2

Autonomous Ships and Time Charterparties

Ceren Cerit Dindar

2.1 INTRODUCTION

The form of a ship has been subject to considerable change and development, both structurally and technically, throughout the centuries, but one factor has always remained constant: "the human element" (Sözer 2024). The crew has always been on board the ship and has remained responsible for the operation, maintenance, navigation, and safety of the ship and its cargo. However, technological developments in shipbuilding and automation systems, such as AI and robotics, have in the past few years started to switch, or indeed promote, the shipping industry to a new level, which has been termed "autonomous shipping" – a distinguishing feature of which is the belief that the presence of the crew on board the ship should no longer be looked upon as an elementary condition, although some have submitted their concerns about this profound shift in the industry and asserted that the operation of autonomous ships on the sea is merely utopian and does not seem possible or viable when today's technology is taken into regard (Karlis 2018, 120).[1] The *Yara Birkeland*,[2] *Shortfall of Gravitas*,[3] *Mayflower*,[4]

[1] Hunter has pointed out the twofold perception of autonomous ships: some believe that they could operate commercially, while others argue that we are many decades away from being able to operate autonomous ships in international trade, as the existing rule of law will need to be reviewed and revised (Hunter 2021, 207).

[2] The *Yara Birkeland* is the result of a project that began in 2017 as a partnership between environmentally focused Norwegian agricultural company Yara and Finland-based global maritime technology company Kongsberg, with the aim of building the world's first autonomous, fully battery-powered, zero-emissions container ship. See further Yara (2023).

[3] The *Shortfall of Gravitas* (SOG) was introduced by SpaceX in July 2021 as an autonomous spaceport ship that is fully automated and capable of moving to the recovery area without a tug (SpaceX 2021).

[4] The *Mayflower*, an AI-driven and radar-sensor-deployed marine research boat, is engineered to traverse the Atlantic without a crew. The main motivation for starting this project was the belief that critical data for ocean protection could be collected more cheaply with autonomous research ships than with traditional research ships. See further Mayflower 400 UK n.d.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

and *Zhi Fei*[5] are good examples to illustrate where the shipping sector is at the moment.

Considering their economic and environmental benefits and the prospects of better navigational safety compared to their human-controlled counterparts (AAWA 2016, 4; Burmeister et al. 2014, 5; Cain and Turner 2018; Coraddu et al. 2020, 1–2; Kretschmann et al. 2017, 78; Sözer 2024, 23–27; Tettenborn 2020, 118n17), it is likely that these unmanned ships, which can be partially or fully autonomous, will soon be widely operational. Despite the perceived benefits, the use of autonomous ships also poses certain risks. Indeed, one of the most challenging aspects of the proliferation of autonomous ships is widely considered to be the potential legal problems associated with their use. This is mainly because the current maritime legal framework was designed and developed for ships that are wholly controlled by a crew on board the ship. Therefore, to what extent the present laws and regulations are compatible with autonomous ships is a question to be answered conclusively. Many projects on autonomous ships have been developed over the past ten years[6] in different parts of the world, especially in major shipping countries such as Finland, Norway, and the UK. Some of these projects have been dedicated to the applicability of the existing legal rules to autonomous ships at the national and international levels,[7] such as the Maritime Unmanned Navigation through Intelligence Networks (MUNIN) project,[8] the Advanced Autonomous Waterborne Applications Initiative (AAWA),[9] and the Comité Maritime International Working Group on Maritime Autonomous Surface Ships.[10] Since 2017, the International Maritime Organization (IMO) has addressed the potential legal issues concerning the introduction of autonomous ships (IMO

[5] The *Zhi Fei*, China's first autonomous and electric container ship, which has a capacity of 300 containers, began its regular voyages between the Chinese ports of Qingdao and Dongjiakou in April 2022 (Marine Industry News 2022).

[6] It should be noted that research projects conducted on autonomous ships are not limited to the past decade. For example, the Intelligent Ship Project, the first research initiative on autonomous shipping, was initiated in Japan in the 1980s. The project examined the possibility of operating a ship without human support and intervention (Infomaritime 2018). For a recent autonomous ship project in Japan, the MEGURI 2040, see Inoue and Mori (2021); Nippon Foundation (n.d.).

[7] Although others are technical R&D projects concentrating on the construction and operation of these types of ships. The principal objective of this group of projects is the production of a model that can pass actual sea trials (Soyer 2020, 105).

[8] The MUNIN project developed a concept for unmanned merchant vessels, focusing on the operation of a dry bulk carrier in intercontinental trade, using a hybrid system combining autonomous technology with shore-based monitoring. The project assessed its technical, economic, and legal feasibility, showing commercial viability and safety improvements, while highlighting legal challenges concerning manning and liability attribution. See MUNIN (2016).

[9] Funded by Tekes, AAWA is a project analyzing the feasibility of autonomous merchant ship navigation, the applicability of current technology, and the risks the industry will face: see Rolls-Royce (2016a).

[10] In 2015, the Comité Maritime International (CMI) established the International Working Group on Maritime Autonomous Surface Ships (MASS) to address legal issues related to

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

2017b). The IMO's Regulatory Scoping Exercise for the Use of Maritime Autonomous Surface Ships (MASS) concluded in 2021 (IMO 2021, annex). The Maritime Safety Committee, during its 105th session, approved a separate code for autonomous ships and commenced drafting the MASS Code (IMO 2022b, 37). The nonmandatory Code[11] was set to be formally adopted in May 2026, with the effective date for adoption being July 1, 2030 (IMO 2024b).[12]

So far, the steps being taken to address the potential legal problems associated with autonomous ships are mostly focused on IMO instruments, as well as the United Nations Convention on the Law of the Sea (UNCLOS)[13] and the Civil Liability Convention[14] (Hunter 2021, 209). However, the concerns of industry in relation to autonomous ships should also be addressed.[15] This chapter reviews the standard forms of charterparties as a significant part of the overall study of rules, regulations, and civil liability (219). Following this review, the chapter turns to how the concept of time charterparty finds applicability to this new generation of ships, how the fundamental obligations of shipowners and charterers under the standard time charter forms will be affected, and to what extent the current standard contractual framework for time charter forms needs to be changed. Since English law is predominant in the field of charterparties, the analysis is derived from that perspective. It is also noted that charterparty relations are mainly conducted through standard charterparty forms.[16] These forms have been designed with types of trade, the needs of the charter industry, and developments in law in mind. There are

autonomous vessel operations and to assess international legal approaches. A questionnaire was circulated to CMI members, covering national law; liability; IMO conventions; the UNCLOS, December 10, 1982, 1833 UNTS 397; the International Convention for the Safety of Life at Sea, November 1, 1974, 1184 UNTS 2 (as amended) (SOLAS); the Convention on the International Regulations for Preventing Collisions at Sea, October 20, 1972, 1050 UNTS 16 (COLREGS); and the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers, July 7, 1978, 1361 UNTS 2 (STCW). Twenty-three associations responded and their answers were published on the CMI website. For the questionnaire, see CMI (2023).

[11] At the 105th session, it was agreed that the finalization of nonmandatory guidelines will take place in the first half of 2024, with the adoption of a mandatory code targeted for entry into force in 2028 (IMO 2022a).

[12] For more detail on the progress of the IMO's regulatory work on MASS, see Tunfors (2022).

[13] UNCLOS, December 10, 1982, 1833 UNTS 397.

[14] International Convention on Civil Liability for Oil Pollution Damage, November 29, 1969, 973 UNTS 3.

[15] Those concerns faced by autonomous ships primarily revolve around issues of liability, insurance, safety standards, and gaps in the regulatory framework that have created hesitation among industry stakeholders, limiting investments in this technology and raising concerns about its practical implementation.

[16] That such a practice is developed can be explained on the ground that it reduces the workload of the parties. Since the clauses are standardized, the parties do not need to think about the main obligations and rights of the parties; they only need to fill in details as to charterparty relations, such as the names of the parties, the ship's name, the delivery time, and the duration of the charter. See Plomaritou and Papadopoulos (2017, 234).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

various standard time charter forms in current usage.[17] The New York Produce Exchange (NYPE) form is one of the shipping industry's most widely used dry-cargo time charterparties (BIMCO 2015; Plomaritou and Papadopoulos 2017, 235).[18] The analysis in this chapter is limited to the most recent version, NYPE 2015.[19]

2.2 AUTONOMOUS SHIPS GENERALLY

2.2.1 *Definition of Autonomous Ships and Analysis of Levels of Automation in Ship Operation*

The notion of autonomous vessels remains notably elusive, with no singular, universally recognized definition to command the field of discourse. However, the definition posited by the IMO is one of the most widely acknowledged and frequently cited. The IMO opts for the term "Maritime Autonomous Surface Ship" (MASS), meaning "a ship which, to a varying degree, can operate independently of human interaction" (IMO 2021, annex, 3, 2018a). The IMO further refines this definition by categorizing MASS into four distinct classes, gradated according to the extent to which automation permeates the operational functions of the vessel.[20] In this categorization,[21] with ships in the first degree of autonomy, the crew is on board for the purpose of providing the ship's direction and management. However, there is automation in some operations and the seafarer can intervene when necessary. A ship in this group is referred to as a "ship with automated process and decision support." Ships with a second degree of autonomy can be controlled and operated remotely. However, the crew continues to be on board to make interventions when necessary. The ships that will bring about the most radical change in the

[17] These include NYPE 46, NYPE 92, NYPE 2015, Baltime, Gentime, Asbatime, BPTime 3, and Shelltime 3 and 4 forms. Factors such as the purpose of the vessel, the type and specification of the vessel, the trading opportunities and restrictions, the cargoes to be carried, and the parties involved have a role in determining the form of charter chosen (Plomaritou and Papadopoulos 2017, 217).

[18] The authors of the book *Time Charters* indicated that the 1946 version of the NYPE form continues to be regarded as the most significant standard form within the dry cargo sector (Coghlin et al. 2014, para. I.2). As Professor Baughen elucidates, the detailed prescriptions in NYPE 46 concerning the obligations of shipowners and charterers, hire, vessel performance, and maintenance have rendered it an indomitable fixture (Baughen 2019, 315).

[19] The first draft of the document was produced by American broker interests in 1913. NYPE 2015, the sixth version, is the result of a joint authorship by the Association of Shipbrokers and Agents, the Baltic and International Maritime Council (BIMCO), and the Singapore Maritime Foundation (BIMCO 2015).

[20] In addition to the IMO's categorization, there are other automation levels suggested by organizations such as Lloyd's Register, DNV, Burea Veritas, Nippon Kaiji Kyokai, and the American Bureau of Shipping. For more on these classifications, see Fukuto (2021, 40–48); Sözer (2024, 46–49); Wright (2020, 37–44).

[21] Explanations regarding the categorization of autonomous ship are made considering IMO (2018b, annex I, 1). This categorization was later endorsed by the committee (IMO 2018c, 36).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

maritime industry are those with the third and fourth degrees of autonomy, due to the absence of a crew on board the ship. In third-degree ships, the crew is not on board; it is accepted that the ship is operated and managed remotely by personnel in a center established on land or on shore. A ship in this category is a "remotely controlled ship without seafarers on board," or a semi-autonomous ship. Finally, ships with a fourth degree of autonomy, or "fully autonomous ships," have no crew on board and no active control by personnel from the remote operation center. Through AI systems integrated into the system, the ship determines its movement by evaluating the current situation and conditions and making the necessary decisions regarding the operation of the ship without the need for human support. In spite of the self-operation feature of this group of ships, remote operation centers still exist,[22] but the role of center personnel is limited to monitoring the actions of the system and decision-making process in case of system failure (IMO 2017a, 6). Whatever the method of operation and the level of autonomy, there should be a person in charge of the autonomous ship, either on board or in a remote operation center, who has the authority to intervene, performing the duties of the master (IMO 2023e, 42, 2023b, 4). Regarding the relationship between these accepted degrees, the IMO suggests that the levels do not represent a hierarchical order (IMO 2018b, annex 1, 1, 2021, annex, 4).

Based on these autonomy levels, theoretically, in a particular case, a ship may operate at just one level. There may be no expectation that the ship's autonomy level will change; the ship is assumed to operate at a fixed autonomy level throughout the voyage, or to maintain a "static autonomy level" (Barber et al. 2000, 145). However, it is also possible to design systems where the autonomy level changes during the voyage, based on different conditions or operations. For example, a ship may be designed to operate autonomously while sailing on the high seas, but the design might also enable control to transfer to the operator or crew during specific phases of the voyage, such as passing through a busy strait, entering a port, or performing docking or loading operations (AAWA 2016, 30; Ringbom and Collin 2021, 14–15). A ship's autonomy level may change multiple times during the voyage (Barber et al. 2000, 130; Sözer 2024, 45). This is referred to as a "dynamic autonomy level" in ship operation. Autonomous ships will transition freely between different levels of autonomy during a particular voyage (AAWA 2016, 6–7; Fukuto 2021, 47; Maritime UK 2022, 20–21; Ringbom and Collin 2021, 14–15; Yang et al. 2020). The operation and design of autonomous ships currently in service, such as the *Yara Birkeland*[23] and the *Prism Courage*,[24] support this submis-

[22] This can be inferred from the assumptions accepted for regulatory scoping exercise by the Maritime Safety Committee at its 103rd session (IMO 2021, annex, 6).

[23] The ship currently navigates autonomously under the supervision of a crew of three on board, but with mooring, for example, done manually (Yara 2024).

[24] The *Prism Courage* is an LNG ship currently in the testing period for a transoceanic voyage, designed to be operated under the fourth degree of autonomy. It has sailed for more than 300 hours without human intervention, except for the approval process. See IMO (2023c, 2).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

sion.[25] The analysis in this chapter is approached through the prism of "dynamic autonomy." The term "autonomous ship" is used to refer to a ship operated without any crew on board.

2.2.2 *Remote Operation Center*

Unlike conventional ships, autonomous ships consist of two separate parts, the first of which has a classical appearance at sea. Because the crew is completely separated from the ship, its operation and monitoring involve a remote operation center.[26] That center is defined as "a location remote from the MASS that can operate some or all aspects of the functions of the MASS" (IMO 2023b, 6).[27] The center is also defined as a structure consisting of computer hardware, telecommunications equipment, and various high-tech tools arranged to perform a specific function, managed and operated by the relevant personnel (Sözer 2024, 84).[28] It is possible to list the functions of the center as monitoring the ship, ensuring the ship's direction and management, collecting data, and fulfilling certain legal obligations (Sözer 2024, 89–92). However, depending on the fact of each case, its main function may change during a particular voyage. Following the dynamic autonomy submission, for example, if the ship proceeds on the high seas, the main function of the center might be to monitor the ship. But, if the ship is sailing through a busy strait, the main function of the center might be to control the ship. Physical conditions and technical conditions may require such an active role change by the center during the voyage. It may not be technically possible to sail the ship remotely throughout the voyage – for example, where continuous data exchange and communication between the ship and the operation center, located either on land or aboard another vessel,[29] is not provided (AAWA 2016, 4). This communication would depend on the transmission of high-resolution and large-scale data collected by various sensors, cameras, radar, infrared technology, and the Automatic Identification System (AIS),

[25] For the explanations and citations given in this paragraph, the author is indebted to Dr. Selim Ciğer, whose recent submissions are summarized here (Ciğer 2024, 1152–1153).

[26] In 2022, the IMO updated its terminology, referring to what was previously known as a "shore control center" as a "remote operation center" (IMO 2023b, 6).

[27] The UK is among the first countries to specifically address remotely operated unmanned vessels in a code. Annex 2 of *The Workboat Code Edition 3* concerns remotely operated unmanned vessels. In the Code, the remote operation center is defined as "either a shore-based location which is permanent or mobile or a manned vessel from which a remotely operated unmanned vessel is operated" (MCA 2023, 26).

[28] For definitions as to remote operation centers in the literature, see Choi and Lee (2021, 448n11).

[29] Although these centers were referred to as shore centers when the concept of the center was first placed on the agenda, it was later suggested that they could be established not only on shore but also on land or at a location on the sea: for the first approach, see AAWA (2016); MUNIN (2016); for the second, see Sözer (2024, 85). The definition of a remote operation center in *The Workboat Code Edition 3* indicates that the center can be at any shore-based location or on manned ships (MCA 2023, 26).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

ensuring that the operation center can maintain uninterrupted access to the ship's systems (Ciğer 2024, 1145).[30] The reliability of current technologies to facilitate such data transfer is debatable, particularly concerning potential risks arising from connection delays, as well as adverse factors such as weather and distance (1145).[31] Solutions may involve utilizing both technologies (remote operation and autonomous operation) in tandem (1146)[32] and active role changes at the remote operation center. The ship will be controlled through an interface in which the bridge is simulated in the center, which replicates camera and sensor systems on the ship, plus controls such as steering gear and joysticks for the remote operator.[33]

There are three main issues around the concept of the remote operation center. The first relates to the status of the remote operator.[34] The remote operator is responsible for monitoring the ship's condition, course, speed, and environmental factors during navigation in light of the information sent from the ship; supervising the decision held by the system; and, when necessary, taking direct operation and management of the ship (Ciğer 2024, 1149; Sözer 2024, 88–93). The Joint Working Group (JWG) has yet to explain fully the role of the remote operator, though it has provisionally affirmed that, irrespective of the level of autonomy, a human captain must preside over each autonomous ship (IMO 2023b, 4). In the report submitted by the International Federation of Shipmaster's Associations on the roles and responsibilities of the master, it is also emphasized that autonomous ships are ships by nature and that they need a master. Autonomous ships, like all ships, should be under the command and control of a master who has both situational awareness and sufficient maritime knowledge (IMO 2023a, 4). The role of the ship master will not disappear, but the execution of the role may be filled by a person on land who has the necessary qualifications and can exercise discretionary authority when necessary (4). A MASS ship master may be preferred over traditional manning (IMO 2023a, annex, 1). At this point, it should be mentioned that the UK was among the first countries to issue regulations on personnel working in remote operation centers. The Maritime and Coastguard Agency adopted the *Workboat Code Edition* 3 in December 2023. The technical requirements for the operation of ships remotely controlled are regulated within Annex 2. The Code is also important in terms of the definition of the remote operator. In Annex 2, the remote operator is defined as "any person, including the Master, with recognised or certifiable experience who is engaged in the remote operation of a [Remotely Operated Unmanned Vessel]" (MCA 2023, 27). The existence of a master in the remote operation center is also accepted by the

[30] Ciğer cites AAWA (2016, 30–32); Ringbom and Collin (2021, 9): Ciğer (2024, 1145n51).
[31] Ciğer cites AAWA (2016, 30–32); IMO (2024a, 4); Vartdal et al. (2018, 9–10): Ciğer (2024, 1145n52).
[32] For similar submissions, see AAWA (2016, 13); IMO (2023d, annex, 9); Vartdal et al. (2018, 12).
[33] For examples of these structures, see Rolls-Royce (2016a); for video, see Kongsberg (2021); Rolls-Royce (2016b).
[34] For detailed analysis of the legal status of the remote operator, see Choi and Lee (2021).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

JWG, which notes that the human master should have the means to intervene in ship operations when necessary, regardless of the mode of operation and the autonomy level (IMO 2023b, 4). Analysis held in the literature also demonstrates that the general trend is to treat the remote operator of the ship as a master while the application of master-related terms is evaluated. For example, the authors who analyze the application of Article 4(2)(a) of the Hague-Visby Rules[35] to autonomous ships submitted that a remote operator can be treated as the functional equivalent of a master in the context of the relevant article, so that the carrier can escape from liability for loss and damage arising due to the fault of the remote operator in the navigation or management of the autonomous ship (Baughen 2021, 87–88; Stevens 2020, 159, 161). The prevailing view, in essence, is to regard those entrusted with the control and operation of the ship – despite their absence from the ship's physical presence – as holding positions akin to master and crew.[36] It follows that personnel tasked with the governance of autonomous ships should be recognized in a capacity resembling that of the ship's master, bearing responsibilities comparable to those traditionally assigned to the master. This rationale, therefore, warrants the assertion that the relationship between the shore-based operational center staff and their autonomous vessels mirrors, in substance, the long-established association between the master and the time charterer.

The second issue regarding the remote operation center is whether each center and remote operator will be responsible for the operation of only one ship or more than one. The MUNIN project plans for up to ninety ships controlled from a remote center (Porathe et al. 2014, 2). The project also suggests that one operator may be responsible for monitoring and controlling up to six ships (Man et al. 2015, 2676). The possibility of a master being in charge of more than one ship was supported by the JWG (IMO 2023b, 5). It can be inferred from this approach that the general view of the JWG is that more than one ship can be controlled from one center. One of the currently active remote operation centers, Massterly in Horten, Norway, provides management and operation services for the *Yara Birkeland* and ASKO's electric barges MS *Marit* and MS *Therese*. This example also demonstrates the practical application of a single center controlling multiple ships (Massterly 2024; Wilhelmsen 2024). In fact, if it is accepted that each vessel will be controlled from a separate center, this will require a huge number of centers to be set up and staffed. From an economic perspective, this proposition appears to lack rationality, so probably the most effective approach would be to operate as many ships as possible from a single center.[37]

[35] International Convention for the Unification of Certain Rules of Law relating to Bills of Lading, August 25, 1924 (Hague Rules), as amended by the Protocol Amending the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading, February 23, 1968, 1412 UNTS 128.

[36] For a similar submission, see Choi and Lee (2021, 459); Soyer et al. (2022, 7); Stevens (2020, 148, 152).

[37] For the submissions that one operator can operate multiple ships, see Karlis (2018, 121); Soyer et al. (2022, 44); Stevens (2020, 148, 153).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

The final issue is who will provide the remote operation service. It can be argued that the owner of an autonomous ship can construct its own center and staff it with personnel to monitor and operate the ship. However, these centers consist of computer hardware, telecommunications equipment, and various high-tech tools. The cost of establishing a remote operation center varies based on factors such as facility size, technology integration, and operational requirements. For example, while the cost of equipping and maintaining an autonomous bulker, inclusive of annual operational expenses and rental commitments, remains a matter of rough estimation, it is acknowledged that the investment for the development of the remote operation center lies between US$1 million and US$2.1 million, with annual operational outlay approximating US$0.87 million. The establishment of such a center entails a recurring cost of US$33,000 per vessel annually (Ziajka-Poznańska and Montewka 2021, 6–8), alongside the considerable infrastructure expenses, as exemplified by the KRISO research center's construction cost of 22.1 billion Korean won (approximately US$16 million) (KRISO n.d.). Following these values, the construction of an individual center by each owner may not be considered economically viable, especially if the shipowner operates a single ship. Since, as noted above, operating more than one ship from the center is a sensible choice, it could be argued that where the shipowner operates larger fleets, it could set up its own remote operation center and all its ships could be operated from the same center. Considering the fact that shipping companies even arrange special ports for their fleet,[38] this could also be done with respect to the operation center and it could be cost-effective. However, depending on the area it is traveling through, as the ship moves from one port to another it may be necessary for it to change the operation center (Sözer 2024, 85; see also Baughen 2021, 84),[39] such as the air traffic control area and the vessel traffic services system.[40] This may be due to the difficulty of transmitting information when the ship is at a great distance from the center (Sözer

[38] For instance, the Mediterranean Shipping Company owns a terminal in Genoa port, which facilitates the seamless operation of its fleet (Combine Goodz 2021). Similarly, A. P. Moller-Maersk, through its subsidiary APM Terminals, operates numerous port facilities worldwide, including dedicated terminals in various countries (Maersk 2022). These strategic investments in port infrastructure enable shipping companies to exert greater control over their logistics operations, thereby reducing reliance on external port facilities and mitigating potential disruptions in their supply chains. For another recent example, see Berger (2024).

[39] Professor Baughen, during his analysis on the seaworthiness obligation of the carrier, raises this question: "Will seaworthiness through the competence of the 'crew' attach at the time the voyage starts or will this be a moveable feast attaching each time the vessel passes into the orbit of a new set of [shore-based controllers]?" Behind these words, there might also be a thought that a new set of shore-based controllers might be an issue at the time each center is changed (Baughen 2021, 84).

[40] Some academics point to similarities between the remote operation center and vessel traffic services. In this regard, see Carey (2017, 29–30); Soyer et al. (2022, 46). Air traffic control services are stated as the closest setup to a remote operation center (Sözer 2024, 95).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

2024, 85; see also Carey 2019, 7).[41] When the ship goes outside the control area of the remote operation center, the owner of the ship might be required to connect with another center. Rather than the service of remote operation being provided by the shipowner and associated maritime centers throughout the entire voyage, third-party shipping management companies will usually be involved in the operation process. It is not uncommon for shipowners that do not have shipping knowledge and experience to contract with a company to provide technical, crew, and commercial management and ancillary services (Plomaritou and Papadopoulos 2017, 115). The company can provide a remote operations center and personnel to operate the ship, either onshore or on board, as well as serve as the technical managers of the ship (Hunter 2020).[42] Steps taken by the Baltic and International Maritime Council (BIMCO) actually reflect this view. The AUTOSHIPMAN agreement was recently adopted by BIMCO in view of the increasing number of remotely operated ships, with the aim of providing a contractual framework for third-party ship managers that deliver operational services for these ships. It contains terms regarding the obligations, responsibilities, and liabilities of the parties (BIMCO 2024b). The form is drafted considering the SHIPMAN 2024 agreement (BIMCO 2024a). In addition, the number of companies offering management and operation services for remotely operated and autonomous vessels is growing by the day (Massterly n.d.; Ocean Infinity 2022). The specialized nature of the capabilities and technology featured in these remote operation centers means that it is prudent to delegate ship responsibilities to specialized entities.

2.3 THE CONCEPT OF TIME CHARTERPARTY AND APPLICABILITY FOR AUTONOMOUS SHIPS

Time charters are simply contracts for the use of the ship and crew, under which the ship is manned by the shipowner and the charterer has the right to direct the commercial employment of the ship for an agreed period of time within the agreed trading limits in respect of geographical limitations and the type of cargo permissible in consideration of payment of hire, without obtaining possession of the ship

[41] In *Unmanned Ships and the Law* (Sözer 2024), Hans Ottosen, then CEO of Danelec Marine, pointed to the difficulty in transmitting constant vessel data due to satellite capacity and speed and suggested that operations of remote-controlled ships will be restricted to the area that is close to the shore with access to high bandwidth. Following this, it can also be said that where the ship is operated in a wider area, a practice could be developed that requires a change of center.

[42] Analysis of the AUTOSHIPMAN form shows that it is designed in a way that third-party managers provide technical management (box 6), crew management (box 7), and commercial management (box 8) of the ship, depending on the preference of the shipowner. The AUTOSHIPMAN form and permission to use it here have kindly been provided by BIMCO. It should be noted that BIMCO is the creator and copyright holder of the contract and any commercial use of the contract should be through BIMCO's contract editor, SmartCon.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

(Baughen 2021, 93).[43] From the shipowner's standpoint, time charters are significant as they provide an opportunity for the shipowner to gain income for a particular period of time without worrying about operational costs. For charterers, this type of contract also serves an important purpose. As stipulated by Lord Wilberforce in *The "Nanfri"* case, "the nature and purpose of [a time charter] is to enable the charterers to use the vessels during the period of the charters for trading in whatever manner they think fit."[44] Most charterers are speculators who aim to gain from the fluctuations in the charter market (Plomaritou and Papadopoulos 2017, 226). From their perspective, time charters are a tool to maximize profits. Time charters are often used by traders who need transportation for their goods and wish to have maximum flexibility regarding the commercial usage of the ship (225). For example, for sellers who do not own a vessel but often sell their goods under a cost, insurance, and freight contract, time charters are a useful tool to perform their obligations under such sale contracts. There is, therefore, no doubt that time charters play a vital role in international trade.

The fact that a ship is autonomous does not change the significance of the time charter, but it may require a slight change in the definition. Indeed, one of the fundamental features of a time charter is that it gives the charterer the contractual right to direct the commercial employment of the ship within the agreed trading limits through the employment orders given to the master.[45] In the case of autonomous ships, since there is no crew on board to follow the charterer's employment orders, the ship is in fact chartered in a bare form – in other words, without crew. It is uncertain whether the concept of time charter will continue to exist or whether it will commence to be used as a form of bareboat charter.

A bareboat charter is a contractual arrangement whereby a ship is chartered by a third party without any crew on board. Under this agreement, possession of the ship and full authority over it pass to the charterer for an agreed period in return for a hire payment (Davies 2005, para. 1.1).[46] Bareboat charters are entered into not so much for the purpose of transporting goods but as part of a complicated financial arrangement. Often, the charterer will in due course become the owner of the ship.[47]

[43] For explanations of the characteristics of the time charter, see *Skibsaktieselskapet Snefonn, Skibaksjeselskapet Bergehus and Sig Bergesen D.Y. & Company v. Kawasaki Kisen Kaisha Ltd. (The "Berge Tasta")* [1975] 1 Lloyd's Rep. 422, 424; *Scandinavian Trading Tanker Co. A.B. v. Flota Petrolera Ecuatoriana (The "Scaptrade")* [1983] 2 Lloyd's Rep. 253, 256–257.

[44] *Federal Commerce & Navigation Co. Ltd. v. Molena Alpha Inc. (The "Nanfri")* [1979] AC 757, 777.

[45] NYPE 2015, Clause 8(a) ("Performance of Voyages"), states in part: "The Master shall be conversant with the English language and (although appointed by the Owners) shall be under the orders and directions of the Charterers as regards employment and agency." That provision is commonly referred to as the employment clause, which will be discussed in more detail later in this chapter.

[46] An explanation of the characteristics of the demise charter is given in the judgment of *The "Giuseppe di Vittorio"* [1998] 1 Lloyd's Rep. 136, 156.

[47] A hire purchase agreement may, for instance, involve a bareboat charter arrangement. In a variant of this, a financial institution may extend a loan to facilitate the purchase of a vessel,

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

The contract in question may at first sight appear to be similar to a time charter, but with the difference that the bareboat charterer is obliged to provide its own crew, have the possession of the ship, and assume responsibility as "owner" for any liabilities arising during the operation of the ship.[48] Since the crew is employed by the charterer, any acts, omissions, or negligence committed by the crew are also considered to be the responsibility of the charterer under a bareboat charter.

Where the remote operation center and personnel working in the center are arranged by the time charterer in cases where there are no crew on board an autonomous ship, the concept of time chartering in the form of bareboat chartering is effectively beginning to be used (Baughen 2021, 97). However, the accuracy of this submission might change depending on whether – in the future, when autonomous ships are involved in time charter operations – the arrangement of remote operation centers and personnel provided by the time charterer will be the preferred method.

From the shipowner's point of view, this might at first sight seem to make sense. One of the shipowner's fundamental concerns under a time charter is that the orders given by the charterer during the charter period remain within the agreed trading limits and do not cause any unsafe situation for the ship, crew, and cargo. This concern in relation to the traditional ship is currently managed by the shipowner and its employee, the master. When the order is first given by the charterer, it is evaluated and a decision is then made to follow or reject it. With regard to autonomous ships, if trading limits in terms of geographical restrictions and the type of cargo permitted under the time charter and safety issues can be managed by the shipowner through an AI system, the shipowner may not need a person to protect its interests in the ship, crew, and cargo and may prefer not to deal separately with a remote operation center (Baughen 2021, 97). While this method makes the shipowner's work easier, it has two downsides. First, such an approach may give a harm to the nature of the time charter. The time charterer's right to use the ship is only limited with commercial employment of the ship. Arrangement of the remote operation center and personnel by the charterer in one sense means that navigational management of the ship is also transferred to the charterer. This transfer has the potential to disrupt established concepts under time charter. For example, in a case where the charterer fails to pay the charter hire on time, if the conditions arise, the shipowner has the right to suspend the charter service and withdraw the ship from the service.[49] While the control of the operation center is in the hands of the time charterer through personnel appointed by the charterer,

subsequently taking ownership of the ship while leasing it back on a bareboat charter to the borrower for the term of the loan. This arrangement permits the bank to mitigate both the operational expenses and the liabilities typically associated with the vessel's operation, which it would otherwise bear under a mortgage agreement. See the example in Williams (2013, 132).

[48] The differences between bareboat charter and time charter were explained by MacKinnon L.J.: "There is all the difference between hiring a boat in which to row yourself about, in which case the boat is handed over to you, and contracting with a man on the beach that he shall take you for a row, in which case he merely renders services in rowing you about." *Sea and Land Securities v. William Dickinson* (1942) 72 Lloyd's Rep. 159, 163.

[49] These rights of the shipowner are stipulated under Clause 11(c) and (d) of NYPE 2015.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

how can the shipowner exercise these rights? It will not be physically possible for the shipowner to perform these rights without the cooperation of the charterer. The charterer can continue to use the ship, disregarding the shipowner's rights. Another example relates to the redelivery stage of the ship. It is well settled that under a time charter the charterer is obliged to redeliver the ship to the shipowner at the end of the charter duration (Coghlin et al. 2014, para. 4.30). However, where the control is in the hands of the charterer, although the shipowner does not want the ship to be delayed or redelivered early, the charterer can still send it to the most distant port by giving the orders to the personnel it has appointed, causing a late redelivery, or leave it earlier than the end of the duration. Thus, the arrangement of the center and personnel by the charterer might result in the charterer taking control of the ship in a manner that may conflict with the shipowner's interests under the time charter. With regard to the arrangements with the center made by the charterer, although the charterer does not have the ship physically, since he controls the ship remotely or autonomously, he can still be treated as having possession of the ship, and this will conflict with the nature of the time charter.[50] Second, considering the value of autonomous ships, which is likely to be higher than that of conventional ships, no shipowner is likely to trust the charterer to the extent that arrangements as to the remote operation of the ship are made by the charterer.[51]

Further, time charterers are mostly speculators who want to profit from the fluctuations in the charter market, or traders who need to transport their goods. Considering that the remote operation of ships and the selection of personnel for the center are areas that require more expertise than the management of traditional ships due to the high level of technology, they may have concerns about arranging for the remote operation center to take control of someone else's ship. In addition, assuming responsibility as "owner" for any liabilities arising during the operation of the vessel might carry additional risk. Therefore, in the future, it is more likely that the charterer will prefer not to be involved in the remote operation arrangement.

For these reasons, it is most likely that the shipowner will make arrangements for the center and personnel for the operation of the autonomous ships. The shipowner can make these arrangements itself or it may contract with third-party shipping management companies.[52] The latter is likely preferable because if the shipowner becomes the employer of the center personnel, there may be problems if several ships owned by different people are operated from the same center. Whatever the

[50] In instances where remote operation arrangements are undertaken by the charterer, since the shipowner loses the control of the ship and it can also be said that it loses the possession of the ship, it would be more precise to accept that the contract between the shipowner and the charterer is given a status of demise charter.

[51] A similar point is made when discussing who will be the employer of the remote operators under the demise charter: see Amaxilati (2022, 119).

[52] Under Clause 10 of the AUTOSHIPMAN form, the manager can be made responsible either for providing the remote operation center or for managing it, depending on the agreement of the parties. Crew management can also be left to the manager (see Clause 7).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

preference, the autonomous ship is provided to the time charterer for a period of time with the remote operation center and personnel. In this case, the time charter will not take the form of a bareboat charter. The concept of time charter will continue to exist; the possession of the ship remains with the shipowner, but the definition needs to be broadened to indicate that the time charter is a contract to use the ship and "the arranged remote operation centers with personnel" for a specified period of time within the agreed trading limits. This outcome is based on the assumption that, under the time charter, the remote operation center and personnel are arranged by the shipowner or its appointed management company.

Following this model, the concept of time charter will continue to exist, but the relationship between shore-based personnel and the charterer, and between the shipowner and shore-based personnel, is added to the equation. It should be noted here that the charterparty agreement is operated under the freedom-of-contract principle. This means that contractual parties may freely decide the terms of their contract (Williams 2013, 131). They are not subject to any mandatory rules unless the charter contains a clause paramount.[53] Therefore, where time charters are made for autonomous ships in the future, it might be necessary for the contractual parties to make certain amendments related to contractual terms and their obligations and rights. In addition, the terms referring to the crew and master in the forms must be reconsidered. The remainder of this chapter is dedicated to those issues, with particular reference to NYPE 2015 and English case law.

2.4 ANALYSIS OF FUNDAMENTAL RIGHTS AND OBLIGATIONS OF SHIPOWNERS AND CHARTERERS UNDER TIME CHARTERS FOR AUTONOMOUS SHIPS

2.4.1. *The Shipowner's Obligation to Provide a Ship That Complies with the Charter Description at the Time of Delivery*

It is common to see a clause in time charters that describes features of the ship such as class, cargo capacity, nationality, speed, and bunker consumption. From the charterer's point of view, this clause is probably one of the most important parts of the time charter, as the charterer agrees to pay a fixed rent for an unknown vessel for

[53] The phrase "clause paramount" typically refers to clauses in contracts (such as bills of lading or charterparties) that identify certain governing rules – often those of a recognized international convention – that override the contractual terms in cases of conflict. These clauses ensure that the terms of international conventions like the Hague-Visby Rules or the Hamburg Rules supersede the contract's provisions on issues such as the limitation of liability, rights, and duties of the carrier, in the event of inconsistency. In *Homburg Houtimport B.V. v. Agrosin Private Ltd. ("The Starsin")* [2003] 1 Lloyd's Rep. 571, para. 35, the House of Lords emphasized the importance of the clause paramount in determining which international rules govern a contract of carriage.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

the entire period of the charter, based solely on the contractual description of the vessel. The shipowner's obligation under the description clause is to provide a ship that conforms to the contractual description (Coghlin et al. 2014, para. I.33). Providing a ship that does not comply with the charter description is a breach of the charter, and the charterer is entitled to damages for the loss suffered, unless the charterparty contains a provision that excludes the shipowner's liability for its failure (para. 3.18). If the description in the charter indicates condition status,[54] such as the ship's class,[55] or an intermediate term status, such as the ship's speed and bunker consumption (Coghlin et al. 2014, para. 3.77),[56] the shipowner's failure to provide a ship that complies with the description can be considered a repudiatory breach, and the charterer has a right to terminate the charter. Under NYPE 2015, descriptions as to the ship are given in the preamble. In addition, the form contains Annex A ("Vessel Description") – a detailed vessel questionnaire that forms part of the charterparty. There is also Clause 12, under which speed and bunker consumption are stipulated.[57] When time charters are made for autonomous ships, the descriptive information given about the ship in the form needs to be extended.

Autonomous shipping possesses distinctive features that will facilitate functions such as mooring, berthing, and cargo handling without the need for human assistance. The *Yara Birkeland*, a ship that is currently expected to perform these operations, serves as a tangible example of this emerging technological development.[58] From the charterer's perspective, capabilities of the ship to perform these

[54] Under English law, contractual terms are classified as condition, warranty, and innominate terms depending on their importance for contractual parties. While the term "condition" is used to refer to the fundamental term of the contract and its breach gives the innocent party the right to terminate the contract (*Poussard v. Spiers* (1876) 1 QBD 410), the term "warranty" is used to express an immaterial term of the contract, the breach of which entitles the innocent party only to claim for damages (*Bettini v. Gye* (1876) QBD 183). The third category of the contractual term, an innominate term, is later added to the other two in *Hongkong Fir Shipping Company Ltd. v. Kawasaki Kisen Kaisha Ltd. (The "Hongkong Fir")* [1961] 2 Lloyd's Rep. 478. It can be said that this group of terms is somewhere in the middle of the two in terms of importance. The breach of it entitles the innocent party to claim damages, but in order that the right to terminate the contract is provided the breach must have "deprived [the innocent party] of substantially the whole benefit which it was intended that he should obtain from the contract": *The "Hongkong Fir,"* 494.

[55] *Routh v. MacMillan* (1863) 9 LT 541; *Cosmos Bulk Transport Inc. v. China National Foreign Trade Transportation Corporation (The "Apollonius")* [1978] 1 Lloyd's Rep. 53, 61.

[56] See *Dolphin Hellas Shipping S.A. v. Itemslot Ltd. (The "Aegean Dolphin")* [1992] 2 Lloyd's Rep. 178.

[57] For detailed analysis of Clause 12 of NYPE 2015, see Dindar (2017).

[58] During the construction and trial process of the *Yara Birkeland*, various sources pointed to the ship's ability to berth, moor, and handle cargo autonomously. (In this regard, see, for example, Ship Technology 2017.) After two years of operation, it is currently known that the ship is able to berth without any human support. However, mooring is still done manually, since the ship's robotic mooring arms remain in the testing process (Yara 2024). With regard to the cargo-handling capabilities of the *Yara Birkeland*, the author is unaware of any source that refers to this at the present time.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

operations, especially cargo handling, might be important. Under Clause 8 of NYPE 2015, "charterers shall perform all cargo handling, including but not limited to loading, stowing, trimming, lashing, securing, dunnaging, unlashing, discharging, and tallying, at their risk and expense, under the supervision of the Master." If the ship is capable of performing cargo-handling autonomously, this provision will be inapplicable. Since the charterer is not the one who has the right of ownership or possession of the chartered ship, it would not be reasonable to hold it liable for cargo-handling, which is performed by the ship under remote or autonomous operation without involvement of the charterer. In such a case, it will be more proper to impose this obligation on the shoulders of the shipowner. Thus, an autonomous ship's cargo-handling capability requires a profound shift in terms of the liability. Therefore, if the autonomous ship has such a capability, the charterer will want to be aware of this information, so the description clause should be extended by making this information a part of the ship's description.

It might also be important for the charterer to know the location of the remote operation center. Although the remote operation center and the ship are separate elements, without the center the ship will not have any meaning for the charterer. Therefore, the time charter is now a contract for the use of the ship with an associated remote operation center and personnel. This author suggests that information related to the capacity of potential remote operation centers arranged for the ship can be made a part of the ship's description. For example, if the shipowner prefers an operation center that has limited capacity and only allows the ship to be used within the geographical limit of a particular region due to data transmission difficulties and if the shipowner does not have any intention to arrange another center that extends the employment area of the ship outside of the specified region, this information should be given as part of a description clause and/or under Clause 1(b) as part of the trading limits.[59] It is important that the charterer knows this beforehand, because the information is relevant to plan future employment. If its intention is to use the ship outside of the designated area, it might not enter into the charter agreement for that ship. There might also be some cases in which the shipowner changes the remote operation center during the period of charter. The reason behind this may be due to problems the shipowner encounters with the remote operation center or its closure. The shipowner should be careful about such a change. One of the implied obligations imposed on the shipowner under the time charter is that the shipowner will not, at any stage of the charter, make any alterations to the ship that may (or potentially will) affect the services to be provided.[60] Following this, if the remote operation center is changed during the

[59] NYPE 2015, Clause 1(b) ("Trading limits") states: "The Vessel shall be employed in such lawful trades between safe ports and safe places within the following trading limits [text to be entered here] as the Charterers shall direct."

[60] *Isaacs v. McAllum* (1921) 6 Ll. L. Rep. 289, 291.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

charter period, the shipowner must arrange a center that has at least the same capabilities as the previous one. If we consider this in terms of the geographical area in which the operation center can provide the service, the center that limits the charterer's area of operation compared to the previous center should not be chosen by the shipowner. Otherwise, this will be a breach of the shipowner's implied obligation, and the charterer is entitled to damages. If it is proved that this alteration goes to the root of the contract, the charterer may also be entitled to terminate the charter.[61] Some information as to personnel in the remote operation center can also be important for the charterer to evaluate the seaworthiness of the autonomous ship. However, this information is more accurately considered under the clause dealing with the seaworthiness of the ship rather than under the description clause.

Under NYPE 2015, some changes might also be needed related to the description given to warranties for speed and bunker consumption (performance). These warranties are usually subject to weather conditions.[62] This means that the shipowner warrants that the ship will be able to achieve the described speed and bunker consumption only if good weather conditions exist. Good weather is commonly defined in time charters referring to the Beaufort[63] and Douglas scales.[64] For example, Clause 12(a) of NYPE 2015 refers to both scales to describe good weather as "wind up to and including Force four (4) as per the Beaufort Scale and sea state up to and including Sea State three (3) as per the Douglas Sea Scale."[65] In a particular case where the time charterer asserts that the ship underperformed during the voyage, the burden of proof rests on the charterer. In order to clear this hurdle, the charterer needs to show that, although good weather conditions existed, the ship underperformed. To prove this, the chartering party normally relies on a report of the ship's performance prepared by a weather routing company (WRC). Clause 12 (b) of NYPE 2015, which states that "the Charterers shall have the option of using their preferred weather routing service," provides an option to the charterer. It is made clear later, in Clause 12(d) of NYPE 2015, that the charterer can rely on this report to support its claim for underperformance. On the other hand, the ship's

[61] This conclusion is reached considering the comments by the authors of the *Time Charters* book on how the changes of elements of the ship's description affect the contractual relations (Coghlin et al. 2014, para. 3.15).

[62] See line 9 of NYPE 46, line 18 of NYPE 93, and lines 11–12 of the Baltime form.

[63] The Beaufort scale is a system for measuring wind speeds. Used both at sea and on land, it provides a scale of wind force ranging from 0 to 12. For a detailed description of each force, see Met Office (2023).

[64] The Douglas sea scale is a tool used to measure the conditions of the sea and swell. It comprises ten degrees, ranging from 0 to 9. For a description of each degree, see OceanWave Sail (n.d.); see also London Club (2001).

[65] NYPE 2015, Clause 12(a) states: "Upon delivery and throughout the duration of this Charter Party the Vessel shall be capable of speed and daily consumption rates as stated in Appendix A in good weather on all sea passages with wind up to and including Force four (4) as per the Beaufort Scale and sea state up to and including Sea State three (3) as per the Douglas Sea Scale (unless otherwise specified in Appendix A)."

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

logbook prepared by the master is preferred by the shipowner as a main source of evidence to rebut the chartering party's underperformance claims in a particular case.[66] Since they are prepared by different parties, there are often inconsistencies between weather and sea conditions recorded in a WRC report and the ship's logbook. Generally, the records maintained by the master in a logbook are given greater credence than those recorded in a WRC report. This perspective appears to be logical, given the master's status as a trained weather observer recognized by the World Meteorological Organization. The master's presence on board the vessel during the entire charter period, observing weather and sea conditions firsthand, further substantiates the credibility of these records (Harris 2014, 4). This conventional view also supports the ship's logbook by pointing out that the WRC report is prepared by using satellite imagery, which is just a snapshot of weather and sea conditions, and so that may not capture the local impact of weather and sea conditions, such as currents, on the ship's performance (4). Furthermore, data for the preparation of the report is collected only once or twice a day (Alexander 2013). Where autonomous ships are used, the traditional view will lose its dominance because information in a ship's logbook entries[67] on the effect of sea and weather conditions on the ship's performance will no longer be recorded by the master who is on board the ship but by a person in the remote operation center, or perhaps by AI using shipboard sensors. When autonomous ships are operated under time charter, there will be no difference between the ship's remote operation center logbook[68] and the WRC report in terms of the way data is collected. Both will be done remotely, but the first will be more reliable as it will be collected by an advanced system of autonomous ships and during the actual voyage. There may even be no need for the charterer's WRC arrangement. Autonomous ships will reduce the charterer's main concern that the master may exaggerate the sea and wind conditions and make inaccurate logbook entries to the shipowner's advantage. Even if the records are kept by personnel working at the center arranged by the shipowner, and there may be some contractual relationship between them and the shipowner or between them and a third-party manager arranged by the shipowner, the center personnel or its AI systems will make entries in the ship's logbook based on data collected continuously from the ship. Therefore, even if the charterer has concerns about the records, it can easily request that their accuracy be validated by the shipboard sensors.

[66] Clause 12(e) of NYPE 2015 also indicates that this will be the main source of the shipowner against the underperformance claims.

[67] A logbook is still kept in the case of autonomous ships. This submission can be supported by the recent regulatory work in the UK. Under Annex 2, para. 2.2.2 of the *Workboat Code Edition* 3, it is stipulated that all remotely operated unmanned vessels shall have a working log or equivalent which is completed and kept at the control position (MCA 2023).

[68] As the logbook is no longer kept on board the ship, this terminology may be preferred. Given the level of technology and autonomy involved in operating an autonomous vessel, this book is most likely to be kept electronically by personnel at the operation center.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

Following these explanations, it can be said that the description as to the capability of the autonomous ship to record the sea and weather conditions might also be made a part of the ship's description under NYPE 2015, so that the charterer might not need to worry about the records and the WRC arrangement indicated under Clause 12(d). Further consideration might also be needed as to Clause 12(e) of NYPE 2015. The clause indicates that where the ship fails to perform as agreed in the charter, the parties may refer the dispute to "an independent expert or alternative weather service by mutual agreement." These experts resolve disputes over underperformance claims arising from a discrepancy between the parties' evidence. This clause might be changed for autonomous ships, to state that data collected through the ships will prevail.

2.4.2 *The Shipowner's Obligation to Provide a Seaworthy Ship*

Under time charters, for the delivery of the ship to be valid and for the charter period to commence, it is important that the ship meets certain delivery requirements relating to delivery time, the place of delivery, and the condition of the ship, which are commonly set out in the charterparty. These requirements are deemed to be conditions precedent to delivery unless the terms of the contract provide otherwise. Therefore, if the ship does not comply with these requirements, the charterer may reject the ship (Coghlin et al. 2014, para. 8.3). In the context of the operation of autonomous ships, a consideration of the requirements stipulated in time charter forms indicates that those relating to the time and place of delivery may not require reevaluation. However, a more thorough analysis is necessary regarding the requirements concerning the ship's condition.

Standard time charter forms contain terms that specify how the condition of the ship should be at the time of delivery.[69] Most of the forms require the ship to be seaworthy at the time of delivery.[70] The shipowner's seaworthiness obligation under NYPE 2015 is defined in Clause 2(b):

> The Vessel on delivery shall be seaworthy and in every way fit to be employed in 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.

Even if the charter does not refer to any express seaworthiness requirement in this regard, this is implied by law.[71] The classic test for seaworthiness at common law is expressed by Scrutton L.J. as follows:

[69] Some of these terms are very detailed, such as Clause 1 of Shelltime 4, while others describe the condition of the ship very briefly, such as lines 25–26 of Baltime.

[70] See, for example, lines 21–24 of NYPE 46, Clause 2 of NYPE 93 and 2015, Clause 1 of Baltime, Clause 2.1 of BPTime 3, and Clause 1(b) of Shelltime 4.

[71] *Kopitoff v. Wilson* (1876) 1 QBD 602.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

> The ship must have that degree of fitness which an ordinary careful owner would require his vessel to have at the commencement of her voyage having regard to all the probable circumstances of it. Would a prudent owner have required that it should be made good before sending his ship to sea, had he known of it?[72]

If this question is answered in the affirmative in a particular case, then it can be said that the ship is unseaworthy. The concept of seaworthiness, in relation to traditional ships, enters the analysis mainly under three groups: (1) physical defects of the ship and inadequate and insufficient equipment; (2) inadequacy and insufficiency of the crew; and (3) inadequacy of documentation.[73] The legal principles in this regard are well established, and a substantial body of literature has already been written on this topic (Coghlin et al. 2014, ch. 8; Girvin 2011, 383–399; Kassem 2006; Zhan and Zang 2023). The shipowner's obligation to provide a seaworthy ship will continue, but these three groups should be reinterpreted and subject to potential change for autonomous ships, considered below.[74]

2.4.2.1 Physical Defects of the Ship and Inadequate and Insufficient Equipment

The traditional ship is a single object, the body, called a hull, which contains the machinery, the equipment, and the operation center that holds the crew members. Unlike traditional ships, autonomous ships are composed of two parts: a sea module and a land module. Although these two modules are separated physically, they have an operational and functional connection. Imagine that the sea part of the autonomous ship is working properly, collecting large-scale data through various sensors, cameras, and radar systems. However, there is a regular failure in the transmission of the collected data due to a communication problem related to the center. In such a case, the ship may not be able to operate unless it proceeds autonomously.[75] Defects in the operation center, such as those relating to the cyber risk management system, may also render the ship unseaworthy. Due to this distinctive feature of autonomous ships, two different concepts have been proposed as a new category of seaworthiness: "communication worthiness," which is the ability of the center to maintain continuous connectivity and provide services remotely (Sözer 2024, 85, 88), and "cyber-worthiness," which gauges the efficiency and quality of measures taken against

[72] *F. C. Bradley & Sons Ltd. v. Federal Steam Navigation Co.* (1926) 24 Ll. L. Rep. 446, 454.

[73] These three groups of categorizations are emphasized in *Papera Traders Co. Ltd. v. Hyundai Merchant Marine Co. Ltd. (The "Eurasian Dream")* [2002] 1 Lloyd's Rep. 719, 736–737.

[74] If it is accepted that such an obligation will not be an issue, this will give a harm to the essence of the contractual relations since in such a case the charterer will not be able to use the ship efficiently.

[75] While seaworthiness analysis is made in respect of Hague/Hague-Visby Rules, Professor Baughen and Professor Williams also reached the conclusion that seaworthiness analysis now extends to landward and covers issues related to remote operation centers (Baughen 2021, 83; Williams 2021, 224–225).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

cyber-attacks (Sözer 2021, 99–110). Time should tell whether these concepts will enter widespread use.

Furthermore, seaworthiness is a relative term.[76] The concept includes the type and age of the ship, the type of voyage planned, the nature of the cargo, and various other factors (Girvin 2017, 17; Kassem 2006, 25–26; Wilson 2010, 181). Therefore, depending on an autonomous ship's navigational, technical, and operational characteristics, the standard expected from a particular operation center is dynamic and subject to change.

2.4.2.2 Inadequacy and Insufficiency of the Crew

Scholars accept that the inadequacy and insufficiency of the crew for seaworthiness evaluation should extend to personnel in the operation center (Baughen 2021; Stevens 2020, 148; Williams 2021, 226–227). This conclusion is sensible because of the strong functional and operational links between the ship and the operation center. If seaworthiness analysis were not extended to land-based personnel, the charterer's right to use the ship might be harmed fundamentally, undermining the essence of the time charterer. Therefore, the duty to provide adequate and sufficient personnel for the operation center should be imposed on the shipowner as part of its seaworthiness obligation. The most challenging question is how personnel in the operation center are deemed to be adequate or sufficient.

Clause 2(b) of NYPE 2015, regarding the traditional ship, incorporates the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STCW)[77] as a benchmark to assess the crew's situation. The applicability of STCW is regulated in Article III(1), which states that the Convention "shall apply to seafarers serving on board seagoing vessels entitled to fly the flag" of a State party. Following this wording, the application of the Convention directly to personnel in the center so as to evaluate their adequacy and sufficiency might not be possible due to the requirement of working on board and to the qualifications of seafarers (Eder 2019, 55; Soyer 2021, 171; Veal and Tsimplis 2017, 322). However, the absence of specific standards regarding personnel staffing an operation center should not be interpreted as indicating they lack appropriate qualifications. Although personnel will not be present on board, the general approach adopted is to hold their position akin to that of master and crew members.[78] The persons responsible for monitoring and operating the ship from the operation center should have certain qualifications. If these standards are not established, the capability of personnel

[76] *Eridania S.P.A. v. Rudolf A. Oetker (The "Fjord Wind")* [1999] 1 Lloyd's Rep. 307, 315 (Lord Justice Clarke approved this in the Court of Appeal: [2000] 2 Lloyd's Rep. 191, 197). See also Girvin (2011, 384); Stevens (2020, 148, 150).

[77] International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers, July 7, 1978, 1361 UNTS 2 (STCW).

[78] See Section 2.2.2.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

working in each center will be different, with the result that the risks to which each ship is exposed during its voyage will vary according to the qualifications of the center's personnel. This can even affect insurance. Determining the required qualifications and competences of personnel in the center may not be easy. First, although the deployment of these personnel will be from land and not from sea, it may still be possible to take into account some of the standards that should be met in relation to seafarers for these personnel. The STCW Appendix to Regulation II/2 contains regulations on the minimum knowledge required for the certification of the masters and chief mates of ships weighing 200 gross registered tons or more:

> A master has ultimate responsibility for the safety of the ship, its passengers, crew and cargo, and that a chief mate shall be in a position to assume that responsibility at any time, examination in these subjects shall be designed to test their ability to assimilate all available information that affects the safety of the ship.

Since personnel working in the center will also be responsible for the safe navigation of the ship and its cargo, it will be appropriate to seek the qualifications and characteristics of the master and chief mate stated in this regulation for personnel working in the operation center, rather than associating them directly with the seafarers on board the ship. For example, the information that personnel in the center may need includes radar devices, meteorology and oceanography, ocean current systems, ship maneuvering and handling, and maritime law. One might think that when a ship with a fourth degree of autonomy is operating autonomously, these skills might not be needed because the ship is capable of performing all functions independently. But that assertation may not be entirely accurate. The ship may start its voyage under full autonomy, but, when it needs human support and remote control, personnel with these skills could have a significant effect.

In addition, the STCW is within the scope of Regulation II/2, the mandatory minimum requirements for being certified as master and first mate on ships weighing over 200 gross tons. Masters and chief mates of ships weighing 1,600 or more gross tons will be required to have an appropriate certificate. To obtain this certificate, each candidate must comply with the conditions set by the flag State administration in terms of health, especially vision and hearing. In addition, for certification as master, at least thirty-six months is needed; however, this period may be reduced to at least twenty-four months if at least twelve months of seagoing service has been performed as a chief mate or if the administration requires special training that is considered equivalent to this service. The health condition required under this regulation can be explained by the ability to fulfil the task effectively, and the condition of having served for a certain period of time before can be explained by the experience requirement of the work to be performed. At this point, similar conditions should also be required from personnel at the center, given the nature of the work to be performed by them.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

Following this analysis, to some extent the qualifications required by the STCW can apply to personnel working in the center.[79] Two recent legal steps – the AUTOSHIPMAN form[80] and the UK *Workboat Code Edition 3*[81] – also show that qualifications expressed in the STCW will continue to be applicable. However, the pursuit of the qualifications in the STCW alone will not be sufficient for these personnel due to the distinguishing feature of remote operations. For example, although Clause 5(a) of AUTOSHIPMAN references the STCW, other qualifications also apply: "The Managers shall provide suitably qualified Crew who shall comply with the requirements of the Applicable Laws (including but not limited to the STCW)."[82] Such an approach is sensible because, while personnel in the center ensure the safe navigation of the ship, this navigation is carried out by systems with a high degree of autonomy. This specialized work has particular requirements (Choi and Lee 2021, 461; Williams 2021, 227; Wright 2020, 91).[83] For example, personnel receive training in software, communication technology, and special protocols regarding autonomous ship operation (Veal and Tsimplis 2017, 323). The existing regime regulating the training and certification standards for vessel traffic system personnel (IMO 1997) can be applied to training and certification standards for personnel working in the center (Amaxilati 2022, 120).

In conclusion, with regard to crew-related requirements set out in NYPE 2015, reference to the STCW is necessary but insufficient in terms of an autonomous ship's operation. Additional requirements should be incorporated into the clause. The common position of the JWG regarding personnel capabilities is that training, certification, and competency requirements will be addressed under the MASS Code using the STCW requirement as a basis (IMO 2023b, 5).

2.4.2.3 Adequacy of Documentation

Documentation is the third focus for the seaworthiness analysis of autonomous ships. The governing law of the contract, the law of the flag, or the law of the port

[79] For a similar view, see Choi and Lee (2021, 456).

[80] AUTOSHIPMAN, Clause 5(a) states: "The Managers shall provide suitably qualified Crew who shall comply with the requirements of the Applicable Laws (including but not limited to STCW)."

[81] The *Workboat Code Edition 3* provides: "Training and certification requirements for manned vessels are applicable to operators of Remotely Operated Unmanned Vessels" (MCA 2023, annex 2, para. 7.2.4).

[82] Similarly, Clause 7.2.5 of the *Workboat Code Edition 3* provides: "A remote operator shall . . . be appropriately trained and qualified for the remote operation of all vessels they are required to operate" (MCA 2023).

[83] For submissions that the STCW and new requirements as to shore-based personnel should found application side by side for cases where a dynamic autonomy level (see Section 2.2.1) from onboard operation to remote control became an issue, and that while the first continues to be applicable for seafarers on board, new requirements are sought for personnel in the center: see Amaxilati (2022, 121); Carey (2017).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

may legally require documentation (Girvin 2019, 450; Wilson 2010, 11). Documents relating to cargo, navigational charters, and documents required under the International Safety Management Code and the International Ship and Port Facility Security Code are included in seaworthiness analysis (Kassem 2006, 45). Where the autonomous ship has started to be used, especially for the carriage of goods internationally, documents related to safety management, emergency plans, and documents that show autonomous features of the ship might be required to test compliance of the ship with the relevant port features.

2.4.2.4 Timing for Seaworthiness Analysis

Is the wording in NYPE 2015 regarding the point in time considered for the seaworthiness analysis applicable to the operation of an autonomous ship under time charter? Unlike its predecessors, which required the ship to be in a seaworthy condition and ready to receive cargo at the time of delivery,[84] NYPE 2015 separates the shipowner's obligation to deliver the ship in a seaworthy condition from its obligation to deliver the ship in a cargoworthy condition.[85] The reason for this change is that in practice the first port of loading is usually different from the place of delivery specified in the charterparty.[86] It seems unreasonable to expect the shipowner to provide a vessel capable of carrying cargo when there is no cargo at the place of delivery. Following this separation of the two obligations, Clause 2(c) of NYPE 2015 now gives the parties the right to choose the time at which the shipowner is obliged to provide a cargoworthy vessel. That time can be either at delivery or at the first port of loading, as agreed between the parties. Where time charters are made for an autonomous ship, the wording adopted in NYPE 2015 for cargoworthiness can remain. However, with regard to the analysis of the seaworthiness of an autonomous ship, the author suggests that restricting the shipowner's obligation regarding seaworthiness to the time of delivery may not serve the purpose of the obligation and might significantly affect the charterer's right to use the autonomous ship under the time charter. As explained at the beginning of this chapter, a change in the location of the remote operation center can be an issue during the voyage. If this becomes a regular practice, it might be preferable to provide the opportunity to test the seaworthiness of the ship each time it remotely connects to another remote operation center and to analyze each center following the three criteria set forth above as to seaworthiness. Otherwise, the shipowner may not demonstrate due diligence in choosing a new operation center. In addition, even if the operation center is not changed, a change of personnel working in the

[84] See NYPE 46, lines 21–24; NYPE 1993, lines 33–36.
[85] See NYPE 2015, Clause 2(b)–(c).
[86] See NYPE 2015, Time Charterparty Explanatory Notes, 4.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

center may be an issue.[87] Change of a crew is not something that is regularly done during the voyage, as the ship is in the middle of the sea. However, personnel in the operation center may come and go at will. In this sense, autonomous ships are different from traditional ships. This difference might be considered as reasonable grounds for transforming the seaworthiness obligation to a continuous one. Although this approach is not adopted in most time charter forms and the obligation of the shipowner is heavily extended, such a change may be made in the future.

In the context of the operation of autonomous ships, analysis as to delivery requirements stipulated in NYPE 2015 shows that those relating to the time and place of delivery may not require reevaluation. However, a more thorough analysis is necessary with regard to the requirements concerning the condition of the ship – in other words, its seaworthiness.

2.4.3 *The Shipowner's and Master's Obligation to Comply with the Charterer's Orders*

In the context of a time charter, the shipowner, in consideration of payment of hire, grants the charterer the right to exploit the ship's earning capacity[88] and undertakes to provide a specified charter service. Consequently, the time charterer is entitled to provide instructions to the master about how the vessel is used. Almost all time charter forms contain a provision commonly referred to as an employment clause, which delineates the scope of the charterer's authority to issue directives to the master concerning the employment of the ship.[89] For example, Clause 8(a) of NYPE 2015 provides: "The Master … (although appointed by the Owners) shall be under the orders and directions of the Charterers as regards employment and agency." In the absence of an express stipulation in this regard, the obligation is implied because it is necessary to ensure that the contract efficiently works. It should be noted that the master is not obliged to comply with every single order given by the charterer. Under a time charter, the master is obliged to comply with the charterer's instructions as to employment, but does not have such an obligation if the instructions affect the navigation or safety of the ship. This is a well-established principle of English jurisprudence.[90] The distinctions between employment and navigation are articulated by Lord Hobhouse in *The "Hill Harmony"* case: "'Employment'

[87] This was also pointed out by Professor Baughen, who submitted that during a particular voyage, different shore-based controllers will be employed at different stages of the ship's operation. Baughen posed the question of when the seaworthiness analysis should be made in such a case (Baughen 2021, 84).

[88] *Whistler International Ltd. v. Kawasaki Kisen Kaisha Ltd. (The "Hill Harmony")* [2001] 1 Lloyd's Rep. 147, 156.

[89] NYPE 46, Clause 8; NYPE 1993, Clause 8(a); NYPE 2015, Clause 8(a); Baltime, Clause 9; BPTime 3, Clause 10; Shelltime 4, Clause 13(a).

[90] For details of this principle, see *Whistler International Ltd. v. Kawasaki Kisen Kaisha Ltd. (The "Hill Harmony")* [2001] 1 Lloyd's Rep. 147; Coghlin et al. (2014, ch. 19).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

embraces the economic aspect – the exploitation of the earning potential of the vessel. 'Navigation' embraces matters of seamanship" (at 159). Since the charterer's order regarding the selection of the ports of loading and discharge and orders relating to loading, carriage, and delivery of the cargo embrace an economic aspect, in an ordinary case these must be regarded as lawful employment orders (unless they affect the navigation or safety of the ship, cargo, or crew). Therefore, the master has a duty to follow these orders. Orders that affect the navigation and safety of the ship are left outside the charterer's right to use, as these are "matters falling within the specialized professional maritime expertise of the master" (at 152).

When this obligation of the master is considered in relation to an autonomous ship, the first question is who (in the absence of any master on board the ship) will be responsible for analyzing whether the order given by the charterer has the status of an employment order that the master is obliged to follow, or affects the navigation and safety of the ship, which the master may disregard. This function can be performed by remote operators.[91] It has also been suggested that the word "master" in the abovementioned employment clause of NYPE 2015 should be replaced by "the owners and/or the person or persons operating the vessel" (Baughen 2021, 95). Considering that an autonomous ship is operated under a dynamic level of autonomy,[92] such an approach seems sensible. In a particular case, even if the ship is operated fully autonomously during service at the time of charter, when the order is given by the charterer, the level of autonomy can be reduced to remote operation. The controller can evaluate orders given in terms of safety and navigation and then decide how to proceed. In other words, here the remote operator has started to act in the capacity of the master in assessing the orders,[93] and the remote operator's "professional maritime expertise" is brought into the assessment. In such a case, there might be no need for further analysis of this obligation, as the established rules relating to the master's assessment of the employment orders may also apply to remote operators. For example, when the order is given, it is not expected that the master is obliged to comply with every order immediately. There may be some

[91] Professor Baughen considered Clause 8 of NYPE 2015 regarding the wording that the master shall be under the orders and directions of the charterers and submitted that this function could be performed by a shore-based controller (SBC; Baughen 2021, 95). Although Baughen prefers to use the term "SBC" in his paper, "remote operator" is used throughout this chapter.

[92] For an explanation of a dynamic level of autonomy approach, see Section 2.2.2.

[93] Similarly, for example, it has been submitted that the "reasonable judgment" of the risk to the ship by the master assumes that the master is the person "on the spot" and in a good position to assess the risk to the ship, crew, and cargo. In the third degree of autonomy, the ship is unmanned but remotely controlled, so the "controller" may act in the capacity of the master in assessing the risk. These comments were made on the emphasized wording in the war risks clause (Clause 17(d)) of GENCON 1994: "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 . . . and there is another longer route to the discharging port, the Owners shall give notice to the Charterers that this route will be taken." See Hunter (2021, 211).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

orders that require further consideration. In such cases, the master has the right to evaluate the order for a reasonable period of time.[94] For an autonomous ship, such time is also provided to the remote operator. Similarly, in terms of a traditional ship, if compliance with the order in question does not fall within the scope of the charter, such as the charterer's last voyage order, causing delay, the master has the right to refuse to comply with it and to ask the charterer for a new order.[95] This can also be applied in a similar way to autonomous ships. In such cases, the remote operator can ask the charterer for a new order.

However, considering that the remote operator is expected to be responsible for the operation and monitoring of more than one ship, it might not be practical that the autonomy level during a particular voyage is reduced and then every single order of the charterer is evaluated by the remote operator. Therefore, it might be useful to leave some place for the independent decision-making ability of the ship under full autonomy. It will be evaluated below to what extent the autonomous ship may itself evaluate the charterer's orders under three groups without human support.

The first group comprises employment orders, with which the master is under an obligation to comply. Unless it affects the safety and navigation of the ship, it is expected that the autonomous system also complies with these orders. It is unclear whether the system is capable of making such an assessment. At this point, it might be useful to mention how these systems are to be operated.

AI applications mimic human cognitive and decision-making processes, achieving navigation safety on par with, if not exceeding, vessels manned by humans. In doing so, human-induced risks may be eliminated altogether. AI systems do not merely execute preprogrammed instructions, although it is impossible to program a system to account for every potential problem and solution. Rather, these systems must be capable of adapting to dynamic conditions, much like the crew members they aim to replace, and be able to resolve unforeseen issues (Porathe et al. 2018, 422). As such, it is highly probable that machine-learning methods will be predominantly employed in the management of these ships (Ringbom and Collin 2021, 10; Vartdal et al. 2018, 10). During machine-learning processes involving technology that enables computers to perform complex tasks by learning from examples, data, and experience (Royal Society 2017, 16), humans can play an active role, either by categorizing or labeling the data for the machine to analyze or, in a more limited capacity, by correcting the machine's erroneous predictions or selections (Wright 2020, 54–55).[96]

[94] *Midwest Shipping Company Ltd. Inc. v. D. I. Henry (Jute) Ltd. (The "Anastasia")* [1971] 1 Lloyd's Rep. 375, 379; *Kuwait Petroleum Corporation v. I & D Oil Carriers Ltd. (The "Houda")* [1994] 2 Lloyd's Rep. 541.

[95] *Torvald Klaveness A/S v. Arni Maritime Corporation (The "Gregos")* [1995] 1 Lloyd's Rep. 1; *The Alma Shipping Corporation of Monrovia v. Mantovani (The "Dione")* [1975] 1 Lloyd's Rep. 115, 118.

[96] For the explanations and citations given in this paragraph, the author is indebted to Dr. Selim Ciğer (Ciğer 2024, 1142–1143).

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

In some cases, the ship itself may be capable of evaluating the employment status of the charterer's order. For example, if the charterer's order is to depart from the port at a certain time, as that time approaches, the ship itself can evaluate the order in terms of safety, using data on weather and sea conditions collected by the ship's sensors. The system can then determine the most appropriate response to these conditions. Similarly, when the charterer orders the ship to slow steam or to proceed with full speed, the ship can evaluate whether it is required to comply or whether the order should be refused for safety or navigational reasons in accordance with the algorithm, engine capacity of the ship, and charterparty performance warranties. Recall, however, that time charters, by their very nature, rely on continuous adaptability to accommodate instructions from the charterer, and each order introduces potential unanticipated occurrences. Therefore, if the order given is the one that the ship itself cannot evaluate and make a decision about within its algorithm, human support might be needed. In such a case, the autonomy level can be reduced swiftly to remote operation, and the remote operator's approval, or final decision, can proceed based on the charterer's orders.

The second group comprises the orders that the master has a right to refuse. These are the orders that fall outside the scope of the agreed charter. If the effect of the employment order given by the charterers is to require the master to do something outside that scope of the agreed charter, the order requires the shipowner to provide services that it has not agreed to provide at the beginning. The master has a right to refuse this order. When the vessel is operated fully autonomously, it may be possible for the ship to evaluate these orders, taking into account the geographical and time restrictions of the charterparty. When the order is given, the autonomous system of the ship without any human support can consider algorithms related to agreed limitations and then refuse to comply with the order on the ground that it is outside the scope of the agreed charter terms. For example, if the last voyage order exceeds the agreed charter period given by the charterer, the system can calculate the length of the proposed voyage and then refuse it. Similarly, if the order causes the ship to proceed to a port outside the agreed geographical limits, the system can refuse to comply with the order. The system can correctly analyze the situation and refuse these orders on the ground that they are outside the scope of the charter. The master has a right to refuse the second group of orders. However, the master may also prefer to comply with this group of orders even though they exceed the limits of the charter. If an autonomous ship makes a decision that the shipowner does not like, a remote operator could come into an active position to overrule it.

Lastly, the master is under an obligation to refuse the third group of orders. These are orders that cause illegal and fraudulent acts (Williams 2013, 148).[97] The common

[97] Professor Williams also indicates the orders that subject the ship and crew to danger as orders that the master is obliged to refuse. The role of safety in the assessment of an employment order has been considered previously and will not be revisited here.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

example relates to a bill of lading. For example, after the cargo has been loaded on board the ship, the charterer may ask the master to sign the date of the bill earlier than the actual date. Such an order is particularly likely to be given if the charterer has entered into a sales contract under which it, as the seller, is obliged to complete the loading of the cargo on the specified date. In order not to breach its obligation under the contract of sale, the terms insist that the master signs the bill of lading as an ante-date bill of lading. Similarly, the charterer may also order the master to sign the date of charter later than the actual date (that is, postdate the bill of lading). In some cases, the charterer might also order the master to record the goods as being in apparent good order and condition, although the goods are not in such a state.[98] Since the purpose of such orders by the charterer is to defraud the consignee, the master is obliged to refuse them. The master is also under an obligation to refuse the charterer's order to deliver the cargo to a person who does not have a right to receive it, unless there is an express term to the contrary in this regard.[99]

Following this information, the question is whether the autonomous system can evaluate this type of order. Even if the ship is eligible to perform loading and discharging operations autonomously, given that a paper bill of lading is still required, since there will be no crew on board the ship, the evaluation of these types of orders can only be possible if there is involvement of a shipowner's land-based personnel. This is not something that can be done by the autonomous system or by the remote operator from another center. In terms of autonomous ship operations, if the electronic bill of lading is an issue, the author believes that land-based personnel support is still needed, but signing the bill of lading as ante or postdate can be prevented by the autonomous system.

Continuous reference to human oversight for routine operations would undermine the intended efficiency of autonomous systems. Even if the autonomous system has a role in the assessment of the charterer's order, it cannot be fully delegated to technology. An autonomous ship should do what it can to the extent of its capabilities, but if it encounters unforeseen risks or conditions that fall outside the scope of its programming and machine-learning process, it becomes essential to rely on the approvals and decisions of remote operators as to the status of the charterer's order. Following this, it is now clear that Clause 8(a), the employment clause, of NYPE 2015 should be redrafted and the obligation to comply with the charterer's order should be imposed on "the owners and/or the person or persons operating the ship and/or the autonomous system itself."

[98] See *Naviera Mogor S.A. v. Société Metallurgique de Normandie (The "Nogar Marin")* [1988] 1 Lloyd's Rep. 412. This is actually not a time charter case: voyage charterers presented an inaccurate bill of lading (although the goods were not in good condition, the bill of lading contained a statement that they were shipped in apparent good order and condition).

[99] See *Enichem Anic S.p.A. v. Ampelos Shipping Co. Ltd. (The "Delfini")* [1990] 1 Lloyd's Rep. 252.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

Where the time charterer's orders have been assessed by the ship's independent decision-making ability, in some cases legal issues may also arise as to the indemnity right of the shipowner. Indemnity is normally implied when the shipowner suffers loss or liability because of complying with the charterer's orders, unless the shipowner has agreed in the charter to bear the loss, damage, or liability in question (Coghlin et al. 2014, para. 19.32), or unless the order in question is one that the master is under an obligation to refuse (para. 19.19). The principle of causation is integral to indemnity claims. For shipowners to recover under implied indemnities, there must be an unbroken chain of causation between the instructions of the charterers and the loss suffered.[100] The advent of autonomous systems seems to challenge this direct causation paradigm. For example, if an autonomous ship grounds at an ostensibly safe port, as in *The "Erechthion"* case,[101] causation might not be straightforward. Was the grounding due to defective programming, erroneous input data, the inherent unsafety of the port, or the charterer's order? The court's finding in *The "Erechthion"* – that the grounding was proximately caused by compliance with charterers' orders – could be difficult to transpose onto autonomous scenarios. Moreover, *The "Island Archon"*[102] demonstrates that liability flows from charterers' orders when risks are not contractually assumed by the owners. It was held by the Court of Appeal that an indemnity was to be implied, since the risk of incurring liability for dubious cargo claims was one that, under the charter, the owners had not agreed to bear. An analogous argument could arise with autonomous ships where programming errors exacerbate port risks. The legal system must address whether such errors constitute an extension of the charterers' orders or an independent navigation failure.

2.4.4 *The Charterer's Obligation to Use the Ship between the Safe Ports*

The advent of autonomous ships also plants a flag on a reevaluation of traditional principles, such as the safe port obligation. The charterer's obligation to send ships only to ports that can accommodate them safely is one of the key aspects of a time charterparty. This obligation is expressly stipulated under standard charter forms.[103]

[100] *A/B Helsingfors Steamship Company Ltd. v. Rederiaktiebolaget Rex (The "White Rose")* [1969] 2 Lloyd's Rep. 52, 59; *Royal Greek Government v. Minister of Transport (The "Ann Stathatos")* (1949) 83 Ll. L. Rep. 228.

[101] *New A Line v. Erechthion Shipping Co. S.A. (The "Erechthion")* [1987] 2 Lloyd's Rep. 180.

[102] *Triad Shipping Co. v. Stellar Chartering & Brokerage Inc. (The "Island Archon")* [1993] 2 Lloyd's Rep. 388; appeal in [1994] 2 Lloyd's Rep. 227.

[103] NYPE 46, lines 27–35; NYPE 93, Clause 5; Baltime, Clause 2; Shelltime 4, Clause 4(c). In the absence of any express provision regarding trading of the vessel between safe ports, the court may imply a term in this regard if this is necessary to give business efficiency to the contract. See *Vardinoyannis v. The Egyptian General Petroleum Corporation (The "Evaggelos Th.")* [1971] 2 Lloyd's Rep. 200; *Atkins International H.A. v. Islamic Republic of Iran Shipping Lines (The "APJ Priti")* [1987] 2 Lloyd's Rep. 37, 42.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

Clause 1(b) of NYPE 2015 states: "The Vessel shall be employed in such lawful trades between safe ports and safe places within the following trading limits [text to be entered here] as the Charterers shall direct." The existence of such a provision primarily requires the charterer to direct the ship to a prospectively safe port.[104] This kind of provision is also construed to mean that if the port becomes unsafe later due to a change of circumstances while the ship is still en route, the charterer then has a secondary obligation to cancel its previous order and provide a new, prospectively safe port for the vessel.[105] The reason behind imposing a secondary obligation on the charterer regarding unsafe ports is mainly to protect the shipowner and also the crew and any third-party interests.

The automation and digitization of ships and ports redefines what constitutes the well-established general principle of a "safe port" and, particularly, the meaning of "safety." Therefore, the principle in question, rooted in protecting vessel integrity, requires recalibration to address the uniqueness posed by autonomous ships. The notion is intricately linked with the master's responsibility to navigate the ship safely and the charterer's obligation to nominate safe ports. This recalibration can be made through reference to the earlier decisions embodied in case law, as stated in *The "Mary Lou"*: points of law could arise that were not covered by the general principles, and it might then be helpful to consult earlier authorities, albeit that the conclusion of the court on such points of law should be consistent with those general principles.[106] The seminal definition of a safe port was articulated by Sellers L.J. in *The "Eastern City"*:

> A port will not be safe unless, in the relevant period of time, the particular ship can reach it, use it and return from it without, in the absence of some abnormal occurrence, being exposed to danger which cannot be avoided by good navigation and seamanship.[107]

The question of whether a port is safe for a particular vessel at a particular time is a subjective one, and the answer depends on the particular circumstances of each case. As English case law developed over time, various modalities emerged to define the concept. These include the identification of dangers as either temporary or persistent, the establishment of monitoring and reporting systems, the consideration of delays and inordinate duration, the evaluation of local warnings and departure systems, the adequacy of warning systems, the analysis of deficient berthing and mooring facilities, the evaluation of navigational aids, and the assessment of safety in

[104] *Kodros Shipping Corporation v. Empresa Cubana De Fletes (The "Evia" (No 2))* [1982] 2 Lloyd's Rep. 307, 320.
[105] *The "Evia" (No 2)*, 320.
[106] *Transoceanic Petroleum Carriers v. Cook Industries Inc. (The "Mary Lou")* [1981] 2 Lloyd's Rep. 272, 276.
[107] *Leeds Shipping Company Ltd. v. Société Française Bunge (The "Eastern City")* [1958] 2 Lloyd's Rep. 127, 131.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

departure. Considering these modalities, this analysis will first focus on the meaning of safe ports. Such an analysis is necessary to decide whether the charterer is in breach of its obligation to nominate a safe port under the time charter in the case of autonomous ships. The charterer's duty to nominate a safe port must extend beyond mere physical hazards to encompass the burgeoning risks associated with cybersecurity. In this regard, digital resilience is an integral component of the "safe port" doctrine (Shazi 2024, 3, 14).

2.4.4.1 The Meaning of Safety in the Light of Modalities

TYPES OF DANGERS. Temporary dangers described in English case law are those that arise sporadically or unpredictably and that do not inherently define the port's characteristics. Temporary dangers for autonomous ships may include weather events, systemic failures in AI navigation due to disrupted satellite signals, and unplanned latency in V2X (Vehicle-to-Everything) communication. Regarding the impact of temporary dangers on the concept of safe port, it is submitted that purely temporary dangers will not make a port unsafe. But temporary dangers may be an important element in a lack of safety, particularly if the existence of the danger is not known to the master of the ship.[108] We may infer that the temporary danger might also make the port unsafe in some circumstances.

Temporary risks, manageable through navigation, do not render a port unsafe. As Teare J. noted in *The "Ocean Victory"*: "The measure of safety is not what is 'reasonable' but whether any dangers in a port can be avoided by good navigation and seamanship."[109] The legal principles articulated in cases such as *The "Evia" (No. 2)* emphasize that charterers are not liable for a lack of safety arising from "unexpected and abnormal events" that are transient in nature. Lord Roskill clarified this principle:

> If those characteristics are such as to make that port or place prospectively safe in this way, I cannot think that in spite of them, some unexpected and abnormal event thereafter suddenly occurs, which creates conditions of unsafety where conditions of safety have previously existed and as a result the ship is delayed, damaged or destroyed, that contractual promise extends to making the Charterer liable for any resulting loss or damage, physical or financial.[110]

Following this, if the temporary danger in the port might be accounted as an unexpected and abnormal event, the charterer might escape liability. Yet temporary dangers like weather events could be handled by real-time adjustments in the ship's

[108] *Independent Petroleum Group Ltd. v. Seacarriers Count Pte. Ltd. (The "Count")* [2008] 1 Lloyd's Rep. 72, para. 22.
[109] *Gard Marine & Energy Ltd. v. China National Chartering Co. Ltd. (The "Ocean Victory")* [2014] 1 Lloyd's Rep. 59, para. 100.
[110] *The "Evia" (No. 2)*, 315.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

course or speed, if it is assumed that the system is equipped to respond. In addition, temporary dangers might be set aside, requiring advanced systems capable of real-time data processing for autonomous ships. These ships must rely on continuous environmental monitoring and data analytics to mitigate short-term hazards, such as adverse weather or sudden navigational obstructions, that may otherwise jeopardize port safety.

Persistent dangers, such as silting, may render a port inherently unsafe. In contrast to temporary dangers, persistent threats are integral to the port's nature. For autonomous ships, structural issues with the port or a consistent failure in port systems can be considered as persistent dangers. In *The "Houston City,"* the absence of hauling-off buoys and a missing fender, both long-standing deficiencies, rendered the port inherently unsafe.[111] Such deficiencies are recognized as fundamental breaches of the charterer's obligations. Sellers L.J., in *The "Stork,"* affirmed that it is not enough that a danger merely exists: the danger must be of such a nature that it constitutes a characteristic of the port that renders it unsafe.[112] For autonomous ships, addressing persistent dangers entails integrating these known risks into the programming of navigation and decision systems. The importance of standardized digital infrastructures in ports, including cybersecurity protocols and the consistent maintenance of physical and digital systems, is needed to ensure that these dangers do not compromise vessel safety. Thus, the liability implications of algorithmic errors versus port deficiencies remain a contentious area. Persistent cyber vulnerabilities, for example, could be likened to the physical deficiencies in *The "Houston City"* if they are endemic to the port's infrastructure and might require that the port in question is accepted as an unsafe port.

PROPER SYSTEMS FOR MONITORING AND REPORTING. Ports must integrate predictive technology and redundancies to handle autonomous ships, ensuring that temporary dangers (such as a loss of network coverage) are managed. The absence of AI-compatible safety systems may render a port unsafe, even if traditional dangers (such as weather) are manageable. Modern jurisprudence increasingly emphasizes port systems and information dissemination over inherent physical risks: the focus of

[111] *Reardon Smith Line Ltd. v. Australian Wheat Board (The "Houston City")* [1956] 1 Lloyd's Rep. 1.

[112] *Compania Naviera Maropan S/A v. Bowater's Lloyd Pulp and Paper Mills Ltd. (The "Stork")* [1954] 2 Lloyd's Rep. 397; appeal in [1955] 1 Lloyd's Rep. 349. In *The "Stork,"* the key issue was whether Tommy's Arm was an unsafe port. The court found that it was unsafe because it had inherent characteristics – such as its small size and exposure to regular gales – that created a persistent and unavoidable risk to ships using it. Even though the master was aware of the potential danger and had been reassured by a pilot, the port was still deemed unsafe because the risk was inherent to the location itself and could not be mitigated by the ship's ordinary precautions. Thus, a port is not unsafe merely because a danger exists, but because the danger is an inherent feature of the port itself. Temporary, unusual, or avoidable hazards (such as an isolated act of negligence by a pilot) do not necessarily render a port unsafe unless they form part of the port's general characteristics.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

unsafe port arbitrations is very often about the systems in place for dealing with known physical risks, as much as or more than physical risks.[113] For example, in *The "Marinicki,"*[114] a lack of proper systems for monitoring channel safety and reporting hazards rendered the port unsafe, even if the obstruction itself was temporary or minor. It is unclear whether autonomous ships can integrate real-time data and rely on existing port information systems, or whether ports must develop new systems that cater to their specific needs. Failure to provide this could make a port unsafe for autonomous ships under the standard set forth in *The "Marinicki."* Given this logic, ports are required to adopt cybersecurity measures that are certified in accordance with ISO standards to safeguard autonomous ships from external threats.

DELAYS. Delays at ports can transform a prospectively safe port into an unsafe one, particularly when the delay exposes the ship to additional risks. *The "Lucille"*[115] reflects the proposition that a port prospectively safe at the time of nomination can become unsafe due to congestion or other factors. This is exacerbated for autonomous ships, as they depend on digital optimization and predictive scheduling, leaving them particularly vulnerable to unforeseen delays. For example, without dynamic adjustment to traffic flows or access to real-time data on congestion, autonomous systems may fail to adequately reposition vessels to mitigate risks. Ports accommodating autonomous ships should have AI-integrated scheduling systems that minimize delays and offer automated contingency plans. The absence of such capabilities might render a port retrospectively unsafe, as autonomous ships lack the onboard human discretion to compensate for failures of external systems. However, the involvement of a remote operator might set aside potentially unsafe situations. Autonomous ships may also face difficulties in handling delays caused by unforeseen circumstances, such as cyberattacks, temporary infrastructure failures, or weather disruptions. The ability of an autonomous ship to respond to such delays may be affected by the sophistication of its navigational algorithms and the availability of alternatives for diversion. If delays lead to frustration of the voyage or inordinate duration, the port might be deemed unsafe.

LOCAL WARNINGS AND DEPARTURE SYSTEMS. The court in *The "Dagmar"*[116] emphasized the necessity of local warning systems to ensure that ships receive adequate notice to depart during adverse weather. This principle applies even more

[113] For cases that emphasize port systems, see, for example, the early case of *Smith v. Dart* (1884) 14 QBD 105 and the more recent case of *Maintop Shipping Company Ltd. v. Bulkindo Lines Pte. Ltd. (The "Marinicki")* [2003] 2 Lloyd's Rep. 655.

[114] *Maintop Shipping Company Ltd. v. Bulkindo Lines Pte. Ltd. (The "Marinicki")* [2003] 2 Lloyd's Rep. 655.

[115] *Uni-Ocean Lines Pte. Ltd. v. C-Trade S.A. (The "Lucille")* [1983] 1 Lloyd's Rep. 387.

[116] *Tage Berglund v. Montoro Shipping Corporation Ltd. (The "Dagmar")* [1968] 2 Lloyd's Rep. 563.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

stringently to autonomous ships if they rely entirely on digital inputs and preset programming for decision-making. Local warning systems should interface with the vessel's autonomous operating system to trigger immediate adjustments in course or initiate departure sequences. *The "Khian Sea"*[117] demonstrates the need for ports to provide systems to ensure that vessels can depart promptly in emergencies. For autonomous ships, these systems should include automated departure protocols that integrate weather forecasts, traffic conditions, and berthing clearances into vessel operating systems. A port failing to provide digitally integrated warnings and departure mechanisms tailored for autonomous ships likely would breach its safe port obligation.

ADEQUACY OF WARNING SYSTEMS. The adequacy of warning systems directly relates to whether a port can mitigate risks prospectively. *The "Ocean Victory"* stressed the importance of a systematic approach where warnings must be part of a broader infrastructure capable of addressing the risks associated with navigation and berth safety. For autonomous ships, the adequacy test extends beyond traditional systems (such as weather alerts and meteorological data) to encompass cybersecurity protocols. Autonomous systems are vulnerable to cyberattacks that could distort critical warning data or disable the ship's response mechanisms. For instance, a port's warning system for autonomous ships should be capable of verifying the authenticity and accuracy of incoming data to prevent tampering. Systems such as blockchain-enabled communications and secure V2X protocols have emerged as benchmarks for adequacy. A failure to provide these safeguards would compromise the safe port doctrine, as autonomous ships are entirely dependent on reliable digital inputs.

DEFICIENT BERTHING AND MOORING FACILITIES. A port may be deemed unsafe if the mooring or berthing facilities are inadequate. The impact of deficient facilities for mooring or berthing, which are prerequisites for autonomous ships, may constitute unsafe conditions if they cannot accommodate the specific operational parameters of autonomous ships, such as automated docking systems. For example, in *The "Houston City,"* the ship was damaged in a northerly gale due to the absence of a hauling-off buoy and a section of fender. It was held that Geraldton was unsafe for the ship because of these deficiencies. The case demonstrates that even temporary or localized inadequacies in infrastructure, such as missing buoys or fenders, create foreseeable risks that can render a port unsafe. This principle translates to the autonomous shipping context by necessitating a reevaluation of infrastructure compatibility. Autonomous ships require berths equipped with automated docking systems, such as dynamic positioning fenders, automated mooring arms, and AI-

[117] *Islander Shipping Enterprises S.A. v. Empresa Maritima Del Estado S.A. (The "Khian Sea")* [1979] 1 Lloyd's Rep. 545.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

driven berth allocation systems. The absence of facilities designed for autonomous operations, such as robotic line handlers or AI-guided fender positioning, may directly impact the vessel's ability to safely berth or unberth. Ports failing to provide these modernized systems could be deemed unsafe, particularly where the deficiencies foreseeably impair the vessel's autonomous systems, resulting in physical damage or delays.

NAVIGATIONAL AIDS. Navigational aids are critical to a port's safety and were addressed in *The "Saga Cob,"* which emphasized the role of navigational aids in neutralizing hazards such as properly lighted channels.[118] For autonomous ships, this requirement should extend to digital navigational aids such as real-time hydrographic updates, geofencing capabilities, and high-accuracy GPS. The failure to provide such aids would disproportionately affect autonomous ships that rely on machine-readable inputs. *The "Sussex Oak"*[119] noted that risks beyond the port's control, such as the presence of sea ice, require navigational aids to mitigate the ship's exposure. A port's failure to provide accurate digital aids, such as unreliable hydrographic surveys or poorly maintained electronic charts, may expose autonomous ships to navigation errors. These vulnerabilities can be mitigated by remote monitoring and operation, but the availability of robust navigational aids can still be considered essential to meeting the safe port standard. For example, ports utilizing augmented reality overlays for channel navigation have set new benchmarks, demanding that autonomous ships receive real-time guidance tailored to their specific draught and size. It is thought that the absence of these systems compromises the navigational safety of autonomous ships, particularly in ports with dynamic environmental conditions, such as siltation or shifting currents.

CYBERSECURITY RISKS. Even if the adequacy of port safety is provided through equipment and infrastructure, political and physical risks may also be present. For example, *The "Evaggelos Th."*[120] draws attention to political risks, such as confiscation or war, while *The "Saga Cob"* emphasizes that political threats must be an inherent characteristic of the port. In that regard, autonomous ships may introduce new threats to political safety, including State interference in digital systems (such as forced shutdowns and GPS spoofing) and risks tied to AI export controls and proprietary software regulations. Ports in politically volatile regions must demonstrate technological sovereignty and robust cybersecurity protocols to be deemed safe for autonomous ships. As per *The "Chemical Venture,"* charterers must exercise due

[118] *K/S Penta Shipping A/S v. Ethiopian Shipping Lines Corporation (The "Saga Cob")* [1992] 2 Lloyd's Rep. 545, 550.
[119] G. W. *Grace & Co Ltd. v. General Steam Navigation Company Ltd. (The "Sussex Oak")* [1949] 83 Ll. L. Rep. 297.
[120] *Vardinoyannis v. The Egyptian General Petroleum Corporation (The "Evaggelos Th.")* [1971] 2 Lloyd's Rep. 200.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

diligence to assess political and physical safety.[121] In doing so, reasonable care includes evaluating the apparent degree of danger.[122] For autonomous ships, it can be said that due diligence requires assessing port compatibility with autonomous systems and cybersecurity certifications of the port. Failure to evaluate these risks can be considered a breach of due diligence obligations.

2.4.4.2 The Charterer's Defenses to Avoid Liability

The safe port obligation also allocates liability for losses resulting from an unsafe port to the charterer who nominates it.[123] However, as can be inferred from the definition of a safe port in *The "Eastern City"* case, the charterer can escape liability if the danger is avoidable by ordinary good navigation and seamanship, or if there is an abnormal event. At this point, it is important to look at how these two exceptions will be interpreted in terms of autonomous ship operations.

ABNORMAL OCCURRENCES. Abnormal occurrences (such as rare storms or collisions caused by third-party negligence) are those that do not render a port unsafe unless inherent in the port's characteristics.[124] In the author's view, for autonomous ships, cyberattacks or failures in digital traffic management are no longer "abnormal" but are predictable risks in technologically dependent ports. Abnormal occurrences, such as sudden algorithmic failures or external interference, must be anticipated in port risk assessments (Wróbel et al. 2017, 159, 166). Ports that fail to provide adequate risk mitigation protocols should not be considered safe. Autonomous ships require ports to ensure resilience against digital anomalies and redundancy in communication protocols. The traditional doctrine of "abnormal occurrences" should exclude cyber-related failures that may be anticipated. A port prone to frequent cyber threats would be inherently unsafe for an autonomous ship.

GOOD NAVIGATION AND SEAMANSHIP. It is also important to note that a port is only considered unsafe if the risk in question cannot be avoided by the exercise of good seamanship and navigation. This implies that the shipowner and the master of a ship cannot exonerate themselves from their responsibility to mitigate the consequences of risks that, with reasonable diligence, they could have circumvented (Coghlin et al. 2014, para. 10.46). In the event of loss occurring in such circumstances, the liability shall not fall upon the charterer.

[121] *Pearl Carriers Inc. v. Japan Line Ltd. (The "Chemical Venture")* [1993] 1 Lloyd's Rep. 508.
[122] *The "Saga Cob,"* 407–408.
[123] *St. Vincent Shipping Co. Ltd. v. Bock, Godeffroy & Co. (The "Helen Miller")* [1980] 2 Lloyd's Rep. 95.
[124] See *The "Mary Lou"* and *The "Ocean Victory."*

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

In *The "Polyglory,"* the test for safety rests on whether an ordinary prudent and skillful master can reasonably overcome the risks.[125] Yet, the paradigm shift introduced by autonomous ships necessitates a reevaluation of this doctrine. Autonomous systems, equipped with algorithm-driven navigation, now assume the role traditionally entrusted to the master. However, these systems cannot, in isolation, encompass the discretionary prudence that lies at the heart of good seamanship. Where dangers arise that extend beyond the predictive capabilities of an autonomous system – such as an unforeseen port hazard, digital anomaly, or operational complexity – the role of a remote operator must be considered. This hybrid model (a dynamic level of automation) recognizes that the principle of good seamanship in autonomous navigation cannot be reduced solely to AI performance. Instead, it is augmented by the oversight of a remote operator, whose intervention replicates – to the extent practicable – the judgment of a prudent and skillful master.

Autonomous ships are designed to perform navigational tasks with precision, but their programming can be inherently limited to programmed scenarios. For example, if a port experiences sudden cyber disruptions or physical hazards, the remote operator's ability to intervene and reassess the situation ensures that the ship's actions adhere to the principles of good seamanship. As noted in *The "Ocean Victory,"* "safety is not absolute, but the measure of safety is whether any dangers in a port can be avoided by good navigation and seamanship" (para. 100). This principle now applies equally to the collaborative functioning of AI systems and remote operators, so that all risks – whether physical or digital – are managed with prudence and skill. The fundamental inquiry remains, as articulated in *The "Ocean Victory,"* whether any dangers in a port can be avoided by good navigation and seamanship. For autonomous ships, it can be said that this inquiry incorporates two critical components: (1) AI's operational capacity, which is the primary executor of good seamanship in routine navigation – that is, whether the autonomous system, operating as programmed, can navigate safely within the anticipated parameters of port conditions; and (2) remote operator intervention, which acts as the secondary layer of decision-making, stepping in when the vessel's AI systems encounter risks outside its programmed parameters. To this end, as an adjunct to the vessel's navigation, the remote operator does not supplant the AI but ensures that its actions are aligned with maritime principles when faced with unforeseen events. A failure to recognize this dual structure would be to ignore the realities of modern navigation and, indeed, to leave the vessel bereft of the discretionary judgment required under the doctrine of good seamanship.

[125] *Kristiandsands Tankrederi A/S v. Standard Tankers (Bahamas) Ltd. (The "Polyglory")* [1977] 2 Lloyd's Rep. 353, 363. Similarly, it was pointed out in *The "Ocean Victory"* that the standard required is that "expected of the ordinary prudent and skilful master": para. 112.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

2.4.4.3 Suggestions for the Application of the Safe Port Doctrine for Autonomous Ships

The available modalities for interpreting the "safe port" principle and the charterer's defense to avoid liability are interpreted above in the context of autonomous shipping. Since the safe port doctrine is mainly developed by case law, and the obligation of the charterer to use the ship only between safe ports is included in NYPE 2015 with the words "The Vessel shall be employed . . . between safe ports and safe places," this author does not propose any changes to the text. This wording is also applicable in terms of autonomous ships. However, in NYPE 2015, an autonomous ship can specifically be recognized, so the language should be amended to account explicitly for the safety requirements of technologically advanced vessels. For example, "safe port" should be redefined to include compatibility with autonomous ship infrastructure, such as sensor networks, automated berthing systems, and robust cybersecurity measures. More importantly, the meaning of safety and exceptions in the context of autonomous ships should be reinterpreted by case law. Globally recognized standards for smart port technologies should be adopted, ensuring consistency and reliability across international ports.

2.4.5 *The Charterer's Obligation to Payment of Hire-Off Hire*

The payment of hire by the charterer in consideration of the use of the ship is another obligation for consideration in relation to the autonomous ship. This obligation is expressly stipulated under Clause 17 of NYPE 2015. In the case of autonomous ships operating under time charter, it is important to acknowledge that the charterer's obligation remains unchanged. The expectation is that the remote operation services are arranged by the shipowner. In most cases, these services will be provided by third-party shipping management companies upon agreement with the shipowner, rather than the shipowner setting up its own center. Since the time charterer will be outside the contractual relationship between the shipowner and the center, the charterer should not be exposed to any further obligation as to payment made in consideration of remote and autonomous operation of the ship. This responsibility should remain with the shipowner. The author suggests that, in the context of autonomous ships engaged in time charter operations, the discussion surrounding payment of hire is likely to be predominantly focused on the concept of off-hire. An off-hire clause is a common feature of time charters.[126] While the exact wording of these clauses varies among charters, it serves to release the charterer from its obligation to pay the hire for a period during which the ship cannot be used due

[126] See NYPE 46, Clause 15; NYPE 93, Clause 17; NYPE 2015, Clause 17; Baltime, Clause 11(a); Shelltime 4, Clause 21(a); Shelltime 3, Clause 21; BPTime 3, Clause 19.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

to circumstances beyond its control.[127] Clause 17 of NYPE 2015 contains two main parts. The latter part of the clause addresses the issue of loss of time resulting from a decrease in the ship's speed. This constitutes an alternative avenue for loss recovery for the charterer in cases of underperformance of the ship.[128] The section requiring further consideration in terms of an autonomous ship is the initial part of the clause, which refers to particular events:

> *In the event of loss of time from deficiency and/or default and/or strike of officers or ratings, or deficiency of stores, fire, breakdown of, or damage to hull, machinery or equipment, grounding, detention by the arrest of the Vessel, . . . or detention by Port State control or other competent, authority for Vessel deficiencies, or detention by average accidents to the Vessel or cargo, unless resulting from inherent vice, quality or defect of the cargo, drydocking for the purpose of examination, cleaning and/or painting of underwater parts and/or repair*, or by any other similar cause preventing the full working of the vessel, payment of hire and overtime, if any, shall cease for the time thereby lost. (emphasis added)

There are two potentially problematic issues surrounding the off-hire clause in NYPE 2015 regarding autonomous ships in time charters. The first is the impact of the text "preventing the full working of the ship." Although the clause quoted above is silent as to whether the charterparty must be completely interrupted or whether the partial loss of the service provided in a particular case is sufficient to accept that the full operation of the vessel is prevented, the NYPE off-hire clause is a net loss of time clause.[129] Therefore, a partial loss of the charterparty service is also accepted as sufficient for the charterer to benefit from the off-hire clause. Following this, if an autonomous ship operation is prevented partially, for example, it can still be said that the charterer benefits from the off-hire clause.

The second problematic issue is related to events that trigger the off-hire clause. It is accepted that the vessel will be off-hired if these specified events prevent the full operation of the ship. Some of the italicized text identifies events that may still have a role in terms of autonomous ship operations. For example, issues pertaining to the radar system or sensor of the autonomous ship can be interpreted under the

[127] *Mareva Navigation Co. Ltd. v. Canaria Armadora S.A. (The "Mareva A.S.")* [1977] 1 Lloyd's Rep. 368, 381.

[128] For how the second part of the clause has a role in underperformance claims, see Coghlin et al. (2014, paras. 25.78–25.81). Although comments in that book regarding the relevant subject focus on the wording (lines 99–100) in NYPE 46, the wording preferred in the second part of the off-hire clause in NYPE 2015 (lines 402–405) is not different. Therefore, it is submitted that the explanations offered are also valid for NYPE 2015.

[129] The authors of the *Time Charters* book, while evaluating the net loss of time status of the off-hire clause in NYPE 46, noted the wording "shall cease for the time thereby lost" in line 99 of NYPE 46. They submitted: "Clauses of this kind, which allow the charterers to deduct hire equivalent to the amount of time lost, rather than for the whole of a defined period, are called 'net loss of time'" (Coghlin et al. 2014, para. 25.56). Following this, since similar wording also exists in NYPE 2015, it can be said that clause 17 of NYPE 2015 is also a net loss of time clause.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

"machinery or equipment" group. Although the first part of the events responds, to some extent, to the need for autonomous ship operations, the problems that may arise in relation to the remote operation center, such as a physical deficiency of the center preventing the full operation of the ship, do not fall under any of the events listed. This is normal because autonomous ship operations were not considered when the clause was drafted. It is also important to explore whether at least the second part of the events expressed in the clause under the wording of "by any other similar cause" prevent the full working of the vessel and its lash-up to the operation center.

At first sight, the text appears to cover all types of events that prevent the full operation of the vessel. It may be suggested that all types of events that occur during the operation of an autonomous ship and prevent the full working of the ship could fall under this group. Following this, during the operation of an autonomous ship, if there are any problems related to the remote operation center or personnel in the center, the charterer could benefit from the off-hire provision under this category. However, due to the existence of the word "similar," the text must be regarded as referring to the same types of causes as those previously mentioned in Clause 17.[130] The term therefore will only apply to other similar causes listed in the first part of the clause. When the events listed in the first part above are considered in terms of autonomous ship operations, none of them appear related to events that might arise at a remote operation center. Therefore, it is difficult to include the loss of time in relation to the operation center and personnel in the center in the "any other similar cause" wording. If the word "whatsoever" is inserted and the wording in the NYPE 2015 off-hire clause is redrafted as "any other cause whatsoever," there will be no need for the causes to be the same as those in the list to trigger the off-hire clause.[131] This approach underscores the dispositive effect of the word "whatsoever."[132] In such cases, problems relating to remote operation centers or personnel at the centers can

[130] It should be noted here that, contrary to the wording of NYPE 93 and NYPE 2015 ("any other similar cause"), the wording "any other cause" is preferred to express the second part of events under NYPE 46, so that the word "similar" is missing. However, it is submitted that this wording is also interpreted as covering the same types of causes as those previously mentioned in line 99 of NYPE 46 on grounds of a rule of construction known as the *ejusdem generis* rule: *Andre & Cie S.A. v. Orient Shipping (Rotterdam) B.V. (The "Laconian Confidence")* [1997] 1 Lloyd's Rep. 139, 150; see also Coghlin et al. (2014, paras. 25.37–25.41). Adding "similar" before "any other cause" under the off-hire clause in NYPE 93 and NYPE 2015 simply makes the *ejusdem generis* causes explicitly effective (Coghlin et al. 2014, para. 25.41).

[131] For examples of cases related to the interpretation of the "whatsoever" wording, see *Belcore Maritime Corporation v. F.LII. Moretti Cereali S.p.A. (The "Mastro Giorgis")* [1983] 2 Lloyd's Rep. 66; *Andre & Cie S.A. v. Orient Shipping (Rotterdam) B.V. (The "Laconian Confidence")* [1997] 1 Lloyd's Rep. 139, 151; *Cosco Bulk Carrier Co Ltd. v. Team-Up Owning Co Ltd. (The "Saldanha")* [2011] 1 Lloyd's Rep. 187, para. 36.

[132] *Belcore Maritime Corporation v. F.LII. Moretti Cereali S.p.A. (The "Mastro Giorgis")* [1983] 2 Lloyd's Rep. 66, 68.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

fall within the second part of the events and the charterer can gain the benefit of the off-hire clause. However, inclusion of the phrase "whatsoever" will widen the scope of the off-hire clause considerably, so it will be challenging to convince the shipowner to accept this new text. Instead, the easier solution would be that, considering the nature of autonomous ship operation, the list of events given in the initial part of the clause is expanded to include new events sui generis to the remote operation center, such as a breakdown of the connection system, software issues, and data transmission problems. It should be noted that although these problems arise, in some cases this might not prevent the full operation of the ship and loss of time may not arise. For example, if the ship is operated remotely and its control and operation are lost due to a failure in data transmission, and the ship's autonomous operation feature comes into play (as a result of the dynamic autonomy of the ship) and the ship is still able to operate on its own, there will be no loss of time, so there will be no off-hire period. In addition, it is possible that the service provided in the operation center is disturbed due to fire, flood, earthquake, or other natural events, so that the full working of the ship is prevented. Such events might also be incorporated into the clause. As given above, the off-hire clause also refers to particular events related to the crew – such as deficiency, default, or labor strike – and those types of events might also arise at the center. Such a situation is, of course, more manageable than at sea, but might still cause loss of time for the charterer. Therefore, a deficiency, default, or labor strike of personnel in the center should be included in the clause.[133]

Given that the occurrence of some types of events, such as communications or software problems, may regularly disturb the operations of autonomous ships, the incorporation into the clause of a provision for de minimis events is sensible. Such a provision makes the activation of an off-hire clause conditional on the minimum period required by the clause to have been lost due to events specified in the clause.[134] For example, according to the de minimis provision in BPTime 3, the ship is not considered to be off-hire in a case in which the loss of time is less than three hours in any calendar month. Under that clause, the charterer is deemed to have calculated the time lost due to an off-hire event incorrectly if it takes into account a loss of time less than three hours. The addition of such a provision in NYPE 2015 could prevent the expected but common problems related to software and connection problems from causing legal issues between the parties if they occur for only a short period of time.

[133] Professor Baughen also draws attention to the fact that the phrase "deficiency and/or default and/or strike of officers" will have no meaning in relation to the autonomous operation of the ship. It has been suggested that this wording should be redrafted to refer to "servants or agents of the owners involved in the performance of the charter" to serve the purpose of the off-hire clause. See Baughen (2021, 96).

[134] See Shelltime 4, lines 346–348; BPTime 3, lines 352–353.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

2.5 CONCLUSION

The integration of AI into the maritime shipping sector is advancing rapidly. While autonomous vehicle technology is nearing practical implementation on roads, with automotive manufacturers worldwide competing for dominance, similar developments are occurring in the maritime domain both domestically and internationally. Autonomous ships play a critical role in military missions, hydrographic surveys, and oil exploration. The shipping sector of the carriage of goods by sea has also started to benefit from autonomous ships, but this benefit is currently limited to domestic carriage. Moving AI into international seagoing vessels is challenging due to the lack of an international framework. Developing an AI regime for international shipping will be possible only after the MASS Code has been completed. However, the adoption of the Code may not be sufficient to enable autonomous ships to trade globally. Standard maritime contracts, such as charterparties and management contracts, should also be ready for this type of carriage. The latter are now in place, with the AUTOSHIPMAN form recently released by BIMCO. However, no steps have been taken to integrate autonomous shipping in the law governing charterparties. This chapter offered elements for a regime for time charters.

The analysis shows that the wording of NYPE 2015 is not flexible enough to accommodate the concept of autonomous shipping with regard to the fundamental obligations of the shipowner and charterer under time charters. These terms need to be reconsidered and the clauses dealing with these obligations under NYPE 2015 should be redrafted. Regarding the shipowner's obligation to provide a ship that complies with the charter description, it can simply be said that it is necessary to add new elements as part of the ship's description. The shipowner's obligation to provide a seaworthy ship should be reevaluated considering issues as to the remote operation center and personnel at the center so that the time charterer uses the ship efficiently during the period of charters. Time charters, by their very nature, rely on continuous adaptability to accommodate instructions from the charterer. Analysis of the shipowner's obligation to comply with the charterer's order shows that the assessment of the status of the charterer's orders, whether they are employment orders or not, by an AI system might not always be an issue. The remote operator is likely to be involved in the assessment process in some cases. This shows the importance of a dynamic autonomy level in ship operations, especially under time charters. With regard to the charterer's obligation to use the ship only between safe ports, it is imperative to reevaluate the concept of a safe port within the context of case law, taking into account features of the autonomous ships and their operational capabilities. Finally, the off-hire clause of NYPE 2015 needs to be redrafted to cover events relating to the remote operation center and personnel employed there, as these may cause the charterer to lose some level of service during the charter period. Although there is no separate analysis in this chapter regarding the wording of master and crew used in NYPE 2015, it can simply be said that this language should be replaced with the

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

words "shipowner, remote operator, or personnel at the center," and the form should include a definition of what the remote operator and remote personnel mean in the context of the form.

REFERENCES

AAWA (Autonomous Waterborne Applications Initiative). 2016. "Remote and Autonomous Ships: The Next Steps." AAWA Position Paper.

Alexander, Leon. 2013. "Speed & Performance: Discrepancies between Ships' Data and Independent Weather Bureaus." *Clyde & Co Shipping Newsletter*, February 8.

Amaxilati, Zoumpoulia. 2022. "The Human Element in Autonomous Shipping." In *Disruptive Technologies, Climate Change and Shipping*, edited by Barış Soyer and Andrew Tettenborn. Informa Law.

Barber, K. Suzanne, Anuj Goel, and Cheryl E. Martin. 2000. "Dynamic Adaptive Autonomy in Multi-Agent Systems." *Journal of Experimental & Theoretical Artificial Intelligence* 12 (2): 129–147.

Baughen, Simon. 2019. *Shipping Law*. 6th ed. Routledge.

2021. "Unmanned Vessels and International Conventions for the Carriage of Goods by Sea." In *Artificial Intelligence and Autonomous Shipping: Developing the International Legal Framework*, edited by Barış Soyer and Andrew Tettenborn. Bloomsbury.

Berger, Paul. 2024. "DP World Is Seeking to Build a Trade Hub in Mexico." *Wall Street Journal*, September 25.

BIMCO (Baltic and International Maritime Council). 2015. "NYPE 2015." Accessed December 18, 2024. www.bimco.org/contracts-and-clauses/bimco-contracts/nype-2015.

2024a. "AUTOSHIPMAN Now Available." December 17. Accessed December 20, 2024. www.bimco.org/insights-and-information/contracts/20241217-autoshipman-now-available.

2024b. "BIMCO Approves First Management Agreement for Autonomous Ships." November 8. Accessed December 20, 2024. www.bimco.org/news/priority-news/20241009-autonomous-ships.

Burmeister, Hans-Christoph, Wilko Bruhn, Ørnulf Jan Rødseth, and Thomas Porathe. 2014. "Can Unmanned Ships Improve Navigational Safety?" *Transport Research Arena (TRA) 5th Conference: Transport Solutions from Research to Deployment*. Accessed January 25, 2025. https://publications.lib.chalmers.se/records/fulltext/198207/local_198207.pdf.

Cain, Fiona, and Matthew Turner. 2018. "Autonomous Ships: Are We Ready?" Hayes Boone, May 17. www.haynesboone.com/news/publications/cain-and-turner-on-autonomous-ships.

Carey, Luci. 2017. "All Hands Off Deck? The Legal Barriers to Autonomous Ships." CML Working Paper Series, No. 17/06.

2019. "Report on BIMCO Autonomous Ship Seminar." Report 19/01, National University of Singapore, Centre for Maritime Law.

Choi, Junghwan, and Sangil Lee. 2021. "Legal Status of the Remote Operator in Maritime Autonomous Surface Ships (MASS) under Maritime Law." *Ocean Development & International Law* 52 (4): 445–462.

Ciğer, Selim. 2024. "Yeni Tip Gemilerin İşleyiş Esasları Bakımından Otonomi Kavramı ve IMO'nun Otonom Gemi Kategorileri Üzerine Düşünceler." *İstanbul Hukuk Mecmuası* 82 (4): 1135–1183.

CMI (Comité Maritime International). 2023. "Maritime Law for MASS." Accessed December 20, 2024. https://comitemaritime.org/work/mass/.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

Coghlin, Terence, Andrew W. Baker, Julian Kenny, John D. Kimball, and Thomas H. Belknap, Jr. 2014. *Time Charters*. 7th ed. Informa Law.
Combine Goodz. 2021. "Mediterranean Shipping Company." September 14. Accessed January 20, 2025. www.combinegoodz.com/blog/Mediterranean-Shipping-Company/.
Coraddu, Andrea, Luca Oneto, Beatriz Navas de Maya, and Rafet Kurt. 2020. "Determining the Most Influential Human Factors in Maritime Accidents: A Data-Driven Approach." *Ocean Engineering* 211: 107588.
Davies, Mark. 2005. *Bareboat Charters: A Practical Guide to the Legal and Insurance Implications*. 2nd ed. Informa Law.
Dindar, Ceren Cerit. 2017. "The Performance of the Chartered Ship: A Much Clearer Obligation under the NYPE 2015?" *Journal of International Maritime Law* 23 (6): 425–442.
Eder, Bernard. 2019. "Unmanned Vessels: Challenges Ahead." *Lloyd's Maritime and Commercial Law Quarterly* 25 (1): 47–56.
Fukuto, Junji. 2021. "Automation Levels of Automated/Autonomous Ships." *ClassNK Technical Journal* 4: 35–50.
Girvin, Stephen. 2011. *Carriage of Goods by Sea*. 2nd ed. Oxford University Press.
2017. "The Obligation of Seaworthiness: Shipowner and Charterer." CML Working Paper Series, No. 17/11.
2019. "The Carrier's Fundamental Duties to Cargo under the Hague and Hague-Visby Rules." *Journal of International Maritime Law* 25 (6): 443–462.
Harris, Graham. 2014. "Speed and Consumption." *Speed and Consumption Issues Conference*, London Shipping Law Centre, October 22.
Hunter, Grant. 2020. "First Ever Standard Form Contract for Autonomous Ship Operation Underway." BIMCO, November 6.
2021. "Standard Contracts for the MASS(es): Charterparties and Other Arrangements for Autonomous Ships." In *Ship Operations: New Risks, Liabilities and Technologies in the Maritime Sector*, edited by Barış Soyer and Andrew Tettenborn. Informa Law.
IMO (International Maritime Organization). 1997. "Guidelines for Vessel Traffic Services." A 20/Res.857 (December 3, 1997).
2017a. "Final Report: Analysis of Regulatory Barriers to the Use of Autonomous Ships." Submitted by Denmark. MSC 99/INF.3 (January 18, 2017).
2017b. "Scoping Exercise on Autonomous Vessels Put on Agenda." www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MSC-98th-session.aspx.
2018a. "IMO Takes First Steps to Address Autonomous Ships." May 25. www.imo.org/en/MediaCentre/PressBriefings/Pages/08-MSC-99-MASS-scoping.aspx.
2018b. "Regulatory Scoping Exercise for the Use of Maritime Autonomous Surface Ships (MASS): Report of the Working Group." MSC 99/WP.9 (May 23, 2018).
2018c. "Report of the Maritime Safety Committee on Its Ninety-Ninth Session." MSC 99/22 (June 5, 2018).
2021. "Outcome of the Regulatory Scoping Exercise for the Use of Maritime Autonomous Surface Ships (MASS)." MSC.1/Circ.1638 (June 3, 2021).
2022a. "Development of a Goal-Based Instrument for Maritime Autonomous Surface Ships (MASS): Draft Road Map for Maritime Autonomous Surface Ships." MSC 105/7 (April 22–29, 2022).
2022b. "Report of the Maritime Safety Committee on Its 105th Session." MSC 105/20 (May 19, 2022).
2023a. "Common Issues Identified in the RSEs of the Three Committees and How Best to Address Them, Including Consideration of the Outcome of MSC 106, FAL 47 and LEG

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

110 and Any Documents Referred to MASS-JWG 2 by the Three Committees." Submitted by IFSMA. MASS-JWG 2/2/1 (March 8, 2023).

2023b. "Development of a Goal-Based Instrument for Maritime Autonomous Surface Ships (MASS): Report of the MSC-LEG-FAL Joint Working Group on Maritime Autonomous Surface Ships (MASS) on Its Second Session." MSC 107/5/1 (May 2, 2023).

2023c. "Development of a Goal-Based Instrument for Maritime Autonomous Surface Ships (MASS): Results of a Transoceanic Voyage Test with Autonomous Navigation System." Submitted by the Republic of Korea. MSC 107/INF.18 (March 28, 2023).

2023d. "Development of a Goal-Based Instrument for Maritime Autonomous Surface Ships (MASS): Study on the Definition and Organization of a Remote Control Centre (RCC) with a View to Its Certification." Submitted by Belgium. MSC 107/INF.14 (March 28, 2023).

2023e. "Report of the Maritime Safety Committee on Its 107th Session." MSC 107/20 (June 26, 2023).

2024a. "Consideration of Common Issues, Taking into Account Those Identified in the RSE and by FAL 47, LEG 110 and MSC 107." Network Governance Submitted by Liberia, Republic of Korea, and United Arab Emirates. MASS-JWG 3/3/3 (March 27, 2024).

2024b. "Maritime Safety Committee: 109th Session (MSC 109), December 2–6, 2024." Accessed January 20, 2025. www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MSC-109th-session.aspx.

Infomaritime. 2018. "Timeline: Development of Autonomous Ships (1970s–2018)." June 8. http://infomaritime.eu/index.php/2018/06/08/timeline-development-of-autonomous-ships/.

Inoue, Soichiro, and Hideo Mori. 2021. "Development of Automated Ship Operation Technologies: MEGURI 2040 Unmanned Ship Demonstration Experiment Project." *ClassNK Technical Journal* 3: 59–66.

Karlis, Thanasis. 2018. "Maritime Law Issues Related to the Operation of Unmanned Autonomous Cargo Ships." *World Maritime University Journal* 17 (1): 119–128.

Kassem, Ahmad Hussam. 2006. "The Legal Aspects of Seaworthiness: Current Law and Development." PhD diss., Swansea University.

Kongsberg. 2021. "Kongsberg Maritime: Remote Operation Center." https://youtu.be/UPtdgiIrlJI?feature = shared.

Kretschmann, Lutz, Hans-Christoph Burmeister, and Carlos Jahn. 2017. "Analyzing the Economic Benefit of Unmanned Autonomous Ships: An Exploratory Cost-Comparison between an Autonomous and a Conventional Bulk Carrier." *Research in Transportation Business & Management* 25: 76–86.

KRISO. n.d. "Autonomous Ship Verification & Evaluation Research Center." Accessed January 20, 2025. https://kriso.re.kr/menu.es?mid = a20202070000.

London Club. 2001. "Weather-Wise Performance." *Stoploss Bulletin* 21 (February): 1.

Maersk. 2022. "A.P. Moller-Maersk Divests Its Share in Global Ports." August 29. www.maersk.com/news/articles/2022/08/29/maersk-divests-its-share-in-global-ports.

Man, Yemao, Monica Lundh, and Thomas Porathe. 2015. "From Desk to Field: Human Factor Issues in Remote Monitoring and Controlling of Autonomous Unmanned Vessels." *Procedia Manufacturing* 3: 2674–2681.

Marine Industry News. 2022. "China Launches Autonomous Container Ship Zhi-Fei." May 4. https://marineindustrynews.co.uk/china-launches-autonomous-container-ship-zhi-fei/.

Maritime UK. 2022. *Being a Responsible Industry: Maritime Autonomous Ship Systems (MASS) UK Industry Conduct Principles and Code of Practice*. Version 5.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

Massterly. 2024. "Remote Operations Centre Opened." March 8. www.massterly.com/archives/blog-post-title-three-mrmsx.
n.d. "Massterly: Pioneering the Autonomous Shipping Industry." www.massterly.com.
Mayflower 400 UK. n.d. "The Mayflower Autonomous Ship." Accessed January 10, 2025. www.mayflower400uk.org/mayflower-autonomous-ship/.
MCA (Maritime and Coastguard Agency). 2023. *The Workboat Code Edition 3: The Safety of Small Workboats and Pilot Boats: A Code of Practice*.
Met Office. 2023. *Factsheet 6: The Beaufort Scale*. National Meteorological Library and Archive.
MUNIN (Maritime Unmanned Navigation through Intelligence Networks). 2016. "Final Report Summary: MUNIN (Maritime Unmanned Navigation through Intelligence in Networks)." https://cordis.europa.eu/project/id/314286/reporting.
Nippon Foundation. n.d. "The Nippon Foundation MEGURI2040 Fully Autonomous Ship Program." Accessed January 25, 2025. www.nippon-foundation.or.jp/en/what/projects/meguri2040.
Ocean Infinity. 2022. "Remote Control Centre Goes Live." February 15. https://oceaninfinity.com/remote-control-centre-goes-live/.
OceanWave Sail. n.d. "Douglas Sea Scale." Accessed January 25, 2025. https://oceanwavesail.com/explore-sailing/douglas-sea-scale/.
Plomaritou, Evi, and Anthony Papadopoulos. 2017. *Shipbroking and Chartering Practice*. 8th ed. Informa Law.
Porathe, Thomas, Nicole Costa, and Åsmund Tjora. 2014. *MUNIN D7.4: Organizational Layout of SOC*. MUNIN.
Porathe, T. Å. Home, Ø. Rødseth, K. Fjørtoft, and S. O. Johnsen. 2018. "At Least as Safe as Manned Shipping? Autonomous Shipping, Safety and 'Human Error.'" In *Safety and Reliability: Safe Societies in a Changing World*, edited by Stein Haugen, Anne Barros, Coen Gulijk, Trond Kongsvik, and Jan Erik Vinnem. CRC Press.
Ringbom, Henrik, and Fellix Collin. 2021. "Terminology and Concepts." In *Autonomous Ships and the Law*, edited by Henrik Ringbom, Erik Røsæg, and Trond Solvang. Routledge.
Rolls-Royce. 2016a. "Autonomous Ships: The Next Step." www.rolls-royce.com/~/media/Files/R/Rolls-Royce/documents/%20customers/marine/ship-intel/rr-ship-intel-aawa-8pg.pdf
Rolls-Royce. 2016b. "Rolls Royce Plans to Deploy Fully Autonomous Cargo Ships by 2020." Accessed January 25, 2025. https://youtu.be/yRwQ95vXVmM?feature = shared.
Royal Society. 2017. *Machine Learning: The Power and Promise of Computers That Learn by Example*. DES4702.
Shazi, Ntandokazi. 2024. "An Evaluation of the Safe Port Obligation in the Light of Smart and Autonomous Ships." NUS Law Working Paper 2024/005, NUS Centre for Maritime Law Working Paper 24/02.
Ship Technology. 2017. "YARA Birkeland Autonomous Container Vessel." October 5. www.ship-technology.com/projects/yara-birkeland-autonomous-container-vessel/?cf-view.
Soyer, Barış. 2020. "Autonomous Vessel and Third Party Liabilities: The Elephant in the Room." In *New Technologies, Artificial Intelligence and Shipping Law in the Twenty-first Century*, edited by Barış Soyer and Andrew Tettenborn. Informa Law.
2021. "The Future of Autonomous Shipping: The Regulatory Challenge." In *Artificial Intelligence and Autonomous Shipping: Developing the International Legal Framework*, edited by Barış Soyer and Andrew Tettenborn. Bloomsbury.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press

Soyer, B. A. Tettenborn, and G. Leloudas. 2022. *Remote Controlled and Autonomous Shipping: UK Based Case Study*. Swansea University, Institute of International Shipping and Trade Law.

Sözer, Bülent. 2021. "Seaworthiness within the Context of Cyber Risks: Cyberworthiness." In *Ship Operations: New Risks, Liabilities and Technologies in the Maritime Sector*, edited by Barış Soyer and Andrew Tettenborn. Informa Law.

2024. *Unmanned Ships and the Law*. Informa Law.

SpaceX. 2021. "A Shortfall of Gravitas." SpaceOFFSHORE, July. https://space-offshore.com/a-shortfall-of-gravitas/.

Stevens, Frank. 2020. "Carrier Liability for Unmanned Ships; Goodbye Crew, Hello Liability?" In *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century*, edited by Barış Soyer and Andrew Tettenborn. Informa Law.

Tettenborn, Andrew. 2020. "Shipping: Product Liability Goes High-Tech." In *New Technologies, Artificial Intelligence and Shipping Law in the Twenty-first Century*, edited by Barış Soyer and Andrew Tettenborn. Informa Law.

Tunfors, Henrik. 2022. "Evolution of IMO's MASS: Through the Prism of the Chair." In *Autonomous Vessels in Maritime Affairs: Law and Governance Implications*, edited by Tafsir Matin Johansson, Jonatan Echebarria Fernández, Dimitrios Dalaklis, Aspasia Pastra, and Jon A. Skinner. Palgrave Macmillan.

Vartdal, Bjørn Johan, Rolf Skjong, and Asun Lera St. Clair. 2018. "Remote-Controlled and Autonomous Ships." DNV GL Maritime, Position Paper.

Veal, Robert, and Michael Tsimplis. 2017. "The Integration of Unmanned Ships into the *Lex Maritima*." *Lloyd's Maritime and Commercial Law Quarterly* 2: 303–335.

Wilhelmsen. 2024. "Massterly Launches Pioneering Remote Operation Centre in Horten." March 20. www.wilhelmsen.com/media-news-and-events/news/2024/massterly-launches-pioneering-remote-operation-centre-in-horten/.

Williams, Richard. 2013. *Gard Guidance on Maritime Claims and Insurance*. Gard.

2021. "Unmanned Ships: A Challenge to the Current International Regime Regulating the Carriage of Goods?" In *Ship Operations: New Risks, Liabilities and Technologies in the Maritime Sector*, edited by Barış Soyer and Andrew Tettenborn. Informa Law.

Wilson, John F. 2010. *Carriage of Goods by Sea*. 7th ed. Pearson Education.

Wright, Robin Glenn. 2020. *Unmanned and Autonomous Ships: An Overview of MASS*. Routledge.

Wróbel, Krzysztof, Jakub Montewka, and Pentti Kujala. 2017. "Towards the Assessment of the Potential Impact of Unmanned Vessels on Maritime Transportation Safety." *Reliability Engineering & System Safety* 165: 155–169.

Yang, Xue, Ingrid B. Utne, Stian S. Sandøy, Marilia A. Ramos, and Børge Rokseth. 2020. "A Systems-Theoretic Approach to Hazard Identification of Marine Systems with Dynamic Autonomy." *Ocean Engineering* 217: 107930.

Yara. 2023. "The Fully Autonomous, Battery-Powered Container Feeder." Accessed January 10, 2025. www.yara.com/news-and-media/media-library/press-kits/yara-birkeland-press-kit//.

Yara. 2024. "Yara Birkeland, Two Years On." April 28. www.yara.com/knowledge-grows/yara-birkeland-two-years-on/.

Zhan, Xiankai, and Pengfei Zhang. 2023. *Merchant Ships' Seaworthiness: Law and Practice*. Routledge.

Ziajka-Poznańska, Ewelina, and Jakub Montewka. 2021. "Costs and Benefits of Autonomous Shipping: A Literature Review." *Applied Sciences* 11 (1): 4553.

https://doi.org/10.1017/9781009760171.006 Published online by Cambridge University Press