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Comparison of Problems Related to the Carriage of Goods by Sea Between Traditional and Autonomous Vessels

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ABSTRACT: When performing the carriage of goods by sea, each contracting party, shipowner and charterer, has a number of rights and obligations. In legal sources which regulate carriage of goods by sea, in particular contracts concluded between parties, international conventions and national laws, standard clause is shipowner's obligation to provide a seaworthy vessel. Such obligation implies that the vessel must be able to carry and keep the contracted cargo in good condition and also have required number of qualified crew. On the other side, charterer's obligation is to order the vessel to sail to ports/berths which are considered safe (safe port warranty). Also, legal sources of carriage of goods by sea regulate liability issues for loading and discharging operations, the limitation of the shipowner's liability and application of provisions related to exclusion of liability. All of the above represent important rights and obligations of the regulation of the carriage of goods by sea, and so regulated thus far have been common in the carriage of goods by sea by traditional vessels. However, the question that arises is how the problems related to the carriage of goods by sea will be regulated when such carriage is performed by autonomous vessels. In other words, there is a question about interpretation of the provisions of seaworthiness, safe port warranty, liability and the limitation of the shipowner's liability and exclusion of liability in the carriage of goods by sea by autonomous ships.
The purpose of this paper is comparison of problems related to the carriage of goods by sea between the traditional and autonomous vessels, and regarding the regulation of seaworthiness, safe port warranty, liability, the limitation of the shipowner's liability and exclusion of liability. The results of this comparison lead to the conclusion that reconsideration of the content of the listed terms is needed when we are talking about carriage of goods by sea by autonomous vessels.

1 INTRODUCTION

Carriage of goods by sea is as old as sea navigation itself. Sea is the most convenient natural route, which led to its use for carriage, particularly carriage of goods. The need to carry goods affected the development and improvement of different ship types for carrying various types of goods. Ships are continuously improved upon, with technological advances continuously being made, and over the last few years there has been increasing talk on the concept of using autonomous ships to replace traditional ships in different types of carriage of goods by sea.

Almost all current traditional ships possess a certain level of autonomy and can perform certain functions "on their own" [2]. However, the goal of many participants in the maritime industry is to develop and put into use fully autonomous ships, so the realization of using the new generation of ships is becoming increasingly relevant.

The term autonomous ship means systems which can steer a ship and make decisions on any changes in control settings without human intervention. In this case, the use of artificial intelligence (AI) can deliver the necessary decision supporting tools. Autonomous ships can be both manned or unmanned, with unmanned meaning that the crew is not physically on-board [6]. The International Maritime Organization (IMO) defines these ships as Maritime Autonomous Surface Ships (MASS). Therefore, IMO defines autonomous ships as maritime autonomous surface ships and distinguishes between different degrees of their autonomy. According to IMO, degrees of ship autonomy are as follows: first degree of autonomy means a ship with automated processes and decision support, in which seafarers are on board to operate and control shipboard systems and functions (in this case some operations may be automated). The next degree of autonomy implies remotely controlled ships with seafarers on board, but the ship is controlled and operated from another location. Next degree of autonomy is a remotely controlled ship, where the ship is controlled and operated from another location and there are no seafarers on board. Finally, the highest degree of autonomy is a fully autonomous ship, where the operating system of a ship can make decisions and determine actions on its own [10]. Although there are different degrees of autonomy of autonomous ships, we will use a single term – "autonomous ship" for all those types of ships.

The main reason for the continuous development of autonomous systems is an increase in safety and reduction in costs. In autonomous ships, a human crew will initially oversee ship operations, but the plan is to develop a fully autonomous system over time, which will allow navigation without crew and in which computers and artificial intelligence will be able to take full control of the ship. Finally, the purpose of autonomous ship development is to replace human action, which should be faster, safer, more accurate, more productive and/or cheaper compared to traditional ships [14]. Also, the reduction or complete exclusion of the human factor from maritime accidents, which are a frequent cause of naval accidents in traditional ships, is considered a great advantage of the introduction of autonomous ships.

Autonomous ships are certainly the future of maritime industry [18], which will see a revolution of the shipping sector, especially commercial operations such as carriage of goods by sea. Therefore, the question arises as to the regulation of the carriage of goods by sea and the regulation of some standard obligations of the contracting parties regarding the carriage of such goods by autonomous ships.

When performing the carriage of goods by sea, each contracting party, shipowner, and charterer has a number of rights and obligations. In legal sources which regulate the carriage of goods by sea, in particular contracts concluded between parties, the provisions of international conventions and national laws regulate important obligations regarding the carriage of goods by sea. Some of these provisions regulate a shipowner's obligation to provide a seaworthy vessel, a charterer's obligation to send a ship only to safe ports and berths (safe port warranty), liability for loading and discharging operations, limitation of a shipowner's liability and application of provisions related to the exclusion of liability.

The purpose of this paper is to highlight the problems related to the carriage of goods by sea regarding the regulation of seaworthiness, safe port warranty, liability, the limitation of a shipowner's liability and exclusion of liability, and to compare the same problems between traditional and autonomous ships. To achieve the purpose of this paper, we will use the comparative method and analysis method, and we will use the same methods to compare and analyze how the highlighted problems are regulated when it comes to traditional ships, i.e. how they will be regulated when it comes to autonomous ships.

To be able to more easily determine how the usual obligations of the contracting parties will be regulated when it comes to the carriage of goods by autonomous ships, we will first take a look at the ways of regulating carriage of goods by sea and fundamental obligations of the parties when it comes to the carriage of goods by traditional ships.

2 REGULATING CARRIAGE OF GOODS BY SEA – CHARTER PARTY CONTRACTS

Carriage of goods by sea is usually regulated by concluding a contract called charter party contract. Namely, when a shipowner agrees to make the entire carrying capacity of his vessel available for either a particular voyage or a specified period of time, the contract normally takes the form of a charter party [23]. Charter party contracts are classified by two criteria: ship space and contract term, while they can be contracts for a certain period of time (time charter) and contracts for a voyage (voyage charter) [16].

With a time charter contract, a shipowner undertakes to perform the carriage of goods within the contracted time and with a contracted ship for the client, and a client undertakes to pay hire during that time. The client is authorized to freely use the ship for commercial purposes during the term of the contract, while the ship master is required to carry out the orders of the client within the limits of the contract and according to the intended use of the ship. Client's orders may pertain to the port of arrival or cargoes to be carried [22].

With voyage charters, unlike the time charters, the fundamental obligation of a shipowner is to carry goods in one or more predetermined voyages, while a voyage charterer pays freight. Therefore, a voyage charter contract can stipulate a certain number of voyages or set out a number of voyages which can be performed within a specified time [5].

The purpose of contracting the time charter and voyage charter is the same, and that is the carriage of goods by sea. With the same fundamental obligation of contracting parties, charterparty contracts have other similar contractual provisions of the parties. Some of these provisions relate to the regulation of seaworthiness, safe port warranty, liability, the limitation of a shipowner's liability, and exclusion of liability. Different legal sources, which regulate

carriage of goods by sea, in particular contracts concluded between parties, international conventions, and national laws, give special attention to regulating these issues. The highlighted obligations and problems of the parties are important for this type of carriage [5, 16, 22, 23].

3 THE SHIPOWNER'S OBLIGATION TO PROVIDE A SEAWORTHY VESSEL

Ship's seaworthiness is one of the fundamental obligations of shipowners established by the International Convention for the Unification of Certain Rule of Law relating to Bills of Lading (Hague Rules) and to the Protocol to Amend the International Convention for the Unification of Certain Rules of Law, relating to the Bill of Lading (Visby Rules) [8, 17]. The term seaworthiness can be viewed as absolute and as relative seaworthiness. Absolute seaworthiness includes the elements of nautical safety of the ship for sailing in terms of the hull, machinery, ship equipment and ship certificates, while relative seaworthiness of a ship for sailing means that the ship must be able to carry the agreed cargo while maintaining the cargo in good condition and, with regard to this, it must be equipped with all propulsion materials and necessary means and have a required number of qualified crew members. Seaworthiness of a ship means that the ship must be capable of performing the contracted obligations and must possess a degree of fitness which an ordinary careful and prudent owner would require his vessel to have at the commencement of her voyage having regard to all the probable circumstances of it. So, the condition of the ship, its crew and equipment should be fit enough to withhold foreseeable perils that can be encountered during the charter service [21].

Charter parties expressly impose an obligation of shipowners to provide seaworthy ships at the time of delivery. Examples of the same obligation of shipowners can be found in different examples of charter party contracts. For example, according to Clause 2 of the New York Produce Exchange Form from 2015 (code name: NYPE 2015), "The Vessel on delivery shall be seaworthy and in every way fit to be employed for the intended service […]" [15]. Other examples of express seaworthiness obligations can also be found in Clause 2 of the NYPE 93 [16], Clause 1 of the Baltime 1939 (revised 2001) Uniform Time Charter [1], Clause 2.1 of the BPTime 3 Time Charter Party [3], and 1(b) of the Shelltime4 form Time Charter Party [20]. Also, the standpoint of case law when it comes to a ship's seaworthiness is that even if there is no express seaworthiness requirement, it is implied by law [12].

In the carriage of goods by sea, a shipowner acts as a navigation entrepreneur and it is necessary to protect their contracting counterparties against the shipowner's possible arbitrary actions. For that reason, among other things, it is necessary to have a contractual stipulation on the seaworthiness of the ship.

When determining the ship's seaworthiness, the greatest attention is given to the condition of the hull, machinery, equipment, crew's qualifications, and ship's certifications. Namely, the traditional ship is a single item which consists of a hull, machinery, equipment, and control centre that enables crew members to decide what to do, how to do it and/or what not to do. However, the seaworthiness of a ship is not measured in absolute standards and the standard of seaworthiness of a ship varies and depends on the condition of the ship with regard to the risk of a specific undertaking. This takes into account the type of cargo and realistic dangers on the voyage.

Unlike the traditional ship, an autonomous ship is not a single item and what makes an autonomous ship different is that the hull of the ship is still at sea, but the control centre is on land [2]. Therefore, we can say that an autonomous ship consists of two parts: the sea module and the land module, where the land module is generally referred to as a control centre. A control centre does not necessarily have to be on land, but it can also be on a platform located at sea [2, 6, 14, 18]. Considering the specific qualities of autonomous ships, when determining their seaworthiness, a question can be raised whether the attention when determining the seaworthiness should only be given to the sea part of an autonomous ship or should the control centre also be included. The answer to this depends on whether the control centre can be accepted as an essential component of the ship or not. We believe that a seaworthiness analysis should be made by focusing on both parts. The truth is that the sea part of an autonomous ship is technically capable of performing the voyage safely, but there is an insufficiency of the control centre's staff engaged in operating the ship and the part without which the voyage would not be possible [2, 6].

Technical progress in shipbuilding has always affected the standard of the ship's ability to sail the sea. Also, in the case of autonomous ships, due to all of their specific qualities, the content of seaworthiness will also need to be reconsidered. Seaworthiness standards for this type of ships will depend on their specific qualities.

4 CHARTERER'S OBLIGATION TO SEND A SHIP TO SAFE PORTS/BERTHS (SAFE PORT WARRANTY)

In the carriage of goods by sea, it is common to see an express limitation that the chartered ship trades only between safe ports and safe berths. This implies the obligation of a charterer to send a ship to safe ports and/or berths, the so-called safe port warranty. Namely, charter party contracts contain a special clause on determining trading limits, in which there is a blank space which is to be filed by the parties, i.e. which they use to determine the trading limits. If the space in the contractual provision is left blank, it is deemed that the contract does not contain trading limits with regard to the limits of navigation. Charterers usually give an absolute warranty that ports to which they send a ship will be safe, but in some charterparties the charterer's warranty is one of due diligence only. If charterers breach their

warranty, the master has a right to refuse to enter or refuse to stay at the port in question [4].

An example of a provision on trading limits can be found in Clause 1/b of the New York Produce Exchange Form from 2015 (code name: NYPE 2015), according to which the ship shall be employed in such lawful trades between safe ports and safe places according to contractually defined trading limits as the charterers shall direct. Identical provisions are contained in, for example, Clause 2 of the Baltime Charter Party, Clause 4/c of Shelltime 4 [1, 3, 20].

The rules on safe port and safe berth are of a fundamental character in maritime law, and the obligation to adhere to them is unique in all contracts. Safe port does not mean just a naturally safe port or a port in which a ship can safely load or discharge cargo without the risk of physical danger, but also a port in which a ship can sail to and from and thus load or discharge cargo without political risks [19]. Whether the port is safe is a factual issue and depends on numerous circumstances. For example, according to the accepted definition of a safe port from English case law of The Eastern City, a port will not be safe unless a particular ship can reach it in the relevant period of time, 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 [13]. Therefore, a safe port is a port which offers physical, navigational, and political safety.

Also, the definition of a safe port basically applies when it comes to a safe berth as well. A berth means a certain place within a port where a ship loads or discharges cargo. Regarding this, the term safe berth, which implies a berth to which the ship can navigate, sail into, remain at berth, and leave within a certain time period without some sudden dangerous circumstances which cannot be avoided by good ship manoeuvring and seamanship. According to the contractual provisions, the place for loading or discharging at the port must be provided by the charterer, and the shipowner is required to place the ship at that location if they can do so without danger to the ship and if the loading of cargo can be done at that place without danger to the ship.

In case of an absence of the contractual provision regarding the trading limits of the ship between a safe port and a safe berth, the position of the case law is that such a provision is implied if this is necessary to give a business efficiency to the contract.

When it comes to the contractual provision on lawful trades between safe ports and safe places and the carriage of goods by autonomous ships, in this case it is definitely necessary to consider the criteria for defining the terms of safe port and safe berth. The problem with this matter is how to define "safety". It is not enough for an autonomous ship to be safe, but the port and the berth to which the ship arrives or from which it leaves also need to be safe. Autonomous ships will be set to work under certain conditions, and these conditions prevent the making of a "bad decision". In addition to this, they will also have the advantage of being able to collect large amounts of data on surrounding conditions, to analyse, process, and integrate all such data and respond in time. They will never tire, never get sick or forget about certain dangers. However, connection problems in the port area are possible with autonomous ships, due to which the problems of its safety are imposed. Also, the absence of particular hardware and sensors necessary for the ship approaching may make the port or berth in question unsafe.

Until new criteria are established for determining the term of safety, which includes the safety of the port and berth between which autonomous ships trade and carry goods by sea, it is up to the contracting parties to stipulate same warranty in more detail in their contract, within the provision on trading limits.

5 LIABILITY FOR LOADING AND DISCHARGING OPERATIONS

In the carriage by sea, a charterer is usually required to bring the cargo alongside the ship and place it under the tackle at their own expense and risk, so that it can be lifted by ship cranes (alongside rule) [16]. The ship is then required to load and arrange the cargo at its own expense and risk. The same rule also applies for cargo discharging. This traditional way of handing over the cargo for carriage to contracting parties can be changed. Such need is especially present in charter party contracts for carriage of mass-produced goods, where the cargo is loaded by mechanised means (by cranes, conveyer belts, etc.), most often under the control of the charterer.

Therefore, cargo operations at the port are currently being handled by humans and, under current regime, the liability for loading and discharge is usually imposed on the charterer.

It is expected that some autonomous ships will be designed to have a feature of handling loading and discharging operations automatically. It means that during loading and discharging, there will be no intervention of a charterer from the outside. For example, on the Yara Birkeland ship, the world's first fully electric and autonomous container ship with zero emissions, loading and discharging will be done automatically, using electric cranes and equipment. The ship will not have ballast tanks but will use a battery pack as permanent ballast. The ship will also be equipped with an automatic mooring system – berthing and unberthing will be done without human intervention and will not require special implementations dockside [7].

Therefore, there is a difference between the current way of handling liability for loading and discharging operations of a traditional ship compared to the same liability in an autonomous ship.

6 OTHER PROBLEMS RELATED TO THE USAGE OF AUTONOMOUS SHIPS FOR THE CARRIAGE OF GOODS BY SEA

In this section of the paper, we will discuss certain provisions related to the usage of autonomous ships

for the carriage of goods by sea, specifically, the limitation of a shipowner's liability and application of provisions related to the exclusion of liability, which are important when we compare the same provisions to those for the carriage of goods by sea by a traditional ship.

6.1 *Limitation of the shipowner's liability*

In maritime law, contrary to the general principle of the law of obligations, a shipowner is not liable for total damages, but only for damages up to certain prescribed limits. The requirement for the application of this law is the absence of reason for the loss thereof. The right to the limitation of liability applies, among other things, to contractual liability for the cargo carried by sea under the charterparty contract.

The issue of the limitation of liability is regulated by the International Convention on Limitation of Liability for Maritime Claims from 1976, as amended by the Protocol from 1996 [9]. The basis for the limitation of liability system is a scale comprising several layers (groups) of the limitation of liability according to the ship's tonnage. Limits for smaller ships are proportionally larger per tonne than for larger ships. The lowest foreseen limit is applied to all ships under 500 tonnes (small ships). For ships of more than 500 tonnes, a certain number of calculation units is added to the limit for ships under 500 tonnes according to certain groups. Stipulated liability limits are applied to the totality of all claims arising from the same event, and Special Drawing Rights (SDR) as defined by the International Monetary Fund are used as the calculation unit [11]. The basis for the application of the limit amount is gross tonnage, and this means that the amount of limited liability is determined according to the tonnage of the ship for which this liability occurred.

There are cases of a loss of right to the limitation of liability, and the person who is liable will not have a right to the limitation of liability if they prove that the damage occurred due to their personal act or omission committed with intent to cause damage, or recklessly and with knowledge that such loss would probably result. The burden of proof naturally lies with the applicant.

Considering the presented fundamental characteristics of the right to the limitation of a shipowner's liability, for contractual liability for the cargo carried by an autonomous ship, we highlight the same issues as in previous contractual provisions. Considering the specific qualities of an autonomous ship and its two component parts, the sea module and the land module, which is generally referred to as a control centre, there is a problem in determining the tonnage. Specifically, the question is whether we should take into account the weight of the control centre too when determining a shipowner's limitation of liability or only the tonnage of the sea part of an autonomous ship?

In attempting to answer this question, we will again have to take into account the specific qualities of an autonomous ship and, for this type of ships, the right to the limitation of a shipowner's liability will depend on the specific qualities of an autonomous ship.

6.2 *Application of provisions related to the exclusion of liability*

The fundamental obligation of a shipowner in the carriage of goods by sea is to deliver cargo to its destination in the condition and in the quantity in which it was taken for carriage, and to deliver it without delays. The shipowner is liable to the other contracting party for damages which occurred due to a breach of this contractual obligation. A breach of the contractual obligation implies a default, incomplete performance or late performance, and the liability of the carrier implies the obligation to reimburse damages.

According to Article 4 Section 2 of the Hague Rules, there are a number of cases in which a shipowner (i.e. carrier, because this is term used in the Hague Rules) will not be held liable for damages to the cargo. These are excepted perils, i.e. exceptions from the general principle of the liability of a shipowner/carrier. According to the Hague Rules, there are a number of cases in which a shipowner shall not be held liable for damages. Some of these excepted perils are actions and omissions of the master, mariner, pilot, or servants of the carrier in navigation or in ship management. For the shipowner to be held liable for the work of the above persons, they need to work within the scope of the performance of their duties, while the shipowner's persons are independently liable for the damages caused outside of the scope of their duties, in accordance with the general legal principles, i.e. without limitations. An exception from the shipowner's liability is the damage caused to the ship by fire. When it comes to fire, a shipowner shall be liable for damages only if is proven that the fire was caused by an actual fault or privity. A decision of the Hague Rules on the shipowner not being responsible for the fire is based on the assessment that every fire on a ship is not endangering only the cargo, but also the safety of the ship, which means that this activity falls within the nautical activity of the crew. Also, a shipowner is exceptionally not liable for cases of perils, dangers, and accidents of the sea or other navigable waters. So, these imply dangers "from the sea", i.e. dangers which are inherent to the sea and which are of extraordinary nature in their occurrence. An exception from liability are acts of God [8]. These are external events which could not be foreseen, avoided, or prevented. At sea, they most frequently take the shape of heavy weather.

Some of these exceptions do not provide a clear answer on how to apply them to an autonomous ship. For example, the exception of a shipowner for damages caused on the ship by fire. If the fire occurs in the control centre without any fault or privity of the shipowner, then can we say that the shipowner will not be responsible for the loss. Or can it be said whether this exception only applies to the case of fire which occurred on the part of an autonomous ship at sea.

These and similar questions most often arise due to the fundamental differences between a traditional and

an autonomous ship. As we highlighted, among other things, the difference between them is that a traditional ship is a single item, while an autonomous ship is not, i.e. it has a control centre which is separate from the rest of the ship.

7 CONCLUSION

The carriage of goods by sea using autonomous ships requires that standard obligations of contracting parties be regulated differently than for traditional ships. Some of these provisions pertain to the regulation of seaworthiness, safe port warranty, the limitation of a shipowner's liability, and exclusion of liability. All highlighted obligations and problems of the parties are important in the carriage of goods by sea, and we compared them for traditional and autonomous ships.

A traditional ship is a single item comprising hull, equipment and control centre that enables members of the crew to decide what to do or not do, whereas the autonomous ship is not a single item because the hull of the ship is still at sea, but the control centre is on land or on a platform at sea. Therefore, when determining the ability of an autonomous ship for sailing, it is necessary to determine whether the attention will only be given to sea part of the autonomous ship or will the part in the control centre also be included. When determining seaworthiness, the greatest attention is given to the condition of the hull, machinery, equipment, crew's qualifications and certifications, and due to the specific qualities of an autonomous ship, the seaworthiness requirement will need to be reconsidered.

We pointed out the charterer's obligation to send ships to safe ports/berths (safe port warranty) when performing carriage by sea. Comparing this obligation in traditional and autonomous ship, we highlighted the problem of defining the term "safety" when it comes to autonomous ships. Autonomous ships may experience connection problems in the port area and therefore there is an issue of their safety. Also, the absence of particular hardware and sensors necessary for ship approaching may make the port or berth in question unsafe and it is necessary to determine new criteria for defining the term of safety, which includes the terms of safe port and safe berth between which autonomous ships trade and carry goods by sea.

Furthermore, when it comes to the liability for loading and discharging operations of a traditional ship compared to the same liability of an autonomous ship, cargo operations at the port are currently handled by humans and under current regime, and the liability for loading and discharge is usually imposed on the charterer. But it is expected that some autonomous ships will be designed with an ability to handle loading and discharging operations automatically. It means that there will be no intervention of a charterer from the outside in loading and discharging.

With regard to the limitation of a shipowner's liability, the same issues are pointed out with regard to autonomous ships as in the previous contractual provisions from the carriage of goods by sea. Therefore, it is necessary to decide whether the weight of the control centre should be taken into account when determining the liability of a shipowner or should only the tonnage of the sea part of an autonomous ship be taken into account?

Also, provisions related to the exclusion of liability in the carriage of goods by sea need to be amended. For example, an exception from a shipowner's liability for damage caused to the ship by fire leaves an ambiguous answer on how to apply this exception on an autonomous ship. If a fire occurred at the control centre, it is unclear whether we can say that the shipowner is not liable for it or whether this exception shall apply only in the case of a fire on the part of the ship at sea.

Finally, a series of provisions in the carriage of goods by sea need to be adjusted to the specific qualities of autonomous ships and re-examined for the purpose of performing the carriage of goods by sea by next-generation ships.

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