and net register tons (nrt) with gross tonnage (GT) and net tonnage (NT). Gross tonnage influenced manning regulations, safety rules, and registration fees, while both gross and net tonnages were used to calculate port dues. Gross tonnage depended on the ship's enclosed spaces, while net tonnage was calculated based on cargo spaces, with a minimum of 30 percent of the gross tonnage.

For more information visit: <https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Tonnage-Measurement-of-Ships.aspx>

⁴⁰ In the 1960s, the use of freight containers for sea transport saw a rapid increase, leading to the development of specialized container ships. In response to safety concerns, the International Maritime Organization (IMO) initiated a study in 1967 to evaluate containerization safety in marine transport. This study identified the container itself as a crucial aspect to address. In collaboration with the Economic

The Facilitation Committee examined the Convention on Facilitation of International Maritime Traffic (FAL Convention)⁴². Regarding the Legal Committee, the

Commission for Europe, IMO developed a draft convention. In 1972, the finalized Convention was adopted during a conference jointly organized by the United Nations and IMO. The 1972 Convention for Safe Containers has two primary objectives: Ensuring a high level of safety for human life during container transport by establishing universally accepted test procedures and related strength requirements; facilitating international container transport by creating consistent international safety regulations applicable across all surface transport modes, preventing the proliferation of disparate national safety rules.

The Convention's scope encompasses most internationally used freight containers, except those designed exclusively for air transport. It applies to containers of a specified minimum size with corner fittings for handling, securing, or stacking. The Convention includes two annexes:

- Annex I outlines regulations for testing, inspecting, approving, and maintaining containers.
- Annex II details structural safety requirements and tests, including test procedures.

Approved containers must bear a safety approval plate issued by an Administration of a Contracting State or a designated organization. This approval should be recognized by other Contracting States, ensuring the reciprocal acceptance of safety-approved containers, streamlining international container transport. Container owners are responsible for the ongoing maintenance of safety-approved containers, subject to periodic examinations. The Convention mandates various tests, combining safety requirements from both inland and maritime transport modes. To maintain flexibility, the Convention incorporates a simplified amendment procedure (tacit amendment procedure) allowing swift adjustments of test procedures to meet the evolving needs of international container traffic.

For more information visit: [https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-Safe-Containers-\(CSC\).aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-Safe-Containers-(CSC).aspx)

⁴¹ The Special Trade Passenger Ships Agreement of 1971 and the Protocol on Space Requirements for Special Trade Passenger Ships of 1973 were established to address safety concerns related to the transportation of a large number of unberthed passengers in specific trade routes, particularly in the Indian Ocean. Before these agreements, passenger transport in these contexts was regulated by the Simla Rules of 1931, which became outdated following the adoption of the 1948 and 1960 SOLAS Conventions. As a result, the International Maritime Organization (IMO) convened an International Conference in 1971 to develop safety requirements for special trade passenger ships in alignment with the 1960 SOLAS Convention. The Special Trade Passenger Ships Agreement includes the Special Trade Passenger Ships Rules of 1971, which introduce modifications to the regulations of Chapters II and III of the 1960 SOLAS Convention to ensure passenger safety in these specialized trade routes. In 1973, following the 1971 Conference, the IMO collaborated with organizations such as the World Health Organization (WHO) to create technical rules concerning the safety aspects of passenger transport on these ships. The Protocol on Space Requirements for Special Trade Passenger Ships, adopted in 1973, contains these technical rules as an annex. These rules outline the spatial requirements necessary to ensure the safety of passengers aboard special trade passenger ships. Together, the 1971 Agreement and the 1973 Protocol provide a comprehensive framework for the safety and regulation of passenger transport in special trade routes, with the Protocol's space requirements complementing the provisions of the Agreement.

For more information visit: <https://www.imo.org/en/About/Conventions/Pages/Special-Trade-Passenger-Ships-.aspx>

⁴² The FAL Convention, in force since 1967, plays a crucial role in ensuring a unified global approach to facilitating international shipping. It is continually amended and updated by Governments through the FAL Committee of IMO, which meets annually at IMO's London Headquarters. The Convention's Annex outlines standards, recommended practices, and rules aimed at simplifying formalities, documentary requirements, and procedures related to ships' arrival, stay, and departure. To facilitate this, IMO has developed standardized FAL documentation, known as FAL Forms, for use by authorities and Governments. Since April 2019, the FAL Convention mandates electronic exchange of FAL declarations between ships and ports. Starting from January 2024, a single-window approach will be mandatory in all ports, eliminating references to documents or forms in the Convention. Additionally, the Explanatory Manual to the Convention on Facilitation of International Maritime Traffic provides guidance and interpretation of the Convention's annex, aiding in understanding its legal provisions. The Manual is

scoping exercise concluded that MASS could be accommodated within the existing regulatory framework of LEG conventions with limited adjustments or the introduction of new instruments. While some conventions could readily accommodate MASS, others may necessitate additional interpretations or amendments to address identified gaps and themes. Notably, the roles and responsibilities of the master and remote operator emerged as high-priority issues that require joint consideration across committees. Additionally, legal terms like "fault," "negligence," and "intention" in the context of harm caused by autonomous technology warranted examination. UNCLOS⁴³, although not an IMO Convention, will play a crucial role in governing MASS operations within its legal framework. Consequently, UNCLOS will also require careful consideration.⁴⁴

From a contractual point of view, on the other hand, it is customary in this industry to refer to so-called forms, which are standardized forms of contracts widely used in maritime practice. One of the bodies most concerned with forms is BIMCO⁴⁵ (Baltic and International Maritime Council). This body is one of the most cutting-edge and is the one that is taken as the benchmark with regard to maritime contracts. Under consideration is the creation of a form specifically made for self-driving ships. Reference is made to Chapter V of this paper in this regard. The current challenge is to go into whether the current international conventions can also apply to future autonomous and automated maritime transport. There are numerous international conventions that cover all aspects

periodically reviewed and updated, with the most recent update in April 2019 and ongoing updates since 2023.

For more information visit: <https://www.imo.org/en/OurWork/Facilitation/Pages/FALConvention-Default.aspx>

⁴³ The United Nations Convention on the Law of the Sea (UNCLOS) is a multilateral treaty established under the United Nations. It was the result of the third United Nations Conference on the Law of the Sea (UNCLOS III), held from 1973 to 1982. This convention was made open for signature on December 10, 1982, in Montego Bay and officially became effective on November 16, 1994, after the 60th instrument of ratification was deposited. UNCLOS serves to define and codify the standards and principles of international maritime law. These principles are based on customary international law related to maritime affairs, which are rooted in the United Nations Charter and existing international maritime laws like the 1958 Geneva Conventions. UNCLOS significantly strengthens and expands many of these requirements. One notable aspect of UNCLOS is the establishment of the International Court of the Law of the Sea. This court is responsible for resolving disputes related to the interpretation and application of the treaty, ensuring a fair and consistent application of maritime law.

For more information visit: <https://www.unclos.org/>

⁴⁴ <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx>

⁴⁵ "Facilitating trade is at the very heart of our business, and since 1905, we've helped our members keep world trade moving. We make it our business to help our members with theirs. BIMCO members cover over 60% of the global fleet and consist of local, global, small, and large companies. We are an organization and global shipping community of around 2,000 members in more than 130 countries.", BIMCO <https://www.bimco.org/about-us-and-our-members>

of maritime transportation. In this regard, three of the most important conventions, SOLAS⁴⁶, COLREGS⁴⁷ and MARPOL⁴⁸, will be analysed to determine, based on the available literature, whether these regulatory texts can also be applied to autonomous.

II.2 Focus: SOLAS

The "International Convention for the Safety of Life at Sea" (SOLAS) is a very important convention for safety in the marine sector. First adopted in 1914 in response to the tragic sinking of the "RMS Titanic", SOLAS has been updated and revised over the years to address the evolving challenges of the maritime industry⁴⁹. The primary concern of SOLAS is the safety of human life at sea. The convention establishes standards and minimum requirements that member states must adopt to ensure the safety of ships and people on board. These standards cover a wide range of aspects, including the design and construction of ships, safety equipment, crew training, and emergency procedures. One of the fundamental requirements of SOLAS relates to the safety equipment of ships. The convention stipulates that every ship must be equipped with adequate lifesaving appliances, such as lifeboats, rafts, life jackets, and distress signals. This equipment is designed to ensure that the crew and passengers have means of rescue available in case of emergency. SOLAS also sets rigorous standards for the design and construction of ships. Ships must be built to ensure the stability and structural strength necessary to withstand the harshest marine conditions. Additionally, ships must be equipped with fire alarm and detection systems, as well as navigation control systems to ensure proper navigation and prompt response to incidents. Crew training is another crucial aspect addressed by SOLAS. The convention states that ship personnel, including navigation officers and engineering staff, must be adequately trained and certified to carry out their duties safely and efficiently. This includes knowledge of safety procedures, emergency

⁴⁶ International Convention for the Safety of Life at Sea (SOLAS), 1974, [https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-\(SOLAS\),-1974.aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-(SOLAS),-1974.aspx)

⁴⁷ Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs), <https://www.imo.org/en/About/Conventions/Pages/COLREG.aspx>

⁴⁸ International Convention for the Prevention of Pollution from Ships (MARPOL), [https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-\(MARPOL\).aspx](https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx)

⁴⁹ [https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-\(SOLAS\),-1974.aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-(SOLAS),-1974.aspx)

operations, and proper navigation. In the event of a maritime incident or emergency, SOLAS establishes clear procedures for coordinating rescue operations. Member states are required to establish maritime rescue coordination centres and cooperate with each other to ensure a swift and effective response to distress calls. SOLAS has undergone several revisions over the years to keep pace with technological advancements and new challenges in the maritime industry. Its provisions have been adopted and implemented by a large number of countries worldwide, making SOLAS one of the most widely adhered-to international treaties in the field of maritime safety. In conclusion, the SOLAS Convention is a crucial international instrument to ensure the safety of human life at sea. Through its imposed standards and requirements, SOLAS contributes to creating a safer maritime environment and protecting both the crew and passengers of ships. It continues to be a central pillar in the maritime industry and represents an ongoing commitment to improving global maritime safety.⁵⁰

Article II⁵¹ states that the SOLAS Convention is applicable to "vessels flying the flag of contracting governments."⁵² Unless explicitly stated otherwise, the regulations of SOLAS only apply to "vessels engaged in international voyages."⁵³ The term "vessel" is not explicitly defined within SOLAS. However, the convention mentions five general categories of vessels, including "passenger vessels,"⁵⁴ "cargo vessels,"⁵⁵ "tankers,"⁵⁶ "fishing vessels,"⁵⁷ and "nuclear vessels."⁵⁸ It can be argued that unmanned maritime vehicles (UMVs) discussed in this dissertation do not fall under any of these specified vessel types, and thus, the convention may not apply to their operations. Nevertheless, the definition of "cargo vessels" is broad, stating that they encompass any vessel that is

⁵⁰ P. Pritchett, 2015, "Ghost ships: why the law should embrace unmanned vessel technology". Tulane Maritime Law Journal, Vol. 40(1), pp. 208-210

⁵¹ SOLAS Convention, Art. II (2) "The present Convention shall apply to ships entitled to fly the flag of States the Governments of which are Contracting Governments."

⁵² SOLAS Convention, Art. II

⁵³ Ibid

⁵⁴ SOLAS Convention, Regulation 2 – Definitions (f): "A passenger ship is a ship which carries more than twelve passengers."

⁵⁵ SOLAS Convention, Regulation 2 – Definitions (g): "A cargo ship is any ship which is not a passenger ship."

⁵⁶ SOLAS Convention, Regulation 2 – Definitions (h): "A tanker is a cargo ship constructed or adapted for the carriage in bulk of liquid cargoes of an inflammable nature."

⁵⁷ SOLAS Convention, Regulation 2 – Definitions (i): "A fishing vessel is a vessel used for catching fish, whales, seals, walrus or other living resources of the sea."

⁵⁸ SOLAS Convention, Regulation 2 – Definitions (j): "A nuclear ship is a ship provided with a nuclear power plant"

not a "passenger vessel" and does not carry more than 12 passengers. Therefore, if UMMVs do not carry passengers, they could potentially be considered as "cargo vessels" provided they meet the criteria for being classified as "vessels." An "international voyage" is defined as a voyage from a country covered by SOLAS to a port outside that country, or vice versa⁵⁹. Many UMMV operations do not involve movements to or from ports of SOLAS Contracting Governments or any other ports. Consequently, SOLAS is unlikely to be applicable to UMMVs in such cases⁶⁰. Unless specifically mentioned, SOLAS regulations do not apply to "warships and troopships," as well as cargo vessels with a gross tonnage below 500. Although SOLAS does not offer a precise definition of a "warship," it can be argued that it aligns with the definition of a "warship" as outlined in Article 29⁶¹ of the United Nations Convention on the Law of the Sea (UNCLOS). The question of whether UMMVs constitute "warships" under UNCLOS has been discussed elsewhere in this report, and the same considerations apply to whether any UMMVs within the scope of this report can be classified as "warships." While it could be contended that UMMVs operated remotely by a crew under armed forces discipline could be deemed "manned" under Article 29 of UNCLOS, a more natural interpretation suggests that UMMVs are not "manned" and thus do not qualify as warships. However, if a UMMV carries deployable arms, further examination may be necessary. Some arguments have been put forth suggesting that if UMMVs are considered vessels, they could be categorized as "cargo vessels" under SOLAS. Contracting Governments possess the authority to exempt vessels embodying innovative features from complying with certain chapters of SOLAS, such as

⁵⁹ R. Veal, M. Tsimplis, A. Serdy, and A. Ntovas, S. Quinn, 2016, "Liability for operations in Unmanned Maritime Vehicles with Differing Levels of Autonomy", Chapter 4 "The Applicability of International Shipping Regulations to Unmanned Maritime Vehicles".

⁶⁰ R. Veal, M. Tsimplis, A. Serdy, and A. Ntovas, S. Quinn, 2016, "Liability for operations in Unmanned Maritime Vehicles with Differing Levels of Autonomy", Chapter 4 "The Applicability of International Shipping Regulations to Unmanned Maritime Vehicles".

⁶¹ UNCLOS Convention, Article 29: "For the purposes of this Convention, "warship" means a ship belonging to the armed forces of a State bearing the external marks distinguishing such ships of its nationality, under the command of an officer duly commissioned by the government of the State and whose name appears in the appropriate service list or its equivalent, and manned by a crew which is under regular armed forces discipline."

Chapters II-1⁶², II-2⁶³, III⁶⁴, and IV⁶⁵. This exemption may be granted when the application of regulations in these chapters would impede research and development of such features for vessels engaged in international voyages. It can be argued that unmanned operation qualifies as an "innovative feature," and enforcing Chapter III concerning life-saving appliances could hinder research and development in the field of unmanned vehicles. This matter should be addressed with the relevant Contracting Government Administration. SOLAS also provides the option for equivalence. If a SOLAS regulation mandates a specific fitting, material, appliance, apparatus, or provision, the Administration may allow alternatives if they are deemed equally effective as the requirements stipulated in SOLAS regulations. This flexibility allows for negotiations with the relevant Administration when specific requirements pose challenges for UUVs in terms of fittings, materials, appliances, or apparatus. However, it is crucial to review the entirety of SOLAS provisions to determine the precise application of each chapter to different classes of vessels⁶⁶. In accordance with Regulation 33 of Chapter 5⁶⁷ of the

⁶² SOLAS Convention, "Chapter II-1 - Construction - Structure, subdivision and stability, machinery and electrical installations"

⁶³ SOLAS Convention, "Chapter II-2 - Construction - Fire protection, fire detection and fire extinction"

⁶⁴ SOLAS Convention, "Chapter III - Life-saving appliances and arrangements"

⁶⁵ SOLAS Convention, "Chapter IV - Radiocommunications"

⁶⁶ R. Veal, M. Tsimplis, A. Serdy, and A. Ntovas, S. Quinn, 2016, "Liability for operations in Unmanned Maritime Vehicles with Differing Levels of Autonomy", Chapter 4 "The Applicability of International Shipping Regulations to Unmanned Maritime Vehicles".

⁶⁷ SOLAS Convention, "Chapter V - Safety of navigation, Regulation 33 - Distress messages: obligations and procedures: 1. The master of a ship at sea which is in a position to be able to provide assistance, on receiving a signal from any source that persons are in distress at sea, is bound to proceed with all speed to their assistance, if possible informing them or the search and rescue service that the ship is doing so. If the ship receiving the distress alert is unable or, in the special circumstances of the case, considers it unreasonable or unnecessary to proceed to their assistance, the master must enter in the log-book the reason for failing to proceed to the assistance of the persons in distress, taking into account the recommendation of the Organization to inform the appropriate search and rescue service accordingly. 2. The master of a ship in distress or the search and rescue service concerned, after consultation, so far as may be possible, with the masters of ships which answer the distress alert, has the right to requisition one or more of those ships as the master of the ship in distress or the search and rescue service considers best able to render assistance, and it shall be the duty of the master or masters of the ship or ships requisitioned to comply with the requisition by continuing to proceed with all speed to the assistance of persons in distress. 3. Masters of ships shall be released from the obligation imposed by paragraph 1 on learning that their ships have not been requisitioned and that one or more other ships have been requisitioned and are complying with the requisition. This decision shall, if possible, be communicated to the other requisitioned ships and to the search and rescue service. 4. The master of a ship shall be released from the obligation imposed by paragraph 1 and, if his ship has been requisitioned, from the obligation imposed by paragraph 2 on being informed by the persons in distress

SOLAS Convention, the responsibility falls upon the master of a ship at sea, who is capable of providing assistance, to promptly proceed to aid individuals in distress at sea. However, in the case of unmanned ships where the master and crew are absent, the question arises as to whether the operator is obligated to operate the ship to fulfil the duty of saving lives at sea. According to the findings of the questionnaire⁶⁸ conducted by the International Maritime Committee⁶⁹, most states believe that the absence of a master or crew on board cannot serve as a defence for failing to fulfil the obligation to rescue individuals in distress at sea. The United States, in its domestic legislation⁷⁰, also includes provisions regarding the obligation of vessels to provide assistance at sea. In the case of unmanned ships, a remotely operated unmanned ship can navigate at an appropriate speed to offer assistance to distressed individuals. Even without a crew on board, the unmanned ship can contribute to the rescue operation by providing positioning assistance, offering shelter, and transmitting real-time on-site information to shore bases through recorded

or by the search and rescue service or by the master of another ship which has reached such persons that assistance is no longer necessary.

5. The provisions of this regulation do not prejudice the Convention for the Unification of Certain Rules of Law Relating to Assistance and Salvage at Sea, signed at Brussels on 23 September 1910, particularly the obligation to render assistance imposed by article 11 of that Convention”

⁶⁸ In 2017, the CMI (*Comité Maritime International*) submitted a questionnaire titled "Maritime Law for MASS" to its member states. This questionnaire aimed to understand the positions of different participating states regarding certain issues that arose with the introduction of autonomous ships. In 2018, these data were discussed at the CMI Assembly held in London. The website: <https://comitemaritime.org/work/mass/> presents all the results, divided by country and cumulative, which emerged after the completion of the questionnaire. Among the various issues raised, there is also the one concerning the behavior that shipowners should adopt in the event of incidents involving the rescue of people at sea and how this may impact the introduction of crewless ships. Questions 3.1, 3.2, and 3.3 address this topic.

⁶⁹ The *Comité Maritime International* (CMI) is an international organization that deals with maritime law and legal issues concerning the maritime industry on a global level. Founded in 1897, the CMI brings together maritime law professionals from different nations and plays a leading role in the development, harmonization, and application of international maritime law. The CMI promotes cooperation among scholars, legal professionals, government representatives, and maritime industry organizations. Through meetings, conferences, and specialized committees, the CMI examines and analyzes emerging legal issues in the maritime field and develops tools and guidelines to address them. The organization focuses on a wide range of topics, including maritime transportation, maritime insurance, carrier liability, charterparty contracts, marine pollution, salvage, and much more. The outcomes of the CMI's work are often used as a reference source for governments, international organizations, and courts in maritime dispute cases. The CMI plays a crucial role in promoting cooperation and harmonization of maritime law on an international level, thereby contributing to the efficiency, consistency, and safety of maritime operations worldwide.

⁷⁰ 46 U.S. Code § 2304 - Duty to provide assistance at sea: “(1)A master or individual in charge of a vessel shall render assistance to any individual found at sea in danger of being lost, so far as the master or individual in charge can do so without serious danger to the master’s or individual’s vessel or individuals on board. [...]”.

data. Similarly, the Maritime Traffic Safety Law of the People's Republic of China⁷¹ emphasizes that passing vessels should make every effort to rescue people in distress, promptly report the situation to the relevant authority, and provide their own details. Some countries, however, argue that since unmanned ships do not have a designated master, there is no obligation to fulfil the duty of providing assistance at sea. The United Kingdom⁷², for example, asserts that assistance should be provided by the master rather than the ship itself, and it should only apply to masters who are capable of providing assistance. Factors such as the distance between the ship and the distressed individual and the technical capabilities of the ship should be considered when determining the master's ability to aid. If the unmanned ship itself is unable to rescue individuals in distress at sea, the entities associated with the unmanned ship should not be held responsible for failing to fulfil the obligation. Japan goes even further by stating that unmanned ships are not required to provide assistance due to the absence of any crew on board⁷³. Japan believes that it is the "master" who should be accountable for rescuing distressed individuals, and since Regulation 33⁷⁴ of the SOLAS Convention stipulates that the master "should be on

⁷¹ Maritime Traffic Safety Law of the People's Republic of China Chapter VII Articles 37-38: "Article 37: Vessels or installations involved in a collision shall exchange their names, nationalities and ports of registry and do their best to rescue personnel in distress. The vessels involved may not leave the scene of the accident without authorization, insofar as their own safety is not seriously endangered. Article 38: Upon receiving a request for rescue, the competent authority shall immediately organize a rescue operation. All units concerned and vessels or installations in the vicinity of the scene must act under the orders of the competent authority."

⁷² The Merchant Shipping (Safety of Navigation) Regulations 2020

⁷³ According to the CMI questionnaire answer, Japan stated "The lack of an on-board crew can be a reason for not providing assistance of persons in distress at sea because the provision imposes the duty on the "master" of a ship. Regulation 33 of SOLAS Chapter V is provided on the assumption that the master is aboard the ship. Mariners Act Art. 14 and its Regulation Art 3 (1)-3 which implements SOLAS exempts the ship's master from pursuing the rescue action where she could not go to the rescue site with excusable reasons or in a special circumstance when it is not appropriate for her to go the rescue site or it is not necessary to do so"

⁷⁴ SOLAS convention, Chapter V - Safety of navigation - Regulation 33 - Distress messages: obligations and procedures: "1. The master of a ship at sea which is in a position to be able to provide assistance, on receiving a signal from any source that persons are in distress at sea, is bound to proceed with all speed to their assistance, if possible informing them or the search and rescue service that the ship is doing so. If the ship receiving the distress alert is unable or, in the special circumstances of the case, considers it unreasonable or unnecessary to proceed to their assistance, the master must enter in the log-book the reason for failing to proceed to the assistance of the persons in distress, taking into account the recommendation of the Organization to inform the appropriate search and rescue service accordingly. 2. The master of a ship in distress or the search and rescue service concerned, after consultation, so far as may be possible, with the masters of ships which answer the distress alert, has the right to requisition one or more of those ships as the master of the ship in distress or the search and rescue service considers best able to render assistance, and it shall be the duty of the master or masters of the ship or ships requisitioned to comply with the requisition by continuing to proceed with all speed to the assistance of persons in distress.

board," unmanned ships without a master and crew may be exempted from fulfilling the obligation under such circumstances. In reality, under the general obligation of the SOLAS Convention, Contracting Governments are responsible for taking all necessary measures to ensure safety at sea. The absence of a master on a ship cannot be considered a defence or exemption under the law. Using this as a justification for defence would not absolve the ship from liability; in fact, it could lead to even greater liability. Such an approach would not facilitate the widespread use of unmanned ships in the international community⁷⁵. Therefore, not only the master and crew members but also other individuals involved, such as onshore operators, designers, and ship owners, should bear responsibility for unmanned ships and fulfil the corresponding obligations when the ship is at sea. Certain provisions within the SOLAS Convention pose challenges for the application to unmanned ships, including the minimum safe manning requirements and the obligation to save lives at sea. Additionally, Chapter III of the SOLAS Convention requires ships to be equipped with life-saving appliances to the satisfaction of the Administration, which becomes difficult to fulfil for unmanned ships that have been unoccupied for extended periods. Furthermore, Chapter IV of the SOLAS Convention mandates the presence of personnel competent in distress and safety radio communications, which presents a challenge when radio communications are managed by onshore staff for unmanned ships. Most of these regulations assume the presence of a crew on board, and blindly applying them to unmanned ships would hinder their development. These regulations can only be applied if they are feasible and necessary for unmanned ships. Certainly, the SOLAS Convention allows for some flexibility in applying regulations to special types of ships, including unmanned ships. Chapter 1-4 of

3. Masters of ships shall be released from the obligation imposed by paragraph 1 on learning that their ships have not been requisitioned and that one or more other ships have been requisitioned and are complying with the requisition. This decision shall, if possible, be communicated to the other requisitioned ships and to the search and rescue service.

4. The master of a ship shall be released from the obligation imposed by paragraph 1 and, if his ship has been requisitioned, from the obligation imposed by paragraph 2 on being informed by the persons in distress or by the search and rescue service or by the master of another ship which has reached such persons that assistance is no longer necessary.

5. The provisions of this regulation do not prejudice the Convention for the Unification of Certain Rules of Law Relating to Assistance and Salvage at Sea, signed at Brussels on 23 September 1910, particularly the obligation to render assistance imposed by article 11 of that Convention

⁷⁵ According to R. Li, "On the Legal Status of Unmanned Ships", 2019

the SOLAS Convention⁷⁶ states that administrations may exempt ships with novel features from certain provisions if their application would impede research and development. Resolution A.1047 (27)⁷⁷ also acknowledges that administrations may adopt alternative arrangements tailored to technical advancements and specific ship types and trades, provided that they ensure a level of safety equivalent to that established by the Port State Control regime. However, these amended clauses primarily focus on ship construction and installation, and the obligations of unmanned ships to ensure navigation safety and safety of life at sea remain intact even after the amendments. Regulations pertaining to navigation safety and saving lives at sea should be further reviewed and amended to accommodate the specific requirements of unmanned ships in the future⁷⁸

II.3 Focus: COLREGs

In all legal systems and under UNCLOS, users of the sea are obligated to exercise a duty of care towards other sea users and the marine environment. As ships are the primary means of transporting people and goods across the oceans, it is crucial to establish rules and behaviors that ensure the fulfillment of this duty of care. This responsibility is commonly referred to as "good seamanship" and also encompasses the effective management of the ship. The concept of "good seamanship" primarily focuses on safely exercising navigational rights to protect the well-being of those on-board ships, other sea users, and the marine environment. The Collision Regulations play a significant role in guiding the fulfilment of this duty, although they are not the sole determining factor. Therefore, the ability of an Unmanned Maritime Vehicle (UMV) to comply with these

⁷⁶ SOLAS Convention, Chapter I - General provisions - Part A - Application, definitions, etc. - Regulation 4 – Exemptions, part (b): “(b). The Administration may exempt any ship which embodies features of a novel kind from any of the provisions of chapters II-1, II-2, III and IV of these regulations the application of which might seriously impede research into the development of such features and their incorporation in ships engaged on international voyages. Any such ship shall, however, comply with safety requirements which, in the opinion of that Administration, are adequate for the service for which it is intended and are such as to ensure the overall safety of the ship and which are acceptable to the Governments of the States to be visited by the ship. The Administration which allows any such exemption shall communicate to the Organization particulars of same and the reasons therefor which the Organization shall circulate to the Contracting Governments for their information.”

⁷⁷ Resolution A.1047 (27) - PRINCIPLES OF MINIMUM SAFE MANNING Adopted on 30 November 2011 [https://wwwcdn.imo.org/localresources/en/KnowledgeCentreIndexofIMOResolutions/AssemblyDocuments/A.1047\(27\).pdf](https://wwwcdn.imo.org/localresources/en/KnowledgeCentreIndexofIMOResolutions/AssemblyDocuments/A.1047(27).pdf)

⁷⁸ R. Li, “On the Legal Status of Unmanned Ships”, " China Oceans Law Review, vol. 2019, no. 4, 2019, pp. 165-190.

regulations can instil confidence in its operation, as it demonstrates a commitment to maintaining standards consistent with manned ships⁷⁹⁸⁰.

The International Regulations for Preventing Collisions at Sea provide guidelines for navigational practices aimed at preventing collisions between vessels. These regulations, known as COLREGS, consist of five parts. Part A establishes general provisions for applicability, while Part B specifies detailed rules for steering and sailing. Part C outlines requirements for lights and shapes, and Part D prescribes sound and light signaling criteria. Part E grants certain exemptions from the rules.⁸¹

Part A - General

According to Rule 1, the COLREGS apply “to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels.”⁸² The definition of vessels includes “every description of water craft, including non-displacement craft, WIG craft and seaplanes, used or capable of being used as a means of transportation on water”⁸³. Rule 2 is a crucial provision within the COLREGS. It states that compliance with the rules does not absolve any vessel, owner, master, or crew from the consequences of neglecting precautions required by common seafaring practices or specific circumstances. This rule emphasizes the importance of seamanship and allows for deviations from the rules under certain circumstances. It requires human judgment in decision-making processes, including determining when to perform prescribed COLREGS maneuvers or alternative actions. While remote communication technology may facilitate remote decision-making, autonomous ships without supervision would violate Rule 2.

Part B - Steering and Sailing Rules

Rule 5 mandates that every vessel must maintain a proper lookout using sight, hearing, and all available means to assess the situation and the risk of collision. The reference to sight and hearing explicitly necessitates human involvement in evaluating

⁷⁹ A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, “Liability for operations in unmanned maritime vehicles with differing levels of autonomy”, University of Southampton, Institute of Maritime Law, Southampton, chapter 4.3, pp. 62-63

⁸⁰ P. Pritchett, 2015, “Ghost ships: why the law should embrace unmanned vessel technology”. Tulane Maritime Law Journal, Vol. 40(1), pp.206-207.

⁸¹ Technical Provisions <https://www.imo.org/en/OurWork/Safety/Pages/Preventing-Collisions.aspx>

⁸² COLREGS Convention Part A, Rule 1, Application – part (a)

⁸³ COLREGS Convention Part A, Rule 3, Definitions – part (a)

the situation, aligning with Rule 2. Autonomous ships relying solely on data processing from sensors and algorithms would not fulfill the requirement for appraisal through sight and hearing. Even in a future scenario with exclusively autonomous ships communicating to prevent close encounters, any breach of Rule 5 would be technical⁸⁴. The current requirement for human involvement provides crucial backup to an autonomous network. The present generation of unmanned crafts employs advanced sensors to relay information to shore-based remote controllers. This satisfies the requirement of Rule 5 since human input is still involved in the appraisal process. The use of electronic aids and shore-based orientation does not violate the spirit or wording of Rule 5. However, additional clarification is required. Rule 6⁸⁵ stipulates that vessels must proceed at a safe speed⁸⁶, allowing them to take appropriate action and come to a stop within a suitable distance considering the prevailing circumstances. This rule is closely connected to Rules 2 and 5, and any communication delays should be taken into account when determining a safe speed. Rule 8 requires that actions taken to avoid collisions comply with the rules, be positive, timely, and demonstrate adherence to good seamanship. The remaining provisions in Part B provide specific instructions for steering and sailing. Compliance with these provisions poses no difficulty if an unmanned ship possesses the situational awareness outlined in Rules 2 and 5. Remote-controlled and supervised autonomous ships, with immediate remote-control capability, can fulfil the required human appraisal. However, unsupervised autonomous ships cannot meet this requirement. Finally, Rule 18 addresses the responsibilities between vessels and gives navigational priority to vessels categorized as "not under command."⁸⁷ Such vessels are unable to manoeuvre as required by the rules due to exceptional circumstances. This status typically applies to vessels experiencing engine failure or similar difficulties. It could potentially include unmanned ships that have lost communications.⁸⁸ In such cases, displaying appropriate signals to inform other sea users about the vessel's status is critical. However, it is important to note

⁸⁴ R. Veal, M. Tsinplis, 2017, "The navigation of Unmanned ships into the lex maritima", *Lloyd's Maritime and Commercial Law Quarterly*, pp. 303-335.

⁸⁵ P.K. Mukherjee, 2023, "Maritime Autonomous Surface Ships (MASS) : Precarious Legal Position of the Shore-Based Remote Controller", in "Autonomous Vessels in Maritime Affairs", Palgrave Macmillan, Cham ; Switzerland, pp.284-287

⁸⁶ R. Veal, M. Tsinplis, A. Serdy, 2019, "The Legal Status and Operation of Unmanned Maritime Vehicles", in "Ocean Development & International Law", Vol. 50, pp.37-39

⁸⁷ COLREGS Convention Part B, Rule 18, Responsibilities between vessels – part (a.i)

⁸⁸ According to R. Veal, M. Tsinplis, 2017, "The navigation of Unmanned ships into the lex maritima", *Lloyd's Maritime and Commercial Law Quarterly*, pp. 303-335.

that "exceptional circumstances"⁸⁹ specifically refer to situations beyond a vessel's ordinary operational arrangements and would generally not cover unmanned operability.

Part C & D - Lights and Shapes / Sound and Light Signals

Parts C and D outline detailed requirements for vessel signalling to communicate with other sea users. The specific technical requirements are specified in COLREGS Annexes I-IV. These requirements also serve to demonstrate the necessary sophistication of an unmanned ship's electronic lookout system, as the ship must be capable of detecting signals from other vessels at a minimum. Ensuring signalling capability remains resilient in the event of ordinary communication failures is a crucial aspect for unmanned ships to demonstrate their safety. However, governments may accept "closest possible compliance"⁹⁰ with the requirements of Parts C and D for vessels with special construction or purpose, regarding the number, position, range, arc of visibility of lights and shapes, as well as characteristics of sound signalling devices. The extent to which unmanned ships can benefit from this provision will depend on discussions between operators and relevant maritime authorities.⁹¹

In conclusion, The definition of a ship in the COLREGS implies that U MVs (Unmanned Maritime Vehicles) may fall outside the direct application of these rules, as they may not fit the criteria of "transportation" on water. However, this does not exempt the navigation and control of U MVs from regulation. The COLREGS serve as a codification of the existing duty of good seamanship, which means that U MV owners still have a responsibility to ensure the safety of other users of the sea. Ignoring the COLREGS would be disregarding the duty of care in common law jurisdictions, where breaching these rules could constitute "fault" and lead to civil liability. Rules such as Rule 5 (keeping

⁸⁹ COLREGS Convention Part B, Rule3, General Application – part (f): “The term “vessel not under command” means a vessel which through some exceptional circumstance is unable to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel”.

⁹⁰ COLREGS Convention Part A, Rule 1, Application – part (e): “Whenever the Government concerned shall have determined that a vessel of special construction or purpose cannot comply fully with the provisions of any of these Rules with respect to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signalling appliances, such vessel shall comply with such other provisions in regard to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signalling appliances, as her Government shall have determined to be the closest possible compliance with these Rules in respect of that vessel.”

⁹¹ R. Veal, H. Ringbom, 2017, “Unmanned ships and the international regulatory framework”, *Journal of International Maritime Law*, Vol. 23, pp. 113-115.

a proper lookout) and Rule 6 (maintaining a safe speed) require the ship to be aware of its surroundings, including other sea users, prevailing conditions, technical limitations, and be able to interpret and respond to light and sound signals from other vessels in a timely manner to ensure safety. UUVs must possess these capabilities.⁹²

II.4 Focus: MARPOL

MARPOL, as the main regulation established by the International Maritime Organization (IMO), specifically focuses on addressing various types of pollution caused by ships. This comprehensive framework encompasses a range of requirements, from the construction and equipment specifications for vessels like oil tankers, to operational procedures and guidelines. These include limits on discharges, protocols for ship-to-ship transfers, and extensive reporting obligations in the event of spills. It is crucial for unmanned ships to adhere to MARPOL's provisions just as manned ships do. However, compared to other IMO regulations, the obligations imposed by MARPOL are less likely to pose significant challenges to unmanned operations.⁹³

Article 3 of MARPOL addresses the general application of the convention. It states that the convention applies to ships that are entitled to fly the flag of a party to the convention or ships that operate under the authority of a party. However, it does not apply to warships, naval auxiliaries, or other ships owned or operated by a state and used exclusively for non-commercial government service. Nevertheless, each party is required to ensure that such ships, without impairing their operations or capabilities, act in a manner consistent with the convention to the extent that is reasonable and practicable⁹⁴. The application of MARPOL has two main requirements. First, the entity in question must meet the definition of a "ship" as outlined in the convention. Second, the ship must either be entitled to fly the flag of a state party or be operated under the authority of a state party. It is important to note that the definition of "ship" may vary among the six

⁹² A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, "Liability for operations in unmanned maritime vehicles with differing levels of autonomy", University of Southampton, Institute of Maritime Law, Southampton, chapter 4.3, pp. 71-72

⁹³ R. Veal, H. Ringbom, 2017, "Unmanned ships and the international regulatory framework", *Journal of International Maritime Law*, Vol. 23, p. 116.

⁹⁴ MARPOL Convention, Article 3, "Provisions"

annexes of MARPOL. Additionally, the application of the convention to unmanned maritime vehicles (UMVs) can vary between different states, as states may have different approaches to classifying UMVs. However, the principle of "no more favourable treatment" ensures that all ships, regardless of their flag state, must comply with the relevant standards. Article 3(3) provides an exemption under the convention for warships and other state-owned vessels that are operated by a state. To qualify for this exemption, the ship must be used exclusively for government non-commercial service at the time. However, state parties are still obligated to prescribe measures that ensure these exempted vessels act in a manner consistent with the convention, as long as it does not impair their operational capabilities. The determination of what constitutes an impairment, and the reasonableness and practicability of the prescribed measures lie with the state party or its relevant authorities. This means that a state party may impose measures that affect military UMVs, and the stringency of such measures will depend on each state party's interpretation of Article 3(3)⁹⁵. According to MARPOL, the definition of "ship" is provided as follows: "For the purposes of the Present Convention, unless expressly provided otherwise...(4) Ship means a vessel of any type whatsoever operating in the marine environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft and fixed or floating platforms."⁹⁶ The inclusion of various types of vessels within the definition of "ship" essentially equates the two terms. However, the lack of specific defining characteristics for these vessels leaves the definition somewhat circular. Nevertheless, once a vessel meets the threshold of being considered a "ship," the definition becomes broad, encompassing all types of vessels. However, this broad definition is narrowed down in different parts of the Annexes.⁹⁷ The reference to "submersible" in Article 2(4) holds potential significance. Although the term "submersible" is not explicitly defined in the Convention. There has been a debate suggesting that once it is recognized that UMVs can discharge pollutants, they fall within

⁹⁵ MARPOL Convention, Article 3.3 "The present Convention shall not apply to any warship, naval auxiliary or other ship owned or operated by a State and used, for the time being, only on government non-commercial service. However, each Party shall ensure by the adoption of appropriate measures not impairing the operations or operational capabilities of such ships owned or operated by it, that such ships act in a manner consistent, so far as is reasonable and practicable, with the present Convention"

⁹⁶ MARPOL Convention, Article 2 – Definitions (4) "Ship"

⁹⁷ According to A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, "Liability for operations in unmanned maritime vehicles with differing levels of autonomy", University of Southampton, Institute of Maritime Law, Southampton, chapter 4.5.1, pp. 75

the purpose of the Convention. Therefore, the assumption is that UUVs are covered by the Convention through either of the means mentioned above. However, there remains significant potential for varying interpretations under national law.⁹⁸

Assuming that MARPOL generally applies to UUVs, it is necessary to examine the applicability of the different annexes of MARPOL, each containing detailed provisions.

Within MARPOL, Annex I focuses on regulations for preventing oil pollution. Chapter 1, Regulation 2 addresses its application:

“(1) Unless expressly provided otherwise, the provisions of this Annex shall apply to all ships.”⁹⁹

The term "vessels" in general does not receive a separate definition in Annex I, so the considerations mentioned earlier apply. Chapter 1 also includes an exemption at Regulation 3:

“(1) Any ship such as a hydrofoil air cushion vehicle, near surface craft or submarine craft etc. whose constructional features are such as to render the application of any of the provisions of chapter 3 and 4 of this Annex relating to construction and equipment unreasonable or impracticable may be exempted by the Administration from such provisions, provided that the construction and equipment of that ship provides equivalent protection against pollution by oil, having regard to the service for which it is intended.”¹⁰⁰

The extent to which UUVs of any type fall under the scope of the Regulation 3 exemption remains unclear. However, Chapter 2, which pertains to surveys and certification, applies to oil tankers of 500 gross tonnage (grt) and above, as well as other vessels of 400 grt and above, and does not seem relevant to the UUVs under consideration. Chapter 3, which includes requirements for machinery spaces, generally applies to all vessels of 400 grt and above. However, Part C of Chapter 3, which deals with the control of operational discharges of oil, is particularly relevant. Regulation 15.1 explicitly

⁹⁸ According to Gaskell (2000), p.121; H Jessen ‘Was ist ein “Schiff?” (2014); Gahlen “Ships revisited: a comparative study (2014) 20 JIML, quoted in A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, “Liability for operations in unmanned maritime vehicles with differing levels of autonomy”, University of Southampton, Institute of Maritime Law, Southampton, chapter 4.5.1

⁹⁹ MARPOL Convention, Annex I, Regulation 2, Chapter 1, “Applications”

¹⁰⁰ MARPOL Convention, Annex I, Regulation 2, Chapter 3.a, “Applications”

prohibits the discharge of oil or oily mixtures into the sea, except for specific exceptions outlined in Regulation 15¹⁰¹. Regulation 14(4) stipulates that: "The Administration should ensure that vessels below 400 gross tonnage are equipped, to the extent feasible, to retain oil or oily mixtures on board or discharge them in accordance with the requirements of Regulation 15.6 of this Annex."¹⁰² Regulation 15.6 provides exceptions to the general prohibition on oil discharge at sea and also applies to UUVs.

“C Requirements for ships less than 400 gross tonnage in all areas except the Antarctic area

6. In the case of a ship of less than 400 gross tonnage, oil and all oily mixtures shall either be retained on board for subsequent discharge to reception facilities or into the sea in accordance with the following provisions:

1. The ship is proceeding en route
2. The ship has in operation equipment of a design approved by the administration that ensures that the oil content of the effluent without dilution does not exceed 15 ppm
3. The oily mixture does not originate from cargo pump-room bilges on oil tankers
4. The oily mixture, in the case of oil tankers, is not mixed with oil cargo residues. "¹⁰³

According to this provision, vessels below 400 gross tonnage, including UUVs, are permitted to discharge oil in a wide range of locations as long as they are en route and equipped with administration-approved systems to ensure that the oil content in the effluent does not exceed 15 parts per million. Consequently, UUVs must have suitable filtering equipment and a monitoring system to ensure compliance with the 15 ppm requirement.¹⁰⁴

Moving on to Annex II, it does not apply to UUV operations as it specifically pertains to the bulk carriage of noxious liquid substances, which UUVs are not currently engaged in. Annex III of MARPOL addresses pollution prevention by harmful substances

¹⁰¹ MARPOL Convention, Annex I, Regulation 15, Chapter 3, "Retention of oil on board"

¹⁰² MARPOL Convention, Annex I, Regulation 14.4, Chapter 3

¹⁰³ MARPOL Convention, Annex I, Regulation 15.6, Chapter 3

¹⁰⁴ A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, "Liability for operations in unmanned maritime vehicles with differing levels of autonomy", University of Southampton, Institute of Maritime Law, Southampton, chapter 4.5.1

carried in packaged form by sea. Regulation 1 states that Annex III applies to " all ships carrying harmful substances in packaged form"¹⁰⁵ However, Regulation 1.5 clarifies that Annex III does not apply to ship's stores and equipment. "Harmful substances" are defined by the International Maritime Dangerous Goods Code, a publication that assists states in fulfilling their obligations under SOLAS and MARPOL. It provides information on various classes of dangerous goods, including explosives and toxic substances. Regulation 1.2 makes it clear that the carriage of harmful substances is " prohibited, except in accordance with the provisions of [Annex III]."¹⁰⁶

Annex III could potentially apply to certain UUVs if they carry packages containing dangerous substances. However, these packages would not be considered cargo in the traditional sense and would not come with shipping documentation such as a bill of lading. In many cases, packages of dangerous goods, if present, are likely to be considered part of the UUV's equipment. It has been argued that a module containing harmful substances designed for scientific operations might be classified as equipment, similar to a towed sonar on a research vessel. If Annex III does apply to specific UUVs, its requirements would primarily involve efforts to minimize the risk of marine pollution, such as Regulation 5's requirement to properly stow and secure harmful substances to minimize hazards to the marine environment.¹⁰⁷ Due to the small quantities of such substances that might be carried on board current UUVs, the likelihood of substantial pollution threats is low. However, the mere possibility of such pollution resulting from the carriage of these substances could influence the actions of the port state with jurisdiction, as outlined in Regulation 8¹⁰⁸. According to Regulation 8.1, when a ship is in a port of another party, it may be subject to inspection by duly authorized officers if there are reasonable grounds to believe that the master or crew are not familiar with essential shipboard procedures related to the prevention of pollution by harmful substances. On a straightforward reading of Article 8.1, such an inspection would not be lawful since UUVs do not have an on-board master or crew as envisioned by the regulation. However, the intention of the regulation is to allow the port state to ensure

¹⁰⁵ MARPOL Convention, Annex III, Regulation 1

¹⁰⁶ MARPOL Convention, Annex III, Regulation 1.5

¹⁰⁷ A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, "Liability for operations in unmanned maritime vehicles with differing levels of autonomy", University of Southampton, Institute of Maritime Law, Southampton, chapter 4.5.1

¹⁰⁸ MARPOL Convention, Annex III, Regulation 8, "Port State control on operational requirements"

that a ship within its territory does not pose a threat to the local marine environment. Thus, knowledge that a particular UMV contains harmful substances could potentially justify inspection under this provision. MARPOL's Annex V governs the pollution caused by garbage. Within the context of Annex C, this encompasses "Garbage ... generated during the normal operation of the ship."¹⁰⁹ As per Regulation 2, Annex V is applicable to all ships, including UMVs. It imposes limitations on the disposal of such garbage at sea, but its practical application in the context of UMVs is expected to be limited.

Annex VI pertains to regulations concerning air pollution. It serves as the foundation for controlling greenhouse gas emissions by the IMO (International Maritime Organization). Additionally, it addresses air quality by imposing specific requirements for bunker qualities, particularly in designated special areas. In general, Annex VI applies to "all ships," except in cases expressly specified otherwise in Regulations 3, 5, 6, 13, 15, and 16 of the Annex. Chapter 2 focuses on surveys, certification, and control methods. Regulation 5, which deals with surveys, applies exclusively to ships with a gross tonnage of 400 or above. However, for ships with a lower gross tonnage, the administration may establish suitable measures to ensure compliance with the applicable provisions of Annex VI. Chapter 3, titled "Requirements for control of emissions from ships," begins with Regulation 12, containing detailed provisions on Ozone-depleting substances that may be relevant to some of the USVs within the scope of this report, depending on their specifications. There doesn't appear to be any hindrance to the applicability of Regulation 13 (nitrogen oxides) and Regulation 14 (sulphur dioxides), which address the control of emissions release from ships. The relevance of this annex is contingent upon the emissions produced by the specific USV under consideration.¹¹⁰

The vast majority of MARPOL's regulations have limited applicability in the context of UMVs. However, it should be noted that Regulation 15(6) (discussed earlier) concerning oil discharge applies to USVs that have the ability to release such substances. As UMVs continue to increase in size and carry larger quantities of oil, whether as part

¹⁰⁹ MARPOL Convention, Annex V, Regulation 1, "Definitions"

¹¹⁰ A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, "Liability for operations in unmanned maritime vehicles with differing levels of autonomy", University of Southampton, Institute of Maritime Law, Southampton, chapter 4.5.1

of their operational activities or as cargo, the provisions of MARPOL will become more significant and relevant.¹¹¹

¹¹¹ A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, “Liability for operations in unmanned maritime vehicles with differing levels of autonomy”, University of Southampton, Institute of Maritime Law, Southampton, chapter 4.5.2

Chapter III – Cybersecurity: how cybercrimes can threaten maritime automated vessels.

The advent of self-driving ships brings with it the danger and threat of massive exposure to cyber-attacks. This type of attack is also increasingly common in traditional shipping, where the new frontier of piracy is digital. In a world dominated by technology and with the expectation of its increasingly pervasive use, the question arises as to how it will be possible to defend against this phenomenon and how the entire shipping industry is moving and will move in the future to cope with such events. The literature on the subject of this chapter and this thesis is rather sparse, a sign that the phenomenon is still relatively young and evolving. The purpose of this chapter is to analyse the current situation and try to understand how self-driving ships may be affected by this phenomenon. Today sensitive data can be attacked, but this event would not jeopardise the maritime expedition. As the ship acquires more and more autonomy until it reaches the maximum level, identified by the IMO as 'Degree 4', cyber attacks could turn into terrorist attacks, endangering not only the safety of the expedition but also that of all the people on board the vessel, as well as those living near port or coastal areas, and all the other people working at sea.

Current situation

The contemporary world is characterized by the widespread utilization of information and communication technologies (ICT), artificial intelligence, blockchain, big data, the Internet of Things (IoT), and other forms of end-to-end digital technologies across various sectors, including maritime transport. The digitalization of maritime transport infrastructure is poised to play a pivotal role in the domain of maritime transport and logistics. The 2020 Maritime Transport Review¹ astutely observes that "emerging technologies such as blockchain solutions, online platforms, and logistics enterprises relying on information technology have demonstrated their resilience during the COVID-

¹ UNCTAD Review of maritime transport (2020). Available from: https://unctad.org/system/files/official-document/rmt2020_en.pdf

19 pandemic."² This underscores the importance of integrating ships and ports into ICT networks while necessitating the development of specialized legal frameworks and cybersecurity measures. This concept was echoed in the 2021 edition³, which indicates that the risk of cyber-attacks is increasing as the use of technology while surfing increases. The practical implementation of information technologies and autonomous vessels in the maritime industry confronts a substantial challenge: the establishment of a suitable legal framework capable of safeguarding cybersecurity. Presently, both international and national legal frameworks fall short in meeting the contemporary requirements for ensuring the cybersecurity of maritime assets, including ships and related infrastructure. The absence of a universal approach to the conceptual aspects of cybersecurity and international collaboration further hinders the development of a proper legal mechanism for regulating cybersecurity in this domain.⁴ Maritime transportation plays a pivotal role in ensuring the economic sustainability of numerous regions worldwide. The industry's importance continues to grow due to factors like the increasing global population, rising living standards, investments, and the removal of trade barriers. This escalating reliance on maritime transportation applies to both domestic and international trade in regions endowed with navigable rivers or composed of island clusters. Furthermore, in markets emphasizing sustainable development, cost-efficiency, and, more recently, eco-friendly practices, the maritime sector shoulders the responsibility for transporting a staggering 90% of all goods. Recent advancements in technologies such as the Internet of Things (IoT), Big Data, and Artificial Intelligence have facilitated the transition toward more digitally integrated maritime infrastructures. Consequently, there is a renewed imperative to evaluate cybersecurity measures. Additionally, the increased connectivity and dependence on intelligent devices have become prime motivators for cybercriminal activities, including social engineering, identity theft, and spam emails. Protecting the integrity of next-generation maritime infrastructures has become an urgent necessity. Connectivity through navigation systems like the Automatic Identification System (AIS)⁵,

² UNCTAD Review of maritime transport (2020). Available from: https://unctad.org/system/files/official-document/rmt2020_en.pdf

³ https://unctad.org/system/files/official-document/rmt2021_en_0.pdf

⁴ N. A. R. Al Ali, A. A. Chebotareva, V. E. Chebotarev, 2021, "Cyber security in marine transport: opportunities and legal challenges", *Scientific Journal of Maritime Research*, pp. 248

⁵ As stated in IMO website: "Automatic identification systems (AIS) transponders are designed to be capable of providing position, identification and other information about the ship to other ships and to coastal authorities automatically" <https://www.imo.org/en/OurWork/Safety/Pages/AIS.aspx>.

Global Navigation Satellite System (GNSS)⁶, and Radio Detection and Ranging (RADAR) has introduced vulnerabilities into maritime infrastructures. Moreover, shipping companies have faced sophisticated cyber-attacks targeting in-port information systems and causing damage to essential on-vessel equipment. The reliance on the internet, often with unprotected computers, coupled with inadequate security training for crews, further increases the likelihood of successful cyber breaches. It is evident that the absence of comprehensive security awareness training across the entire supply chain poses a significant vulnerability. Consequently, hackers can exploit conventional tactics such as spam emails or Denial-of-Service (DoS) attacks to breach security. To address these concerns, a security plan is urgently needed to offer recommendations for safeguarding the maritime supply chain. A coordinated strategy involving international marine organizations is crucial in the short term. The practice of updating software through removable media also heightens the risk of identity theft and in-port data breaches. Real-time information sharing using emerging technologies like IoT compounds these risks due to insecure network services and weak authentication protocols.⁷

The global COVID-19 pandemic has further amplified the world's reliance on digital technologies, highlighting the pivotal role played by maritime transport infrastructures in sustaining global supply chains and the functioning of economies worldwide. Digitalization has ushered in new risks and threats, with cyberattacks emerging as a significant concern. Cyberattacks encompass a range of crimes where computer systems are the primary target. These crimes include illegal access to information systems, system interference, data manipulation, and interception. Within the maritime transport sector, cyberattacks have surged dramatically, with a fourfold increase since February 2020. An illuminating white paper produced by the UK-based risk management firm Astaara in collaboration with the British Port Association revealed that cybercrime extracts a staggering \$2 trillion from the global economy annually, while

⁶ The European Union Agency for the Space Programme (EUASP), the EU Agency for Space Studies and Union Space Policy, describes GNSS as “Global Navigation Satellite System (GNSS) refers to a constellation of satellites providing signals from space that transmit positioning and timing data to GNSS receivers. The receivers then use this data to determine location.” <https://www.euspa.europa.eu/european-space/eu-space-programme/what-gnss>

⁷ M. A. Ben Farah, E. Ukwandu, H. Hindy, D. Brosset, M. Bures, I. Andonovic, X. Bellekens, *Cyber Security in the Maritime Industry: A Systematic Survey of Recent Advances and Future Trends in Information*, 2022, pp.1-2.

cybersecurity spending only amounts to \$150 billion each year.⁸ Regrettably, cyberattacks in the shipping industry remain relatively under-recognized, and many incidents go unreported. This lack of information, prevalent in both shipping and other transport sectors, has hindered investments in cybersecurity and efforts to combat cybercrime. Cybercrimes pose some of the gravest threats to maritime safety and security, with the shipping sector being particularly susceptible to cyberattacks targeting information, communication, and operational technologies. An alarming example occurred in October 2020 when the International Maritime Organization (IMO), the United Nations agency responsible for shipping safety and security, fell victim to a cyberattack targeting its IT infrastructure⁹. Ports, given their substantial financial transactions and the influx and outflux of goods, are deemed prime targets for cyberattacks. Awareness within maritime operators and authorities about the cyber vulnerability of ships, maritime infrastructure, and other facilities has only recently emerged, having been largely overlooked in the past. This delayed awareness has hindered the implementation of measures to counter and mitigate cybercrimes in the shipping industry, necessitating a critical harmonization of laws governing the detection, investigation, prosecution, and prevention of cybercrimes in shipping. The widespread use of electronic devices and technological advancements has heightened the risk of cybercrimes in shipping. The ongoing simplification and harmonization of administrative and customs procedures, as part of the European Union's efforts to establish a single market for maritime transport, have led to increased reliance on electronic data and information exchange systems. Initiatives like the e-Navigation Strategy Implementation Plan (SIP) and the Maritime Cloud, supported by the IMO, aim to enhance marine navigation systems, communication, and shore support services. These developments, while beneficial, have expanded the attack surface for cyber threats in the maritime domain. In terms of organizational responses, the global and cross-border nature of cybercrime, coupled with the rapid evolution of technologies, necessitates a progressive re-evaluation of the competencies and structures of national public bodies responsible for safety and security. Additionally, standards and recommendations concerning new

⁸ G. Marchiafava, 2022, "Cybercrime and Cybersecurity in shipping: a legal framework in progress," *Rivista di Studi Politici Internazionali*, Aprile-Giugno, pp. 239.

⁹ There are many articles about this specific event, for more information visit: <https://www.marinelink.com/news/imo-hit-cyber-attack-482113>.

electronic devices require constant updates to address the ever-evolving cyber threat landscape. In Italy, the management of cybercrime in aviation and shipping has shifted from maritime transport administration to homeland security agencies. However, this shift may have unintended consequences on the effectiveness of efforts to ensure cyber safety and security in shipping. Given the knowledge and experience acquired by public bodies involved in maritime matters, it would be prudent to assign them a direct role within a new administrative structure dedicated to combating cybercrimes. Recognizing this crucial role is paramount for safeguarding cyber safety and security in the maritime sector.¹⁰

The effectiveness of implementing information technologies and autonomous vessels within maritime transport is intrinsically linked to the assurance of cybersecurity. This assurance encompasses not only safeguarding against illicit actions and cyber threats from hackers, pirates, and terrorists but also guarding against inadvertent actions, such as negligence, software system failures, and a lack of awareness. Consequently, the adoption of these technologies and vessels is expected to exacerbate the cybersecurity challenge¹¹. As the maritime industry increasingly adopts internet-related technologies like electronic maps, virtual navigation tools, and satellite systems, the risk of cyberattacks continues to escalate. Unfortunately, many port facilities and ships remain ill-prepared to counter these cyber threats. Presently, the issue of ensuring cybersecurity in maritime transport is compounded by the absence of cybersecurity-related norms in numerous international and national legal regulations governing the maritime sector. This deficiency arises from the lack of a unified, systematic, and comprehensive approach to standardizing cybersecurity requirements and regulations. To address the cybersecurity gap in the maritime industry, there is a pressing need to initiate efforts for harmonizing existing legal norms and enacting new measures, regulations, and mandatory standards to address cybersecurity concerns.

The complexity of cyberattacks underscores the dynamic and rapidly evolving nature of the threat landscape. Social engineering tactics involve the use of deceptive

¹⁰ G. Marchiafava, *Cybercrime and Cybersecurity in shipping: a legal framework in progress*, 2022, *Rivista di Studi Politici Internazionali*, Aprile-Giugno, pp. 239-240.

¹¹P. McGillivray, 2018, "Why Maritime Cybersecurity Is Policy Priority and How It Can an Ocean Be Addressed" – *Marine Technology Society Journal*, Vol. 52, Issue 5, pp. 44–57

emails or fraudulent websites designed to manipulate emotions and entice individuals into interacting with malicious links or files. Attackers typically employ one of three strategies:

a) Impersonation of high-ranking personnel to coerce victims into transferring funds to an account for an ostensibly urgent but undisclosed reason.

b) Encouraging victims to visit a website under their control, thereby infecting their computers with malware.

c) Sending email attachments, often password-protected with the password provided in the email, containing embedded viruses.

In such situations, exercising common sense and approaching unexpected emails with scepticism can significantly mitigate risks. Some organizations employ security software to filter internet access; however, due to the vastness of the web, these systems cannot accurately classify every website. Shipping companies rely on a variety of software, but if their cybersecurity measures are inadequate, malicious cyber actors can infiltrate their systems to manipulate or steal data. Onboard ships, legacy systems or unprotected networks may lack the defenses, updates, or designs necessary to withstand cyber threats since they were not initially built to address evolving connectivity challenges. Consequently, ship systems with unknown or insecure connections become vulnerable to unauthorized access by adversaries seeking to monitor, disrupt, or gain control of critical equipment. Seafarers frequently use portable devices like USB sticks for data transfer, which are well-known for their cybersecurity risks. However, the security of more modern vessels is not guaranteed. The increased digitization of ships results in more connections, thereby expanding the threat landscape. Furthermore, ships equipped with modern technology may be viewed as high-risk from an information security perspective due to their potential to hold substantial amounts of data, which could easily be lost or stolen. The guidelines from the International Maritime Organization (IMO)¹² identify various potential vulnerable systems on ships, including but not limited to:

¹² “The guidelines provide high-level recommendations on maritime cyber risk management to safeguard shipping from current and emerging cyber threats and vulnerabilities and include functional

1. Bridge systems
2. Cargo handling and management systems
3. Propulsion and machinery management and power control systems
4. Access control systems
5. Passenger servicing and management systems
6. Passenger-facing public networks
7. Administrative and crew welfare systems
8. Communication systems

Threats such as jamming and spoofing of global positioning systems (GPS) signals, manipulation of Automatic Identification System (AIS) data, and vulnerabilities in other satellite-based tracking systems highlight the challenges associated with relying exclusively on electronic systems for safe navigation. The U.S. Department of Transportation's Maritime Administration Advisories (MARAD) recently issued Advisory 2020-016¹³, addressing numerous instances of significant GPS interference reported worldwide in the maritime domain. The U.S. Coast Guard Navigation Center (NAVCEN) maintains a dedicated website for reporting GPS interference and sharing information on effective navigation practices. Even though the Electronic Chart Display and Information System (ECDIS) complies with IMO regulations, it has been identified as vulnerable to hacking. Some of these systems operate with administrative rights and lack password protection, making them susceptible to tampering. Physical access could enable a malicious actor to upload viruses through the USB slot, access the underlying operating system, or propagate malware/ransomware.

elements that support effective cyber risk management. The recommendations can be incorporated into existing risk management processes and are complementary to the safety and security management practices already established by IMO.” As stated in <https://www.imo.org/en/OurWork/Security/Pages/Cyber-security.aspx>. The guidelines are available at: [https://wwwcdn.imo.org/localresources/en/OurWork/Security/Documents/MSC-FAL.1-Circ.3-Rev.2%20-%20Guidelines%20On%20Maritime%20Cyber%20Risk%20Management%20\(Secretariat\)%20\(1\).pdf](https://wwwcdn.imo.org/localresources/en/OurWork/Security/Documents/MSC-FAL.1-Circ.3-Rev.2%20-%20Guidelines%20On%20Maritime%20Cyber%20Risk%20Management%20(Secretariat)%20(1).pdf)

¹³ <https://www.maritime.dot.gov/msci/2020-016-various-gps-interference>

Similarly, there is a risk of viruses infiltrating cargo and machinery systems through unsuspecting and inadequately trained users, combined with unsecured networks or the improper use of portable storage devices. For example, an infected removable media could introduce a virus when connected to the ship's loading computer to upload a cargo plan provided by the terminal, or when a service technician applies software updates to the machinery and propulsion control system using their infected computer.

Generally, the risks are more limited on standalone systems compared to those connected to uncontrolled networks or the internet. Systems integrated with remote condition-based monitoring, such as cargo management systems interfaced with pumps, valves, or shipment tracking (e.g., reefer container monitoring systems), and machinery systems, are more susceptible to cyberattacks. Given the increasing incidence of cyber-related incidents, it is imperative to explore solutions to address these threats.¹⁴

Risks' Mitigation

The company's strategy for mitigating cyber threats should adopt a comprehensive, multi-layered approach that takes into account the roles of individuals, processes, and technology:

People

- **Awareness and Training:** it is crucial for employees to understand potential cybersecurity risks and how to respond to them effectively. This includes recognizing possible threats and knowing the necessary actions to establish and maintain a high level of cybersecurity.
- **Virus scans:** regular virus scans should be conducted on all files and removable drives that access shipboard computers to detect and remove potential malware.
- **Email practices:** employees should only open emails and attachments from known and trusted senders, reducing the risk of falling victim to phishing attacks.
- **Reporting:** any suspicious or unusual issues or incidents should be promptly reported to the appropriate authorities or IT personnel.

¹⁴ A. Arora, E. Antoniadou, "Maritime Cyber Risk Management Guidelines", Standard Club, pp.3-

- **Contingency plans:** staff should be well-versed in what to do if critical IT/OT systems fail, including where and how to seek assistance.
- **OT systems redundancy:** understanding the existence of redundant controls and manual overrides in OT systems can help prevent incidents and ensure operational continuity.
- **Restricting personal devices:** connecting personal laptops, tablets, removable media, or phones to ship's operational systems should be restricted to prevent potential security breaches.

Processes

- **Backup and Updates:** proper procedures for taking backups and applying system updates should be in place, whether done manually with portable storage devices or remotely through automatic updates via a secure internet connection.
- **Data management:** data should be managed carefully, with sensitive information encrypted and retained based on its sensitivity level.
- **Software management:** unauthorized software should be kept away from ship systems, and timely application of software updates, including security patches, should be enforced.
- **Password policies:** stringent password policies should be implemented, including changing default passwords, avoiding common/shared usernames and passwords, and requiring passwords to meet complexity criteria.
- **Removable media management:** strict control over the types of removable media that can be used and the information that can be transferred via them should be maintained, along with enhanced protection and security measures for these devices.
- **Communication and Media control:** protocols and channels for ship-to-shore communication should be established, with a clear separation between official and personal use computers. Critical work-related information should not be shared on personal email or social media platforms.

- **Incident management:** plans for minimizing the impact of cyberattacks and restoring systems promptly should be in place, including sharing lessons learned to prevent similar incidents from recurring.

Technology

- **Infrastructure upgrades:** outdated systems and legacy technology should be upgraded, and insecure and unencrypted connections should be replaced with secure infrastructure.
- **Security tools:** deploy appropriate security tools such as antivirus software, firewalls, intrusion detection systems, software whitelisting, and content filtering to maintain system security and performance.
- **User authentication:** systems for user authentication and authorization should be maintained to ensure appropriate access to information, with regular reviews of access privileges.
- **Network segmentation:** implement network segregation and segmentation, ensuring that critical systems operate on a segregated infrastructure to limit the potential spread of threats.
- **Monitoring and evaluation:** continuously monitor and assess the effectiveness and strength of cybersecurity barriers through functional testing, vulnerability assessments, penetration testing, red teaming, recovery plan testing, drills, and audits.

On ships, the focus should be on maintaining fundamental cybersecurity practices, as seafarers are not expected to be cybersecurity experts. Raising awareness, developing a "cyber sense," practicing good cyber hygiene, and following established procedures are essential for maintaining cybersecurity in this environment.¹⁵

International Conventions

Cybersecurity should be a core consideration at all levels of a company, from top management onshore to personnel onboard, as it is an integral component of the safety

¹⁵ A. Arora, E. Antoniadou, "Maritime Cyber Risk Management Guidelines", Standard Club, pp. 8-9.

culture essential for the secure and efficient operation of ships. Training plays a pivotal role in ensuring cybersecurity at sea, equipping both the crew and passengers with awareness of technological hazards and threats, along with the knowledge of how to respond to potential attacks. The international legal framework governing maritime affairs primarily encompasses several key agreements. These include the Convention on the High Seas (1958) (UNCLOS I), the Convention on the International Regulations for Preventing Collisions at Sea (1972), the International Convention for the Safety of Life at Sea (SOLAS) (1974), the International Convention on Maritime Search and Rescue (1979), the United Nations Convention on the Law of the Sea (UNCLOS, 1982), the International Convention on SALVAGE (1989), and the International Ship and Port Facility Security Code (ISPS Code) (2002). These legal documents set forth requirements to ensure the safety of navigation, which can be broadly categorized into the following groups: technical requirements pertaining to ship design, construction, and equipment; navigation requirements governing ship navigation organization; qualifications and medical requirements pertaining to ship crew members; requirements for safety management systems; and provisions addressing threats related to piracy and terrorism.¹⁶ While these conventions offer interpretations of general requirements for maritime security, they do not address cybersecurity at sea due to objective factors. At the time of their development and adoption, information, and communication technologies (ICT) had not yet permeated all aspects of human life, rendering considerations of cybersecurity at sea unnecessary. For instance, the Convention on the High Seas (1958) mandates that each State-Party must take necessary measures to ensure safety at sea. These measures encompass communication signals, collision prevention, ship crew staffing and working conditions, ship equipment design, and seaworthiness. The Convention on the International Regulations for Preventing Collisions at Sea (1972) contains rules governing safe speed selection, manoeuvring, lighting, sound devices, distress signals, and more. The SOLAS Convention 1974 (International Convention for the Safety of Life at Sea) has a crucial role for maritime safety and life protection. It encompasses provisions on technical ship readiness for navigation, ship design, required rescue equipment, vessel fire safety, machinery and electrical equipment standards, and nuclear-powered vessel

¹⁶ N. A. R. Al Ali, A. A. Chebotareva, V. E. Chebotarev, Cyber security in marine transport: opportunities and legal challenges, 2021, *Scientific Journal of Maritime Research*, pp. 250-251

operation. SOLAS also establishes requirements for fire protection, lifeboat provision, and other life-saving equipment. Chapter V of SOLAS, "Safety of navigation,"¹⁷ comprises 21 rules covering hazard reports, meteorological and ice reconnaissance services, ship traffic separation scheme establishment, disaster reports, navigation equipment, rescue signals, navigation publications, manning requirements, and more.

To enhance safety and efficiency and protect the marine environment, Chapter V Regulation 11 on "Ship reporting systems"¹⁸ has been added to this chapter. These

¹⁷ Chapter V identifies certain navigation safety services which should be provided by Contracting Governments and sets forth provisions of an operational nature applicable in general to all ships on all voyages. This is in contrast to the Convention as a whole, which only applies to certain classes of ship engaged on international voyages. The subjects covered include the maintenance of meteorological services for ships; the ice patrol service; routing of ships; and the maintenance of search and rescue services. This Chapter also includes a general obligation for masters to proceed to the assistance of those in distress and for Contracting Governments to ensure that all ships shall be sufficiently and efficiently manned from a safety point of view. The chapter makes mandatory the carriage of voyage data recorders (VDRs) and automatic ship identification systems (AIS). [https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-\(SOLAS\),-1974.aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-(SOLAS),-1974.aspx)

¹⁸ SOLAS Convention, Chapter V, Regulation 11 "Ship reporting System"

1. Ship reporting systems contribute to safety of life at sea, safety and efficiency of navigation and/or protection of the marine environment. A ship reporting system, when adopted and implemented in accordance with the guidelines and criteria developed by the Organization pursuant to this regulation, shall be used by all ships, or certain categories of ships or ships carrying certain cargoes in accordance with the provisions of each system so adopted.
2. The Organization is recognized as the only international body for developing guidelines, criteria and regulations on an international level for ship reporting systems. Contracting Government shall refer proposals for the adoption of ship reporting systems to the Organization. The Organization will collate and disseminate to Contracting Governments all relevant information with regard to any adopted ship reporting system.
3. The initiation of action for establishing a ship reporting system is the responsibility of the Government or Governments concerned. In developing such systems provision of the guidelines and criteria developed by the Organization shall be taken into account.
4. Ship reporting systems not submitted to the Organization for adoption do not necessarily need to comply with this regulation. However, Governments implementing such systems are encouraged to follow, wherever possible, the guidelines and criteria developed by the Organization. Contracting Governments may submit such systems to the Organization for recognition.
5. Where two or more Governments have a common interest in a particular area, they should formulate proposals for a co-ordinated ship reporting system on the basis of agreement between them. Before proceeding with a proposal for adoption of a ship reporting system, the Organization shall disseminate details of the proposal to those Governments which have a common interest in the area covered by the proposed system. Where a co-ordinated ship reporting system is adopted and established, it shall have uniform procedures and operations.
6. After adoption of a ship reporting system in accordance with this regulation, the Government or Governments concerned shall take all measures necessary for the promulgation of any information needed for the efficient and effective use of the system. Any adopted ship reporting system shall have the capability of interaction and the ability to assist ships with information when necessary. Such systems shall be operated in accordance with the guidelines and criteria developed by the Organization see footnote pursuant to this regulation.
7. The master of a ship shall comply with the requirements of adopted ship reporting systems and report to the appropriate authority all information required in accordance with the provisions of each such system.
8. All adopted ship reporting systems and actions taken to enforce compliance with those systems shall be consistent with international law, including the relevant provisions of the United Nations Convention on the Law of the Sea.
9. Nothing in this regulation or its associated guidelines and criteria shall prejudice the rights and

systems contribute to human life safety at sea, navigation safety, and environmental preservation by facilitating information collection and exchange via radio messages for purposes such as search and rescue, pollution prevention, oil spill response, and weather forecasting. As of January 1st 2020, SOLAS convention amendments have been in effect, including provisions aimed at preventing accidents involving lifeboats. These changes pertain to lifeboat maintenance, rigorous inspections, operational tests, routine and major repairs, as well as lifeboat launching devices and disconnecting mechanisms¹⁹. The list of marine satellite communication system suppliers is expanding. Amendments to SOLAS's Chapter IV and certain codes now require the installation of "recognized mobile satellite services" for distress signal transmission and disaster communication at sea. Previously, rules mandated the installation of Inmarsat's satellite communication systems. It is worth noting that while these provisions and rules can be applied to the implementation of information technologies on ships, it is imperative to amend existing agreements and introduce new regulations to address the operation of autonomous vessels and cybersecurity at sea effectively. The UNCLOS Convention, encompasses provisions that govern navigation safety, ship traffic, collision liability, and compels states to take

duties of Governments under international law or the legal regimes of straits used for international navigation and archipelagic sea lanes. 10. The participation of ships in accordance with the provisions of adopted ship reporting systems shall be free of charge to the ships concerned. 11. The Organization shall ensure that adopted ship reporting systems are reviewed under the guidelines and criteria developed by the Organization. Copyright 2005 Lloyd's Register or International Maritime Organization. All rights reserved. Lloyd's Register, its affiliates and subsidiaries and their respective officers, employees or agents are, individually and collectively, referred to in this clause as the 'Lloyd's Register Group'. The Lloyd's Register Group assumes no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant Lloyd's Register Group entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract. Lloyd's Register Rulefinder 2005 – Version 9.4 SOLAS - International Convention for the Safety of Life at Sea - Chapter V - Safety of navigation - Regulation 12 - Vessel traffic services Regulation 12 - Vessel traffic services1. Vessel traffic services (VTS) contribute to safety of life at sea, safety and efficiency of navigation and protection of the marine environment, adjacent shore areas, work sites and offshore installations from possible adverse effects of maritime traffic. 2. Contracting Governments undertake to arrange for the establishment of VTS where, in their opinion, the volume of traffic or the degree of risk justifies such services. 3. Contracting Governments planning and implementing VTS shall, wherever possible, follow the guidelines developed by the Organization. The use of VTS may only be made mandatory in sea areas within the territorial seas of a coastal State. 4. Contracting Governments shall endeavour to secure the participation in, and compliance with, the provisions of vessel traffic services by ships entitled to fly their flag. 5. Nothing in this regulation or the guidelines adopted by the Organization shall prejudice the rights and duties of Governments under international law or the legal regimes of straits used for international navigation and archipelagic sea lanes.

¹⁹ A set of important amendments to the International Convention for the Safety of Life at Sea (SOLAS) and various codes enter into force on 1 January 2020. <https://www.imo.org/en/MediaCentre/PressBriefings/Pages/35-SOLAS-EIF-2020.aspx>

necessary measures to ensure safety at sea. Paragraph 4 of Article 94 of UNCLOS outlines these measures, which include:

- The inspection of each vessel before registration and at appropriate intervals by a qualified state inspector. Vessels must also carry necessary maps, nautical publications, navigation equipment, and instruments for safe navigation.
- The requirement for vessels to be commanded by a captain and officers possessing appropriate qualifications related to navigation, communication, ship machinery, and equipment. The crew's qualifications and numbers should correspond to the vessel's type, size, machinery, and equipment.
- A mandate for the captain, officers, and, when needed, the crew to be well-versed in applicable international regulations covering aspects such as life protection, collision prevention, marine pollution prevention, and radio communication, and to adhere to these rules.

Most of the aforementioned agreements include provisions delineating the legal status of captains. These provisions define their official rights and responsibilities in fulfilling international obligations set forth in these conventions. According to these agreements, a captain's legal status hinges on their authority to manage the vessel and its crew. This includes responsibilities related to navigation, ensuring safe navigation, maintaining onboard order, averting harm to the vessel, its occupants, and cargo. The captain also serves as the representative of the ship-owner and cargo owner in dealings and claims concerning the vessel, cargo, and shipping itself. Additionally, these agreements emphasize the captain's duties when encountering danger, which include promptly transmitting information about the incident to nearby vessels and relevant government authorities. However, it is evident that these provisions and rules need revision and expansion to address the legal status and responsibilities of individuals who will assume the role of a captain on autonomous vessels, particularly in transmitting safety alerts at sea and ensuring cybersecurity of navigation. These provisions are not applicable to autonomous vessels since they lack a captain and traditional crew.²⁰

²⁰ N. A. R. Al Ali, A. A. Chebotareva, V. E. Chebotarev, *Cyber security in marine transport: opportunities and legal challenges*, 2021, *Scientific Journal of Maritime Research*, Chapter 4, pp. 251-252

In light of the reality of cybercrime threats in maritime transport, there is a compelling need to develop a dedicated international treaty and legal mechanisms to combat crimes and cyberattacks in the maritime sector while safeguarding maritime cybersecurity. Existing international agreements on cybercrime, such as the Budapest Convention on Cybercrime (2001), the Arab Convention, and the Draft Convention on International Information Security (2011), primarily focus on broader cybercrime issues. Therefore, the proposed international treaty should encompass provisions not only for prosecuting those responsible for cyberattacks but also for establishing and overseeing unified minimum standards and requirements for cyber systems to enhance maritime navigation safety. In 2017, within the framework of the International Maritime Organization (IMO), several legal documents addressing cybersecurity in the maritime industry were developed and adopted. These documents include:

- Recommendations for managing cyber risks in the maritime industry.
- Cyber Risk management in maritime security management systems, as outlined in Resolution MSC. 428 (98)²¹.

²¹ The Maritime Safety Committee, at its 98th session in June 2017, also adopted Resolution MSC.428(98) - Maritime Cyber Risk Management in Safety Management Systems. The resolution encourages administrations to ensure that cyber risks are appropriately addressed in existing safety management systems (as defined in the ISM Code) no later than the first annual verification of the company's Document of Compliance after 1 January 2021. "THE MARITIME SAFETY COMMITTEE, RECOGNIZING the urgent need to raise awareness on cyber risk threats and vulnerabilities to support safe and secure shipping, which is operationally resilient to cyber risks, RECOGNIZING ALSO that Administrations, classification societies, shipowners and ship operators, ship agents, equipment manufacturers, service providers, ports and port facilities, and all other maritime industry stakeholders should expedite work towards safeguarding shipping from current and emerging cyber threats and vulnerabilities, BEARING IN MIND MSC-FAL.1/Circ.3 on Guidelines on maritime cyber risk management approved by the Facilitation Committee, at its forty-first session (4 to 7 April 2017), and by the Maritime Safety Committee, at its ninety-eighth session (7 to 16 June 2017), which provides high-level recommendations for maritime cyber risk management that can be incorporated into existing risk management processes and are complementary to the safety and security management practices established by this Organization, RECALLING resolution A.741(18) by which the Assembly adopted the International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management (ISM) Code) and recognized, inter alia, the need for appropriate organization of management to enable it to respond to the need of those on board ships to achieve and maintain high standards of safety and environmental protection, NOTING the objectives of the ISM Code which include, inter alia, the provision of safe practices in ship operation and a safe working environment, the assessment of all identified risks to ships, personnel and the environment, the establishment of appropriate safeguards, and the continuous improvement of safety management skills of personnel ashore and aboard ships, 1 AFFIRMS that an approved safety management system should take into account cyber risk management in accordance with the objectives and functional requirements of the ISM Code; 2 ENCOURAGES Administrations to ensure that cyber risks are appropriately addressed in safety management systems no later than the first annual verification of the company's Document of Compliance after 1 January 2021; 3 ACKNOWLEDGES the necessary precautions that could be needed to preserve the confidentiality of certain aspects of cyber

- Recommendations for cybersecurity on ships.

Annex No. 10 of Resolution MSC. 428 (98) provides recommendations for maritime administrations to incorporate cyber risk considerations into safety management systems during the first annual verification of a company's Compliance Document after January 1, 2021. This resolution is presently the sole international document mandating maritime administrations of IMO member states to account for cyber risks within ship safety management systems. Consequently, as of January 1, 2021, many vessels in foreign ports may face the risk of sanctions for non-compliance with IMO cybersecurity recommendations. Failure to adhere to these recommendations could result in charterer contract refusals, varying marine cargo insurance rates for compliant and non-compliant ships, and the evaluation of cyber incidents at the ship/port interface based on cybersecurity recommendations. These recommendations acknowledge that cyber technologies have become indispensable for operating and managing various systems critical for navigation safety and marine environment protection. They define "maritime cyber threats" as risks to technological resources stemming from circumstances or events that may disrupt cargo and passenger transportation, navigation safety, or a vessel's security due to information compromise related to navigation, cyber system maintenance and development, and intentional or unintentional cyber threats. The recommendations further outline vulnerable ship systems, including navigation bridge systems, cargo handling and management systems, engine, machinery, and power management systems, access control systems, passenger service and management systems, public internet networks for passenger use, administrative systems and networks, and communication systems. While not an exhaustive list, these recommendations provide a model for classifying such actions or omissions as unlawful at the national level and incorporating them into criminal legislation as punishable offenses against maritime cybersecurity. The IMO Principles for Effective Risk Management in the Maritime Industry centre around five core elements: identification, protection, detection, response, and recovery. However, for these elements to be effective, they must be ingrained in the overall legal culture of all parties involved in maritime transport safety. Presently, safety culture concerns are encapsulated in the International Code of Safety Management (ISM Code). This code

risk management; 4 REQUESTS Member States to bring this resolution to the attention of all stakeholders”
<https://www.imo.org/en/OurWork/Security/Pages/Cyber-security.aspx>

aims to establish an international standard for safe vessel management and operation, as well as environmental protection. It mandates that ship-owners or other authorized individuals committed to ship operation establish a safety management system and implement an acceptable policy to achieve safety objectives. In 2016, the Baltic and International Maritime Council (BIMCO), in conjunction with several influential maritime associations, issued the 'Guidelines on Cybersecurity Onboard Ships.' Building upon this initiative, BIMCO, alongside various maritime industry organizations, released the 4th version of the Guidelines on Cybersecurity Onboard Ships in December 2020. The 2016 Guidelines outlined a fundamental cybersecurity awareness concept comprising six interconnected steps: identifying threats, vulnerabilities, risk exposure, developing protection and detection measures, creating contingency plans, and responding to cybersecurity incidents. Moreover, these Guidelines underscored the importance of organizations being knowledgeable about and applying existing security measures, as well as understanding their potential and limitations. Each company was encouraged to conduct internal risk assessments to identify threats, assess existing systems and procedures, and complement these with third-party assessments to uncover any overlooked threat vectors. A multi-level approach was recommended, emphasizing both technical and procedural aspects. These Guidelines formed the foundation for the adoption of Resolution MSC.428. The second edition of the Guidelines incorporated information on insurance matters, recommendations for effective network isolation, and practical advice for ship-to-shore interface connectivity, as well as managing cybersecurity during port entry and communication with coastal organizations. Furthermore, an insurance subsection addressing coverage following cyber-attacks, a significant aspect of ship-owner risk exposure (10.6 – 'Losses arising from a cyber incident'), was added. Given the evolving landscape of cyber threats in the maritime industry, there is a compelling and immediate need to establish internationally binding regulations governing cybersecurity. The existing international legal framework for cybersecurity lacks comprehensive and effective mechanisms to address specific challenges arising from diverse forms of cyber aggression.²² Cybercrimes in maritime

²² N. A. R. Al Ali, A. A. Chebotareva, V. E. Chebotarev, Cyber security in marine transport: opportunities and legal challenges, 2021, Scientific Journal of Maritime Research, Chapter 4, pp. 253. In particular this concept is pointed out by the Russian author A. Martirosyan in his publication "Cybersecurity and International Maritime Law: An Overview of Current International Legal Issues in the Field of Cybercrime" 2020, quoted by the authors of this publication.

transport encompass a range of illicit activities, including seizing control over management systems, cyberattacks on ship navigation and propulsion systems, cargo handling and container tracking systems at ports and on vessels (Container Tracking System – CTS), automated processes, Electronic Chart Display and Information System (ECDIS), site data recorders (Terminal Operating System-TOS), and more. Each of these systems is vulnerable in various ways concerning maritime cybersecurity. Proficient hackers can infiltrate maritime industry systems, potentially leading to catastrophic consequences. These risks include altering vessel data, such as location, cargo details, speed, and identity, creating deceptive 'ghost ships' misidentified as legitimate vessels, transmitting false weather information to coerce course changes, triggering false collision warnings, falsifying signals, and more. Perpetrators of cybercrimes in maritime transport encompass not only hackers but also pirates and terrorists. Considering the gravity of the situation, it is advisable to explore the creation of a specialized judicial body to address cybercrimes or delegate this responsibility to the International Criminal Court. The establishment of such a mechanism to combat cybercrime could play a vital role in mitigating these types of offenses. In summary, the current international legal framework for maritime transport security falls short in providing comprehensive and effective mechanisms to ensure cybersecurity and address specific challenges stemming from diverse forms of cyberattacks on maritime transport facilities.²³ To ensure broad adoption of the guidelines among organizations operating in the shipping industry, the recommendations are intentionally formulated broadly. Stakeholders are encouraged to implement Cyber Risk Management through various national guidelines and standards, including those developed by private and public bodies like BIMCO and the ISO/IEC 27001 standard. While these guidelines are recommended, they could eventually contribute to the creation of international instruments in cybersecurity within the shipping industry, potentially becoming legally binding through incorporation into treaties or national legal systems. In terms of cybersecurity measures within maritime transport practice, the International Association of Classification Societies (IACS) issued a Recommendation on Cyber Resilience in April 2020. This recommendation outlines technical requirements for stakeholders to enhance the resilience of ships against cyber

²³ N. A. R. Al Ali, A. A. Chebotareva, V. E. Chebotarev, *Cyber security in marine transport: opportunities and legal challenges*, 2021, *Scientific Journal of Maritime Research*, Chapter 4, pp. 251-252

threats. Similarly, the International Association of Ports and Harbors (IAPH) published a Port Community Cybersecurity Report in June 2020. This report addresses cybersecurity matters and provides recommendations for port communities to develop a global, accessible language for cybersecurity. It emphasizes the importance of collaborative, coordinated cyber defence efforts within port communities and explores financial support options for managing cybersecurity²⁴.

Lastly, the *Comité Maritime International* has established an International Working Group on Cybercrime in Shipping to explore potential legal initiatives in this area, aligning with its objective of unifying maritime law comprehensively.²⁵

Budapest Convention 2001

As for global regulations on cybercrime, the Council of Europe adopted the Budapest Convention in 2001, which became effective in 2004. This Convention stands as the inaugural international legal framework addressing offenses committed through the internet and other computer networks. Its primary objectives encompass standardizing domestic criminal laws related to cybercrime, equipping domestic criminal procedures with the necessary powers for investigating and prosecuting these offenses, and establishing a swift and efficient framework for international cooperation between nations and the private sector. It's important to note that while this Convention doesn't directly address cybercrime in maritime transport, it defines nine offenses across four categories, some of which are relevant to shipping and aviation. Article 7 of this Convention states that contracting states should introduce criminal offenses into their legal systems regarding "the manipulation, alteration, deletion, or suppression of computer data resulting in falsified data intended to be treated as genuine for legal purposes, whether or not the data is directly legible and understandable. A Party may require an intent to defraud or a similar dishonest intent for criminal liability to apply."²⁶ This article safeguards the measures implemented in shipping to ensure the integrity of electronic

²⁴ G. Marchiafava, Cybercrime and Cybersecurity in shipping: a legal framework in progress, 2022, *Rivista di Studi Politici Internazionali*, Aprile-Giugno, pp. 244.

²⁵ G. Marchiafava, Cybercrime and Cybersecurity in shipping: a legal framework in progress, 2022, *Rivista di Studi Politici Internazionali*, Aprile-Giugno, pp. 245.

²⁶ Budapest Convention 2001, Article 7

identification documents, readable transport document devices secured with cryptography techniques, and biometric passenger verification systems²⁷.

The United Nation Resolution on cybercrime

The United Nations General Assembly has adopted resolutions and launched initiatives aimed at combating the criminal misuse of information technologies, a concern that also extends to the maritime transport sector. These initiatives involve recommendations, albeit not legally binding, to Member States, urging them to enact national laws and practices capable of addressing cybercrime, fostering cooperation in investigation and prosecution, sharing information and expertise in information technologies, and training and deploying personnel proficient in countering malicious cyber activities. States and international organizations should actively promote the development of a global and effective cybersecurity culture in the application and utilization of information technologies. Recognizing the increasing interconnectedness between national critical infrastructures, including those employed in maritime transport, and the critical information infrastructures influencing their operations, the General Assembly suggests that States, in coordination with relevant stakeholders, formulate strategies for mitigating cyber risks to their critical information infrastructures. Furthermore, it encourages States, regional bodies, and international organizations, including the IMO, to exchange best practices and measures related to cybercrime, cybersecurity, and the safeguarding of critical information infrastructures. Given the surge in malicious digital activities targeting critical infrastructures, businesses, and individuals, and the need for heightened coordination and cooperation among States, the UN General Assembly has resolved to establish a special intergovernmental committee of experts tasked with drafting a comprehensive treaty aimed at countering the criminal use of information and communication technologies. This response is deemed essential in addressing the escalating cyber threats and cybercrime. The 2001 Budapest Convention on cybercrime is seen as a valuable regional initiative that could serve as a model or reference. The standards and principles outlined in the Budapest Convention may find

²⁷ G. Marchiafava, *Cybercrime and Cybersecurity in shipping: a legal framework in progress*, 2022, *Rivista di Studi Politici Internazionali*, Aprile-Giugno, pp. 246.

implementation in this treaty. A comprehensive United Nations treaty encompassing both cybersecurity and cybercrime would serve as a more fitting legal instrument to ensure peace and security in the realm of cyberspace by introducing consistent security measures. The development of this treaty on cybersecurity and cybercrime should align with existing international, European, and national legal frameworks. Additionally, the work and findings of the intergovernmental Expert Group conducting a comprehensive study on cybercrime should be taken into consideration. The draft convention is expected to be presented to the UN General Assembly during its 78th session in September 2023.²⁸

National and European measures

At the domestic level, certain nations have developed directives concerning cybersecurity. For instance, the UK authorities, in collaboration with the Institute of Engineering and Technology, introduced the 'Guidelines and Standards Code: Cybersecurity for Ports and Port Systems' in 2016. Subsequently, in 2017, they released the 'Guidelines and Standards Code: Cybersecurity for Vessels.' These codes can aid businesses in conducting cybersecurity evaluations, devising strategies for enhancing cybersecurity, and implementing measures to mitigate and prevent potential security breaches, alongside adhering to the IMO's Ship Safety Standards and Regulations²⁹. The United States places a particular emphasis on ensuring cybersecurity within the maritime sector. In 2018, the National Institute of Standards and Technology issued the 'Basic Principles for Enhancing the Cybersecurity of Critical Infrastructure.' In October 2018, the FAA Reauthorization Act was enacted, featuring provisions under the 'j – Maritime Security' section designed to enhance maritime security³⁰. This legislation complements existing statutes related to maritime security by addressing maritime cybersecurity. It provides further clarity regarding the responsibilities of the entities involved in its implementation and introduces the requirement for assessing cyber threats within the framework of ship or port facility security assessments. Ship or port facility security plans

²⁸ G. Marchiafava, *Cybercrime and Cybersecurity in shipping: a legal framework in progress*, 2022, *Rivista di Studi Politici Internazionali*, Aprile-Giugno, pp. 246-249.

²⁹ UNCTAD *Review of maritime transport*, 2018. https://unctad.org/system/files/official-document/rmt2018_en.pdf

³⁰ FAA *Reauthorization Act*, 2018. <https://www.congress.gov/115/plaws/publ254/PLAW-115publ254.pdf>

must incorporate provisions for the detection, response to, and recovery from cyber threats that could lead to security incidents in transportation. It's noteworthy that violations of these provisions may result in civil fines, not exceeding \$25,000 (USD) per day of continued violation, with a maximum cap of \$50,000 (USD). In March 2020, the US Coast Guard issued Circular NVIC 01-20, often referred to as the guiding principles for addressing cyber threats in facilities regulated by the Maritime Transportation Security Act (MTSA). This document, known as the 'Guidelines for Managing Cyber Risks at Maritime Transportation Security Act (MTSA) Regulated Facilities'³¹, offers guidance on handling cyber threats. Furthermore, on October 27, 2020, the US Coast Guard released a working instruction CVC-WI-027 titled 'Ship Cyber Risk Management.' This instruction provides Coast Guard Maritime Inspectors (MI) and Port State Control Officials (PSCO) with guidance on assessing cyber hygiene aboard ships, along with recommendations for actions to be taken when deficiencies are identified^{32, 33}.

In November 2011, the European Network and Information Security Agency (ENISA)³⁴ formulated guidance and recommendations concerning best practices in information security and conducted an evaluation of the cybersecurity aspects within maritime transportation. In their analysis, the Agency underscored several key issues: a limited awareness and emphasis on maritime security, the intricate nature of the maritime information and communication technology (ICT) environment, fragmented governance in the maritime sector, inadequate consideration of cybersecurity in maritime regulations, the absence of a comprehensive approach to maritime cyber risks, and a lack of economic incentives for the implementation of maritime cybersecurity measures. For each critical aspect, the Agency identified priorities and issued recommendations to EU Member States. These recommendations encompass the initiation of awareness campaigns and tailored training programs, the adoption of strategies and best practices related to ICT deployments, alignment of international and European policies, definition of roles and

³¹ The Guidelines on Cyber Security Onboard Ships Version 4. <https://www.ics-shipping.org/wp-content/uploads/2020/08/guidelines-on-cyber-security-onboard-ships-min.pdf>

³² USCG Office of Commercial Vessel Compliance (CG-CVC) Mission Management System (MMS) Work Instruction (WI). <https://www.dco.uscg.mil/Portals/9/CVC-WI-27%282%29.pdf>

³³ N. A. R. Al Ali, A. A. Chebotareva, V. E. Chebotarev, Cyber security in marine transport: opportunities and legal challenges, 2021, Scientific Journal of Maritime Research, Chapter 4, pp. 253-254

³⁴ ENISA serves as a prominent hub of cyber security expertise within Europe. This agency is based in Greece, with its main headquarters located in Heraklion, Crete, and an additional operational office situated in Athens. You can find more information about ENISA on their website at www.enisa.europa.eu.

responsibilities in cybersecurity, incorporation of cybersecurity considerations into regulatory frameworks governing the maritime industry, and the promotion of information exchange. ENISA promotes public-private collaboration in the cybersecurity domain through encouragement, incentives, and recommendations for the establishment and operation of public-private partnerships. In 2019, the EU Cybersecurity Act bolstered ENISA's role in cybersecurity matters for EU Member States, endowing it with a permanent mandate, additional resources, and new functions. During the same year, ENISA released the "Port Cybersecurity - Best Practices for Cybersecurity in the Maritime Sector," aimed at providing port operators and authorities with foundational guidance to formulate their cybersecurity strategies. In 2020, ENISA published an updated version of the "Cyber Risk Management for Ports - Guidelines for Security in the Maritime Sector," designed to aid port operators in addressing cyber risks in the context of digital transformation and heightened regulations. These guidelines were developed in collaboration with various ports in EU Member States. Since 2005, European institutions have swiftly introduced numerous legal instruments addressing cybercrime and cybersecurity. Despite the rising incidents of cyberattacks in the maritime transportation sector and the endeavours of ENISA (European Union Agency for Cybersecurity), specific regulations concerning cybercrime and cybersecurity in shipping remain absent within the existing European legal framework. However, European Union rules governing cybersecurity in the air transport sector have been adopted. This section will explore the significance of some key European legal instruments pertaining to cybercrime and cybersecurity concerning the maritime transportation sector. The initial European Union legal instrument addressing cybercrime was the Council Framework Decision 2005/222/JHA, issued on February 24, 2005, which focuses on attacks against information systems. This decision aligned with the principles outlined in the 2001 Budapest Convention on cybercrime and established a minimum level of protection against cyberattacks. Both the Budapest Convention and the EU Council Framework Decision emphasized general principles but diverged in their approach to cybercrime classification. While the Convention adopted a broad definition of cyber-criminality, distinguishing cyber-attacks from other crimes employing computers as tools, the 2005 Framework Decision concentrated on enhancing information infrastructure security and strengthening cooperation between law enforcement authorities across EU Member

States, aligning their national criminal laws. Recognizing the escalating threat of attacks on information systems and the misuse of botnets for illicit purposes, the European Commission decided to revise Decision 2005/222/JHA. Consequently, in 2013, the EU Parliament and Council enacted Directive 2013/40/EU, which replaced the aforementioned decision. This directive established minimum regulations concerning the definition of criminal offenses and penalties related to cyberattacks, harmonized national criminal laws, and improved cooperation among judicial and other competent authorities. These rules are also applicable to cyberattacks in the maritime transport sector. The directive adhered to the EU legislator's previous approach outlined in the 2005 Framework Decision, forgoing the creation of a comprehensive and unified legal framework covering all internet offenses. Instead, the directive primarily targets specific cybercriminal offenses. The Directive 2013/40/EU mandates EU Member States to adopt measures ensuring that unauthorized access to an information system, intentionally infringing on its security measures, is punishable as a criminal offense. Similarly, they must introduce measures to penalize the deliberate disruption of an information system's operation by manipulating computer data, intentionally and without authorization. Additionally, the deletion, damage, alteration, or suppression of computer data on an information system without proper authorization should be punishable as a criminal offense. Intercepting non-public transmissions of computer data through technical means, intentionally and without authorization, should also incur criminal liability. The directive further obliges Member States to implement measures against the intentional production, sale, procurement, import, distribution, or provision of unauthorized computer access codes, passwords, or devices with the intent to facilitate these criminal activities. Member States must ensure effective, proportionate, and deterrent criminal penalties, with the primary offenses carrying a maximum imprisonment term of at least two years. This directive contributed to the criminalization of cyberattacks within the European Union and facilitated cross-border cooperation among national authorities investigating such offenses. The implementation of these EU rules led to revisions of national criminal codes and related regulations. In 2014, the Council of the European Union adopted the EU Maritime Security Strategy, designed to foster cooperation across borders and sectors, uphold compliance with rules, and enhance security in European maritime sectors.

Cyberattacks were included among the maritime security risks and threats to ships, cargo, crew, passengers, ports, port facilities, and critical maritime and energy infrastructures.³⁵

In 2016, the European Parliament and the Council adopted the NIS (Network and Information Systems) Directive, addressing issues related to cybersecurity across the European Union. This directive comprehensively deals with cybersecurity in the transport sector. It introduces legal measures aimed at elevating the EU's cybersecurity level by ensuring that Member States are adequately equipped, including the establishment of a Computer Security Incident Response Team (CSIRT) and a competent national NIS Authority. The directive promotes cooperation among all EU Member States by establishing a cooperation group to support strategic collaboration and information exchange. It also mandates Member States to establish a CSIRT Network to facilitate operational cooperation in response to specific cybersecurity incidents and the sharing of information on risks, including those concerning maritime transport. Furthermore, the directive encourages the development of a security culture in sectors heavily reliant on information technology, such as transport. It designates shipping companies, port authorities, and vessel traffic service operators as "operators of essential services," imposing on them the responsibility to implement measures ensuring the security of their network and information systems. EU Member States have been incorporating these provisions into their legal systems. In 2017, the Council of the European Union adopted conclusions on a diplomatic response framework to counter malicious cyber activities, known as the Cyber Diplomacy Toolbox, aiming to address the increasing ability and willingness of state and non-state actors to engage in unlawful cyber activities. The Council advocated for a united diplomatic response at the European level, including the imposition of measures within the common foreign and security policy (CFSP), such as restrictive actions. In 2019, the Council Regulation (EU) 2019/796 concerning restrictive measures against cyber-attacks threatening the Union or its Member States was introduced, operating under Article 215 of the Treaty on the Functioning of the European Union (TFEU)³⁶. This regulation imposes economic sanctions to deter and respond to

³⁵ G. Marchiafava, *Cybercrime and Cybersecurity in shipping: a legal framework in progress*, 2022, *Rivista di Studi Politici Internazionali*, Aprile-Giugno, pp. 249-254.

³⁶ Council Regulation (EU) 2019/796 was put into effect through the Council Implementing Regulation (EU) 2020/1125, which was enacted on 30 July 2020. This implementing regulation aimed to

cyberattacks that significantly impact the European Union, its Member States, third countries, or international organizations. The regulation targets individuals, entities, or groups responsible for cyberattacks or those providing support, including financial, technical, or material assistance for such attacks. These cyberattacks encompass those affecting information systems related to critical infrastructures, including transport networks and services essential for maintaining society and the economy, as seen in the transport sector (air, rail, water, and road). Regulation (EU) 2019/1239, implementing the European Maritime Single Window environment, emphasizes that standardization in maritime transport through digitalization necessitates measures to prevent and counter cyberattacks. In June 2020, the EU Commission and the High Representative of the Union for Foreign Affairs and Security Policy proposed the establishment of the Joint Cyber Unit, a physical and virtual platform aimed at coordinating efforts to prevent, detect, discourage, deter, mitigate, and respond to large-scale cyberattacks and crises. This platform intends to promote mutual assistance by leveraging the expertise of EU Member State authorities, relevant EU institutions, bodies, and agencies, including those involved in shipping. It also facilitates cooperation with private transport stakeholders, representing a significant stride towards European Cybersecurity Crisis Management. In December 2020, the EU Commission published a Cybersecurity Toolkit, offering guidance and recommended practices, including those pertinent to enhancing cybersecurity and cyber-resilience in the transport sector, including maritime transport. In March 2021, in its conclusions on the EU's Cybersecurity Strategy for the Digital Decade, the Council underscored the need to respond more effectively to the rising number of cyberattacks with systemic implications. These attacks could disrupt supply chains, critical infrastructure, essential services, democratic institutions, and economic security. The Council called for international cooperation to combat cybercrime, including sharing best practices, technical knowledge, and capacity building. Concerning transport, the Council noted that the EU Commission had introduced cybersecurity provisions into EU legislation on aviation security and pledged to continue efforts to enhance cyber resilience across all transport modes, including maritime transport. In May

enforce the provisions of Regulation (EU) 2019/796, which deals with imposing restrictive measures against cyber-attacks that pose a threat to the European Union or its Member States. Additionally, Decision (CFSP) 2019/797 outlined these restrictive measures. Furthermore, Decision (CFSP) 2021/796, which was approved by the Council of the European Union on 17 May 2021, extended the duration of these restrictive measures until 18 May 2022.

2021, the EU Parliament and the Council adopted Regulation (EU) 2021/887, establishing the European Cybersecurity Industrial, Technology, and Research Competence Centre and the Network of National Coordination Centres. This Competence Centre plays a crucial role in implementing the cybersecurity aspect of the Digital Europe Programme and aims to enhance the security of network and information systems, including those vital for societal functioning, such as transport infrastructures and telematic applications. In July 2021, the European Union adopted Regulation (EU) 2021/1153, establishing the Connecting Europe Facility for the period 2021-2027, a funding instrument supporting the development, modernization, and completion of trans-European networks in transport, energy, and digital sectors. It allows actions aimed at enhancing the resilience of transport infrastructures to cybersecurity threats to be eligible for funding.³⁷

Cybersecurity in autonomous shipping

This section delves into the cybersecurity considerations associated with advancements in the maritime industry, particularly focusing on the concept of autonomous or unmanned vessels. It explores the potential vulnerabilities that exist within these vessels, drawing attention to the research community in cybersecurity. This concern arises by drawing parallels with existing unmanned systems and the various attack surfaces that malicious actors exploit to gain unauthorized access, resulting in data theft, information compromise, and system breaches.³⁸ Generally speaking, self-driving ships can be divided into remotely operated ships and Autonomously Operated ships.

- **Remotely Operated Vessels**

Remotely controlled vessels, akin to their completely unmanned counterparts, rely on extensive sensor networks and algorithms for precise navigation across international waterways. However, the high degree of interconnectivity in these vessels introduces a multitude of new attack surfaces, encompassing sensor networks, remote controls, and communication links between onshore operators

³⁷ G. Marchiafava, *Cybercrime and Cybersecurity in shipping: a legal framework in progress*, 2022, *Rivista di Studi Politici Internazionali*, Aprile-Giugno, pp. 249-254.

³⁸ M. A. B. Farah, E. Ukwandu, H. Hindy, D. Brosset, M. Bures, I. Andonovic, X. Bellekens, *Cyber Security in the Maritime Industry: A Systematic Survey of Recent Advances and Future Trends in Information*, 2022.

and the vessel. The bidirectional data streams over these links raise concerns about data security.

- **Autonomously Operated Vessel**

While autonomous vessels may not be susceptible to traditional cyberattacks stemming from human vulnerabilities (e.g., crew members), they face growing risks of GPS spoofing, exploiting the attack surface presented by communication links. These concerns include the potential for cyberattacks leading to collisions, resulting in loss of life, environmental damage, and other hazards. These threats arise due to the interconnected nature of devices, including issues like weak key management and bidirectional data storage and retrieval from the cloud.³⁹

The maritime industry stands to benefit significantly from increasing levels of digitalization. Embracing data-driven applications transforms traditionally analogue operations into streamlined practices that optimize cargo handling, enhance procurement and logistics, and promote efficiency, growth, innovation, safety, and competitive advantage while minimizing environmental impact. The digitalization journey relies on technologies like blockchain, Big Data, real-time control, artificial intelligence, autonomous vehicles, robotics, network connectivity, communications, virtual reality, and the Internet of Things (IoT). Accelerating adoption necessitates knowledge sharing and collaboration among industry stakeholders to promote new working methods, optimize customer engagement, and improve service delivery. This digitalization journey is envisioned in three phases: optimization, extension, and transformation. Each phase presents unique challenges, including securing funding and managing associated cybersecurity considerations. Research directions for Big Data and artificial intelligence technologies in the maritime industry include maritime transport and port community systems, applications of Big Data from the Automatic Identification System (AIS) in surveillance and sustainability, energy usage optimization, and predictive analytics related to vessel performance. These technologies offer solutions to digitalization challenges, enhance decision-making, and contribute to safety. Robotics will play a

³⁹ M. A. B. Farah, E. Ukwandu, H. Hindy, D. Brosset, M. Bures, I. Andonovic, X. Bellekens, *Cyber Security in the Maritime Industry: A Systematic Survey of Recent Advances and Future Trends in Information*, 2022, pp. 23-24.

crucial role in executing complex operations, particularly in the context of unmanned vessels.⁴⁰

In conclusion, it can be assumed that the issue of cyber security is as central as ever in shipping today even without the advent of self-driving ships. In addition to what we have seen in this chapter, from a private perspective, in the context of negotiations between the parties it is worth mentioning that BIMCO is already moving to make the issue of cybersecurity central to contracts as well. In this regard, in 2019 it drafted a clause 'BIMCO Cyber Security Clause 2019', which has entered into many of the forms in use. The aforementioned clause will be discussed in more detail later on, more precisely in Chapter V - FOCUS: AUTOSHIPMAN by BIMCO of this paper. The addition of a cybersecurity clause to a specific form for the self-driving ship sector (AUTOSHIPMAN) regarding ship management is certainly synonymous with the importance that cybersecurity has and will increasingly have in the industry

⁴⁰ M. A. B. Farah, E. Ukwandu, H. Hindy, D. Brosset, M. Bures, I. Andonovic, X. Bellekens, Cyber Security in the Maritime Industry: A Systematic Survey of Recent Advances and Future Trends in Information, 2022

Chapter IV – How the industry is shaping to unmanned vessels.

Autonomous vessels bring a whole series of contractual and liability issues that the industry is just now seeking to adapt. The novelty of this phenomenon, at least for civil use, means that the subject is still undergoing strong evolution and is slowing down the process of spreading these types of craft for commercial use. Generally speaking, as has already been seen for international conventions and regional and national regulations, insurance contracts and charterparties will not be overturned to any great extent as the uses and minimum requirements remain for these types of vessels as well. The challenge for the sector will be to adapt the current contracts to the new requirements arising from the use of self-driving ships by using forms, insurance contracts, etc., that are already known in order to enable the sector to interface with clauses and contracts that are in part or fully already known, in order to make the introduction of these new features easier. Among these, the AUTOSHIPMAN form, drafted by BIMCO, deserves special mention, which to date is still in beta version and in the process of being refined and approved by the Danish association. This form, which concerns the ship management of self-driving ships, following in the footsteps of the better-known SHIPMAN2009 form, will be the subject of the next chapter.

IV. 1 Maritime Practice and Charterparties

The transportation of goods via maritime routes is typically overseen through the establishment of a contractual arrangement known as a charter party agreement. Specifically, when a ship owner agrees to make the full cargo capacity of their vessel accessible for either a specific voyage or a designated duration, this arrangement typically adopts the structure of a charter party. Charter party agreements are categorized based on two key factors: the allocation of ship space and the duration of the contract. They can manifest as contracts for a specific time frame, known as time charters, or as contracts for a single journey, referred to as voyage charters.¹

¹ M. Pijacar, B. Bulum, 2021 , “Comparison of Problems Related to the Carriage of Goods by Sea Between Traditional and Autonomous Vessels”, the International Journal on Marine Navigation and Safety of Sea Transportation, Vol.35, pp.125-131.

In a time-charter agreement, the ship owner commits to executing the transportation of goods within the agreed-upon timeframe and utilizing the designated vessel for the client. In return, the client commits to paying the stipulated hire for the duration of the contract. During this contractual period, the client is granted the freedom to utilize the ship for commercial purposes, within the constraints of the contract's terms and the intended use of the vessel. The master is obligated to carry out the client's directives within the scope of the contract, which may include instructions regarding the destination port or the cargoes to be transported. In contrast, voyage charters differ from time charters in that the primary responsibility of the ship owner is to transport goods during one or more predetermined voyages, with the voyage charterer responsible for covering the freight charges. Consequently, a voyage charter contract may specify a set number of voyages or outline a timeframe within which a specified number of voyages must be completed. Both time charter and voyage charter agreements share the same overarching objective: the transportation of goods by sea. Given this shared fundamental obligation of the contracting parties, charter party contracts incorporate various analogous contractual provisions. Some of these provisions pertain to matters such as ensuring the seaworthiness of the vessel, guaranteeing the safety of the designated port, establishing liability parameters, limiting the ship owner's liability, and excluding certain liabilities. Various legal sources that govern maritime goods transportation, including contracts between parties, international conventions, and national laws, devote particular attention to regulating these aspects. These highlighted obligations and concerns of the parties involved are of paramount importance within this mode of goods transportation. The responsibility for ensuring a ship's fitness for voyage is a core obligation imposed on shipowners by international maritime conventions such as the Hague Rules and the Protocol to Amend the International Convention for the Unification of Certain Rules of Law, relating to the Bill of Lading (Visby Rules)². This concept of seaworthiness can be categorized into two forms: absolute and relative seaworthiness. Absolute seaworthiness encompasses the ship's nautical safety aspects, including its hull, machinery, equipment, and the possession of appropriate certificates. On the other hand, relative seaworthiness pertains to the ship's ability to transport the agreed cargo while maintaining its condition

² International Convention for the Unification of Certain Rule of Law relating to Bills of Lading (Hague Rules): <https://www.jus.uio.no/English/services/library/treaties/07/7-04/hague-rules.xml>.

and must include suitable propulsion materials, necessary equipment, and an adequate crew complement. In essence, seaworthiness demands that the ship be capable of fulfilling its contracted obligations and possess a level of fitness that an ordinary, prudent owner would expect at the commencement of the voyage, considering all foreseeable circumstances. Consequently, the ship, its crew, and equipment must be sufficiently robust to withstand potential perils encountered during the charter service. Charter parties explicitly place the onus on shipowners to provide seaworthy vessels upon delivery. This obligation is reiterated in various charter party contracts. For instance, Clause 2 of the New York Produce Exchange Form from 2015 (NYPE 2015) stipulates that "The Vessel on delivery shall be seaworthy and, in every way, fit to be employed for the intended service..."³. Similar express seaworthiness obligations can be found in Clause 2⁴ of the NYPE 93, Clause 1⁵ of the Baltime 1939 (revised 2001) Uniform Time Charter, Clause 2.1⁶ of the BPTIME3⁷ Time Charter Party, and 1(b)⁸ of the Shelltime4⁹ form Time Charter

³ NYPE 2015, Clause 2(b), Delivery: "The Vessel on delivery shall be seaworthy and in every way fit to be employed for the intended service, having water ballast and with sufficient power to operate all cargo handling gear simultaneously, and, with full complement of Master, officers and ratings who meet the Standards for Training, Certification and Watchkeeping for Seafarers (STCW) requirements for a vessel of her tonnage."

⁴ NYPE 1993, Clause 2, Delivery: "The Vessel shall be placed at the disposal of the Charterers at The Vessel on her delivery shall be ready to receive cargo with clean-swept holds and tight, staunch, strong and in every way fitted for ordinary cargo service, having water ballast and with sufficient power to operate all cargo handling gear simultaneously.

The Owners shall give the Charterers not less than days ... notice of expected date of delivery."

⁵ BALTIME 1939, Clause 1, Period/Port of Delivery/Time of Delivery: "The Owners let, and the Charterers hire the Vessel for a period of the number of calendar months indicated in Box 14 from the time (not a Sunday or a legal Holiday unless taken over) the Vessel is delivered and placed at the disposal of the Charterers between 9 a.m. and 6 p.m., or between 9 a.m. and 2 p.m. if on Saturday, at the port stated in Box 15 in such available berth where she can safely lie always afloat, as the Charterers may direct, the Vessel being in every way fitted for ordinary cargo service. The Vessel shall be delivered at the time indicated in Box 16."

⁶ BPTIME3 2001, Clause 2.1, Cancellation: "If the Vessel is not ready in accordance with Clause 1 and at Charterers' disposal by the Cancelling Date (which term shall for the purposes of this Clause include any new Cancelling Date determined under this Clause 2) Charterers shall have the option of cancelling this Charter within forty -eight (48) hours after the Cancelling Date."

⁷ According to bimco.org "BPTIME3 is a tanker charter party that was developed by BP in association with BIMCO. Copyright in this document is held by BP. The latest edition of this contract is BPTIME, issued in 2001." <https://www.bimco.org/Contracts-and-clauses/BIMCO-Contracts/BPTIME3#>

⁸ SHELLTIME4, Clause 1(b), Description and Condition of the Vessel: "she shall be in every way fit to carry crude petroleum and/or its products;"

⁹ SHELLTIME4 is a tanker time charter party developed for the oil group SHELL.

Party. Even in cases where there is no explicit requirement, case law typically implies a seaworthiness standard by law.¹⁰

Up until now, there has been limited attention given to conventional "standard" agreements, such as charter parties, which are extensively utilized within the maritime shipping sector. The prevailing assumption has been that unless international regulations explicitly permit the deployment of autonomous ships, engaging in commercial activities involving these vessels would remain infeasible. Consequently, it's been widely acknowledged that the regulatory framework needs to be established before embarking on commercial agreements, particularly in the realm of international trade. Nevertheless, it should not overlook the fact that, in anticipation of the broader integration of autonomous ships, it must scrutinize existing charter parties and other contractual arrangements to determine which provisions might require adjustments to accommodate unmanned vessels. In instances where seafarers remain onboard the ship, as is the case with the first and second degrees of autonomy according to the International Maritime Organization (IMO), there should be minimal necessity to revise existing standard charter party forms and related contracts. However, in the second degree of autonomy, where the ship is controlled from a remote location, it is imperative that there be a sufficient presence of seafarers onboard to ensure competency levels if the control must be transferred back to the ship. The primary focus on standard forms, within the context of autonomous ship operations, centres on degrees three and four. In these scenarios, there are no seafarers physically onboard the vessel, and it is either remotely controlled or possesses the capability for independent decision-making and operation. Two widely used charter parties that have undergone review in the context of unmanned autonomous ship operations are GENCON 1994 and NYPE 1946.¹¹

GENCON 1994

The GENCON form stands as one of the most extensively utilized dry cargo voyage charter parties in the shipping industry. Having endured for over a century, it has now entered its fourth edition. An upcoming version of GENCON is slated for release towards

¹⁰ M. Pijacar, B. Bulum, "Comparison of Problems Related to the Carriage of Goods by Sea Between Traditional and Autonomous Vessels", the International Journal on Marine Navigation and Safety of Sea Transportation, Vol.35, 2021 pp.125-131

¹¹ G. Hunter, 2021, "Standard contracts for the MASS(es) – charter parties and other agreements for autonomous ships", Ship Operations, pp. 203-216.

the end of 2020. Despite significant advancements in the shipping sector since its initial publication, this short and straightforward charter party has seen minimal alterations. However, some clauses in GENCON 1994 may warrant consideration since the introduction of autonomous shipping. In contrast to numerous other voyage charter forms, GENCON does not include a Clause Paramount that incorporates the Hague/Hague-Visby Rules. Instead, it presents its own provision within Clause 2¹², outlining owners' liability for loss, damage, and related matters. Of particular note is the segment of the clause addressing the exclusion of owners' legal liability for loss, damage, or delay, even in cases attributable to the negligence or default of individuals employed by the owners "on board or ashore." While the original drafters of this clause could not have foreseen the concept of an unmanned ship, the language could potentially encompass scenarios contemplated by the International Maritime Organization's four degrees of autonomy. By referencing persons employed by the owners "ashore," this could extend to individuals controlling the ship from a remote onshore location. However, if the ship were to be remotely controlled from another vessel or an offshore site, a revision of the wording would be necessary. In the case of the fourth degree of autonomy, where the ship operates independently in decision-making and action, a question arises as to whether owners can exclude their liability in cases involving the negligence or default of companies providing the computer software and hardware. On a future unmanned vessel, equipped with an array of electronic monitoring devices and sensors, addressing stevedore damage may become less problematic. Clause 5(c)¹³ of GENCON assumes the presence of the master

¹² GENCON 1994, Clause 2, Owners' Responsibility Clause: "The Owners are to be responsible for loss of or damage to the goods or for delay in delivery of the goods only in case the loss, damage or delay has been caused by personal want of due diligence on the part of the Owners or their Manager to make the Vessel in all respects seaworthy and to secure that she is properly manned, equipped and supplied, or by the personal act or default of the Owners or their Manager. And the Owners are not responsible for loss, damage or delay arising from any other cause whatsoever, even from the neglect or default of the Master or crew or some other person employed by the Owners on board or ashore for whose acts they would, but for this Clause, be responsible, or from unseaworthiness of the Vessel on loading or commencement of the voyage or at any time whatsoever"

¹³ GENCON 1994, Clause 5(c), Loading/Discharging: "Stevedore Damage
The Charterers shall be responsible for damage (beyond ordinary wear and tear) to any part of the Vessel caused by Stevedores. Such damage shall be notified as soon as reasonably possible by the Master to the Charterers or their agents and to their Stevedores, failing which the Charterers shall not be held responsible. The Master shall endeavour to obtain the Stevedores' written acknowledgement of liability. The Charterers are obliged to repair any stevedore damage prior to completion of the voyage but must repair stevedore damage affecting the Vessel's seaworthiness or class before the Vessel sails from the port where such damage was caused or found. All additional expenses incurred shall be for the account of the Charterers and any time lost shall be for the account of and shall be paid to the Owners by the Charterers at the demurrage rate."

for assessing stevedore damage and notifying charterers of claims. Nonetheless, there is no stipulation mandating physical inspection of the ship for damage by the master or other crew members. This leaves room for damage assessment based on data provided by onboard sensors and cameras, potentially reducing the scope for disputes, especially when utilizing timestamped photographs taken at the commencement of cargo operations in comparison to sensor-detected damage. Securing a stevedore's written acknowledgment of liability for damage remains a challenge in the digital age, much like in the past. Since the 1980s, industrial actions and strikes have been on a steady decline globally as they have proven to be less effective in dispute resolution. While strike clauses are prevalent in many standard charter party forms, they are gradually being supplanted by "force majeure" clauses or clauses addressing prevention of performance more broadly. Although the General Strike Clause¹⁴ may have diminished in significance, it assumes the presence of the "Master" as an individual physically aboard the ship subject to strike actions. However, the clause also allows owners to act in the same capacity as the master when notifying charterers, potentially mitigating the impact of the master's physical absence from the ship. While an unmanned ship may still face war risks, the "reasonable judgment"¹⁵ of risk to the ship, crew, and cargo is premised on the assumption that the master, being "on the spot," is in the best position to evaluate such risks. In the third degree of autonomy, where the ship is unmanned but remotely controlled, the "controller" may assume the role of the master in assessing risk. However, one might wonder whether, in the fourth degree of autonomy, where the ship possesses independent decision-making capability, the computer system can be trusted to exercise "reasonable judgment" based

¹⁴ GENCON 1994, Clause 16 (a), General Stricke Clause: "If there is a strike or lock-out affecting or preventing the actual loading of the cargo, or any part of it, when the Vessel is ready to proceed from her last port or at any time during the voyage to the port or ports of loading or after her arrival there, the Master or the Owners may ask the Charterers to declare, that they agree to reckon the laydays as if there were no strike or lock-out. Unless the Charterers have given such declaration in writing (by telegram, if necessary) within 24 hours, the Owners shall have the option of cancelling this Charter Party. If part cargo has already been loaded, the Owners must proceed with same, (freight payable on loaded quantity only) having liberty to complete with other cargo on the way for their own account."

¹⁵ GENCON 1994, Clause 17 (d), War Risks: "If at any stage of the voyage after the loading of the cargo commences, it appears that, in the reasonable judgement of the Master and/or the Owners, the Vessel, her cargo, crew or other persons on board the Vessel may be, or are likely to be, exposed to War Risks on any part of the route (including any canal or waterway) which is normally and customarily used in a voyage of the nature contracted for, and there is another longer route to the discharging port, the Owners shall give notice to the Charterers that this route will be taken. In this event the Owners shall be entitled, if the total extra distance exceeds 100 miles, to additional freight which shall be the same percentage of the freight contracted for as the percentage which the extra distance represents to the distance of the normal and customary route."

on data interpretation from external sources. Additionally, it may be worth considering if there is a scenario in which the computer system fully controlling a ship could be deemed the "master" for the charter party's purposes. While a person controlling and monitoring the ship remotely might certainly fear the vessel becoming immobilized, such language appears archaic and unsuitable for an unmanned, fully autonomous ship.¹⁶

NYPE 1946

The NYPE form, initially issued in 1946, continues to be the predominant time charter agreement utilized within the dry cargo industry, with the most recent iteration dating back to 2015. In essence, a time charter party grants charterers access to the ship's services for a predetermined duration (or for a specified voyage in the case of a trip time charter). Standard time charter forms commonly outline the owner's responsibilities regarding the ship's condition, onboard equipment and machinery, as well as the requirement for proper manning upon delivery. Failure to meet these conditions renders the issuance of a notice of readiness unfeasible. When considering a remotely controlled autonomous ship, interpreting "full complement of officers, seamen, engineers, and firemen for a vessel of her tonnage" presents a conundrum. It's plausible that future ship operators may not adhere to conventional titles such as master, seaman, or engineer, and they won't constitute a traditional "crew." These professionals may operate remotely, overseeing multiple ships concurrently from one or more control centres. Consequently, much of the crew-related terminology found in older forms like NYPE 1946 becomes largely superfluous for remotely controlled vessels and entirely obsolete for fully autonomous ones. One of the touted advantages of autonomous ships pertains to enhanced fuel efficiency. Without the necessity for an onboard crew, ship designs may omit accommodation blocks, leading to weight savings and reduced wind resistance. In situations requiring maintenance, riding crews could temporarily reside in container-style accommodations on the deck. Provisions catering to accommodation for a supercargo or passengers, functions unlikely in the type of vessels envisaged for autonomous operations, would necessitate amendment. The phrase "customary assistance with ship's crew and boats" pertains to routine cleaning and maintenance tasks typically conducted by the crew onboard. On unmanned ships, these maintenance and cleaning activities might be

¹⁶ G. Hunter, Standard contracts for the MASS(es) – charter parties and other agreements for autonomous ships, *Ship Operations*, 2021, pp. 203-216.

undertaken by third-party riding crews employed for specific tasks, distinct from the conventional notion of a "crew."¹⁷

Seaworthiness

In the realm of maritime goods transportation, the shipowner assumes the role of a navigation entrepreneur. To safeguard the interests of their contracting counterparts against arbitrary actions, it is imperative to include contractual provisions regarding the ship's seaworthiness. When assessing a ship's seaworthiness, critical scrutiny is directed towards the condition of the hull, machinery, equipment, crew qualifications, and the ship's certifications. The seaworthiness of a ship is not a uniform, absolute standard; rather, it fluctuates based on the ship's condition in relation to the specific risks associated with a particular undertaking. Factors such as the type of cargo and potential voyage hazards are considered. In contrast to traditional ships, autonomous ships are distinct in that they consist of two components: the sea module and the land module, often referred to as the control centre. While the sea module remains at sea, the control centre can be located either on land or on a sea-based platform. In determining the seaworthiness of autonomous ships, a question arises as to whether attention should be solely directed at the sea component or if the control centre should also be included. The answer hinges on whether the control centre is considered an integral part of the ship. Our perspective is that a comprehensive seaworthiness evaluation should encompass both aspects. Although the sea module may possess the technical capabilities for a safe voyage, the adequacy of the control centre's staff, essential for the voyage, must not be overlooked. Advancements in shipbuilding technology have historically influenced a ship's ability to navigate the seas. Similarly, with the emergence of autonomous ships, seaworthiness criteria will need to evolve to accommodate their unique characteristics. The standards for seaworthiness of these vessels will be contingent upon their specific attributes.¹⁸

Safe berths

In the transport of goods by sea, it is customary to encounter a specific restriction: the chartered vessel is typically confined to operating exclusively between secure ports

¹⁷ G. Hunter, 2021, "Standard contracts for the MASS(es) – charter parties and other agreements for autonomous ships", *Ship Operations*, pp. 203-216.

¹⁸ M. Pijacar, B. Bulum, "Comparison of Problems Related to the Carriage of Goods by Sea Between Traditional and Autonomous Vessels", *the International Journal on Marine Navigation and Safety of Sea Transportation*, Vol.35, 2021 pp.125-131.

and safe berths. This implies a commitment on the part of the charterer to designate secure ports and/or berths, commonly referred to as a "safe port warranty." Charter party agreements include a specialized clause for establishing trading boundaries, featuring a blank space to be filled in by the contracting parties to define these boundaries. When this contractual provision remains unfilled, it is understood that the contract does not specify navigation limits. Charterers typically provide an unconditional assurance that the ports to which they dispatch a vessel will be secure. However, in certain charterparty agreements, the charterer's warranty is one of due diligence. If charterers fail to uphold their warranty, the ship's captain has the right to decline entry or continued presence at the respective port. An illustration of a provision delineating trading limits can be found in Clause 1(b)¹⁹ of the New York Produce Exchange Form from 2015 (NYPE 2015), which stipulates that the vessel shall be utilized in lawful trades between secure ports and designated locations, as directed by the charterers. These same provisions are mirrored in various charter party agreements, such as Clause 2²⁰ of the Baltime Charter Party and Clause 4(c)²¹ of Shelltime 4. The regulations concerning safe ports and safe berths are of paramount importance in maritime law, and the obligation to adhere to them is an essential aspect of all contracts. A safe port entails more than just being physically secure for cargo loading and unloading; it also encompasses safe navigation to and from the port, minimizing political risks. Determining port safety is a factual matter dependent on numerous factors. For instance, according to the established definition from English case law (*The Eastern City*)²², a port is not considered safe unless a specific vessel can reach

¹⁹ NYPE 2015, Clause 1(b), Duration/Trip description: "Trading Limits - The Vessel shall be employed in such lawful trades between safe ports and safe 22 places within the following trading limits Click here to *enter text.* as the Charterers shall direct."

²⁰ BALTIME 1993, Clause 2, Trade: "Trading Limits - The Vessel shall be employed in such lawful trades between safe ports and safe 22 places within the following trading limits Click here to enter text.. as the Charterers shall direct"

²¹ SHELLTIME4, Clause 4(c), Period, Trading Limits and Safe Places: "Charterers shall use due diligence to ensure that the vessel is only employed between and at safe places (which expression when used in this charter shall include ports, berths, wharves, docks, anchorages, submarine lines, alongside vessels or lighters, and other locations including locations at sea) where she can safely lie always afloat. Notwithstanding anything contained in this or any other clause of this charter, Charterers do not warrant the safety of any place to which they order the vessel and shall be under no liability in respect thereof except for loss or damage caused by their failure to exercise due diligence as aforesaid. Subject as above, the vessel shall be loaded and discharged at any places as Charterers may direct, provided that Charterers shall exercise due diligence to ensure that any ship-to-ship transfer operations shall conform to standards not less than those set out in the latest published edition of the ICS/OCIMF Ship-to-Ship Transfer Guide."

²² *Leeds Shipping v Société Francaise Bunge (The Eastern City)*: 2 Lloyd's Rep. 127. (1958). *Leeds Shipping v Société Francaise Bunge (The Eastern City)* is a landmark 1958 case that set the industry

it within the relevant timeframe, utilize it, and return from it without being exposed to danger that cannot be averted through proper navigation and seamanship, barring abnormal incidents. Therefore, a safe port encompasses physical, navigational, and political security. Similarly, the concept of a safe berth aligns with this definition. A berth refers to a designated area within a port for cargo loading or unloading. A "safe berth" implies a berth to which the ship can navigate, remain at without issue, and depart from within a specified timeframe, without facing sudden, unpreventable dangers due to good ship handling and seamanship. The charterer is typically responsible for designating the location for loading or unloading within the port, and the shipowner is obligated to place the vessel at that location if it can be done without jeopardizing the ship and the cargo loading process. In cases where the charter party lacks specific provisions regarding trading limits between a secure port and a safe berth, case law generally implies such provisions if they are necessary to render the contract commercially effective. When addressing the contractual stipulation for lawful trades between secure ports and safe locations in the context of autonomous ships' cargo transport, it becomes imperative to consider the criteria for defining "safety." The challenge here lies in defining what constitutes a safe port and berth. Ensuring safety extends beyond the ship's integrity to encompass the safety of the port and berth to which the ship arrives or departs. Autonomous ships operate under predetermined conditions that minimize the potential for making poor decisions. Moreover, they possess the capability to collect, analyse,

standard for determining a safe berth. The case involved Leeds Shipping and Société Francaise, who were parties to a voyage charterparty. The charterparty provided that the vessel Eastern City would proceed to one or two safe ports in Morocco. The Court of Appeal, presided over by the Lord Justices, upheld the previous verdict in favor of Leeds Shipping, the vessel owners, against Societe Francaise, the charterers. The fresh evidence submitted by the Charterers to the Court failed to establish a solid foundation for a successful appeal.

The Court of Appeal reaffirmed that the grounding incident resulted from the unsafe conditions at Mogodar port, which included inadequate anchorage holding ground, insufficient protection from severe weather, and the unpredictable onset of high winds capable of causing anchor dragging. Additionally, the proximity to rocks and shallows heightened the risk of grounding or vessel damage. The Master's conduct was found to exhibit sound judgment and a reasonable approach in fulfilling the contractual obligations of the Owners. Consequently, the grounding could not be attributed to any negligence on the part of the Master. Since the damages arose from a breach of the charterparty by the Charterers, Clause 13 was deemed inapplicable. This was because the Owners did not experience a "non-performance" of their obligations but rather a "misperformance," and as a result, there were no limitations on the Charterers' liability for damages.

This case law has taken on substantial relevance in Anglo-Saxon law, reaffirming the concept that a port is not a safe place per se. For this note, the following sites were consulted:

<https://charterpartycases.com/case/168-leeds-shipping-company-ltd-v-societe-francaise-bunge-the-%E2%80%9Ceastern-city%E2%80%9D-1957-2-lloyd%E2%80%99s-rep-153-1958-2-lloyd%E2%80%99s-rep-127>; <https://www.tankvoyager.com/leeds-shipping-co-ltd-v-societe-francaise-bunge-the-eastern-city-court-of-appeal-hodson-romer-and-sellers-ljj-30-july-1958/>.

process, and integrate large volumes of data about their surroundings and respond promptly. They do not experience fatigue, illness, or forgetfulness regarding potential hazards. However, connectivity issues in port areas may pose safety concerns for autonomous ships. Additionally, the absence of specific hardware and sensors necessary for the ship's approach may render the port or berth unsafe. Until new criteria are established to define safety comprehensively, including the safety of ports and berths for autonomous ships engaged in maritime cargo transport, it falls upon contracting parties to elaborate on these warranties in greater detail within the trading limits provision of their contracts.²³

IV.2 Liabilities, policies, and P&I Clubs

One of the several questions that arise from the introduction of self-driving ships in international trade and the use of these means of navigation more generally is liability in the event of a dispute. As the degree of autonomy increases, the question arises as to who is liable once the master and crew are no longer in place. As these technologies are still in their early stages, the industry has not yet fully moved in this direction. All that remains is to try to analyse the current legislation and the various insurance practices to identify where they might be appropriate for self-driving ships and where, on the other hand, targeted intervention is needed to include drone ships. The concept of liability is fundamental and without an update of this concept accompanied by the inclusion of self-driving ships in insurance contracts, it could completely make the rapid and widespread diffusion of this technology impossible.

Liability

In essence, there are two primary categories of ship's civil liability: contractual liability and third-party liability. The distinction between these hinges on whether the liability arises within the contract terms or is incurred due to private wrongs resulting in damage or losses to a third party. Simultaneously, the basis of liability can also be categorized into two types: fault-based liability, where negligence or breaches of legal

²³ M. Pijacar, B. Bulum, "Comparison of Problems Related to the Carriage of Goods by Sea Between Traditional and Autonomous Vessels", the International Journal on Marine Navigation and Safety of Sea Transportation, Vol.35, 2021 pp.125-131.

rules lead to liability, and strict liability, where liability is imposed without requiring negligence, merely causing the relevant harm is sufficient. Broadly speaking, the civil liability within the shipping industry is predominantly governed by national regulations, which may differ from one jurisdiction to another. With the emergence of international shipping regulations, an increasing number of civil liabilities fall under maritime conventions. These conventions encompass various aspects. Regarding the foundation of liability, fault-based liability is prescribed for some liabilities. For example, the 1910 Collision Convention regulates liability for collisions based on the fault of ships. It stipulates that if a collision results from the fault of one of the vessels, liability for damages is attributed to the one committing the fault. On the contrary, strict liability is associated with certain other liabilities, such as shipwreck removal liability under Article

10 of the Nairobi Wreck Removal Convention²⁴ and oil pollution liability under Article III²⁵ of CLC²⁶, 1992.²⁷

Civil liability encompasses the remedies accessible to a party that has suffered harm due to the actions of another party. This includes liability in tort and contract, among other forms of liability recognized in various legal systems. Since the scenarios examined primarily involve UUVs colliding with ships or stationary objects, specific address to the tort liability aspect of civil liability, without delving into contractual liability to the same extent. Tort liability, in the context of these scenarios, can be categorized into three tiers. The first tier encompasses European Treaty provisions, EU Regulations, Directives, and judgments handed down by the European Court of Justice. The second tier encompasses international conventions that unify tort law at the global level, including those pertaining

²⁴ According to imo.org: “The Nairobi International Convention on the Removal of Wrecks, 2007, was adopted by an international conference held in Kenya in 2007. the Convention provides the legal basis for States to remove, or have removed, shipwrecks that may have the potential to affect adversely the safety of lives, goods and property at sea, as well as the marine environment.

The Convention provides a set of uniform international rules aimed at ensuring the prompt and effective removal of wrecks located beyond the territorial sea.

The Convention also includes an optional clause enabling States Parties to apply certain provisions to their territory, including their territorial sea.” <https://www.imo.org/en/About/Conventions/Pages/Nairobi-International-Convention-on-the-Removal-of-Wrecks.aspx>

²⁵ CLC Convention 1992, Article III, “

1. Except as provided in paragraphs 2 and 3 of this Article, the owner of a ship at the time of an incident, or where the incident consists of a series of occurrences at the time of the first such occurrence, shall be liable for any pollution damage caused by oil which has escaped or been discharged from the ship as a result of the incident.

2. No liability for pollution damage shall attach to the owner if he proves that the damage:

(a) resulted from an act of war, hostilities, civil war, insurrection or a natural phenomenon of an exceptional, inevitable and irresistible character, or

(b) was wholly caused by an act or omission done with intent to cause damage by a third party,

or

(c) was wholly caused by the negligence or other wrongful act of any Government or other authority responsible for the maintenance of lights or other navigational aids in the exercise of that function.

3. If the owner proves that the pollution damage resulted wholly or partially either from an act or omission done with intent to cause damage by the person who suffered the damage or from the negligence of that person, the owner may be exonerated wholly or partially from his liability to such person.

4. No claim for compensation for pollution damage shall be made against the owner otherwise than in accordance with this Convention. No claim for pollution damage under this Convention or otherwise may be made against the servants or agents of the owner.

5. Nothing in this Convention shall prejudice any right of recourse of the owner against third parties.

²⁶ According to imo.org: “The Civil Liability Convention was adopted to ensure that adequate compensation is available to persons who suffer oil pollution damage resulting from maritime casualties involving oil-carrying ships.” [https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Civil-Liability-for-Oil-Pollution-Damage-\(CLC\).aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Civil-Liability-for-Oil-Pollution-Damage-(CLC).aspx)

²⁷ L. Zhou, R. W. W. Xing, Probing Civil Liability Insurance for Unmanned/Autonomous Merchant Ships, in *InsureTech: a Legal and Regulatory View*, 2020, pp. 343-361

to maritime matters. Finally, the third tier comprises the national laws of EU member states. The interplay among these tiers is dynamic, with the unification efforts of the first two tiers gradually reducing disparities in national liability regimes.²⁸

There is substantial commonality across European jurisdictions regarding key aspects of tortious liability. This commonality is evident in various ways. Firstly, similar factual issues arise across tort law systems, giving rise to questions about liability and apportionment of liability. Secondly, while different legal doctrines and mechanisms may be applied, the overarching approaches to these issues exhibit broad similarities when viewed from a general perspective. For example, English law incorporates the principle of "remoteness," which limits a tortfeasor's liability to damage that is reasonably foreseeable. Conversely, some European jurisdictions do not adhere to this principle, but they share the common goal of limiting the tortfeasor's liability to appreciable risks through distinctions between direct and indirect consequences. A closer examination confirms these broad similarities but also reveals striking differences in problem-solving approaches. These differences can be attributed to various historical, cultural, and policy perspectives, influencing what is considered fair, just, and reasonable in tort law cases. English law primarily relies on torts, particularly negligence, where liability arises from a breach of a duty of care resulting in damage. In contrast, French fault liability rules can be found in Article 1382 CC²⁹, with strict liability prescribed for personal injury and property damage cases especially for damages caused by dangerous objects. Vicarious liability is recognized in both systems. Belgium and Italy's civil codes contain provisions akin to Article 1384³⁰ of the French Civil Code, stipulating similar strict liability principles. The German legal system introduces subtle distinctions, including judge-made rules. It necessitates a general requirement of unlawfulness, complemented by societal

²⁸ A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, "Liability for operations in unmanned maritime vehicles with differing levels of autonomy", University of Southampton, Institute of Maritime Law, Southampton, pp. 134-135.

²⁹ French Civil Code, Article 1382: Les présomptions qui ne sont pas établies par la loi, sont laissées à l'appréciation du juge, qui ne doit les admettre que si elles sont graves, précises et concordantes, et dans les cas seulement où la loi admet la preuve par tout moyen. (Presumptions that are not established by law are left to the discretion of the judge, who must admit them only if they are serious, precise and concordant, and only in cases where the law admits proof by any means.)

³⁰ French Civil Code, Article 1384: Le serment peut être déféré, à titre décisoire, par une partie à l'autre pour en faire dépendre le jugement de la cause. Il peut aussi être déféré d'office par le juge à l'une des parties. (The oath may be referred by one party to the other for a decisive ruling in the case. The judge may also refer the oath to one of the parties ex officio.)

safety duties. These variations imply that the specifics of a claim involving UMV-related damage will differ among jurisdictions. In cases involving fault, the outcome remains consistent, civil liability is established. However, when fault cannot be established, the outcome may diverge across states. It's worth noting that regarding civil liability for many types of damage discussed, if the UMV in question qualifies as a "seagoing" ship, the UMV owner may have the right to limit their liability for such losses. For U MVs exceeding 300 gross tons, this right follows the 1976 LLMC³¹. For U MVs below this tonnage threshold, the LLMC 1976 permits state parties to establish their own liability regimes, a topic explored further in this report.³²

Significant disparities exist in how civil liability is established within the European jurisdictions. France, Belgium, and, to a certain extent, Italy establishes comprehensive strict liability for owners of "things" causing damage, even if the owner bears no fault. In contrast, jurisdictions like England and Wales demand not only the defendant's fault but also the existence and breach of a duty of care for liability to arise. Intermediate jurisdictions do not require a duty of care to precede liability but necessitate the defendant's fault. For example, Germany mandates the infringement of one of the claimant's fundamental rights. However, it's crucial to avoid oversimplification when characterizing jurisdictions as more claimant-friendly based solely on their liability frameworks. Several factors moderate this distinction:

1. **International Agreements and Regulations:** Internationally agreed conventions and regulatory provisions, such as the 1910 Collision Convention, play a pivotal role in shaping liability regimes, particularly for "sea-going vessels." These agreements often shift liability from strict to fault-based, making the presence of a duty of care uncontroversial.
2. **Burden of Proof:** Variations exist in the burden of proof for claimants. In England and Wales, the claimant must establish their case based on the balance

³¹ According to imo.org: "The Convention replaced the International Convention Relating to the Limitation of the Liability of Owners of Seagoing Ships, which was signed in Brussels in 1957, and came into force in 1968." [https://www.imo.org/en/About/Conventions/Pages/Convention-on-Limitation-of-Liability-for-Maritime-Claims-\(LLMC\).aspx](https://www.imo.org/en/About/Conventions/Pages/Convention-on-Limitation-of-Liability-for-Maritime-Claims-(LLMC).aspx)

³² A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, "Liability for operations in unmanned maritime vehicles with differing levels of autonomy", University of Southampton, Institute of Maritime Law, Southampton, pp. 134-135.

of probabilities, while French law necessitates the judge's deep-seated conviction and certainty.

3. **Causation:** Different jurisdictions employ distinct approaches to causation, impacting the recovery of losses. For instance, French law distinguishes between direct and indirect causes, affecting the recovery of pure economic loss, which is generally unrecoverable in England and Wales.
4. **Defences and Time Limits:** The nature of defences available to defendants in civil maritime cases exhibits broad similarity across European jurisdictions. Concepts like necessity, agony of the moment, and contributory negligence are recognized, albeit under varying interpretations. Statutory time limits for claims differ significantly among jurisdictions.
5. **Vicarious Liability:** Vicarious liability, holding employers responsible for employee faults, is recognized in many European jurisdictions. However, the criteria for establishing such liability vary. For instance, German law allows employers to absolve themselves if they can demonstrate diligence in employee selection, making it more "defendant friendly."
6. **Liability of Public Bodies:** Liability regimes for public bodies differ across Europe. While England and Wales treat public and private entities similarly, France has a distinct liability regime for public entities, offering them some immunity.

Ultimately, the favourability of a jurisdiction concerning civil liability for autonomous ships interests depends on specific circumstances and the party's case, whether as a claimant or respondent. Selecting a governing law for autonomous vessels civil liabilities is not a straightforward decision, as it may be influenced by various factors. Moreover, the choice of governing law might not always be at the discretion of autonomous ship interests, as EU Regulation 864/2007 (Rome II)³³ determines applicable law in non-contractual obligations within a European context. Under this regulation, the

³³ Regulation (EC) No 864/2007 of the European Parliament and of the Council of 11 July 2007 on the law applicable to non-contractual obligations (Rome II)

law of the place where the damage occurred generally governs civil actions, adding complexity to UMV operation location decisions.³⁴

In contrast to the harmonized nature of civil liability, criminal law exhibits significantly less uniformity among European states. This disparity can be attributed to several factors, with the most critical being the European Union's limited authority in the realm of criminal law. This limitation has led to legal challenges regarding the EU's competence to establish criminal liability in various contexts. The scenarios we are considering have the potential to give rise to criminal liability for some or all of the involved parties, including certain unmanned vessels interests. To comprehend the landscape of criminal liability, it is essential to provide an initial overview and examine the fundamental components of criminal liability. It will be delved into criminal offenses and the associated penalties concerning matters such as loss of life, personal injury, property damage, and environmental harm. Additionally, it will be explored various navigational offenses, encompassing the criminal consequences of breaching the COLREGS (Collision Regulations). Much like the context of civil liability discussed earlier, the absence of specific shipping regulations and conventions governing criminal liability does not imply that drone ships operations occur in a legal vacuum. Instead, broader principles rooted in tort or delict law serve to ensure that individuals found negligent compensate their victims. Similarly, within the realm of criminal law, if the prosecuting authorities in European jurisdictions deem it appropriate, the absence of explicitly defined offenses for ships and their masters does not preclude the application of general offenses as grounds for prosecution. The jurisdictions under consideration recognize both maritime-specific and general criminal offenses. While there are similarities, significant differences exist among these jurisdictions in this regard. Several jurisdictions establish criminal liability for violating COLREGS, albeit with notable variations. In France, criminal liability falls on the "master" of the ships only if the breach is negligent. Conversely, in England and Wales, both the owner and any person in charge of a "ship" are strictly liable for Rules violations. However, these offenses are applicable in autonomous ship scenarios only if the unmanned vessels qualify as a "ship." Regarding

³⁴ A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, "Liability for operations in unmanned maritime vehicles with differing levels of autonomy", University of Southampton, Institute of Maritime Law, Southampton, pp. 134-140.

general criminal offenses, all the jurisdictions criminalize causing loss of life or manslaughter, regardless of the means involved. The crucial distinctions revolve around the required mental state of the perpetrator for liability. In the Netherlands, Sweden, Germany, and France, criminal liability for causing death can arise from negligence. In contrast, in England and Wales, liability may attach only if the defendant is grossly negligent or reckless. Similar considerations apply to inflicting personal injury or grievous bodily harm. Conversely, in England and Wales, in the context of criminal liability for property damage, prosecutions may succeed with a reckless perpetrator, whereas in jurisdictions like Germany and Sweden, intentional property damage is the threshold for liability under general criminal law. Furthermore, variations exist in available defences. France, Sweden, and Germany codify the general defence of necessity in their respective criminal codes. In contrast, no universally applicable necessity defence exists in England and Wales for any offence, a crucial factor in the scenarios we will discuss. Divergent positions are also evident across Europe concerning corporate liability. In Germany, there is no criminal liability for corporate entities as such. In contrast, both England and France hold corporate entities liable for most offences that individuals can commit if committed by their representatives, but only senior personnel representing the "directing mind" of the corporation may incur such liability. In Italy, corporate liability extends to a relatively limited set of codified offences, including homicide. Furthermore, in the Netherlands, employees of any seniority may potentially trigger corporate liability. Overall, from the perspective of self-driving vessels' interests as potential defendants, it is challenging to pinpoint a preferable European jurisdiction for limiting potential criminal liabilities. As with civil liability, the choice depends entirely on the specific circumstances, particularly the nature of the damage inflicted and the culpability of the perpetrator in question.³⁵

³⁵ A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, "Liability for operations in unmanned maritime vehicles with differing levels of autonomy", University of Southampton, Institute of Maritime Law, Southampton, pp.169-170.

Liability of goods' Carriage

The first uses of self-driving ships will most likely be for the carriage of goods. Hence, the question arises as to whether or not the current institution of liability for the transport of goods can also be applied to self-driving ships.

In maritime transport, customary practice dictates that a charterer bears the responsibility of delivering the cargo to the ship's side, positioning it beneath the tackle, at their own cost and risk, allowing it to be hoisted by the ship's cranes (referred to as the "alongside rule"). Subsequently, the ship is obligated to load and stow the cargo at its own expense and risk. This protocol extends to cargo discharge as well. However, this conventional procedure for transferring cargo within the realm of contractual agreements may undergo modification, particularly in charter party contracts related to the transportation of mass-produced goods. In such cases, mechanized means (such as cranes, conveyor belts, etc.) typically controlled by the charterer are employed for cargo loading. Consequently, human personnel currently manage cargo operations at ports, and within the existing framework, the charterer typically assumes liability for loading and unloading activities. The advent of autonomous vessels introduces the prospect of a transformative shift. Some autonomous ships are envisioned to possess the capability to autonomously conduct loading and discharging operations, entirely devoid of external charterer intervention. For instance, the Yara Birkeland vessel, acclaimed as the world's maiden fully electric and autonomous container ship with zero emissions, will autonomously execute loading and discharging operations through the use of electric cranes and equipment. This innovative vessel is devoid of ballast tanks and instead employs a permanent ballast in the form of a battery pack. Moreover, it incorporates an automated mooring system, enabling berthing and unberthing operations without human involvement and without necessitating special dockside modifications. Consequently, a notable disparity arises when considering the allocation of liability for loading and discharging activities between traditional and autonomous ships.³⁶

³⁶ M. Pijacar, B. Bulum, "Comparison of Problems Related to the Carriage of Goods by Sea Between Traditional and Autonomous Vessels", the International Journal on Marine Navigation and Safety of Sea Transportation, Vol.35, 2021 pp.125-131.

Shipowner's Liability Limitation: in maritime law, in contrast to the general principles of obligation law, a shipowner's liability is not all-encompassing; rather, it is confined to specific predetermined limits. The key condition for invoking this legal provision is the absence of fault on the part of the shipowner leading to the loss. This entitlement to limit liability extends to various aspects, including contractual liability concerning cargo transported at sea under charterparty agreements. The framework for governing liability limitation is established by the International Convention on Limitation of Liability for Maritime Claims, initially ratified in 1976 and subsequently amended by the 1996 Protocol. This liability limitation system is structured on a tiered scale that categorizes limitation levels according to a ship's tonnage. Smaller vessels enjoy proportionally higher limits per tonne compared to larger counterparts. The lowest prescribed limit pertains to all vessels under 500 tonnes (small ships). For ships exceeding 500 tonnes, additional calculation units are added to the limit assigned to ships under 500 tonnes based on specific groupings. These predetermined liability limits encompass all claims stemming from the same incident, utilizing Special Drawing Rights (SDR)³⁷ as the unit of measurement, as defined by the International Monetary Fund. Gross tonnage serves as the basis for determining the limit's magnitude, meaning that the liability cap is ascertained based on the ship's tonnage relevant to the particular liability event. Instances exist where the right to limit liability is forfeited, barring the liable party from enjoying this legal protection. Such forfeiture transpires if it can be proven that the damage resulted from a deliberate act or omission committed with the intent to cause harm, or with reckless disregard and awareness that such harm was likely to occur. The burden of proof naturally rests with the claimant. Considering the foundational characteristics of shipowners' liability limitation for contractual cargo transportation by autonomous vessels, we encounter analogous issues as previously examined in contractual stipulations. Given the distinctive attributes of autonomous ships, encompassing the sea module and the land module, commonly referred to as the control centre, a dilemma arises concerning tonnage determination. Specifically, the query revolves around whether the weight of the control centre should factor into the shipowner's liability limitation, or if solely the

³⁷ According to International Money Fund, imf.org: “The SDR is an international reserve asset created by the IMF to supplement the official reserves of its member countries. The SDR is not a currency. It is a potential claim on the freely usable currencies of IMF members. As such, SDRs can provide a country with liquidity. A basket of currencies defines the SDR: the US dollar, Euro, Chinese Yuan, Japanese Yen, and the British Pound.” <https://www.imf.org/en/Topics/special-drawing-right>

tonnage of the sea component of an autonomous vessel should be considered. To address this query, we must once again account for the distinct traits of autonomous ships. The right to limit a shipowner's liability for such vessels hinges upon the peculiar characteristics inherent to autonomous ships.³⁸

Application of Liability Exclusion Provisions: in the realm of maritime goods transportation, a shipowner's primary obligation is to deliver cargo to its intended destination in the condition and quantity as received for transport, and to effectuate this delivery without undue delays. In cases of breach of this contractual obligation—entailing default, incomplete performance, or tardiness—the shipowner becomes liable to the counterparty for any resultant damages.

Article 4 Section 2 of the Hague Rules³⁹ enumerates circumstances in which a shipowner (referred to as the carrier in these rules) shall not be held liable for cargo damage. These circumstances constitute "excepted perils," signifying exceptions to the general principle of shipowner/carrier liability. According to the Hague Rules, there are instances in which a shipowner is absolved of liability. Several of these excepted perils

³⁸ M. Pijacar, B. Bulum, "Comparison of Problems Related to the Carriage of Goods by Sea Between Traditional and Autonomous Vessels", the International Journal on Marine Navigation and Safety of Sea Transportation, Vol.35, 2021 pp.125-131.

³⁹ Hague Rules 1924, Article 4.2, "Neither the carrier nor the ship shall be responsible for loss or damage arising or resulting from:

(a) Act, neglect, or default of the master, mariner, pilot, or the servants of the carrier in the navigation or in the management of the ship.

(b) Fire, unless caused by the actual fault or privity of the carrier.

(c) Perils, dangers and accidents of the sea or other navigable waters.

(d) Act of God.

(e) Act of war.

(f) Act of public enemies.

(g) Arrest or restraint of princes, rulers or people, or seizure under legal process.

(h) Quarantine restrictions.

(i) Act or omission of the shipper or owner of the goods, his agent or representative.

(j) Strikes or lockouts or stoppage or restraint of labour from whatever cause, whether partial or general.

(k) Riots and civil commotions.

(l) Saving or attempting to save life or property at sea.

(m) Wastage in bulk or weight or any other loss or damage arising from inherent defect, quality or vice of the goods.

(n) Insufficiency of packing.

(o) Insufficiency or inadequacy of marks.

(p) Latent defects not discoverable by due diligence.

(q) Any other cause arising without the actual fault or privity of the carrier, or without the actual fault or neglect of the agents or servants of the carrier, but the burden of proof shall be on the person claiming the benefit of this exception to show that neither the actual fault or privity of the carrier nor the fault or neglect of the agents or servants of the carrier contributed to the loss or damage.

encompass actions and omissions by the master, mariner, pilot, or the carrier's personnel during navigation or ship management. For a shipowner to be held accountable for these individuals' actions, they must occur within the scope of their duties. The carrier's personnel, however, bear unrestricted liability for damages arising outside the scope of their duties, in accordance with established legal principles, devoid of limitations. Another exemption from shipowner liability pertains to fire damage. Under the Hague Rules, a shipowner is only liable for fire-related damages if it can be proven that the fire resulted from their actual fault or connivance. The rationale behind the Hague Rules' decision to exclude shipowners from liability for fires lies in the assessment that every onboard fire poses a risk not solely to the cargo but also to the ship's safety, categorizing it as a nautical activity within the crew's purview. Furthermore, shipowners are generally exempt from liability for perils, hazards, and maritime or navigational accidents. These exceptions refer to hazards originating "from the sea," inherent to the sea, and of an extraordinary nature in occurrence. Another exemption is for "acts of God", denoting external events unforeseeable, unavoidable, and beyond prevention. At sea, these events often manifest as severe weather conditions. Certain exceptions pose challenges when adapting them to autonomous vessels. For example, the exemption concerning a shipowner's liability for damages due to fires. If a fire occurs within the control center without any fault or connivance by the shipowner, can it be concluded that the shipowner is not liable for the loss? Alternatively, does this exemption exclusively apply to fires originating within the sea component of an autonomous ship? These and analogous questions frequently arise due to the fundamental distinctions between traditional and autonomous vessels. As previously highlighted, one of the disparities lies in the fact that a traditional vessel is a single entity, whereas an autonomous vessel comprises a control centre separate from the rest of the ship.⁴⁰

⁴⁰ M. Pijacar, B. Bulum, "Comparison of Problems Related to the Carriage of Goods by Sea Between Traditional and Autonomous Vessels", the International Journal on Marine Navigation and Safety of Sea Transportation, Vol.35, 2021 pp.125-131.

IV.3 Insurance and P&I Clubs

Marine insurance encompasses various categories, including cargo insurance, freight insurance, and Hull and Machinery (H&M) insurance, which acts as a property insurance variant protecting against property loss or damage, such as ships or consignments of goods. Additionally, P&I insurance steps in to cover a ship's third-party liability. While H&M insurance primarily covers losses or damages to insured vessels, it's noteworthy that many H&M policies feature a "3/4ths Collision Liability" Clause⁴¹. This clause signifies that H&M underwriters agree to indemnify the assured for three-fourths of any sums paid to others as a result of the insured vessel colliding with another vessel. This partial coverage, as stipulated by the 3/4ths Collision Liability Clause, was designed to incentivize the assured to assume a portion of the risks, thereby encouraging greater caution in navigation. To cover the remaining one-fourth of collision liability, the assured can either opt for an additional clause within the hull insurance or turn to additional P&I club insurance. The P&I insurance provided by clubs stands as a primary means for shipowners to shield themselves against third-party civil liability claims. The risks detailed in club rulebooks are diverse and expanding. However, shipowners have the flexibility to choose and negotiate the specific perils they wish to cover. While different P&I clubs may offer varying degrees of coverage for maritime risks, most P&I rules encompass but are not limited to liabilities concerning crew and passengers, liability for individuals embarked or disembarked, stowaways, refugees, or persons rescued at sea, life salvage, collisions with other vessels, damage to fixed or floating objects, pollution, liability for obstruction and wreck removal, general average, and salvage.⁴²

Additional liabilities unrelated to maritime operations or navigation may also come into play. These include Kidnap and Ransom insurance (K&R)⁴³ and Mortgagees Interest

⁴¹ "3/4 ths Collision Liability Clause" is within two different forms ITCH 1995 Clause 8 and IVCH 1995 clause 6. It states:

"The Underwriters agree to indemnify the Assured for 3/4ths of any sum or sums paid by the Assured to any other person or persons by reason of the Assured becoming legally liable by way of damages for...where such payment by the Assured is in consequence of the Vessel hereby insured coming into collision with any other vessel."

⁴² L. Zhu, R. W. W. Xing, 2020, "Probing Civil Liability Insurance for Unmanned/Autonomous Merchant Ships", in *InsureTech: a Legal and Regulatory View*, pp. 346-347.

⁴³ Incidents of kidnapping for ransom are persistent global concerns due to the potentially substantial profits for those involved in such criminal activities. Kidnap and ransom (K&R) insurance aims to provide individuals with a means to safeguard their loved ones without having to yield significant wealth as ransom. Nonetheless, it is essential to recognize that this insurance may not be suitable for everyone. Prior to making

Insurance (MII)⁴⁴. K&R insurance, tailored to safeguard individuals and corporations operating in high-risk global regions, can extend coverage to the crew in situations involving piracy and maritime crimes. MII insurance steps in to safeguard a bank or lender's mortgage interests when the borrower's or ship owner's insurers fail to respond adequately. Certain other non-marine insurance products may have relevance to a ship's liability, such as cybersecurity insurance. However, it's worth noting that cybersecurity insurance has been specifically addressed by the Institute Cyber Attack Exclusion Clause CL380⁴⁵. This exclusion acknowledges that the risk of cyberattacks is distinct from traditional maritime risks. Additionally, product liability insurance is typically procured by shipbuilders and software designers to shield against potential liability for defects in their products. Nonetheless, in the realm of unmanned or autonomous ships, cyber security and manufacturing reliability emerge as paramount concerns.⁴⁶

An important question in this context pertains to the readiness of current insurance providers to accommodate unmanned or autonomous ships. As previously mentioned,

a decision to purchase kidnapping insurance, careful consideration of several key factors is imperative. One must grasp its functioning, be informed about its coverage scope, and gain insight into its usual associated costs.

<https://www.investopedia.com/articles/personal-finance/062915/guide-kidnap-ransom-insurance-coverage.asp>

⁴⁴ According to Gard, the mortgagee of a ship will typically insist on being included as a co-insured party within the ship owner's hull insurance policy. The necessity for a separate, supplementary insurance to safeguard the mortgagee's interests arises from the fact that the mortgagee is not involved in the vessel's operations and lacks the capacity to take action in case of the owner's negligence or breaches. In the context of a hull policy, any defenses that the hull insurer might raise against a claim from the owner are equally applicable to the mortgagee.

Mortgagee's Interest Insurance offers protection to the mortgagee, irrespective of any fault or circumstances that could jeopardize the owner's coverage under the hull policy. It essentially serves as a secondary insurance policy for the mortgagee.

https://www.gard.no/web/products/content?p_document_id=77387

⁴⁵ The Institute Cyber Attack Exclusion Clause CL380:

1.1 Subject only to clause 1.2 below, in no case shall this insurance cover loss damage liability or expense directly or indirectly caused by or contributed to by or arising from the use or operation, as a means for inflicting harm, of any computer, computer system, computer software programme, malicious code, computer virus or process or any other electronic system.

1.2 Where this clause is endorsed on policies covering risks of war, civil war, revolution, rebellion, insurrection, or civil strife arising therefrom, or any hostile act by or against a belligerent power, or terrorism or any person acting from a political motive, Clause 1.1 shall not operate to exclude losses (which would otherwise be covered) arising from the use of any computer, computer system or computer software programme or any other electronic system in the launch and/ or guidance system and/or firing mechanism of any weapon or missile.

<http://www.seamanship.eu/marine-clauses-77/instcl/cl380.pdf>

⁴⁶ L. Zhu, R. W. W. Xing, 2020, "Probing Civil Liability Insurance for Unmanned/Autonomous Merchant Ships", in *InsureTech: a Legal and Regulatory View*, pp. 346-347.

only H&M (Hull and Machinery) insurance and P&I (Protection and Indemnity) insurance encompass various forms of third-party civil liability for ship owners. However, a significant obstacle lies in the scarcity of available data for analysing risks and premiums associated with unmanned or autonomous ships. An H&M policy serves to shield ship owners against physical losses or damage to the vessel's hull, machinery, and all related components. The coverage extends to the full value of the vessel, and depending on the selected terms, different versions of hull policies have been developed, including the Institute Time Clauses Hulls 1/10/83 and 1/11/95, and the International Hull Clauses under English law. Beyond collision liability, the primary aim of H&M insurance is to offer fundamental protection against various losses and damages. Regarding P&I insurance, it's noteworthy that the board of directors may be granted discretionary authority to waive compliance with certain Club Rules, indicating the potential for clubs to consider unmanned or autonomous ships. Furthermore, among the thirteen principal underwriting associations comprising the International Group, which covers approximately 90% of the world's ocean-going tonnage⁴⁷, three clubs — namely, Gard⁴⁸, the North Standard⁴⁹, and the Shipowners' Club⁵⁰ — have displayed positive inclinations. In particular, the Shipowners' Club has expressed its readiness to collaborate with ship owners to provide coverage for unmanned or autonomous ships.⁵¹

The introduction of unmanned or autonomous ships will necessitate the consideration of certain non-marine insurance aspects, such as cybersecurity insurance and product liability insurance. However, due to the absence or reduced presence of crew members aboard unmanned or autonomous ships, insurance policies like Kidnap and

⁴⁷ International Group of Protection & Indemnity Clubs, <https://www.igpandi.org/about/>.

⁴⁸ Gard has seen three major developments in new product areas in 2017, including involvement in the development of autonomous shipping. https://www.gard.no/web/news/article?p_document_id=24640524

⁴⁹ “Shipping: An Autonomous Future?” <https://www.nepia.com/articles/shipping-an-autonomous-future/>

⁵⁰ “Member Focus: Autonomous Vessels” In 2018, the Club proudly introduced a specialized P&I policy tailored for autonomous vessels, marking a groundbreaking milestone globally. The Club collaborated closely with autonomous vessel owners, operators, and manufacturers to guarantee that its Members had precisely tailored coverage. This allowed them to concentrate on their operations with the assurance that they were adequately protected in case of unforeseen incidents. Since then, we've welcomed numerous new Members who are actively pursuing groundbreaking advancements in autonomous technology. This article spotlights two of these Members and their recent accomplishments. <https://www.shipownersclub.com/member-focus-autonomous-vessels/>

⁵¹ L. Zhu, R. W. Xing, 2020, “Probing Civil Liability Insurance for Unmanned/Autonomous Merchant Ships”, in *InsureTech: a Legal and Regulatory View*, pp. 345-348.

Ransom insurance (K&R) and Crew liability insurance will lose their relevance. With no crew on board, the likelihood of individuals being kidnapped by pirates or incurring crew-related liabilities becomes virtually non-existent. Taking crew liability as an example, the MLC 2006 mandates that ships must demonstrate certificates confirming the presence of insurance or financial security to cover outstanding wages, repatriation of seafarers, and related costs and expenses, along with compensation for death or long-term disability. While P&I Club Rules typically cover compensation for death or long-term disability, they do not encompass repatriation costs and wages arising from the abandonment provisions outlined in Standard 2.5.2⁵² of the MLC, as amended. In the case of unmanned or autonomous merchant ships, ship owners would likely be relieved of this insurance burden related to crew liability. Both ship owners and software designers and manufacturers must exercise caution regarding piracy and cybersecurity issues. In the forthcoming era of unmanned/autonomous shipping, it is unrealistic to expect that pirates and terrorists will completely vanish from the high seas. Unmanned/autonomous navigation may be susceptible to hacking, and even minor technical errors could lead to significant accidents. The cybersecurity of shipping has been a topic of extensive debate within the IMO Maritime Safety Committee (MSC), culminating in the MSC's adoption of a resolution on maritime cyber risk management in safety management systems. Reports indicate significant vulnerabilities in the cybersecurity of critical navigation technologies at sea, including GPS (Global Positioning System), AIS (Automatic Identification System), ECDIS (Electronic Chart Display and Information System), and others. As anything connected to the internet, including unmanned or autonomous ships, can be vulnerable to cyberattacks, these ships are potentially susceptible to cyberattacks at any time, not solely during maritime adventures. Indeed, there is a notable absence of provisions within the broader scope of marine insurance concerning cyber risk. The insurability of these risks will undoubtedly become a major concern, particularly in terms of how the risks can be shared among various marine insurance policies. Otherwise, there

⁵² Maritime Labour Convention (MLC) Standard A2.5.2 – Financial security. The entire Standard A2.5.2 is available at: https://www.register-iri.com/wp-content/uploads/Text-Amendments-2014-MLC-2006_2.5-MN-7-052-3.pdf.

may be a need to develop new insurance products specifically tailored to cover cyber risks associated with unmanned or autonomous ships.⁵³

IV. 4 Insurance and Cybersecurity

As seen in the previous chapter, cyber security problems are growing in the landscape of this sector, posing an increasing threat. An increase in automation in the sector will inevitably lead to an increase in the threat of cyber-attacks on these ships. Alongside security systems that will have to be increasingly efficient and protective, the insurance industry will have to move to ensure adequate coverage against cyber-attacks. A central role will certainly be played by P&I clubs. To date, this problem has not yet been addressed in relation to self-driving ships. It is therefore worth analysing what initiatives these large institutions have taken with regard to cyber-attacks on traditional ships. As a new frontier of human development, the insurance sector, like all other sectors so far, will inevitably have to adapt and adjust to the development of these new technologies that will sooner or later predominate in the industry. Three major P&I Clubs were examined: the Northstandard, formed through the merger of The North of England Protecting with Indemnity Association Limited (North) and The Standard Club in February 2023; Gard and West P&I.

Northstandard club

The club's rules do not explicitly include a cyber exclusion, and coverage will respond to Protection and Indemnity (P&I) liabilities in the standard manner. However, there is an exception when the war risks exclusion is triggered. For example, if a cyber-attack causes a ship's navigation or mechanical systems to malfunction, resulting in third-party liability, standard P&I coverage will respond unless the incident can be categorized as an act of terrorism or a war risk (both of which are excluded under the club's rules). In cases where there is a dispute over whether an act constitutes terrorism, the decision will be referred to the club's board. In the event that a cyber-attack qualifies as an act of terrorism or an excluded war risk, the club's P&I war risks coverage will respond in excess of the primary P&I war risks coverage, unless the harm was inflicted through the use of

⁵³ L. Zhu, R. W. W. Xing, 2020 "Probing Civil Liability Insurance for Unmanned/Autonomous Merchant Ships", in *InsureTech: a Legal and Regulatory View*, pp. 356-360.

a computer virus. In cases involving harm inflicted by a computer virus, owners can obtain limited coverage within the scope of biochemical risks inclusion coverage.

Additionally, it is a fundamental condition of insurance with the club that every ship complies with all statutory requirements and maintains the validity of all certificates issued by the ship's flag state. It's worth noting that rule 15.1 explicitly references the ISM Code, which includes cybersecurity requirements effective from January 1, 2021. Considering that there may be instances where parties argue that a claim arose due to inadequate cyber preparedness, it is crucial to demonstrate that reasonable steps have been taken to manage cyber risks in accordance with the ISM Code provisions. Compliance with these requirements may vary, and different flag states may have varying criteria for their Document of Compliance (DOC) and Safety Management Certificate (SMC) auditors when reviewing these procedures. Individual clubs will assess the risk and may inquire about compliance and adherence to best practices, such as the BIMCO Cyber Security Onboard Ships guidelines. Each case will be evaluated based on its unique circumstances, and the coverage position will depend on the specific facts of each case. There may be incidents that do not result in third-party liabilities and are therefore not covered under the club's rules. For example, financial losses caused by ransomware or data theft resulting in repairs, fines, and litigation may not be covered. Some of these costs might fall under Defense (FD&D) coverage. The key is to assess the wide range of risks and identify any insurance gaps that need to be addressed.⁵⁴

West P&I

Currently, standard P&I (Protection and Indemnity) insurance does not explicitly include cyber exclusions. However, members are required to ensure that their actions do not compromise their insurance coverage by acting imprudently, unsafely, hazardously, or improperly, which also extends to their handling of cyber risks.

War & Terrorism

There is a growing concern regarding cyber risks that can be categorized as war risks. The capabilities of terrorist and ideological hackers are becoming increasingly

⁵⁴A. Arora, E. Antoniadou, "Maritime Cyber Risk Management Guidelines", The Northstandard Club, available at: https://www.standardclub.com/fileadmin/uploads/standardclub/Documents/Import/publications/loss-prevention-industry-expertise-handouts/3365323-sc_ie_cyber_risks_20201117_final.pdf

sophisticated, and there is also the potential for state interference in GPS and related navigation systems. P&I clubs typically do not serve as the primary underwriters for war P&I coverage. Instead, war P&I coverage is often provided as an additional policy to an owner's hull war coverage. Liabilities resulting from a cyber-attack on a vessel may, therefore, be subject to the war risks exclusion in P&I insurance, which excludes "any hostile act by or against a belligerent power or any act of terrorism."⁵⁵ Whether a cyber-attack qualifies as an "act of terrorism" depends on the motives of the individual releasing the virus or hacking the systems. The UK Terrorism Act 2000⁵⁶ defines terrorism as acts or threats made to advance political, religious, racial, or ideological causes. This definition includes acts or threats designed to seriously interfere with or disrupt electronic systems. IG Clubs do offer a P&I war risk extension coverage of up to US\$500 million⁵⁷, but it does not cover losses caused by "the use or operation of a computer virus as a means of inflicting harm." This exclusion resembles the commonly used market cyber exclusion clause CL380⁵⁸, which is often included in primary war risk policies. This situation could potentially leave an owner without effective P&I coverage for cyber-attacks falling under terrorism.

⁵⁵ <https://www.westpandi.com/news-and-resources/news/archive/p-i-cover-and-cyber-risk/>

⁵⁶ Article 1 "Terrorism: interpretation." states that:

1. In this Act "terrorism" means the use or threat of action where—

(a) the action falls within subsection (2),

(b) the use or threat is designed to influence the government [F1 or an international governmental organisation] or to intimidate the public or a section of the public, and

(c) the use or threat is made for the purpose of advancing a political, religious [F2, racial] or ideological cause.

2. Action falls within this subsection if it—

(a) involves serious violence against a person,

(b) involves serious damage to property,

(c) endangers a person's life, other than that of the person committing the action,

(d) creates a serious risk to the health or safety of the public or a section of the public, or

(e) is designed seriously to interfere with or seriously to disrupt an electronic system.

<https://www.legislation.gov.uk/ukpga/2000/11/section/1>

⁵⁷ <https://www.westpandi.com/news-and-resources/news/archive/p-i-cover-and-cyber-risk/>

⁵⁸ INSTITUTE CYBER ATTACK EXCLUSION CLAUSE 1.1 Subject only to clause 1.2 below, in no case shall this insurance cover loss damage liability or expense directly or indirectly caused by or contributed to by or arising from the use or operation, as a means for inflicting harm, of any computer, computer system, computer software programme, malicious code, computer virus or process or any other electronic system. 1.2 Where this clause is endorsed on policies covering risks of war, civil war, revolution, rebellion, insurrection, or civil strife arising therefrom, or any hostile act by or against a belligerent power, or terrorism or any person acting from a political motive, Clause 1.1 shall not operate to exclude losses (which would otherwise be covered) arising from the use of any computer, computer system or computer software programme or any other electronic system in the launch and/ or guidance system and/or firing mechanism of any weapon or missile.

Future

Currently, club cover does not explicitly address cyber risks, except in the context of war risks. It neither includes nor excludes cyber risks in a straightforward manner. On January 30, 2019, the PRA, the Prudential Regulation Authority, branch of the Bank of England, urged Lloyd's and the insurance sector to address the matter of "silent cyber." Lloyd's responded by mandating that all policies, including first-party property damage policies, must provide clarity on cyber coverage starting from January 1, 2020, either by excluding or affirmatively addressing cyber risks. The Club will continue to strive to provide members with comprehensive coverage, always adhering to the IG Pooling Agreement⁵⁹. As a general rule, P&I insurance provided by IG Clubs does not exclude cyber risks for P&I liabilities arising from the operation of an entered vessel. The Pooling Agreement includes a clause affirming coverage for cyber risks, which is followed by IG's reinsurers. These terms are routinely reviewed in preparation for each renewal. In the meantime, the Club will maintain its commitment to offering coverage for P&I risks related to cyber incidents, in addition to providing support and guidance on cyber exposure and insurance needs for its Members.⁶⁰

Gard

Gard, in its commitment to safeguarding the interests of its members and clients, advocates for a holistic approach to managing cyber risks. This approach places emphasis on preserving the confidentiality, integrity, and accessibility of both IT and OT systems. It encompasses a range of measures, including processes, technology, and, most crucially, personnel. Negligent or inadequately trained individuals represent the most common and straightforward route for cyber criminals to gain unauthorized access.

Recommendation 1: The latest Guidelines on Cyber Security Onboard Ships anticipate that cyber incidents may lead to physical consequences, including safety and pollution incidents. Therefore, companies must evaluate the risks associated not only with

⁵⁹ According to [igpandi.org](https://www.igpandi.org): "Although the Group Clubs compete with each other for business, it is to the benefit of all shipowners insured by Group Clubs for the Clubs to pool their larger risks. Pooling is regulated by the annually renewed Pooling Agreement which defines the risks that can be pooled, those risks which are excluded from cover, and how covered losses are to be shared between the participating Clubs. The Pool provides a mechanism for sharing all claims in excess of US\$ 10 million up to, currently, approximately US\$ 8.9 billion." <https://www.igpandi.org/group-agreements/>

⁶⁰ <https://www.westpandi.com/news-and-resources/news/archive/p-i-cover-and-cyber-risk/>

IT equipment but also with OT equipment onboard ships. They should establish suitable safeguards against cyber incidents involving both categories of equipment. Company plans and procedures for managing cyber risks should align with existing security and safety risk management requirements outlined in the ISPS and ISM Codes, as documented in company policies. Documentation onboard should also encompass requirements related to training, operations, and the maintenance of critical cyber systems. Building on the recommendations in MSC-FAL.1/Circ.3, Guidelines on maritime cyber risk management, the resolution underscores the importance of using existing risk management practices to address operational risks arising from increased reliance on cyber-enabled systems. The guidelines outline several actions that support effective cyber risk management:

- Identify: Define the roles responsible for cyber risk management and identify the systems, assets, data, and capabilities whose disruption poses a risk to ship operations.
- Protect: Implement processes and measures to manage risk, along with contingency planning to safeguard against cyber incidents and ensure the continuity of shipping operations.
- Detect: Develop and implement processes and defenses to promptly detect cyber incidents.
- Respond: Formulate activities and plans to enhance resilience and restore systems essential for shipping operations or services suspended due to a cyber incident.
- Recover: Establish procedures for backing up and restoring cyber systems necessary for shipping operations affected by a cyber incident.

Ultimately, the Document of Compliance holder bears the responsibility for ensuring effective cyber risk management onboard. When a ship is under third-party management, the ship manager should collaborate with the shipowner to delineate responsibilities. Both parties should focus on defining roles, aligning expectations, agreeing on specific instructions, and potentially participating in purchasing decisions and budgetary matters. In addition to complying with ISM requirements, any agreement

should also consider applicable legislation, such as the EU General Data Protection Regulation (GDPR) or specific cyber regulations in coastal states. Managers and owners should contemplate using these guidelines as a foundation for open discussions on how to best implement an efficient onboard cyber risk management regime. All agreements regarding responsibility for cyber risk management should be formalized in writing. Companies should also assess and address service providers' physical security and cyber risk management processes through supplier agreements and contracts. Likewise, coordinating a ship's port calls is a complex task involving various global and local parties. It entails receiving updates from agents, sharing information with port vendors, liaising with port state control, managing ship and crew requirements, and facilitating electronic communication between the ship, port, and onshore authorities. Agents' quality standards hold significance because, like other businesses, agents are susceptible to cyber threats. Cyber-enabled crimes, including electronic wire fraud and false ship appointments, as well as cyber threats such as ransomware and hacking, necessitate collaborative cyber strategies and enhanced relationships between owners and agents to mitigate these risks.

Recommendation 2 emphasizes the need for safe and comprehensible system design and configuration. It stresses that individuals involved in cyber security tasks must grasp that procedures exist to prevent unauthorized access, not merely to meet regulatory or managerial demands. While historical data often informs safety and security practices, the scarcity of facts regarding cyber incidents complicates risk management. Successful cyber-attacks in sectors like shipping, finance, public administration, and air transport have underscored the potential for significant service disruptions. Modern ship technologies, particularly those connected to unsecured networks with internet access, can introduce vulnerabilities. Additionally, remote access by equipment manufacturers to shipboard systems is often overlooked, warranting inclusion in risk assessments. Gard advises companies to thoroughly understand their ship's IT and OT systems and their integration with shoreside entities like public authorities, marine terminals, and stevedores. This entails comprehending all onboard computer-based systems and recognizing how cyber incidents can compromise safety, operations, and business. Certain IT and OT systems allow remote access and maintain continuous internet connections for tasks like monitoring, data collection, maintenance, and security. These may involve "third-party systems" managed remotely, with data flowing both ways or

upload-only. Such systems and workstations with remote capabilities can encompass various ship functions, including bridge and engine room computers, cargo tracking systems, stability support, navigational systems, dynamic positioning, cargo management, safety and security networks, specialized equipment like drilling systems, and emergency shutdown systems for gas tankers or submarine cable operations. Common cyber vulnerabilities on existing and some newbuild ships encompass outdated and unsupported operating systems, missing or outdated antivirus software, inadequate security configurations, and poor network management practices, such as default administrator account usage. Additionally, boundary protection and network segmentation may be lacking, and critical systems might maintain constant connections to shoreside networks, with insufficient access controls for third parties.

Recommendation 3: it highlights the human factor as the weakest link in cyber security. Proper training for seafarers to identify and report cyber incidents is crucial. While the industry has increased cyber risk management training, there is room for improvement, as confirmed by the 2018 Crew Connectivity Survey, where a low percentage of seafarers acknowledged receiving cyber security training or encountering regular password changes onboard. Effective cyber risk assessment should consider both external and internal threats. Onboard personnel, including the master, officers, and crew, play a vital role in safeguarding IT and OT systems, but their potential carelessness, like using removable media without malware precautions, necessitates tailored training and awareness programs. Gard has collaborated with DNV-GL to create a free cyber security awareness campaign to enhance the competence of crew and others. This initiative focuses on daily tasks and routines, aiming to demystify cyber issues for non-specialists. The material aims to influence behavioral changes rather than suggesting industry or rule modifications.

Lastly, Gard advises vigilance in avoiding "COVID-19 phishing" attempts by exercising caution with pandemic-related emails, attachments, or links. It recommends relying on trusted sources for up-to-date, fact-based cyber security information related to COVID-19. Additionally, it warns against disclosing personal or financial information

via email and recommends disconnecting or closing temporary remote access after completing external jobs.⁶¹

⁶¹ <https://www.gard.no/web/topics/article/21025160/cyber-security>

Chapter V – FOCUS: AUTOSHIPMAN by BIMCO

The discipline of private law has, over the years, shaped the shipping market by regulating practical aspects that are now taken for granted. This chapter will be entirely devoted to the analysis of the AUTOSHIPMAN Form, drafted by BIMCO, which will come into effect in the next few months, between the end of 2023 and 2024. BIMCO has also recognized the need to quickly adapt in order to meet the market demand that has already begun, with the creation of the first prototypes of autonomous ships. This form is the first to be specifically addressed to autonomous ships, although it follows, in intent and form, another form also drafted by BIMCO: SHIPMAN¹. The purpose of this chapter is to highlight the main differences between the aforementioned forms. Before delving into this comparison, it is necessary to outline what ship management is and how we have arrived at the SHIPMAN Form.

Ship Management

Ship management encompasses the activities involved in overseeing and operating one or more vessels, typically in a commercial context. It entails assuming responsibility for various aspects of the vessel's operation, including maintenance, equipment, crewing, provisioning, supplies, insurance, employment, and compliance with flag state and port state requirements. According to Willingale, ship management can be simply defined as the provision of diverse services to shipowners for managing their vessels². Ship management functions can be performed by the shipowner or operator, or they can be outsourced to third-party entities contracted for this purpose. The former represents the traditional approach to ship management, primarily observed within larger shipping conglomerates and historical family-run enterprises. However, the more prevalent and analytically intriguing trend is the management of vessels by specialized third-party entities. Nowadays, ship management services are frequently outsourced to independent professional companies. Third-party ship management refers to the professional provision of services by a separate management company, unaffiliated with the vessel's ownership, in exchange for a management fee as per the contracted terms. These third-party ship

¹ According to BIMCO.com, SHIPMAN is a ship management agreement that may include crew, technical and commercial management as well as insurance arrangements in respect of a ship. The latest edition of this contract is SHIPMAN 2009.

² M Willingale, *Ship Management*, 1998

management companies are defined as professional and independent organizations that undertake vessel management responsibilities without any financial stake in the vessels they manage. The key distinguishing factor in these definitions is the concept of "independence" for third-party managers, which sets them apart from in-house management teams. This separation between ownership and management (and potentially control) of a ship is significant. Some third-party ship managers offer commercial management services for various types of vessels, while others specialize in specific sectors, such as tanker owners. The rise of third-party ship managers can be attributed to several factors, including specialization, economies of scale, and cost/economic benefits. These managers bring expertise and focused knowledge to ship management, allowing shipowners to benefit from their specialized services. Additionally, by consolidating the management of multiple vessels, economies of scale can be achieved, resulting in operational efficiencies and cost savings. Ultimately, shipowners can reap the advantages of outsourcing ship management to competent and independent third-party entities.³

AUTOSHIPMAN⁴

Bimco, the Baltic International Maritime Council, has drawn up a first draft of the 'AUTOSHIPMAN' form, i.e., the form for self-driven ships with regard to ship management. This form is expected to enter into force between the end of 2023 and 2024 depending on the speed of drafting and approval. The form is reminiscent of that of the SHIPMAN, a form from which it evidently takes its cue. Many clauses are identical, especially where self-driving transport does not differ from traditional transport.

Services (Section 2)

The ship management contracts (SHIPMAN) and ship management contracts for autonomous navigation (AUTOSHIPMAN) do not differ significantly in terms of the services that the manager, whether an individual or a legal entity, is obligated to uphold. In the SHIPMAN form, these services are divided into four categories: crew management, technical management, commercial management, and ancillary management. A fifth

³ I. Vella, 2016, "Ship Management and Finance", in "The IMLI Manual on International Maritime Law Volume II Shipping Law", Oxford University Press, pp. 105-106.

⁴ The form in question was kindly provided by BIMCO at the request of the writer. The formulary may be subject to changes in the number of clauses present, their content and possibly the current order of the clauses. As of August 2023, it is not yet possible to provide a definitive release date. We thank BIMCO for the opportunity to preview the following formulary in its beta version.

category is added, specifically tailored for drone ships: RCC and RCC Management⁵. The shipowner is free to request the manager to fulfill only some of the services recognized in the form. In AUTOSHIPMAN, the four services provided in SHIPMAN are fully retained.⁶

Technical Management: It covers the ship's technical management. The manager must ensure that the selected personnel are competent for maintenance, verify the vessel's efficiency, compliance with all standards mandated by law and the owner, as well as ensure that works carried out in dry docks are performed in accordance, supervising them, and arranging for the vessel's repair when necessary. The manager is responsible for covering the costs arising from these technical activities and all necessary works to comply with the flag state's laws. The manager is required to arrange supplies, spare parts, and lubricating oils, and if necessary, appoint inspectors and technical consultants. Additionally, they are obliged to prepare a Safety Management System⁷ (SMS) in accordance with the ISM Code^{8,9}.

Crew Management: It's the manager's duty to appoint the ship's captain, where the level of autonomy requires a captain; select and train the crew according to the requirements set by the STCW Convention¹⁰. The manager is responsible for ensuring the transportation and repatriation of seafarers, as well as handling all salary and insurance-related matters. This must comply with the laws of the vessel's flag state. They

⁵ Clause 1 – definitions, defines RCC as “Remote Control Centre” or “RCC” means the place or places from where the Vessel is remotely controlled.” As already mentioned in other chapters, autonomous vessels can have different degrees of autonomy. The RCC is a place where the vessel is controlled and eventually conducted.

⁶ G. Marchiafava, 2008, “Il contratto di ship management”, in “Trattato breve di diritto marittimo”, Vol 2, Giuffrè, pp. 401-409

⁷ This system is created to oversee workplace safety hazards, where occupational safety is described as minimizing risks to an extent that is both feasible and practical, aiming to prevent injuries to individuals.

⁸ According to Imo.org, “the purpose of the ISM Code is to provide an international standard for the safe management and operation of ships and for pollution prevention.” <https://www.imo.org/en/OurWork/HumanElement/Pages/ISMCode.aspx>

⁹ G. Marchiafava, “Il contratto do ship management”, “Trattato breve di diritto marittimo”, 2008, Giuffrè, pp. 401-403

¹⁰ International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. The 1978 STCW Convention marked a pioneering step in setting down fundamental criteria for the education, certification, and ship duty schedules of maritime professionals on a global scale. Prior to this, various nations independently determined the minimal benchmarks for the training, certification, and duty schedules of officers and crew members, often without considering practices in other regions. Consequently, there was significant divergence in minimum standards and protocols, despite the inherently international nature of the shipping industry. <https://www.imo.org/en/OurWork/HumanElement/Pages/ISMCode.aspx>

must verify that the crew has fulfilled all health obligations, are fit for navigation by reviewing all necessary medical certificates confirming their physical fitness. Furthermore, they are required to verify that all crew members possess the minimum English language knowledge required to safely perform their assigned tasks. Concerning crew insurance functions, the ship manager will only be responsible if the parties have agreed upon this during the contractual phase. This clause (6.b)¹¹ should be read in conjunction with clauses 8¹² "Insurance Arrangements" and clause 11 "Insurance Policies (other than RCC Insurance)"¹³. The owner is obligated to ensure the vessel for the entire

¹¹Autoshipman Clause 6(b): Crew Insurances (only applicable if subclause 5(a) applies and if agreed according to Box 10) The Managers shall throughout the period of this Agreement provide the following services: (i) arranging Crew Insurances in accordance with the best practice of prudent managers, with sound and reputable insurance companies, underwriters or associations. Insurances for any other persons proceeding to sea onboard the Vessel may be separately agreed by the Owners and the Managers (see Box 10); (ii) ensuring that the Owners are aware of the terms, conditions, exceptions and limits of liability of the insurances in subclause 5(b)(i); (iii) ensuring that all premiums or calls in respect of the insurances in subclause 5(b)(i) are paid by their due date; (iv) if obtainable at no additional cost, ensuring that insurances in subclause 5(b)(i) name the Owners as a joint assured with full cover and, unless otherwise agreed, on terms such that Owners shall be under no liability in respect of premiums or calls arising in connection with such insurances. (v) providing written evidence, to the reasonable satisfaction of the Owners, of the Managers' compliance with their obligations under subclauses 5(b)(ii) and 5(b)(iii) within a reasonable time of the commencement of this Agreement, and of each renewal date and, if specifically requested, of each payment date of the insurances in subclause 5(b)(i).

¹² Autoshipman Clause 8. Insurance Arrangements
(only applicable if agreed according to Box 11).

The Managers shall arrange insurances in accordance with Clause 10 (Insurance Policies), on such terms as the Owners shall have instructed or agreed, in particular regarding conditions, insured values, deductibles, franchises and limits of liability.

¹³ Autoshipman Clause 11. Insurance Policies (other than RCC insurance)

The Owners shall procure, whether by instructing the Managers under Clause 8 (Insurance Arrangements) or otherwise, that throughout the period of this Agreement:

(a) at the Owners' expense, the Vessel is insured for not less than its sound market value or entered for its full gross tonnage, as the case may be for: (i) hull and machinery marine risks (including but not limited to Crew negligence) and excess liabilities; (ii) protection and indemnity risks (including but not limited to pollution risks, diversion expenses and, except to the extent insured separately by the Managers in accordance with subclause 5(b)(i), Crew Insurances);

NOTE: If the Managers are not providing crew management services under subclause 5(a) (Crew Management) or have agreed not to provide Crew Insurances separately in accordance with subclause 5(b)(i), then such insurances must be included in the protection and indemnity risks cover for the Vessel (see subclause 10(a)(ii) above). (iii) war risks (including but not limited to piracy, blocking and trapping, protection and indemnity, terrorism and crew risks); and (iv) such optional insurances as may be agreed (such as cyber, kidnap and ransom, loss of hire and FD & D) (see Box 12) (vi) any other insurances necessary in respect of the Crew to satisfy employers' liability and workmen's compensation insurance requirements, as applicable; subclauses 10(a)(i) through 10(a)(vi) all in accordance with the best practice of prudent owners of vessels of a similar type to the Vessel, with sound and reputable insurance companies, underwriters or associations ("the Owners' Insurances");

(b) all premiums and calls on the Owners' Insurances are paid by their due date;

(c) the Owners' Insurances name the Managers and, subject to underwriters' agreement, any third party designated by the Managers as a joint assured, with full cover. It is understood that in some cases,

duration of the contract against all risks arising from navigation. To fulfil this obligation, the owner can seek the assistance of a ship manager, to whom the responsibility of entering into the insurance contract may be assigned, negotiating terms and clauses according to the owner's instructions. In such cases, paragraph ii of clause 6(b) stipulates that the manager informs the owner of the terms, conditions, exceptions, and limits of the policies entered into and the insurance contracts. Clauses 6(b)(iv) and 11(c) underscore the concept of "joint assured", meaning that insurance contracts entered into by the ship manager also include the owner as an insured party separate from the policyholder, and vice versa for insurances entered into by the owner, as in the case of vessel insurance. Clause 11(c) stipulates that: "[...] in some cases, such as protection and indemnity, the normal terms for such cover may impose on the Managers and any such third party a liability in respect of premiums or calls arising in connection with the Owners' Insurances."¹⁴ The final part of the above clause deals with the possible liability of the ship manager for the non-payment of insurance premiums by the shipowner in the event that the conditions for the application of joint assured are met, thus co-responsible with the shipowner. On the one hand, the shipowner is obliged, when the conditions for the application of joint assured with the ship manager come to an end, to terminate the condition of joint assured; on the other hand, the shipowner is obliged to procure a release to make the ship manager liable for the payment of the insurance premiums for the period during which the ship management contract was in force, which is also valid for self-driven ships.¹⁵

such as protection and indemnity, the normal terms for such cover may impose on the Managers and any such third party a liability in respect of premiums or calls arising in connection with the Owners' Insurances.

If obtainable at no additional cost, however, the Owners shall procure such insurances on terms such that neither the Managers nor any such third party shall be under any liability in respect of premiums or calls arising in connection with the Owners' Insurances. In any event, on termination of this Agreement in accordance with Clause 21 (Duration of the Agreement) and Clause 22 (Termination), the Owners shall procure that the Managers and any third party designated by the Managers as joint assured shall cease to be joint assured and, if reasonably achievable, that they shall be released from any and all liability for premiums and calls that may arise in relation to the period of this Agreement; and

(d) written evidence is provided, to the reasonable satisfaction of the Managers, of the Owners' compliance with their obligations under this Clause 10 within a reasonable time of the commencement of the Agreement, and of each renewal date and, if specifically requested, of each payment date of the Owners' Insurances. The foregoing Owners' Insurances shall not have any cyber risk exclusions.

¹⁴ Autoshipman, Clause 11(c).

¹⁵ M. Potenza, 2010, "Il nuovo formulario BIMCO di contratto di ship management", in "Rivista del diritto della navigazione", pp. 646-650.

Particular mention is given to clause 5 "RCC and RCC Management and Insurance"¹⁶, as a novelty introduced in Section 2 by the new form under review. Clause 1 "Definitions" contains all the definitions of terms that are most commonly used in the contract. The term RCC is defined as: "Remote Control Centre" or "RCC" means the place or places from where the Vessel is remotely controlled."¹⁷ Among the novelties introduced by this form, there is the requirement for the owner to provide the managers with all the necessary infrastructure, equipment, and systems for the Remote-Control Centre (RCC) to operate the vessel safely according to its level of autonomy. When the managers also assume responsibility for RCC management, the obligation to operate, maintain the RCC, supervise, and manage the RCC operators arises. Whoever bears the responsibility for RCC management must ensure that insurance covering liability risks for the entire duration of the contract is in place and that insurance premiums are paid on time. The concept of "joint assured" also appears in this context, as the other party or third parties must be considered as joint assured. Additionally, "written evidence is provided, to the reasonable satisfaction of the other party of the responsible party's compliance with their obligations under this Clause within a reasonable time of the commencement of the Agreement, and of each renewal date"¹⁸.

¹⁶ Autoshipman, Clause 5 RCC and RCC Management Insurance: 5. RCC and RCC Management and Insurance (applicable as agreed in Box 11).

(a) The Owners shall procure whether by entrusting the Managers or otherwise in accordance with Box 11(i) that the RCC has the necessary infrastructure, equipment, systems and redundancy necessary to operate the Vessel safely and securely in the applicable Autonomous Degree.

(b) If the Managers are responsible for managing the RCC in accordance with Box 11(ii), then the Managers shall throughout the period of this Agreement:

(i) operate the RCC;

(ii) maintain the RCC;

(iii) supervise and manage the RCC Operators; and

(iv) include management systems and procedures for the safe operation of the RCC according to Applicable Laws in their SMS.

(c) The party responsible for the RCC according to Box 11 shall procure that throughout the period of this Agreement the RCC is properly insured, including insurance for liability risks, and that:

(i) all premiums are paid by their due date;

(ii) the other party and any third party designated by the other party is named as a joint assured, subject to underwriters' agreement; and

(iii) written evidence is provided, to the reasonable satisfaction of the other party of the responsible party's compliance with their obligations under this Clause within a reasonable time of the commencement of the Agreement, and of each renewal date.

¹⁷ Autoshipman, Clause 1 – Definitions

¹⁸ Autoshipman, Clause 5 (c) (iii)

Obligations (Section 3)

Regarding the obligations of the manager, there appear to be no significant changes compared to the SHIPMAN 2009 form. This section outlines the obligations for the parties, managers, and owners. Concerning the obligations of the managers, as stated in clause 9¹⁹, the manager is required to exercise their best possible behaviour in providing the "Management Services." They are to be considered agents acting on behalf of and for the owner who appoints them and is the contracting party. The manager is obligated to fulfill all duties arising from vessel management and outlined in the aforementioned contract. In instances where contacting the owner is not feasible, the manager is authorized and obliged to make discretionary decisions regarding provisions, labor, and services required for the voyage and vessel. Additionally, there's an obligation on managers, if contractually obligated to provide "Technical Management Services" (Clause 4)²⁰, to supply all necessary information and fulfill tasks required by the Flag

¹⁹ Autoshipman Clause 9. Managers' Obligations

(a) The Managers undertake to use their best endeavours to provide the Management Services as agents for and on behalf of the Owners in accordance with sound ship management practice and to protect and promote the interests of the Owners in all matters relating to the provision of services hereunder. Provided however, that in the performance of their management responsibilities under this Agreement, the Managers shall be entitled to have regard to their overall responsibility in relation to all vessels as may from time to time be entrusted to their management and in particular, but without prejudice to the generality of the foregoing, the Managers shall be entitled to allocate available supplies, manpower and services in such manner as in the prevailing circumstances the Managers in their absolute discretion consider to be fair and reasonable.

(b) Where the Managers are providing technical management services in accordance with Clause 4 (Technical Management), they shall procure that the requirements of the Flag State are satisfied and they shall agree to be appointed as the Company, assuming the responsibility for the operation of the Vessel and taking over the duties and responsibilities imposed by the ISM Code and the ISPS Code, as applicable, and the Applicable Law.

(c) The Managers (in their capacity as the Company) shall procure that the Vessel has Crew in accordance with the Applicable Laws (irrespective of the degree of autonomous operation at the relevant time).

²⁰ Autoshipman, Clause 4. Technical Management

(only applicable if agreed according to Box 6). The Managers shall provide technical management which includes, but is not limited to, the following services:

(a) ensuring that the Vessel complies with the requirements of the law of the Flag State;

(b) ensuring compliance with the ISM Code;

(c) ensuring compliance with the ISPS Code;

(d) providing competent personnel to supervise the maintenance and general efficiency of the Vessel;

(e) arranging and supervising dry dockings, repairs, alterations and the maintenance of the Vessel to the standards agreed with the Owners provided that the Managers shall be entitled to incur the necessary expenditure to ensure that the Vessel will comply with all requirements and recommendations of the classification society, and with the law of the Flag State and of the places where the Vessel is required to trade;

(f) Coordinating with third party software and hardware manufacturers and suppliers.

State's legal requirements and assume responsibilities outlined in the ISM Code, ISPS Code, and Applicable Law, as needed. Regarding the owner's obligations, the ship manager is entitled to interest if the owner delays payments to the manager. This provision doesn't apply in cases of force majeure events as per Clause 18.²¹ Furthermore, if the owner also happens to be the vessel's owner, the clause compels the owner to communicate the ship manager's data as the Company to the relevant Flag State authorities, as stipulated by ISM and ISPS codes. The remaining points of the clause, 10(c), 10(d), 10(e), particularly concern: the ship manager not being required to perform technical management functions of the vessel; the ship manager taking on crew management functions; or the ship manager not coinciding with the Company as defined by ISM and ISPS codes.²² A noteworthy addition is clause 10(f), referencing clause 5 (RCC Management). In this regard, the owner is obligated to ensure that the Managers receive: "(i) procure that the Managers are provided with the name and contact details of the organisation that manage and operates the RCC; (ii) provide the Managers with the SMS for the RCC; and (iii) instruct the RCC Operators to obey all reasonable orders of the Managers."²³

(g) arranging the supply of necessary stores, spares and lubricating oil;

(h) appointing surveyors and technical consultants as the Managers may consider from time to time to be necessary;

(i) in accordance with the Owners' instructions, supervising the sale and physical delivery of the Vessel under the sale agreement. However, services under this subclause 4(h) shall not include negotiation of the sale agreement or transfer of ownership of the Vessel;

(j) arranging for the supply of provisions unless provided by the Owners; and

(k) arranging for the sampling and testing of bunkers.

²¹ M. Potenza Il nuovo formulario BIMCO di contratto di ship management, *Rivista del diritto della navigazione*, 2010, pp.651-652

²² *ibid*

²³ *Autoshipman*, Clause 10 – Owner's Obligations (f)

Insurance, Budgets, Income, Expenses and Fees (Section 4)

In addition to clause 11 seen earlier, clauses 13 (Management Fee and Expenses)²⁴ and 14 (Budgets and Management Funds)²⁵ deserve mention. Section 4 doesn't display

²⁴ Autoshipman, Clause 13. Management Fee and Expenses

(a) (i) The Owners shall pay to the Managers a predelivery management fee as stated in Box 14(i), being payable together with the first instalment of the annual management fee according to subclause 12(a)(i). If Box 14(i) is left blank an amount equivalent to one month's annual management fee shall apply. (ii) The Owners shall pay to the Managers an annual management fee as stated in Box 14(ii) for their services as Managers under this Agreement, which shall be payable in equal monthly instalments in advance, the first instalment (pro rata if appropriate) being payable as from Delivery of the Vessel (see Clause 1 (Definitions) ("Delivery")) and subsequent instalments being payable at the beginning of every calendar month. The management fee shall be payable to the Managers' nominated account stated in Box 15. (iii) In the event Delivery of the Vessel does not take place for any reason other than default by the Managers, the predelivery management fee stated in Box 14(i) shall remain payable by the Owners to the Managers.

(b) The annual management fee shall be subject to an annual review and the proposed fee shall be presented in the annual budget in accordance with subclause 13(a).

(c) The Managers shall, at no extra cost to the Owners, provide their own office accommodation, office staff, facilities and stationery. Without limiting the generality of this Clause 12 (Management Fee and Expenses) the Owners shall reimburse the Managers for postage and communication expenses, travelling expenses, and other out of pocket expenses properly incurred by the Managers in pursuance of the Management Services. Any days used by the Managers' personnel travelling to or from or attending on the Vessel or otherwise used in connection with the Management Services in excess of those agreed in the budget shall be charged at the daily rate stated in Box 16.

(d) If the Owners decide to layup the Vessel and such layup lasts for more than the number of months stated in Box 17, an appropriate reduction of the Management Fee for the period exceeding such period until one month before the Vessel is again put into service shall be mutually agreed between the parties. If the Managers are providing crew management services in accordance with subclause 5(a), consequential costs of reduction and reinstatement of the Crew shall be for the Owners' account. If agreement cannot be reached then either party may terminate this Agreement in accordance with subclause 22(e).

(e) Save as otherwise provided in this Agreement, all discounts and commissions obtained by the Managers in the course of the performance of the Management Services shall be credited to the Owners.

(f) All payments of fees and any other payments due to the Managers under this Agreement shall be made without any set-off whatsoever and free and clear of any withholding or deduction for, or on account of, any present or future stamp or other taxes, levies, fees, charges, restrictions or conditions of any nature. If the Owners are required by any authority in any country to make any withholding or deduction from any such payment, the sum due from the Owners in respect of such payment will be increased to the extent necessary to ensure that, after the making of such withholding or deduction the Managers receive a net sum equal to the amount which they would have received had no such deduction or withholding been required to be made.

²⁵ Autoshipman, Clause 14. Budgets and Management of Funds

(a) The Managers' initial budget is set out in Annex "C" hereto. Subsequent budgets shall be for twelve-month periods and shall be prepared by the Managers and presented to the Owners not less than three months before the end of the budget year.

(b) The Owners shall state to the Managers in a timely manner, but in any event within one month of presentation, whether or not they agree to each proposed annual budget. The parties shall negotiate in good faith and if they fail to agree on the annual budget, including the management fee, either party may terminate this Agreement in accordance with subclause 22(e).

(c) Following the agreement of the budget, the Managers shall prepare and present to the Owners their estimate of the working capital requirement for the Vessel and shall each month request the Owners in writing to pay the funds required to run the Vessel for the ensuing month, including the payment of any occasional or extraordinary item of expenditure, such as emergency repair costs, additional insurance premiums, bunkers or provisions. Such funds shall be received by the Managers within ten running days

significant deviations from the SHIPMAN 2009 form. In general, this clause pertains to insurance coverage that the owners must obtain for the vessel during the agreement period. The vessel must be adequately insured for various risks, including damage to the vessel itself, pollution risks, war risks, and more. The insurers must be reliable and reputable. If crew insurance requests are made, they must be fulfilled. The insurance must not exclude cyber risks. Owners must demonstrate compliance with these provisions through written evidence.

Box 12: Income Collected and Expenses Incurred on Behalf of Owners This section concerns fund and expense management. Funds collected by the manager must be held in a separate account for the benefit of owners. Expenses incurred by the manager on behalf of owners can be charged to the owners' account and must be paid by them. Funds collected through the vessel's commercial activity must be deposited in a bank account in the name of the owners.

Clause 13: Management Fees and Expenses This clause establishes the fees owners must pay to the manager for management services. It includes an initial (pre-delivery) fee and an annual management fee. The annual fee is subject to yearly review. The manager must provide their offices and personnel without extra costs to owners. The manager can charge communication, travel, and other additional expenses. Any additional days utilized by the manager's staff beyond the agreed budget will be separately charged. Discounts and commissions obtained by the manager during service delivery will be credited to owners.

Clause 14: Budgets and Management Funds This clause addresses budget and fund management. The manager provides an initial budget and subsequently prepares annual budgets. Owners must approve or reject each proposed budget. After budget approval,

after the receipt by the Owners of the Managers' written request and shall be held to the credit of the Owners in a separate bank account.

(d) The Managers shall at all times maintain and keep true and correct accounts in respect of the Management Services in accordance with the relevant International Financial Reporting Standards or such other standard as the parties may agree, including records of all costs and expenditure incurred, and produce a comparison between budgeted and actual income and expenditure of the Vessel in such form and at such intervals as shall be mutually agreed. The Managers shall make such accounts available for inspection and auditing by the Owners and/or their representatives in the Managers' offices or by electronic means, provided reasonable notice is given by the Owners.

(e) Notwithstanding anything contained herein, the Managers shall in no circumstances be required to use or commit their own funds to finance the provision of the Management Services.

the manager estimates the capital requirement for vessel operations and requests owners to deposit funds to cover monthly expenses. The manager maintains accurate records of expenses and costs, making them available for inspection by owners. The manager is not obligated to use their funds to finance management services.

Clauses 13(a) and 13(f) deserve attention as they differ from the SHIPMAN 2009 form. Clause 13(a) - Management Fee and Expenses: This clause establishes the management fees and payment terms for the Managers' services to the Owners of the vessel. Specifically, clause 13(a)(i) pertains to the management fee to be paid before vessel delivery, while 13(a)(ii) concerns the annual management fee paid monthly. It's noteworthy that if vessel delivery doesn't occur for reasons other than Managers' default, the pre-delivery management fee (if indicated) remains due.

Clause 13(f) - Credits and Managers' Commissions: This clause specifies that any discount or commission obtained by the Managers during service provision will be credited to the Owners. Essentially, the Beneficiaries are entitled to any financial benefits resulting from Managers' negotiations or agreements. This clause ensures transparency and promotes equitable relations.

Difference from the SHIPMAN 2009²⁶ form: Clauses 13(a) and 13(f) appear to be tailored to this contract and do not exactly correspond to their counterparts in the

²⁶ Shipman 2009, Clause 19. General Administration

(a) The Managers shall keep the Owners and, if appropriate, the Company informed in a timely manner of any incident of which the Managers become aware which may interfere or interferes with the operation of the Vessel or give rise to claims or disputes involving third parties.

(b) The Managers shall handle and settle all claims and disputes arising out of the Management Services hereunder, unless the Owners instruct the Managers otherwise. The Managers shall keep the Owners appropriately informed in a timely manner throughout the handling of such claims and disputes.

(c) The Owners may request the Managers to bring or defend other actions, suits or proceedings related to the Management Services, on terms to be agreed.

(d) The Managers shall have power to obtain appropriate legal or technical or other outside expert advice in relation to the handling and settlement of claims in relation to subclauses 18(a) and 18(b) and disputes and any other matters affecting the interests of the Owners in respect of the Vessel, unless the Owners instruct the Managers otherwise.

(e) On giving reasonable notice, the Owners may request, and the Managers shall in a timely manner make available, all documentation, information and records in respect of the matters covered by this Agreement either related to mandatory rules or regulations or other obligations applying to the Owners in respect of the Vessel (including but not limited to STCW, the ISM Code and ISPS Code) to the extent permitted by relevant legislation. On giving reasonable notice, the Managers may request, and the Owners shall in a timely manner make available, all documentation, information and records reasonably required by the Managers to enable them to perform the Management Services.

(f) The Owners shall arrange for the provision of any necessary guarantee bond or other security.

SHIPMAN 2009 form, which is a standardized template used for ship management contracts. Clause 13(a) in this text seems more detailed and specific than its counterpart in the SHIPMAN 2009 form, while clause 13(f) is absent in the SHIPMAN 2009 form. This difference indicates that the parties have negotiated customized clauses to suit their specific needs or industry dynamics.²⁷

Legal, General and Duration of the Agreement (Section 5)

This section introduces numerous new clauses not present in the SHIPMAN 2009 form. The principal clauses applicable to autonomous navigation vessels have been retained and, in some cases, expanded upon. An example is clause 18 Responsibilities, under the Force Majeure section. Each party cannot benefit from exemption from responsibility in cases of partial or total non-performance of their obligations due to force majeure, unless they can prove they've done everything reasonable within their capabilities to avoid, minimize, or prevent the consequences of the force majeure event. Clauses concerning responsibility, such as the Himalaya clause, have been retained, stipulating: " It is hereby expressly agreed that no employee or agent of the Managers (including every sub-contractor from time to time employed by the Managers) shall in any circumstances whatsoever be under any liability whatsoever to the Owners for any loss, damage or delay of whatsoever kind arising or resulting directly or indirectly from any act, neglect or default on his part while acting in the course of or in connection with his employment and, without prejudice to the generality of the foregoing provisions in this Clause 18 (Responsibilities), every exemption, limitation, condition and liberty herein contained and every right, exemption from liability, defence and immunity of whatsoever nature applicable to the Managers or to which the Managers are entitled hereunder shall also be available and shall extend to protect every such employee or agent of the Managers acting as aforesaid and for the purpose of all the foregoing provisions of this Clause 18 (Responsibilities) the Managers are or shall be deemed to be acting as agent or trustee on behalf of and for the benefit of all persons who are or might be their

(g) Any costs incurred by the Managers in carrying out their obligations according to this Clause 18 (General Administration) shall be reimbursed by the Owners.

²⁷ M. Potenza Il nuovo formulario BIMCO di contratto di ship management, *Rivista del diritto della navigazione*, 2010, pp.652-653

servants or agents from time to time (including sub-contractors as aforesaid) and all such persons shall to this extent be or be deemed to be parties to this Agreement."²⁸

This clause establishes that no employee or agent of the Managers (i.e., the ship managers or the company operating the vessel) shall be held liable in any way towards the Owners of the vessel for any losses, damages, or delays of any kind caused directly or indirectly by actions, negligence, or omissions of these employees or agents during the performance of their duties or within the scope of their job responsibilities.

This clause extends the same exemptions, limitations, conditions, and rights that apply to the Managers (i.e., the ship managers) to their employees or agents as well. In other words, any legal protection or defence that the Managers may enjoy also extends to their employees or agents acting within the scope of their assignments. The clause establishes that the Managers act as agents or fiduciaries for the benefit of all individuals working for them, including subcontractors, and that such individuals are considered integral parts of the Agreement.

This provision is significant as it provides legal protection to the Managers' employees or agents, preventing them from being personally held liable for actions or decisions made in the course of their job duties within the context of the vessel management agreement. With the intention of efficiently managing the vessel, paragraph (a) of clause 19²⁹ (General Administration) specifies the obligation on the part of the ship

²⁸ AUTOSHIPMAN, Clause 18(d), "Himalaya"

²⁹ Autoshipman, Clause 19. General Administration

(a) The Managers shall keep the Owners and, if appropriate, the Company informed in a timely manner of any incident of which the Managers become aware which may interfere or interferes with the operation of the Vessel or give rise to claims or disputes involving third parties.

(b) The Managers shall handle and settle all claims and disputes arising out of the Management Services hereunder, unless the Owners instruct the Managers otherwise. The Managers shall keep the Owners appropriately informed in a timely manner throughout the handling of such claims and disputes.

(c) The Owners may request the Managers to bring or defend other actions, suits or proceedings related to the Management Services, on terms to be agreed.

(d) The Managers shall have power to obtain appropriate legal or technical or other outside expert advice in relation to the handling and settlement of claims in relation to subclauses 18(a) and 18(b) and disputes and any other matters affecting the interests of the Owners in respect of the Vessel, unless the Owners instruct the Managers otherwise.

(e) On giving reasonable notice, the Owners may request, and the Managers shall in a timely manner make available, all documentation, information and records in respect of the matters covered by this Agreement either related to mandatory rules or regulations or other obligations applying to the Owners in respect of the Vessel (including but not limited to STCW, the ISM Code and ISPS Code) to the extent permitted by relevant legislation. On giving reasonable notice, the Managers may request, and the Owners

manager to keep the shipowner and, if previously appointed according to ISM and ISPS codes, the Company informed. This establishes the obligation to report any incidents known to the manager that may delay the vessel or be subject to third-party claims or actions. Paragraph (e) also adds that the ship manager is required to provide the shipowner, if requested within the limits allowed, with all documents, information, and data related to prescriptions or other obligations concerning the vessel. Similarly, the shipowner is obliged to provide all documentation upon reasonable request from the ship manager. This information must be used by the ship manager for the proper execution of their services as stipulated in the contract. This section of the form contains the main novelties that will be introduced in the future AUTOSHIPMAN. The first of these is clause 20 (Inspection of Vessel and RCC)³⁰, which states that the Owners have the right to inspect the Vessel at any time, provided they give reasonable notice to the Managers. This inspection can be conducted for any reason that the Owners deem necessary. In other words, the Owners may want to inspect the Vessel to verify its conditions, maintenance, or other aspects relevant to them. Additionally, this clause pertains to the inspection of the RCC. The Owners can inspect the RCC with the consent of the Managers. However, this consent must not be unjustifiably denied or delayed. The inspection of the RCC is allowed only on the condition that it does not interfere with the normal operation of the center itself. The purpose of this inspection is operational auditing, which might involve evaluating emergency procedures, available resources, or other aspects related to controlling emergency situations on board the vessel. Another novelty is the introduction of a clause specifically addressing the growing cybersecurity threat. This is clause 23 (BIMCO Cyber Security Clause 2019). In this Clause, the following terms shall have the following meanings:

shall in a timely manner make available, all documentation, information and records reasonably required by the Managers to enable them to perform the Management Services.

(f) The Owners shall arrange for the provision of any necessary guarantee bond or other security.

(g) Any costs incurred by the Managers in carrying out their obligations according to this Clause 18 (General Administration) shall be reimbursed by the Owners.

³⁰ Autoshipman Clause 20. Inspection of Vessel and RCC

(a) The Owners may at any time after giving reasonable notice to the Managers inspect the Vessel for any reason, they consider necessary.

(b) The Owners may with the consent of the Managers, which shall not be unreasonably withheld or delayed, inspect the RCC for the purposes of operational auditing, provided such inspection does not interfere with the operation of the RCC.

- "Cyber Security Incident" refers to the loss or unauthorized destruction, alteration, disclosure, access, or control of a Digital Environment.
- "Cyber Security" refers to technologies, processes, procedures, and controls designed to protect Digital Environments from Cyber Security Incidents.
- "Digital Environment" refers to information technology systems, operational technology systems, networks, internet-enabled applications or devices, and the data contained within such systems.

(a) Each Party must: implement appropriate Cyber Security measures and systems and otherwise make reasonable efforts to maintain its Cyber Security, have in place suitable plans and procedures to enable efficient and effective response to a Cyber Security Incident; regularly review its Cyber Security arrangements to verify practical application and maintain and keep records proving the same. (b) Each Party shall make reasonable efforts to ensure that any third party providing services on its behalf in connection with this Agreement complies with the terms of subclause (a)(i)-(iii). (c) If a Party becomes aware of a Cyber Security Incident that affects or is likely to affect the Cyber Security of either Party, it must promptly notify the other Party. If the Cyber Security Incident occurs within the Digital Environment of one of the Parties, that Party must: promptly take all necessary steps to mitigate and/or resolve the Cyber Security Incident and provide the other Party with contact details and any information that may assist in mitigating and/or preventing the effects of the Cyber Security Incident as soon as reasonably practicable but no later than 12 hours after the initial notification. Each Party must share with the other Party any subsequent information that becomes available and could assist in mitigating and/or preventing the effects of the Cyber Security Incident. (d) The liability of each Party for a breach or series of breaches of this Clause shall not exceed a total of an amount contracted by the parties (or if left blank, USD 100,000), unless it is proven to have resulted solely from the gross negligence or willful misconduct of that Party. This clause pertains to cybersecurity and outlines how the Parties must address cybersecurity incidents, known as "Cyber Security Incidents." The Parties commit to implementing appropriate cybersecurity measures to protect their "Digital Environments." If a Cyber Security Incident occurs in one of their Digital Environments, the involved Party must take prompt actions to resolve the incident and must notify the other Party. It also requires

the Parties to collaborate with each other to share information and assist in mitigating the effects of the incident. The clause limits the liability of the Parties for breaches of these provisions, setting a maximum financial liability, unless the breach is proven to result from gross negligence or deliberate misconduct. Clause 24³¹ (Duration of the Agreement) clarifies the duration of the ship management contract. Consistent with the perpetual nature of the relationship between the shipowner and the ship manager, the obligation remains until either party terminates the contract or one of the cases specified in clause 25 (Termination) occurs. In the case of unilateral termination, the contract cannot be terminated before the minimum contract duration agreed upon between the parties and indicated in Box 18 of the cover page. Furthermore, clause (b)³² provides that if, at the date of contract termination, the vessel is not in a location easily accessible by the parties, the contract will be automatically extended until the vessel reaches a port or location that allows them to make the vessel delivery without difficulty. Clause 25, as mentioned, covers scenarios under which the contract can be considered concluded. Paragraph (a)³³ makes the right to terminate the contract mutual in cases of repeated non-performance by

³¹ Autoshipman Clause 24. Duration of the Agreement

(a) This Agreement shall come into effect at the date stated in Box 2 and shall continue until terminated by either party by giving notice to the other; in which event this Agreement shall terminate upon the expiration of the later of the number of months stated in Box 18 or a period of two (2) months from the date on which such notice is received, unless terminated earlier in accordance with Clause 22 (Termination).

(b) Where the Vessel is not at a mutually convenient port or place on the expiry of such period, this Agreement shall terminate on the subsequent arrival of the Vessel at the next mutually convenient port or place.

³² Autoshipman, Clause 25 – Termination (b) Notwithstanding subclause 22(a):

(i) The Managers shall be entitled to terminate the Agreement with immediate effect by giving notice to the Owners if any monies payable by the Owners and/or the owners of any associated vessel, details of which are listed in Annex “D”, shall not have been received in the Managers’ nominated account within ten (10) days of receipt by the Owners of the Managers’ written request, or if the Vessel is repossessed by the Mortgagee(s).

(ii) If the Owners proceed with the employment of or continue to employ the Vessel in the carriage of contraband, blockade running, or in an unlawful trade, or on a voyage which in the reasonable opinion of the Managers is unduly hazardous or improper, the Managers may give notice of the default to the Owners, requiring them to remedy it as soon as practically possible. In the event that the Owners fail to remedy it within a reasonable time to the satisfaction of the Managers, the Managers shall be entitled to terminate the Agreement with immediate effect by notice.

(iii) If either party fails to meet their respective obligations under subclause 5(b) (Crew Insurances) and Clause 10 (Insurance Policies), the other party may give notice to the party in default requiring them to remedy it within ten (10) days, failing which the other party may terminate this Agreement with immediate effect by giving notice to the party in default.

³³ Autoshipman, Clause 25 – Termination (a) Owners’ or Managers’ default

If either party fails to meet their obligations under this Agreement, the other party may give notice to the party in default requiring them to remedy it. In the event that the party in default fails to remedy it within a reasonable time to the reasonable satisfaction of the other party, that party shall be entitled to terminate this Agreement with immediate effect by giving notice to the party in default.

the counterpart. Additionally, it allows for contract termination if the counterpart persists in breaching crew insurance obligations. Concerning paragraph (c)³⁴, this agreement will be considered terminated in the event of the sale of the Vessel or, if the Vessel becomes a total loss or is declared a constructive or compromised total loss, or is requisitioned or declared missing, or, if bareboat chartered, unless otherwise agreed, when the bareboat charter comes to an end.

Apart from termination through notice or upon the expiration of the 'contract period' as defined in clause 25 of AUTOSHIPMAN, the agreement can be terminated by the parties under the following circumstances:

1. **Extraordinary Termination:** Either party can terminate the agreement if the vessel is sold, becomes a total loss, is declared as a constructive or compromised total loss, is requisitioned, declared missing, or if a bareboat charter ends, unless otherwise agreed. For clarification:
 - The vessel is treated as sold when the registered ownership changes.
 - The vessel is deemed lost if it's actually destroyed or if there's an agreement with underwriters about its constructive total loss, or if a tribunal confirms its constructive loss.
 - The vessel is treated as declared missing ten days after its last report or when declared missing by underwriters, whichever happens first.
2. **Event of Financial Distress:** Either party can terminate if there's an order or resolution for winding-up, dissolution, bankruptcy, or if a receiver/administrator is appointed, or if the party suspends payments, ceases business, or arranges with creditors. Termination occurs immediately upon the occurrence of such events.
3. **Budget, Flag, and Fee Disagreements:** Either party can terminate if they fail to agree on the annual budget, change of flag, or reduction in management fee.

³⁴ Autoshipman Clause 25 – termination (c) Extraordinary Termination

This Agreement shall be deemed to be terminated in the case of the sale of the Vessel or, if the Vessel becomes a total loss or is declared as a constructive or compromised or arranged total loss or is requisitioned or has been declared missing or, if bareboat chartered, unless otherwise agreed, when the bareboat charter comes to an end.

Notice of at least one month is required, and termination occurs at the end of the current budget period or the notice period, whichever is later.

4. **Breach of Obligations:** If a party breaches its obligations under the agreement, the other party can give notice for the breach to be rectified. If the breaching party fails to fix the breach within a reasonable time, the other party can terminate the agreement immediately.
5. **Crew and Insurance Obligations:** If a party fails to meet obligations related to crew insurances (sub-clause 5(b) SHIPMAN) or insurance policies (clause 10 SHIPMAN), the other party can give notice for the breach to be rectified. If the breach isn't fixed within ten days, the notifying party can terminate the agreement immediately.
6. **Financial Non-Compliance:** The managers can terminate if any payments due from the owners or associated vessel owners are not received within ten days of the managers' written request, or if the vessel is repossessed by mortgagees.
7. **Improper Vessel Use:** The managers can also terminate if the owners use or continue to use the vessel for illegal activities such as contraband transport, blockade running, or an unlawful trade, or if the managers consider a voyage to be unduly hazardous or improper. In such cases, the managers can notify the owners to remedy the situation, and if not rectified within a reasonable time, they can terminate the agreement immediately.

It's important to note that the termination of the agreement under any of these circumstances does not affect rights accrued prior to termination³⁵.

Particular attention should be paid to clauses 26 (Sanctions), 28 (BIMCO Law and Arbitration Clause 2020), which replaces clause 23 of the SHIPMAN form (Dispute Resolution Clause), 31 (BIMCO Electronic Signature Clause 2021), 37 (BIMCO Personal Data Protection), and 38 (Managers' Information System).

³⁵ I. Vella, 2016, "Ship Management and Finance", in "The IMLI Manual on International Maritime Law Volume II Shipping Law", Chapter 5.5.1.1. "Termination" pp.113-123.

Clause 26 – Sanction³⁶. The introduction of this clause became necessary after the Russian invasion of Ukraine. The inclusion of this clause imposes a prohibition on traveling to countries that are subject to sanctions by entities such as the European Union, the United Kingdom, and the United States. Clause 26 addresses the application of sanctions, prohibitions, or restrictions on specified individuals, entities, or bodies, including designations of specific vessels or fleets under United Nations Resolutions or trade sanctions imposed by the European Union, United Kingdom, or the United States of America. (a) This clause pertains to sanctions, prohibitions, and restrictions imposed on certain entities or individuals, as well as the designation of specific vessels or fleets under international resolutions or trade sanctions set by the United Nations, European Union, United Kingdom, or the United States. (b) Upon entering into the Agreement and throughout its duration: (i) Both Owners and Managers warrant that they are not subject to any of the aforementioned sanctions, prohibitions, or restrictions that would render any performance under this Agreement unlawful. (ii) Owners further warrant that the Vessel is not designated as a sanctioned vessel and will not be used for any purposes that contravene the restrictions or prohibitions outlined in subclause (a). (iii) Managers warrant that they will not subcontract any of their duties or obligations under this Agreement in violation of the sanctions, prohibitions, or restrictions mentioned in

³⁶Autoshipman, Clause 26 - Sanctions

(a) The provisions of this clause shall apply in relation to any sanction, prohibition or restriction imposed on any specified persons, entities or bodies including the designation of specified vessels or fleets under United Nations Resolutions or trade or economic sanctions, laws or regulations of the European Union, United Kingdom or the United States of America.

(b) On entering into and throughout the duration of this Agreement: (i) Owners and Managers respectively warrant for themselves that they are not subject to any of the sanctions, prohibitions or restrictions in subclause (a) which prohibit or render unlawful any performance under this Agreement; (ii) Owners further warrant that the Vessel is not a designated vessel and will not be used in any trade or for any purposes contrary to the restrictions or prohibitions in subclause (a); (iii) Managers further warrant that they will not sub-contract any of their duties or obligations under this

Agreement in breach of subclause (a).

(c) If at any time during the performance of this Agreement either party becomes aware that the other party is in breach of warranty as aforesaid, the party not in breach shall comply with the laws and regulations of any Government to which that party or the Vessel is subject, and follow any orders or directions which may be given by any body acting with powers to compel compliance, including where applicable the Owners' flag State. In the absence of any such orders, directions, laws or regulations, the party not in breach may terminate this Agreement forthwith.

(d) Notwithstanding anything in this Clause to the contrary, Owners and Managers shall not be required to do anything which constitutes a violation of the laws and regulations of any State to which either of them is subject.

(e) Notwithstanding any other provision in this Agreement, Owners and Managers shall be liable to indemnify the other party against any and all claims, losses, damage, costs and fines whatsoever suffered by the other party resulting from any breach of warranty as aforesaid.

subclause (a). (c) If during the Agreement's execution, one party becomes aware that the other party is in breach of the aforementioned warranties, the non-breaching party must adhere to the laws and regulations of their respective government and follow orders from any authorized entity empowered to enforce compliance, including the flag State of the Vessel if applicable. In the absence of such orders, the non-breaching party has the option to immediately terminate the Agreement. (d) Despite the terms of this Clause, neither Owners nor Managers are obligated to take actions that would violate the laws and regulations of their respective countries. (e) Regardless of other terms within the Agreement, both Owners and Managers are responsible for indemnifying each other against all claims, losses, damages, costs, and fines that may arise due to any breach of the warranties described earlier.

Clause 28³⁷ outlines the Law and Arbitration procedures, providing guidance on the legal framework and resolution process for disputes arising from the Agreement. This clause gives the Parties the option to choose the applicable law and arbitration method in

³⁷ Autoshipman, Clause 28 BIMCO Law and Arbitration Clause 2020

The Parties have been given a choice of law and arbitration alternatives in Box 26 and this is the clause that shall apply.

(a) This Agreement shall be governed by and construed in accordance with English law and any dispute arising out of or in connection with this Agreement shall be referred exclusively to arbitration in London in accordance with the Arbitration Act 1996 or any statutory modification or re-enactment thereof save to the extent necessary to give effect to the provisions of this Clause. The seat of arbitration shall be London even where any hearing takes place in another jurisdiction.

(b) The reference shall be to three (3) arbitrators.

(c) The arbitration shall be conducted in accordance with the London Maritime Arbitrators Association (LMAA) Terms.

(d) In cases where neither the claim nor any counterclaim exceeds the sum of USD 100,000 (or such other sum as the parties may agree) the arbitration shall be conducted in accordance with the LMAA Small Claims Procedure. In cases where the claim or any counterclaim exceeds the sum agreed for the LMAA Small Claims Procedure and neither the claim nor any counterclaim exceeds the sum of USD 400,000 (or such other sum as the parties may agree) the parties may agree that the arbitration shall be conducted in accordance with the LMAA Intermediate Claims Procedure.

(e) The terms, rules and procedures referred to in subclauses (c) and (d) above shall be those current at the time when the arbitration proceedings are commenced.

(f) Any and all notices and communications in relation to any arbitration proceedings under this Clause, including commencement notices and appointment of arbitrators, shall be treated as effectively served from the date and time the e-mail was sent if sent by e-mail to the e-mail addresses below:

Name of Party to this Agreement:

E-mail address(es) for receipt of notices and communications on behalf of the above Party: [insert]

Name of other Party to this Agreement:

E-mail address(es) for receipt of notices and communications on behalf of the above Party: [insert]

Either Party shall be entitled to change and/or add to the e-mail addresses above by sending notice of change to the other Party at the above address (or, if previously amended by notice, the relevant amended addresses). Nothing in this Clause shall prevent any notice and communication in relation to any arbitration proceedings in connection with this Agreement being served by other effective means.

Box 26, and the chosen options will be enforced. (a) The Agreement is subject to English law, and any disputes related to or arising from this Agreement must be exclusively settled through arbitration in London. The arbitration process will adhere to the Arbitration Act 1996 or its subsequent modifications. The arbitration's venue will be London, even if any hearings occur in a different jurisdiction. (b) The dispute resolution process will involve three arbitrators. (c) The arbitration proceedings will follow the guidelines and terms set by the London Maritime Arbitrators Association (LMAA). (d) For disputes where the claim or counterclaim doesn't exceed USD 100,000 (or an agreed sum), the arbitration will adhere to the LMAA Small Claims Procedure. If the claim or counterclaim surpasses this limit but doesn't exceed USD 400,000 (or an agreed sum), the Parties can decide to proceed with the LMAA Intermediate Claims Procedure. (e) The rules, regulations, and procedures mentioned in subclauses (c) and (d) will be those in effect at the start of the arbitration proceedings. (f) All notices and communications regarding arbitration proceedings under this clause, including the commencement of proceedings and arbitrator appointments, will be considered effectively delivered if sent via email to the provided addresses. Both Parties' email addresses must be included, and changes can be made by notifying the other Party. This clause doesn't prevent other means of serving notices and communications related to arbitration proceedings connected to this Agreement.

Clause 31³⁸ introduces the concept of electronic signatures in the agreement and outlines their legal implications. (a) An "Electronic Signature" is defined as electronic data that is attached or logically connected to other electronic data, used by a signatory to indicate their agreement. This includes actions like typing a name, inserting an image of

³⁸ Autoshipman Clause 31. BIMCO Electronic Signature Clause 2021

(a) For the purpose of this Clause "Electronic Signature" shall mean data in electronic form which is attached to or logically associated with other data in electronic form and which is used by a signatory to sign and includes, without limitation, typing a name into a contract, inserting a signature (in the form of an image) into a contract or using a web-based electronic signature platform to generate an electronic representation of a handwritten signature or a digital signature using public key encryption technology.

(b) The Parties agree that this Agreement, and any documents to be signed in connection herewith, may be electronically signed and the use by a Party of an Electronic Signature shall, for the purposes of validity, enforceability and admissibility, be conclusive evidence of that Party's intention to be legally bound as if such signature had been written by hand.

(c) In the event that an Electronic Signature is, for any reason whatsoever, not recognised by any relevant person, entity or authority in any applicable jurisdiction, each Party undertakes, upon request, to promptly provide a handwritten signature on any relevant document.

(d) This Agreement may be executed in one or more counterparts, each of which shall be deemed to be an original and all of which together shall constitute one and the same agreement. A counterpart bearing an Electronic Signature shall satisfy the requirements of this Clause.

a signature, or using an electronic platform to generate a representation of a handwritten or digitally encrypted signature. (b) The Parties mutually agree that this Agreement and any associated documents can be signed electronically. Using an Electronic Signature confirms a Party's intent to be legally bound, with the same validity, enforceability, and admissibility as a handwritten signature. (c) If, for any reason, an Electronic Signature is not recognized by relevant authorities in a jurisdiction, each Party commits to providing a handwritten signature upon request for the relevant document. (d) This Agreement can be executed in multiple copies, and each copy, including those with Electronic Signatures, will be considered an original.

Conclusions

This form contains several new features compared to SHIPMAN 2009, but it is clear that it follows its basic structure. Where the previous clauses could be applied, they have been left the same or slightly modified. It is clear that only those clauses that are necessary and relate to self-driving ships and their management have been tried to be new. Of the clauses included in Section 5, many are clauses that are already known and used in other forms, making the AUTOSHIPMAN a form that, if approved in the form under consideration, will not pose a great difficulty to its users. In any case, the document studied so far is a form whose peculiarity is the possibility of modifying, adding and deleting clauses according to the will of the parties, making it, like all contracts of this type, extremely adaptable and usable in any event.

Many thanks to BIMCO for having provided the writer with the beta version of the AUTOSHIPMAN form even though it is not yet available in its final version.

Bibliography

N. A. R. Al Ali, A. A. Chebotareva, V.E. Cheboratev, 2021, “Cyber security in marine transport: opportunities and legal challenges”, *Scientific Journal of Maritime Research*, Vol. 35, pp. 248-255.

A. Arora, E. Antoniadou, “Maritime Cyber Risk Management Guidelines”, The Northstandard Club.

M.A. Ben Farah, E. Ukwandu, H. Hindy, D. Brosset, M. Bures, I. Andonovic, X. Bellekens, 2022, “Cyber-Security in the Maritime Industry: A Systematic Survey of Recent Advances and Future Trends.” *Information*, 13, pp.1-33.

A.Berret, 2022, “US Perspectives on Regulating Maritime Autonomy”, in “Autonomous Vessels in Maritime Affairs, Law and Governance Implications”, Palgrave Macmillan

H.C. Burmeister, W. Bruhn, Ø. J. Rødseth, T. Porathe, 2014, “Autonomous Unmanned Merchant Vessel and its Contribution towards the e- Navigation Implementation: The MUNIN Perspective”, *International Journal of e-Navigation and Maritime Economy*, 1, pp. 1-13.

H.C. Burmeister, W. Bruhn, Ø. J. Rødseth, T. Porathe, 2014, “Can unmanned ships improve navigational safety?”, *Transport Research Arena*.

J.C. Chagas Lessa, B. Bulut, 2020, “A New Era, a New Risk! “A Study on the Impact of the Developments of New Technologies in the Shipping Industry and Marine Insurance Market”, in *InsuerTech: A legal and Regulatory View*, Vol. 1, pp. 313-342.

B. Gogarty, M.C. Hagger, 2008, “The Laws of Man Over Vehicles Unmanned: The Legal Response to Robotic Revolution on Sea, Land and Air”, *Journal of Law, Information and Science*, Vol.19, pp.92-94 and 114-118.

G. Hunter, 2021, “Standard contracts for the MASS(es) – charter parties and other agreements for autonomous ships”, *Ship Operations*, pp 203-216.

P. K. Mukherjee, 2023 “Maritime Autonomous Surface Ships (MASS): Precarious Legal Position of the Shore-Based Remote Controller”, In “Autonomous Vessels in Maritime Affairs”, Palgrave Macmillan, Cham, Switzerland, pp.277-295.

R. Li, 2019, “On the legal status of unmanned ships”, *China Oceans Law Review*, vol. 4, p.165-190.

G. Marchiafava, 2008, “Il contratto di ship management”, In “Trattato breve do diritto marittimo”, Vol 2, Giuffrè pp. 401-418.

G. Marchiafava, 2022, “Cybercrime and cybersecurity in shipping: a legal framework in progress” in *Rivista di studi Politici Internazionali*, Vol.89, pp. 239-257.

P. McGillivray, 2018, “Why maritime cybersecurity is policy priority and how it can an ocean be addressed”, *Marine Technology Society Journal*, Vol. 52, Issue 5, pp. 44-57.

A. Ntovas, M. Tsimplis, R. Veal, S. Quinn, A. Serdy, 2016, “Liability for operations in unmanned maritime vehicles with differing levels of autonomy”, University of Southampton, Institute of Maritime Law, Southampton.

S. Øie, 2020, “Study of the Risk and Regulatory Issues of Specific cases of MASS”

M. Pijacar, B. Bulum, 2021, “Comparison of Problems Related to the Carriage of Goods by Sea Between Traditional and Autonomous Vessels”, *TransNav* Vol.15 pp. 125-131.

M. Potenza, 2010, “Il nuovo formulario BIMCO di contratto di ship management”, *Rivista del diritto della navigazione*, Vol 39, pp.643-658.

P. Pritchett, 2015, “Ghost ships: why the law should embrace unmanned vessel technology”. *Tulane Maritime Law Journal*, Vol. 40(1), pp. 197–225.

H. Ringbom, 2019, “Regulating autonomous ships – concepts, challenges and precedents”, *Ocean Development & International Law*, Vol. 50, pp. 141–169.

J.P. Rodriguez Delgado, 2018, “The Legal Challenges of Unmanned Ships in the Private Maritime Law: What Laws Would You Change?”, *Maritime, Port and Transport Law between Legacies of the Past and Modernization*, vol. 5, *Diritto marittimo – Quaderni*, pp. 493-524.

Ø.J. Rødseth e H.C. Burmeister, 2015, “Risk Assessment for an Unmanned Merchant Ship”, *TransNav, The International Journal on Marine Navigation and Safety of Sea Transportation*, Vol. 9, No. 3, pp. 357-364.

S. N. Trowers, 2020, “Smooth Sailing or a Risky Expedition: A Critical Exploitation into the Innovation of Unmanned Maritime Vehicles and Its Potential Legal and Regulatory Impacts on the Insurance Sector”, in *InsuerTech: A legal and Regulatory View*, Vol. 1, pp. 363-398

E. Van Hooydonk, 2014, “The law of unmanned merchant shipping - an exploration”, *The Journal of International Maritime Law*, vol. 20, pp. 403-423.

R. Veal, H. Ringbom, 2017, “Unmanned ships and the international regulatory framework”, *Journal of International Maritime Law*, Vol. 23, pp. 100-118.

R. Veal, M. Tsinplis, 2017, “The navigation of Unmanned ships into the lex maritima”, *Lloyd’s Maritime and Commercial Law Quarterly*, pp. 303-335.

R. Veal, M. Tsimplis, A. Serdy, 2019, “The Legal Status and Operation of Unmanned Maritime Vehicles”, In “*Ocean Development & International Law*”, Vol. 50, pp. 23-48.

I. Vella, 2016, “Ship Management and Finance”, in “*The IMLI Manual on International Maritime Law Volume II Shipping Law*”, Oxford University Press.

L. Zhu, R. W. W. Xing, 2020, “Probing Civil Liability Insurance for Unmanned/Autonomous Merchant Ships” in *InsuerTech: A legal and Regulatory View*, Vol. 1 pp. 343-362.

M. Willingale, *Ship Management* (3rd edn, LLP, 1998), LLP.

Sitography

“168. Leeds Shipping Company Ltd v Societe Francaise Bunge (The “Eastern City”) [1957] 2 Lloyd’s Rep 153; [1958] 2 Lloyd’s Rep 127”, 2011, available at: <https://charterpartycases.com/case/168-leeds-shipping-company-ltd-v-societe-francaise-bunge-the-%E2%80%9Ceastern-city%E2%80%9D-1957-2-lloyd%E2%80%99s-rep-153-1958-2-lloyd%E2%80%99s-rep-127>

“A short history of the Paris MoU on PSC”, Paris MoU, available at: <https://www.parismou.org/about-us/history>

“About MUNIN – Maritime Unmanned Navigation through Intelligence in Networks”, 2016, available at: <http://www.unmanned-ship.org/munin/about/>

“About the International Group”, available at: <https://www.igpandi.org/about/>.

“ABOUT US AND OUR MEMBERS”, BIMCO, available at: <https://www.bimco.org/about-us-and-our-members>

“AIS transponders”, available at: <https://www.imo.org/en/OurWork/Safety/Pages/AIS.aspx>

“Allianz: Human error behind 75 percent of marine casualties”, 2021, Available at: <https://safety4sea.com/allianz-human-error-behind-75-percent-of-marine-casualties/>

“Autonomous shipping”, IMO, available at: <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx>

“Autonomous ships The next step”, Rolls Royce, 2016, available at: <https://www.rolls-royce.com/~media/Files/R/Rolls-Royce/documents/%20customers/marine/ship-intel/rr-ship-intel-aawa-8pg.pdf>

“BPTIME3”, available at: <https://www.bimco.org/Contracts-and-clauses/BIMCO-Contracts/BPTIME3#>

“Bureau Veritas”, available at: <https://group.bureauveritas.com/>

“CEO Update: Supporting the maritime industry for the next century”, 2021, available at: https://www.gard.no/web/news/article?p_document_id=24640524.

“COLREG - Preventing collisions at sea”, available at: <https://www.imo.org/en/OurWork/Safety/Pages/Preventing-Collisions.aspx>

“Consultation outcome, Future of transport regulatory review: maritime autonomy and remote operations”, 2023, available at: <https://www.gov.uk/government/consultations/future-of-transport-regulatory-review->

maritime-autonomy-and-remote-operations/future-of-transport-regulatory-review-maritime-autonomy-and-remote-operations

“Convention on Limitation of Liability for Maritime Claims (LLMC)”, available at: [https://www.imo.org/en/About/Conventions/Pages/Convention-on-Limitation-of-Liability-for-Maritime-Claims-\(LLMC\).aspx](https://www.imo.org/en/About/Conventions/Pages/Convention-on-Limitation-of-Liability-for-Maritime-Claims-(LLMC).aspx)

“Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs)”, available at: <https://www.imo.org/en/About/Conventions/Pages/COLREG.aspx>

“Cyber security”, 2021, available at: <https://www.gard.no/web/topics/article/21025160/cyber-security>

“DIRECTIVE 2009/20/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the insurance of shipowners for maritime claims”, 2009, available at: <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:131:0128:0131:EN:PDF>

“EU OPERATIONAL GUIDELINES FOR TRIALS OF MARITIME AUTONOMOUS SURFACE SHIPS (MASS)”, 2020, available at: https://transport.ec.europa.eu/system/files/2020-11/guidelines_for_safe_mass.pdf

“European Climate, Infrastructure and Environment Executive Agency”, available at: https://cinea.ec.europa.eu/index_en

“European Maritime Safety Agency”, available at: <https://emsa.europa.eu/>

“FAL CONVENTION”, available at: <https://www.imo.org/en/OurWork/Facilitation/Pages/FALConvention-Default.aspx>

“FEDERAL MARITIME COMMISSION COMPETITION AND INTEGRITY FOR AMERICA’S OCEAN SUPPLY CHAIN”, available at: <https://www.fmc.gov/>

“Fincantieri To Build 6 Marine Robotic Vessels For Ocean Infinity”, 2022, available at: <https://www.fincantieri.com/en/media/press-releases/2022/fincantieri-to-build-6-marine-robotic-vessels-for-ocean-infinity/>

“GROUP AGREEMENTS”, available at: <https://www.igpandi.org/group-agreements/>

“GUIDELINES ON MARITIME CYBER RISK MANAGEME”, available at: <https://wwwcdn.imo.org/localresources/en/OurWork/Security/Documents/MSC-FAL.1->

Circ.3Rev.2%20-%20Guidelines%20On%20Maritime%20Cyber%20Risk%20Management%20(Secretariat)%20(1).pdf

“How Slow Steaming Impacts Shippers and Carriers”, 2019, available at: <https://www.containerxchange.com/blog/slow-steaming/>

“IMO and the Republic of Korea Symposium on IMO MASS Code”, available at: <https://www.imo.org/en/About/Events/Pages/IMO-MASS-Code-Symposium.aspx>

“INSTITUTE CYBER ATTACK EXCLUSION CLAUSE”, 2003, available at: <http://www.seamanship.eu/marine-clauses-77/instcl/cl380.pdf>

“International Convention for Safe Containers (CSC)”, available at: [https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-Safe-Containers-\(CSC\).aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-Safe-Containers-(CSC).aspx)

“International Convention for the Prevention of Pollution from Ships, 1973”, Article 2, available at: <http://www.marpoltraining.com/MMSKOREAN/MARPOL/intro/a2.htm>

“International Convention for the Prevention of Pollution from Ships (MARPOL)”, available at: [https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-\(MARPOL\).aspx](https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx)

“International Convention for the Safety of Life at Sea (SOLAS)”, 1974, available at: [https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-\(SOLAS\),-1974.aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-(SOLAS),-1974.aspx)

“International Convention on Civil Liability for Oil Pollution Damage (CLC)”, available at: [https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Civil-Liability-for-Oil-Pollution-Damage-\(CLC\).aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Civil-Liability-for-Oil-Pollution-Damage-(CLC).aspx)

“International Convention on Load Lines 1966,” available at: <https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Load-Lines.aspx>

“International Convention on Standards of Training, Certification and Watchkeeping for Seafarers”, 1978, available at: <https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Convention.aspx>

“International Convention on Tonnage Measurement of Ships”, available at: <https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Tonnage-Measurement-of-Ships.aspx>

“International Maritime Organization”, available at: <https://www.imo.org/en>

“Lloyd’s Register”, available at: <https://www.lr.org/en/>

“LR and Samsung Heavy Industries pen MOU for Samsung Autonomous Ship”, 2022, available at: <https://www.lr.org/en/latest-news/lr-samsung-heavy-industries-pen-mou-samsung-autonomous-ship/>

“Maritime Code of the People's Republic of China” , 2021, available at: https://english.www.gov.cn/services/doingbusiness/202102/24/content_WS6035f42dc6d0719374af97b9.html

“Maritime cyber risk”, available at: <https://www.imo.org/en/OurWork/Security/Pages/Cyber-security.aspx>.

“Maritime Law for MASS”, available at: <https://comitemaritime.org/work/mass/>

“Merchant Shipping Act 1995”, 2021, available at: <https://www.legislation.gov.uk/ukpga/1995/21/contents?view=plain>

“Mortgagees Interest Insurance”, available at: https://www.gard.no/web/products/content?p_document_id=77387

“MSCI Advisory, 2020-016-Variou-GPS Interference”, 2021, available at: <https://www.maritime.dot.gov/msci/2020-016-various-gps-interference>

“MUNIN project” official webpage, 2016, available at: <http://www.unmanned-ship.org/munin/>

“Nairobi International Convention on the Removal of Wrecks”, available at: <https://www.imo.org/en/About/Conventions/Pages/Nairobi-International-Convention-on-the-Removal-of-Wrecks.aspx>

“NI641 GUIDELINES FOR AUTONOMOUS SHIPPING”, 2019, available at: <https://marine-offshore.bureauveritas.com/ni641-guidelines-autonomous-shipping>

“P&I Cover and Cyber risk”, 2020, available at: <https://www.westpandi.com/news-and-resources/news/archive/p-i-cover-and-cyber-risk/>

“Public Law 115–254 115th Congress”, 2018, available at: <https://www.congress.gov/115/plaws/publ254/PLAW-115publ254.pdf>

“RC Dock Receives Class Approval from RINA for New Remotely Controlled Unmanned Workboats”, 2023, available at: <https://www.rina.org/en/media/press/2023/03/29/workboat-rc-dock>

“Real Decreto Legislativo 2/2011, de 5 de septiembre, por el que se aprueba el Texto Refundido de la Ley de Puertos del Estado y de la Marina Mercante.” available at: <https://www.boe.es/buscar/act.php?id=BOE-A-2011-16467>

“Review of Maritime Transport 2021”, 2021, available at: https://unctad.org/system/files/official-document/rmt2021_en_0.pdf

“Review of Maritime Transport 2018”, 2018, available at: https://unctad.org/system/files/official-document/rmt2018_en.pdf

“Review of Maritime Transport 2020”, 2020, available at: https://unctad.org/system/files/official-document/rmt2020_en.pdf

“RINA” Homepage, available at: <https://www.rina.org/en>

“SAR Convention”, available at: <https://www.imo.org/en/OurWork/Safety/Pages/SARConvention.aspx>

“Shipping: An Autonomous Future?”, 2018, available at: <https://www.nepia.com/articles/shipping-an-autonomous-future/>

“SOLAS amendments entering into force 1 January 2020”, 2019, available at: <https://www.imo.org/en/MediaCentre/PressBriefings/Pages/35-SOLAS-EIF-2020.aspx>

“Special Drawing Rights”, available at: <https://www.imf.org/en/Topics/special-drawing-right>

“Special Trade Passenger Ships”, available at: <https://www.imo.org/en/About/Conventions/Pages/Special-Trade-Passenger-Ships-.aspx>

“Strategic Plan for the Organization”, 2023, available at: <https://www.imo.org/en/About/Strategy/Pages/Default.aspx>

“Terrorism Act 2000”, 2009, available at: <https://www.legislation.gov.uk/ukpga/2000/11/section/1>

“TEXT OF THE AMENDMENTS OF 2014 TO THE MARITIME LABOUR CONVENTION, 2006”, 2014, available at: https://www.register-iri.com/wp-content/uploads/Text-Amendments-2014-MLC-2006_2.5-MN-7-052-3.pdf.

“THE GUIDELINES ON CYBER SECURITY ONBOARD SHIPS”, Version 3, available at: <https://www.ics-shipping.org/wp-content/uploads/2020/08/guidelines-on-cyber-security-onboard-ships-min.pdf>

“The International Safety Management (ISM) Code”, available at: <https://www.imo.org/en/OurWork/HumanElement/Pages/ISMCode.aspx>

“Trasporto marittimo”, Ministero delle Infrastrutture e dei Trasporti (MIT), 2021, available at: <https://www.mit.gov.it/temi/trasporti/trasporto-marittimo>

“U.S. Department of Transportation”, available at: <https://www.transportation.gov/>

“Unclos Convention”, available at: <https://www.unclos.org/>

“UNMANNED SURFACE VESSELS (USV)”, 2022, available at: <https://marine-offshore.bureauveritas.com/nr681-unmanned-surface-vessels-usv>

“US Code”, Title 1, Chapter 1, §3, available at: <https://www.law.cornell.edu/uscode/text/1/3>

“USDOT Automated Vehicles Activities”, 2022, available at: <https://www.transportation.gov/AV>

“Vessel Cyber Risk Management Work Instruction”, 2021, available at: <https://www.dco.uscg.mil/Portals/9/CVC-WI-27%282%29.pdf>

“What is GNSS?”, 2021, available at: <https://www.euspa.europa.eu/european-space/eu-space-programme/what-gnss>

“Yara Birkeland”, 2022, available at: <https://www.yara.com/news-and-media/media-library/press-kits/yara-birkeland-press-kit/>

A.Bell, “A Guide to Kidnap and Ransom Insurance Coverage”, 2021, available at: <https://www.investopedia.com/articles/personal-finance/062915/guide-kidnap-ransom-insurancecoverage.asp>

Brief History of IMO, available at: <https://www.imo.org/en/About/HistoryOfIMO/Pages/Default.aspx>

J. Saul, H. Lawson, “IMO Hit by Cyber Attack”, 2020, available at: <https://www.marinelink.com/news/imo-hit-cyber-attack-482113>

M. Bailey, “Leeds Shipping Co Ltd v. Societe Francaise Bunge (The “EASTERN CITY”) – COURT OF APPEAL (Hodson, Romer, and Sellers LJJ) – 30 July 1958”, 2023,

available at: <https://www.tankvoyager.com/leeds-shipping-co-ltd-v-societe-francaise-bunge-the-eastern-city-court-of-appeal-hodson-romer-and-sellers-ljj-30-july-1958/>.

Acknowledgements

Thanking everyone is difficult, as the people who contributed to the writing of this thesis are many.

To begin with, I would like to thank Professor Giovanni Marchiafava, for helping me choose this very interesting topic and for his support. I would also like to thank Dr. Grant Hunter, BIMCO's Director for Standards, Innovation and Research, who supported me and provided me with the beta version of the AUTOSHIPMAN form, the core chapter of this paper.

A precious thank you to my family, my mother and my father, who have always supported me in everything, constantly and with love.

A special thanks to a number of people who made two years truly unforgettable, two years that went by far too quickly.

First, in order of appearance, I would like to thank Martina, Greta and Valentina, who have always been there for me and who have supported and endured me. A big thank you to Giulia C, for friends (me) Giusy, who in these three years has been the best motivational coach one can have. I would also like to thank a series of people who gradually came into my life, whom I feel I have known forever and whom I hope I will never lose: thanks to my Gymbros and confident Matteo and Matteo; to my laughing partner and Modern Family Giulia A; to my favourite foreigners Riccardo, Carlotta, Sofia and Gioele and to the best tennis player in Quarto alta, Francesco. Thank you, guys, from the bottom of my heart, this graduation is also a little bit yours.