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An Evaluation of the Shipowner's Liability Challenges arising out of Autonomous and Remote-Controlled Vessels

Are these new issues covered under P&I insurance?

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ABSTRACT

An Evaluation of the Shipowner's Liability Challenges arising out of Autonomous and Remote-Controlled Vessels

Are these new issues covered under P&I insurance?

Research questions:

I: Which are the new shipowner's liability challenges arising out of autonomous and remote-controlled vessels?

II: Are these new issues covered under P&I Insurance? Particularly, under the statutes of Gard P&I Club.

III: If not, which amendments or clarifications would be necessary to provide coverage to the new matters?

Purpose: The aim of the project is to analyze the most relevant shipowner's liability challenges that may arise from remote-controlled and fully autonomous vessels and to determine whether the analysed liability concerns are covered by the conditions of Gard P&I Club.

Findings: The main findings of this study show that the technical development introduced in fully autonomous and remote-controlled vessels does not involve relevant changes concerning shipowner's own fault and strict liability regimes neither does cargo damage liability regime. Concerning vicarious liability, the author found that remote controllers and the autonomous decision-making software could be included within the scope of Section 151 MC. Regarding collision liability, the key point is whether in autonomous vessels, a wrong navigational decision taken by the software triggers shipowner's liability under Section 161 MC, and the conclusion is affirmative. However, if there is a failure in the system that could not have been prevented, no fault shall be deemed to exist, therefore, no liability is triggered. In relation to P&I insurance coverage, the principal amendment is concerning the definition of crew and the inclusion of liability scenarios adapted to remote controllers.

Keywords: Autonomous vessels – Remote-controlled vessels – Shipowner's Liability – Protection and Indemnity insurance – Maritime law – Norwegian maritime law

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1. Introduction

1.1 Scope of study, aim and research restrictions

This paper will study which issues concerning shipowner's liability are emerging from the technical development tied to autonomous and remote-controlled vessels and, subsequently, it will be analysed whether they are comprised under Protection and Indemnity insurance (hereinafter "P&I insurance").

Specifically, the questions addressed are the following:

(i) Which are the new shipowner's liability challenges arising out of remote-controlled and autonomous vessels?
(ii) Are these new issues covered under P&I Insurance? Particularly, under the statutes of Gard P&I Club.
(iii) If not, which amendments or clarifications would be necessary to provide coverage to the new risks?

Thus, the aim of this thesis is twofold. First, to analyze the most relevant challenges concerning shipowner's liability regimes that may arise out of autonomous and remote-controlled vessels in relation to the Norwegian maritime legal system. Secondly, to determine whether the analysed liability issues are covered under P&I insurance, considering, in particular, the conditions of Gard P&I Club. If the results indicate that there is no coverage under Gard's insurance policy, suggestions of amendments to cover the new risks will be put forward.

As mentioned above, the study will be carried out with special focus in Norwegian maritime law regime. Nonetheless, to the extent that Norwegian maritime law is primarily based on International Conventions that have been adopted into the national legal regime, the analysis and conclusions of this paper will have broader value and relevance in an international context as well.

Moreover, the scope of the study will be limited to the shipowner's liability regimes. Accordingly, the liability scheme of any other actor involved in the shipping industry will

not be particularly addressed. Further, within shipowner's liability regimes, the study will be focus on non-contractual liability regimes: vicarious, collision, shipowner's own fault and strict liabilities, and within contractual liability, the analysis will be around shipowner's liability arising out cargo damage.

Concerning the insurance analysis that will be carried out, the P&I statutes and rules taken as a reference for the study will be the ones of Gard. This Mutual Association has been selected due to its Norwegian nationality and because it constitutes one of the principal underwriting associations integrating the International Group of P&I Clubs. Since the P&I conditions are applicable in an international context, the analysis concerning the existence of coverage of the shipowner's liability challenges arising out of autonomous and remote-controlled vessels, will be relevant worldwide. Therefore, the conclusions arrived to in this paper have an international significance.

1.2 Background

The improvement of technology has affected people's communication and worldwide trade in various ways. The transport of goods has been revolutionised by the development of robotics and communication technologies in a way that autonomous and unmanned vessels have nowadays become a realistic scenario. These modes of transport are no longer a remote possibility but a reality. Hence, unmanned and autonomous vessels are not so much a technological challenge anymore but a regulatory and safety one.

The legal framework is a crucial factor in determining if these vessels are feasible; whether they can be a commercial reality and not just a technological possibility. To the extent that new technologies are commercially beneficial and taking into consideration the facilitation of that kind of trade, such vessels have to become part of the existing regulatory framework which will lead States, Organizations and companies to invest in the development of the certain ships.

In this regard, some projects are already being successfully developed. For instance, the European Commission has coordinated an Autonomous Shipping Initiative for European Waters, so-called "AUTOSHIP", which aims to create a stronger European cluster able to thrust the Next Generation of Autonomous Ships. AUTOSHP will build

and operate two vessels, a fully autonomous and a remotely controlled one, and their needed shore control and operation infrastructure, demonstrating their operative capabilities in Short Sea Shipping and Inland Water Ways. This project aims to bring new high-skilled jobs and a safer and greener transport in Europe[1].

Another ongoing prototype is the Norwegian vessel "Yara Birkeland", which is the world's first zero emission, autonomous container feeder. The purpose of the vessel is to carry Yara's products from their production plant in Porsgrunn to Brevik and Larvik, in Norway. Yara's launch is programmed for 2020 and will gradually move from manned operation to completely autonomous operation[2].

Also, the first adaptive ferry transit, "Bastø Fosen VI", developed by the shipping company Bastø Fosen, Kongsberg and the Norwegian Maritime Authority, was tested in February 2020 and will provide the Horten-Moss service. The ferry is currently in an "adaptative transit", where it is expected to perform most of the services automatically, but the captain remains in charge and the crew is still on board[3].

All these projects are illustrative examples of all the steps that private and public entities are taking towards the integration of autonomous technology into the shipping industry and the introduction of new sustainable targets for the environmental crisis we are confronting.

In light of the above, the way maritime transport is conceived today will eventually change in the near future. Unmanned and autonomous vessels entail advantages of significant importance as more efficient and competitive ship operation[4]. Further, the absence of crew and master on board will certainly imply a safer mode of navigation

[1] European Commission, "AUTOSHIP – Autonomous Shipping Initiative for European Waters", 2019. Last visited March 2020, https://www.autoship-project.eu/the-project/.
[2] Kongsberg Marine, "Autonomous ship project, key facts about Yara Birkeland", last visited 27 March 2020, https://www.kongsberg.com/maritime/support/themes/autonomous-ship-project-key-facts-about-yara-birkeland/.
[3] Kongsberg Marine, "Automatic ferry enters regular service following world-first crossing with passengers onboard", 13 February 2020. Last visited 27 March 2020, https://www.kongsberg.com/maritime/about-us/news-and-media/news-archive/2020/first-adaptive-transit-on-bastofosen-vi/.
[4] Maritime Unmanned Navigation through Intelligence in Networks (MUNIN), "Welcome to the MUNIN Project web page", last visited, 27 March 2020, http://www.unmanned-ship.org/munin/

because of the reduction of maritime accidents caused by human errors, which today constitutes around the 65.8% of the marine accident events[5].

Future casualties derived from autonomous and unmanned vessels will instead be mainly caused by defective products and errors in design and systems. Therefore, the role of human error will be reduced or shifted to other figures. Resulting from the lack of crew on board, the reliability and problem-solving capacity of the technology become essential. The autonomous system must function and respond when humans cannot intervene. This transition has to come along with a new legal approach. Subsequently, liability issues arising from autonomous and unmanned vessels cannot be based on human errors as it is understood today[6].

Hence, when analyzing all the new challenges that arise from autonomous and unmanned vessels, shipowner's liability disputes are certainly one of the most relevant questions that is being considered. The implementation of new technologies for the automatic manning of vessels and the absence of personnel on board will trigger the appearance of additional risks and players. These new concerns will certainly influence as well in the marine insurance market and its policies and coverages.

In virtue of the above, this paper will study which issues of shipowner's liability are emerging from the technical development tied to autonomous and remote-controlled vessels and, subsequently, it will be analysed whether they are comprised under P&I insurance policies in particular.

[5] European Maritime Safety Agency (EMSA) "Annual Overview of Marine Casualties and Incidents of 2019", 17 July 2018. Last visited April 2020, https://sectormaritimo.es/wp-content/uploads/2019/11/Annual-Overview-of-Marine-Casualties-and-Incidents-2019.pdf

[6] Mika Viljanen, et al, "Advanced Autonomous Waterborne Applications (AAWA) Position Paper, Remote and Autonomous Ships: The Next Steps", Rolls Royce (2016): 49, https://www.rolls-royce.com/~/media/Files/R/Rolls-Royce/documents/customers/marine/ship-intel/aawa-whitepaper-210616.pdf

1.3 Structure

As a relevant starting point, the concept of autonomous vessel together with the different levels autonomy and manning will be presented in Chapter 2. In Chapter 3 it will be put forward a general overview of the shipowner's liability approach.

Thereafter, vicarious, collision, shipowner's own fault, strict and cargo damage liability regimes will be discussed separately in Chapters 4 to 8 respectively. Under each chapter, there is a sub-chapter with a brief mention to the existing Norwegian regulation and after, the new liability challenges of remote-controlled vessels and autonomous vessels will be addressed under different sub-chapters as well. Thus, within each chapter, the aim is to identify the challenges of the application of each liability regime to remote-controlled and autonomous vessels respectively, and analyse how each liability regimes may be altered by the technology development these vessels entail.

Subsequently, Chapter 9 will be focused on P&I insurance. In one sub-chapter, the regulatory framework of P&I insurance under the Norwegian perspective will be presented. Further, under another sub-chapter, the current scope of cover using Gard's Rules as a reference will be discussed, including subjective conditions of cover and risks insured against. Subsequently, the particularities of remote-controlled and autonomous vessels concerning P&I insurance coverage are examined in the last sub-chapter.

To end, Chapter 10 will englobe the conclusions reached by the author of this thesis.

2. Conceptual framework of autonomous vessels

For a greater appreciation of the impact of the technical development inherent to autonomous and remote-controlled vessels on the liability regimes, it is precise to define, initially, these types of vessels and the relevant degrees of manning and automation they englobe. Without a clear and concrete comprehension of these terms, the concerns about the technological impact and new challenges that come into play when considering issues of liability would not be adequately distinguished. Hence, the aim of this section is to provide the conceptual framework of autonomous and remote-controlled vessels and the scales of autonomy and manning discerned.

2.1 Definition of autonomous ship

Against the lack of a national and international legal definition of what we should understand as autonomous vessels, different organizations and entities have published guidance regarding the classification of autonomous vessels. Hence, the autonomy levels, degrees of manning and analogous concepts have been broadly examined in the literature[7].

The relevant point when addressing autonomous vessels is that navigation and operation rely on a series of systems and advanced software technology which are programmed to make decisions and perform operations without or with accessory human intervention, depending on their level of autonomy. In remote-controlled or unmanned vessels, however, the tasks performed onboard by the seafarers and the master in manned or conventional vessels, are instead performed remotely by an operator who is onshore away from the ship itself[8]. Thus, remote operation does not interfere the manning numbers or the ship's level of autonomy, it affects the location – onshore – from which the task is carried out[9].

Most of the relevant classification societies have issued guidelines where definitions of autonomous and remote-controlled vessels are provided. As an example, DNV GL published in September 2018 a Class Guideline "Autonomous and remotely operated ships" where autoremote vessels are defined as a *"vessel for which one or more key functions are remotely controlled from a remote control centre, possibly by assistance from personnel on board. To support safe and efficient operation of the vessel, the remotely controlled key function(s) is arranged with a defined level of automation ranging from simple decision support to complete automatic control. The extent of support from on-board personnel and the level of automation should be detailed in document Concept of Operation (CONOPS)"*[10].

[7] Paula Navas, "Legal challenges of liability in collisions arising from the development of autonomous and unmanned shipping" (master thesis, University of Oslo, 2019), 5.
[8] Ibidem.
[9] Henrik Ringbom "Regulating Autonomous Ships—Concepts, Challenges and Precedents, Ocean Development & International Law" (2019): 5, doi: 10.1080/00908320.2019.1582593.
[10] DNVGL "Class Guideline – Autonomous and remotely operated ships", September 2018. Last visited April 2020, http://rules.dnvgl.com/docs/pdf/dnvgl/cg/2018-09/dnvgl-cg-0264.pdf

Bureau Veritas has also published "Guidelines for Autonomous Shipping" in 2017 and 2019 where autonomous vessels are defined as "*ship having the same capabilities as those of a smart ship and including autonomous systems capable of making decisions and performing actions with or without human in the loop. An autonomous ship may be manned with a reduced crew or unmanned with or without supervision*"[11].

Hence, the relevant difference between autonomous and unmanned vessels is that, autonomy, is related to the capacity of the vessel to accomplish all her operations without or very small human intervention. In other words, autonomy concerns the degree of decision making deferred from human to the system. On the other hand, manning refers to the human presence on board the vessel performing their duties. Therefore, a fully unmanned ship will not have any crew on board and will be capable of controlling its movements with remote control. Further, as it is defined in Bureau Veritas Guidelines, an unmanned vessel could be remotely controlled, only supervised by the operator or fully autonomous[12].

Moreover, there are remote-controlled or partly autonomous vessels. These ships are controlled remotely, so the operation is performed by the crew and master from an onshore location. As operators are still under control of the navigation of the vessel, she does not have full autonomy.

In essence, according to the definitions stated above, the terms autonomy, manning and remote-control must always be distinguished when addressing these new vessels. Each concept involves different players, navigation systems and risks which may extend to various types of liabilities involved, as it will be discussed in the following chapters.

[11] Bureau Veritas – Guidelines for Autonomous Shipping. Guidance Note NI 641 DT R00 E (December 2017) and NI 641 DT R01 E (October 2019)
https://www.bureauveritas.jp/news/pdf/641-NI_2017-12.pdf
http://erules.veristar.com/dy/data/bv/pdf/641-NI_2019-10.pdf
[12] Ibidem.

2.2 Degrees of autonomy and manning

It is also relevant to specify that the terms autonomy and manning cannot be interpreted as separated categories or types of vessels. Instead, several degrees of manning and autonomy can be differentiated. The degrees may vary even during the same journey depending on the maneuvering to be carried out or on the stage of the navigation[13].

Accordingly, when discussing liability matters in a certain issue, it is also essential to identify the level of manning and autonomy the vessel was having when the accident occurred, as the regime applicable or type of liability may vary depending upon that.

The level of autonomy and the manning degree find also relevance depending on the function that is being automatized. Engines and other technical systems even in manned/conventional vessels are already highly developed[14]. However, regarding bridge functions and navigation the scenario changes as it involves high risks for third parties and for maritime safety[15]. This is why, currently, navigation is frequently based on a high degree of human presence, evaluation and decision-making, whereas machinery functions are, mostly, fully self-controlled and operating under supervision by the crew[16].

Following the above, when shifting towards autonomous and unmanned vessels, the presence of the crew performing functions related with the navigation of the ship will either be changed for a computer or software system in the case of autonomous vessels, or, in fully remote-controlled ships, for a person carrying out said duties remotely from onshore. Thus, the players involved in the vessel's navigation are altered; instead of a master and usual crew on board the vessel, remote-controllers will be in charge of the operation and vessel's navigation and manufacturers and software developers will have a key role in the correct functioning of the ship's IT system.

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[13] Navas, "Legal challenges of liability in collisions arising from the development of autonomous and unmanned shipping", 6.
[14] Ørnulf Jan Rødseth and Håvard Nordahl, "Definition of autonomy levels for merchant ships", *Norwegian Forum for Autonomous Ships* (2017): 8. http://nfas.autonomous-ship.org/resources/autonom-defs.pdf
[15]Ringbom, "Regulating Autonomous Ships—Concepts, Challenges and Precedents, Ocean Development & International Law".
[16] DNVGL "Class Guideline – Autonomous and remotely operated ships".

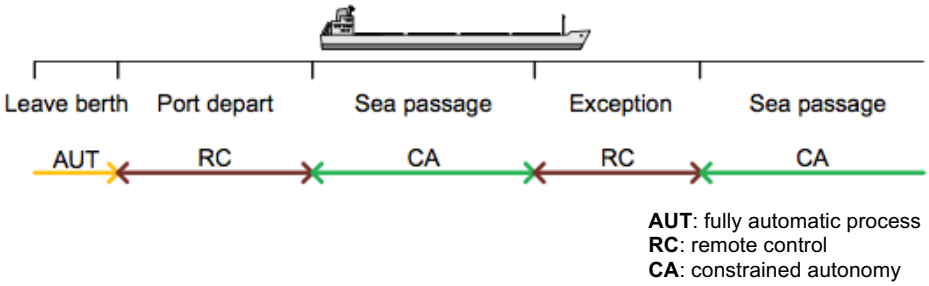
Hence, if the players and roles involved in the operation of the vessel are changed, the risks that she will face during navigation will necessarily be transformed towards a high technological reliance. On top, if the existing actors together with the risks to be confronted change in autonomous and remote-controlled vessels, shipowner's liability challenges will necessarily arise.

On that basis, the IMO's Working Group on Maritime Autonomous Surface Ships suggested during its 100th session held on December 2018, four levels of autonomy identified as follows[17]:

- Degree one: Ship with automated processes and decision support: Seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated and at times be unsupervised but with seafarers on board ready to take control.
- Degree two: Remotely controlled ship with seafarers on board: The ship is controlled and operated from another location. Seafarers are available on board to take control and to operate the shipboard systems and functions.
- Degree three: Remotely controlled ship without seafarers on board: The ship is controlled and operated from another location. There are no seafarers on board.
- Degree four: Fully autonomous ship: The operating system of the vessel is able to make decisions and determine actions by itself.

Furthermore, it is relevant to stress that the degrees of autonomy and manning of the vessel will not necessarily be the same during the entire journey. Some functions within the same voyage may be carried out fully autonomously while others may be performed by personnel on board or remotely by an onshore operator. The Norwegian Forum for Autonomous Ships has issued a publication "Definition of autonomy levels for merchant ships" where a very illustrative graph in this regard is included[18]:

[17]IMO Press Briefings: "IMO takes the first steps to address autonomous ships" May 2018. http://www.imo.org/en/MediaCentre/PressBriefings/Pages/08-MSC-99-MASS-scoping.aspx
[18] Ørnulf Jan Rødseth and Håvard Nordahl, "Definition of autonomy levels for merchant ships", *Norwegian Forum for Autonomous Ships* (2017): 8.



To illustrate how the study of the level of automation in a particular moment of the navigation interferes in liability issues an example is put forward. One same vessel has a software programmed to carry out berthing operations fully autonomously, however, for the course of the navigation in open waters, an onshore operator must monitor the system's functions and authorize all actions before they are carried out. Hence, it combines characteristics of fully autonomy and remote monitoring systems. During navigation in open waters the remote-controller fails to give the order to the system of reducing speed and consequently, the vessel collides with another ship.

To determine the liability regime applicable to this casualty, it is not relevant that the colliding vessel has a system implemented to perform the berthing operations fully autonomously (level 4 of autonomy) because when the collision occurred while the vessel was being remotely monitored by the operator (level 3 of autonomy). Hence, as cause of the collision was the negligence of the remote-controller in performing his duties, the discussion will be around the existence of shipowner's liability for the negligence of the remote-controller and not around the technological failure as such.

On the contrary, we have this same vessel that has collided with a pier during berthing operations carried out fully autonomously by the software, due to a wrong maneuvering decision taken by the IT system. The discussion will focus on whether the shipowner is liable for the errors committed by the decision-making system installed on the vessel.

Furthermore, it is to expect that, when the level of autonomy of the vessel is high, the likely cause of an accident would be much more related to technological errors in the software, whilst for low degrees of automation, human error will remain to be the prevailing cause of accidents.

In essence, the different degrees of manning and autonomy lead to changing circumstances in which the vessel is sailing, even during one same voyage. Thus, when facing a casualty, determining the level of autonomy and manning at the exact moment of the incident is essential to establish the cause of the casualty and type of liability applicable to the shipowner.

3. General overview of the Shipowner's liability regimes

The shipping business is surrounded by numerous and unpredicted risks, where shipowners are held liable for incidents related with the operation of their fleet. A shipowner's civil liability in many occasions depends on the contractual relationships that the company has entered into. For instance, shipbuilding contracts with shipyards, labour contracts with crew members, carriage of cargo contracts with cargo interest parties, charterparties, tug contracts, etc. Thus, any liability arising from these contracts imposed on the shipowner will be determined following what has been agreed and established on the clauses of the contracts. Nonetheless, the shipowner is also susceptible to great non-contractual liabilities. As an example, these liabilities can arise from environmental damage caused by the vessel, bunker-spills, collision or striking[19].

A common prerequisite to establish any type of liability is that causation must be present. Thus, the damage suffered by an injured third party must be sufficiently connected to the act for which the shipowner is responsible. It is the injured party who bears the burden of proving the existence of causal connection between the damage suffered and the negligent act. However, shipowner's strict liability may arise in cases where there has not been a negligent act, but the damages and causation are sufficiently proven by the injured party and therefore, liability is imposed on the shipowner by a statutory provisions or precedent case law[20].

Hence, besides contractual liability, non-contractual liability may be imposed on shipowners on the basis of strict, fault-based or vicarious liability. The application of

[19] A.V. Raghav Sharma, "Maritime autonomous surface ships: caught between the devil's advocate and the deep blue sea" (master thesis, World Maritime University, 2019), 26.
[20] Thor Falkanger, Hans Jacob Bull and Lasse Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective* (Oslo: Universitetsforlaget, 2017), 192.

these liability regimes to autonomous and remote-controlled vessels involves several challenges. As in these types of vessels the shipowner will hold very limited or no control over his own ship, it may be arduous to impose liability on him. Thus, the discussion of the following chapters will put efforts in analyzing how the shipowner's liability regimes may have to be amended to encompass these types of vessels.

The shift towards autonomous and unmanned vessels, will likely reduce the number of accidents caused by human error. However, human error is far from disappearing, it will instead be shifted from ship to shore. Human errors will still be present in autonomous and remote-controlled vessels because, ultimately, the autonomous navigation systems or the remote-control mechanism to navigate the vessel are developed or handled by humans. Therewith, these vessels entail a change on the risks arising from their new modes of operation.

The scope of the analysis in the following sections will be specifically focused on vessels comprised on degrees three and four of autonomy according to IMO's degree distinctions presented above. Hence, remotely controlled vessels –fully unmanned– and fully autonomous vessels will be addressed. According to the definitions presented in Chapter 2, these vessels share the common characteristic that they do not have any crew on board to control the navigation of the vessel. However, the operation in remote-controlled ships will be monitored and/or controlled by an on-shore operator whereas in fully autonomous vessels a robotic system with artificial intelligence will execute the operations without any human intervention[21]. Thus, in accordance with their singular particularities, remote-controlled and autonomous vessels will be analysed under separated titles when required.

[21] Tuan Khee Lee, "Liability regime of autonomous ship: the Scandinavian perspective. How the liability regimes shall be regulated in the Scandinavian region?" (master thesis, University of Oslo, 2016), 15.

4. Vicarious Liability

4.1 Norwegian Regulation

The doctrine of vicarious liability applied to Norwegian maritime law is established in Section 151 of the Norwegian Maritime Code (hereinafter "MC")[22], where it is stated that "*The reder*[23] *shall be liable to compensate damage caused in the service by the fault or neglect of the master, crew, pilot, tug or others performing work in the service of the ship*."

In essence, this provision implies that for the shipowner to be vicariously liable, damage must be caused by the fault or negligence of the listed range of assistants or by other persons or entities that the shipowner may use outside the ship and office. Also, said damage must be caused in relation to the operation of the vessel. Hence, the fault or negligence committed by the shipowner's assistants must have occurred in the course of their service for the vessel.

To establish the existence of vicarious liability, particular attention must be paid to (i) the basis of liability, i.e. the negligent act or omission of the assistant, (ii) the legal relationship between the shipowner and the assistant and (iii) the nature of the services provided to a particular vessel by the employee[24]. To a certain extent, vicarious liability is a combined form of strict and fault-based liability, as the shipowner is liable even though he has not himself committed any error - strict regime -, however, the assistant must have committed a negligent act or omission - fault-based regime -[25].

In practice, it is not very relevant whether the injured party can sue the master or crew because for the faults they have committed, as the chances of enforcing a potential judgement are slim. Thus, the shipowner's vicarious liability is a form of ensuring that an innocent and injured third party can recover the damages suffered due to the fault or

[22] The Norwegian Maritime Code, 24 June 1994, nº 39 with amendments including Act 7 June 2013 nº 30
[23] The Norwegian term "reder" does not have equivalent translation in English. The "reder" is the person (or company) that runs the vessel on his account, usually the shipowner. This appreciation is found on the Preface of the version of the Norwegian Maritime Code translated into English.
[24] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 198 – 207.
[25] Ibidem.

negligence committed by the employees of the shipowner[26]. The shipowner will have the capacity to afford the payment of the claim and will hold insurance policies to cover the losses caused due to the operation of his fleet.

4.2 Particularities of Remote-Controlled Vessels

In remote-controlled vessels with no personnel on board the current duties of the master and crew who perform their work on board the vessel, will be transferred to the shore-based controller. Thus, operation requires a shore-based operator who, from a Remote-Control Centre (RCC), will be in charge of monitoring the safe operation of the vessel relying on all the sensors installed on board. The monitoring and control of the navigation by the remote controllers is possible thanks to the advanced technology at his disposal. As an example, MUNIN has initiated different types of technology as the Remote Maneuvering Support System, which help to ensure the appropriate relay of situational awareness of the vessel dealing with the physical distance between the ship and the RCC[27].

When apportioning liability between the shipowner and the remote controllers, the relevant matter is to determine that the latter can still be considered as personnel who are providing their services to control the navigation of vessels from the RCC instead of on board. Thus, in the absence of personnel on board the ship, the remote controller would be retaining the functions of the master and/or crew.

As the current wording of Section 151 MC does not include "remote operators" expressly, it has to be analysed whether they can be included within any of the terms foreseen in the provision. The remote controllers could be treated either as "master" or "crew" or within the term "others", always on the basis that they are performing work in the service of the ship, which is the relevant requirement for shipowner's vicarious liability to arise.

[26] Ibidem, 190.
[27] Sharma, "Maritime autonomous surface ships: caught between the devil's advocate and the deep blue sea", 7.

The remote operator will assume the roles traditionally carried out by the Master and crew, and these duties are certainly in the service of the ship. However, it might not be necessary that he fits within the existing figure of the master either. Even if the operator does comply with all the provisions regulating the master's role and duties, he is in control of the navigation and, therefore, may be fit within "other" personnel carrying out work for the service of the ship.

Therefore, the significant issue is not so much the wording under which onshore operators are categorized, but that they are providing their services for the operation of the vessel. Thus, Section 151 MC will, in principle, still be applicable without conflict or amendments to remote controllers as they are in charge of the navigation of the ship.

Furthermore, Section 151 MC does not require the existence of an employment contract as a prerequisite for the shipowner to be held vicariously liable for the errors committed by the personnel providing their services for the vessel. Hence, the particular relationship between the shipowner and the remote-controller does not constitute a hindrance for vicarious liability. It can be governed by an employment contract and so the remote-operator will be regarded as an employee of the shipowner. Nonetheless, it is also a possibility that the operator is an independent contractor who provides his services sporadically for the fleet or vessel of a particular shipowner. However, in both scenarios, shipowner's vicarious liability could apply for the acts of the onshore operator based on the fact that he is performing work "in the service of the ship".

In essence, in cases where the cause of a casualty can be traced back to a human error by the operator (or other personnel) that could have been prevented, i.e. poor maintenance or lack of software updates, lack of inspections, incorrect navigational decision or wrongful programming of the software system, the nature of the liability imposed on the shipowner would remain to be vicarious.

Moreover, another scenario within the scope of the shipowner's vicarious liability arises when addressing errors committed by the remote-controller of the vessel due to malfunctioning of the software technology. For instance, in a situation where the software processes the data incorrectly and that leads to a wrong decision of the onshore operator while he is monitoring the vessel's navigation on a marine peril. This situation leads to a

casualty. Here, the primary cause of the decision taken comes from the poor function of the IT system and not from the navigational decision of the operator itself. However, is the shipowner in this situation vicariously liable for the damages caused to a third party due to the remote-operator's decision?

Here, it is necessary to stress that shipowner's vicarious liability requires fault or negligence on behalf of the personnel performing work in the service of the ship. In this case, the first issue that should be analysed is whether the operator could have prevented the casualty. If he failed to update the software system and that is why the software processed the data incorrectly, even if the later navigational decision was right based on the information received, the operator failed to carry out his inspection duties diligently. Hence, shipowner's vicarious liability could be imposed because there has been fault committed by the operator performing work on the service of the ship.

Accordingly, evaluating the negligent behavior in unmanned vessels will be to a great extent related to the failure of the remote controller to detect any errors in the software that could have been prevented or rectified prior to the commencement of the navigation of the vessel. If the operator's failure to exercise due diligence in supervising and maintaining the vessel's equipment (sensors, cameras, etc.) derives in a casualty with damages to a third party, vicarious liability of the shipowner should be deemed to exist.

On the contrary, where the operator (or any other personnel working for the vessel) could not have prevented the system's failure and, therefore, he has not committed any negligent act or omission, the requirements for vicarious liability wouldn't be met. Here, the operator has not breached any statues or regulations and has acted with due diligence and using "good seamanship" criteria at all times.

In conclusion, the current scope of the shipowner's vicarious liability governed in Section 151 MC, could be applicable without conflict for remote operators based on the fact that they are performing work in the service of the ship. They can be considered within the term "others". Therefore, the shipowner would be held vicariously liable for the faults or negligent acts committed by the remote-controller who is in charge of the navigation of the vessel.

4.3 Particularities of Autonomous Vessels

Analyzing vicarious liability regime in the context of fully autonomous vessels becomes more delicate as neither the shipowner, the remote operator nor any other human assistant will be in control of the navigation of the ship. The role of the master and crew will be entirely substituted for a software system which will perform all operational decisions concerning the navigation of the vessel.

The decisions taken by the IT system concerning the navigation of the vessel might be traced back to the instructions given by the designer. The shipowner will not be able to modify or influence in the algorithm programmed in the software system, as this is carried out by the manufacturer[28]. Thus, in autonomous vessels there is not an operator who is in control of the navigation, as radars, sensors and decision-making systems will perform the operation of the vessel. This means that the manufacturer will somehow carry a higher degree of responsibility over the correct functioning of the navigation.

Here, the discussion of the shipowner's vicarious liability will be analysed around three different scenarios that can arise. The first one is where the failure of the software system can be traced back to an error on behalf of the shipowner. The second one is where the failure of the software system could not be prevented by the shipowner's assistants and it constitutes an error of the manufacturer/designer. The third scenario is where the failure of the system cannot be traced back to a human error of any of the players.

Hence, the first scenario is where the failure derives from a negligent act of the shipowner's helpers. For instance, when the autonomous vessel collides due to a defect in the software system that could have been prevented with correct maintenance by the shipowner's employees or assistants. In this case, the shipowner remains vicariously liable towards third parties for the negligent acts or omissions committed by his helpers in the proper maintenance of the radars, sensors and IT system[29].

[28] Sharma, "Maritime autonomous surface ships: caught between the devil's advocate and the deep blue sea", 31.
[29] Unidentified, "Shipowner's liability for unmanned ships. Can existing legislation handle the challenges of the future?" 22 – 23.

The case BRAVUR[30] is an illustrative example. In this case, the steering machinery failed during berthing operations due to a broken bolt in the pneumatic cylinder. It was discovered that the breakage of the bolt could be traced back to a faulty design of the manufacturer. However, both the instance court and the appeal court held that, even if there had been no culpability on the maneuver, liability was to be imposed on the shipowner because he should have undertaken inspections of the ship which could have revealed the relevant material design error[31].

Therefore, within the scope of autonomous vessels, if the design error or the lack of maintenance of the software could have been detected by the shipowner's helpers, vicarious liability will be imposed.

Concerning the second scenario, where the failure in the software derives from fault or negligence on behalf of other players such as the designer, manufacturer or developer, the distribution or the installation companies of the software. The decision making of the software in the course of the navigation will follow the algorithm pre-programmed by the manufacturer. Thus, in most of the cases, the navigational decisions taken by the system will be traced back to the designer or manufacturer.

Therefore, since the manufacturer or designer company is in charge of setting the route of the vessel, that same player should be responsible when a casualty happens due to any miscalculation or any other negligent action[32].

Here, it is to be assumed that the shipowner could not have prevented or known about the error in the system. The question is whether the shipowner is vicariously liable under Section 151 MC of the errors committed by these companies. The answer can be compared to the liability of the shipowner for negligence committed by a shipyard in a traditional vessel. This liability will hence depend on the nature of the works carried out. If the work can be categorized as "typical shipowner's activity", he can be held

[30] ND 1995.163 DSC BRAVUR
[31] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 283.
[32] Iselin Landa Osmo, "Shipowner's liability for unmanned ships. Can existing legislation handle the challenges of the future?" (master thesis, University of Bergen, 2017), 37.

vicariously liable, however, if the works performed do not constitute his regular activity, vicarious liability will not arise[33].

For instance, if a person employed by a shipyard causes damage while performing ordinary maintenance activities on board the ship, the shipowner may be vicariously liable for the damage the person causes. However, major works carried out at a shipyard are a good example of work which do not result in shipowner's liability under vicarious liability rules. Hence, the shipowner cannot be vicariously liable for errors that a shipyard has made when the ship was built. It is mainly the ordinary repair and maintenance activities that may lead to shipowner's vicarious liability[34].

The advanced software technology used for fully autonomous vessels is to be considered out of the scope of the shipowner's regular business activities[35]. Hence, when evaluating the application of the existing shipowner's vicarious liability regime for faults of these entities, it does not seem in accordance with the original nature of this liability approach. Nonetheless, it is the opinion of the author that, leaving the shipowner free from liability in cases where his manufacturer or pre-programmer has committed negligence, leads to clear unfairness for an injured third party seeking to recover damages. This damaged party would have to bring a claim against the manufacturer under product liability and this possibility, is likely to cause big complications: discovering which player is concretely at fault (manufacturer, designer, installer, developer, etc.), the place where the claim should be brought, and proving the causation link and negligent act committed is very complicated for the injured party who does not have any of this information at his disposal.

Accordingly, the author of this paper considers suitable to impose vicarious liability on the shipowner for damages to third parties for errors of the manufacturer, notwithstanding the possibility of the shipowner to claim compensation and recover damages from the negligent company or player through their existing contractual

[33] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 206.
[34] Felix Collin, "Maritime Product Liability at the Dawn of Unmanned Ships – The Finnish Perspective" (Research paper Series 2/2018, University of Turku, 2018), 14.
[35] As explained in the Introduction Chapter of this paper, in current project for the development of autonomous vessels, shipowner companies are partnering with entities which are specialized in developing and supplying software systems with advanced technology. Hence, the shipowners are merely partnering or hiring these companies to develop and install the operational systems.

relationship. However, the identification and separation of tasks and liabilities of this chain of players will, certainly, not be a simple task. It might happen that a failure in the system involves a combination of players or just one of them.

Several concerns arise regarding the third scenario, where the error in the system cannot be traced back to any human error or negligence. For instance, in cases where neither the shipowner nor the manufacturer could have prevented the casualty caused by an unpredictable technical failure or by a wrong decision taken by the system. The controversy relies on whether the shipowner is vicariously liable for the damages caused by the failure or wrong functioning of the software.

Traditionally, liability has been assigned to legal entities, such as humans and registered companies, so, currently there is not a mechanism to hold an IT system liable for damage caused by its decisions. In this regard, given the lack of mechanism to hold the computer system legally responsible for its errors, they cannot pass to the shipowner through vicarious liability, as the nature of this liability approach is to hold the shipowner responsible for the faults of his helpers[36].

However, if the software system takes a navigational decision that results in a casualty, the shipowner should compensate the damages caused to the injured third party based on the existence of fault on the decision taken by system. So, up to here, the navigational decisions of the software system could be, from a liability perspective, equally treated as the ones taken by the master or crew.

Any wrong maneuver or if the systems fails to recalculate the route that leads the vessel where she should not be, such movement should be considered negligent. Here, the computer must have acted thinking that it was the correct decision to make, for it to be classified as a faulty or negligent act[37]. Hence, the "negligence" of the software could be assessed. Nonetheless, the concept of fault or negligence would have to be redefined as well for autonomous vessels to foresee errors by the software.

[36] David Mikal Drummond, "An evaluation of the collision and strict liability framework for the shipowner with respect to autonomous vessels: A Norwegian Perspective", (master thesis, University of Oslo, 2020), 33.
[37] Osmo, "Shipowner's liability for unmanned ships. Can existing legislation handle the challenges of the future?", 34.

Furthermore, even if we have a negligent act of the IT system, we have to evaluate how to include the software within Section 151 MC. The software is developed to control the navigation in autonomous vessels, hence, somehow is carrying out a fundamental service for the vessel. Nonetheless, doubts arise as to whether an IT software as such can be included in this provision as "others" performing work on the service of the ship.

Section 151 MC does not establish any limitations to a broad interpretation of the shipowner's vicarious liability, and therefore, the inclusion of the software of the vessel within the term "others". Even if the existing nature of the vicarious liability could be altered, to expand Section 151 MC as to include the software technology as an entity for which the shipowner is responsible when its decisions cause any damage, makes sense in the light of the technological development we are starting to face within the shipping industry.

Accordingly, the decision-making system would have to be considered as a legal entity with personhood as an artificial person category. This approach would facilitate the imposition on the shipowner the decisions taken by the software seen as a service that performs work for the vessel and from which the shipowner benefits from.

In conclusion of this hypothesis, the author considers that Section 151 MC would have to be interpreted as to englobe within the term "others" the software system. So, in the case it takes any negligent action, vicarious liability can be imposed on the shipowner. This perspective is justified under the view that in fully autonomous vessels the shipowner is taking a "risk" by relying in advanced technology systems, and he leaves the full control of the navigation of his vessel to a decision-making of the software. It is reasonable and precautious to consider that even if no human fault is committed, the shipowner bears vicarious liability for the losses caused by the failure of the technology as a service provider of the vessel.

5. Collision Liability

5.1 Norwegian Regulation

Under Norwegian law, collisions between vessels are regulated in Chapter 8 MC. The provisions in the MC were adopted following the same terms as the Convention for the Unification of Certain Rules of Law with Respect to Collisions (Brussels Convention)[38]. Three different scenarios are established in terms of liability[39]. One is where one of the parties is to be blamed and it should be responsible of bearing all the costs. The second scenario is where both parties are at fault and the liability is shared proportionally to the degree of blame committed by each party. These two types are regulated under Section 161 MC. The third one, established in Section 162 MC, refers to accidental collisions, where there is no party to at fault or when the question of blame is left in doubt, and so, each party should bear their own loss.

In these three scenarios, a fault-based liability approach is used. Therefore, Sections 161 and 162 MC rely on the existence of fault to impose liability on the shipowner. The obligation to cover the damages caused to a third party is directly related to the proportion of fault committed on each side. However, the MC provides very little guidance in respect to the evaluation of fault. The only assistance it provides is contained in Section 161 paragraph 5 where it states, "*when determining the question of fault, the court shall especially consider whether or not there was time for deliberation*". Hence, the allocation of fault or negligence is made differently on a case-by-case basis[40].

5.2 Particularities of Remote-Controlled Vessels

Concerning remote-controlled vessels, two different scenarios that may arise when facing a collision should be discussed. One is where the collision is a result of a failure on the shipowner's behalf and the other one is where there is a collision due to a

[38]Convention for the Unification of Certain Rules of Law with Respect to Collisions (Brussels, 23 September 1910) http://www.admiraltylawguide.com/conven/collisions1910.html
[39] Navas, "Legal challenges of liability in collisions arising from the development of autonomous and unmanned shipping", 27.
[40] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 270 – 277.

technological failure that could not have been prevented by the shipowner nor anyone he is responsible for.

An example of the first scenario would be where the remote operator missed to inspect and update the vessel's software prior to the commencement of the voyage and it fails during the course of navigation causing a collision with another vessel. This error was avoidable and the degree of fault of the colliding remote-controlled vessel can certainly be measured. In these cases, the shipowner would be liable to the other ship according to Section 161 paragraph 1 MC, as someone he is responsible for under Section 151 MC – the remote operator – is at fault due to their failure to comply with the duty of care and the standard of seaworthiness of the vessel[41]. This scenario follows under the same scope as in traditional vessels but with the particularities of remote-controlled vessels.

In contrast, the second scenario arises where the software does not function properly without fault or negligence on the shipowner's behalf. For instance, there is an unavoidable loss of connection, the remote controller losses control over the vessel and this leads to a collision. This second scenario is a result of the high reliance on advance technology of remote-controlled vessels.

Following this line, the Norwegian Supreme Court in several cases[42] has ruled that when no one on board had been negligent, or when there is not any other evidence of negligence on the colliding ship, it is to be considered an unavoidable accident and thus, each of the ships must bear their own loss according to Section 162 MC. In the ND 1971.36 NCS MARNA HEPSØ case, the accident was caused by a failure of MARNA HEPSØ's reverse engine and, as it was not proved that this failure was due to the negligence or fault of the crew, the shipowner was not held liable for the damages caused to the collided vessel. It was ruled that this accident was to be considered an accidental collision according to Section 162 MC.[43]

[41] The duty to ensure that the vessel is seaworthy at the beginning and throughout the voyage is imposed on the master under Section 131 MC. As it has been stated, the remote operator would assume the duties of the master and crew. Hence, the duty to guarantee the seaworthiness of the ship would rely on the remote controller in this regard and it will be related to ensuring that the computer technology and the remote controller function properly.
[42] ND 1971.36 NCS MARNA HEPSØ, ND 1990.362 NCA ODDTUN, ND 1980.277 NCC HAUGLAND.
[43] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 271.

It is yet unresolved how liability will be apportioned in situations where a casualty has occurred due to technology failure without any fault or negligence on behalf of the shipowner or the remote-operator in charge of the navigation of the unmanned vessel. In this regard, two possible solutions are presented by the author.

One is applying the MARNA HEPSØ ruling criteria to remote-controlled vessels. Therefore, the shipowner is released from fault-based liability because the collision was caused due to an unavoidable technical error and hence, it is to be considered an accidental collision under the scope of Section 162 MC. This approach leaves the existing criteria for fault-based liability regime equally applicable to remote-controlled vessels: when technology fails without fault or negligence on the shipowner, he is released from liability due to unpredictable technical error.

On the contrary, another possible solution is that the shipowner bears the risks of the failures of the software system that could not have been prevented in unmanned vessels. This second scenario would constitute a shift towards a strict liability regime, as no fault or negligence is deemed to exist, however liability is imposed on the shipowner. This approach arises under the perspective that technological failure will be the key issue when addressing collisions with remote-controlled vessels because the software system is connecting the vessel with the onshore office. This high reliance on technology is a risk solely involved in the remote-controlled navigation therefore, an injured third party should not bear their own losses when the collision was caused due to a software failure of the remote-controlled vessel. This approach encompasses the imposition on the shipowner of a stricter duty of care and, therefore, a higher exposure to liability if this system fails. A strict liability regime imposed on the shipowner in these cases englobes the unpredictability of the software without having to judge where the fault lies[44].

When discussing these two possible solutions, it might seem controversial for the suffering third parties to bear their own losses when the cause of the casualty is a failure of the software of the unmanned colliding vessel that could not have been prevented (scenario one). However, the application of a strict liability regime to the shipowner

[44] Sharma, "Maritime autonomous surface ships: caught between the devil's advocate and the deep blue sea", 34.

(scenario two) would create a significant differentiation between manned and unmanned vessels. This big distinction might not be justified from a risk point of view and would, in any case, result in difficult issues of delimitation and definition[45].

Accordingly, the author considers that the most suitable option is to maintain the existing fault-based liability regime for manned vessels as similar as possible for remote-controlled vessels. Thus, the first solution described above is preferred over the second one. Therefore, where the system fails, and no fault or negligence is committed by the shipowner, he should be released from liability and the collision should be deemed to be accidental. Hence, each party would be bearing their own losses in accordance with Section 162 MC.

Nonetheless, for appropriate application of fault-based liability approach to collisions involving remote-controlled vessels, the shipowner would have to be subject to a higher reliance on rules and best practices designed specifically for these advanced navigational systems, so that the standard of care englobes extra procedures to ensure that the maintenance and component condition of the software is adequately kept. Also, it would be necessary to redefine the concept of fault, as the software cannot be negligent in a traditional way[46].

5.3 Particularities of Autonomous Vessels

For fully autonomous vessels in which there is no human involvement taking the navigational decisions, channeling liability appears to be more complicated. The discussion here concerns navigational decisions taken solely by the decision-making system. For instance, a situation where the software system has made a navigational decision which does not comply with the COLREGs[47] and this leads to a collision with another vessel.

[45] Viljanen, "Advanced Autonomous Waterborne Applications (AAWA) Position Paper, Remote and Autonomous Ships: The Next Steps", 52.
[46] Drummond, "An evaluation of the collision and strict liability framework for the shipowner with respect to autonomous vessels: A Norwegian Perspective", 25.
[47] International Regulations for Preventing Collisions at Sea 1972 (COLREG), adopted on 20th October 1972 and entered into force on 15th July 1977.

If the decision making-system has breached any of the rules included in the COLREGs, it should be treated as in traditional vessels and fault on the autonomous colliding vessels should be deemed to exist under Section 161 MC. Hence, here arises the need of redefining the concept of fault as to include navigational errors of the software.

The concept of fault would have to be redefined as to include the acts carried out by the software technology and in the light of the technological development the shipping industry is facing, as systems cannot be negligent under the traditional approach[48].

The shipowner will have no control over the software system, and it may take navigational decisions completely unexpected depending on the circumstances. However, the shipowner should bear this risk as he is benefiting from the advanced technology and he will have insurance in place covering this peril. Furthermore, an injured third party should not bear their own losses when the collision was caused due to a software failure of the autonomous vessel.

In essence, shipowner's liability in collisions where the software system of an autonomous vessel takes a wrong navigational decision which is in breach with COLREGs, may be compared to the shipowner's liability for remote-controlled vessels. The main difference relies on who is committing the negligent act that provokes the shipowner's liability: the remote-operator or the decision-making system. Thus, fault-based liability under Section 161 MC would be imposed on the shipowner for the navigational negligent acts committed by the advanced technology installed on the autonomous ship.

6. Shipowner's Fault-based Liability

6.1 Norwegian Regulation

Fault-based liability regime follows the traditional approach under Norwegian law that liability for damages is to be triggered by intention or negligence. To establish the

[48] Osmo, "Shipowner's liability for unmanned ships. Can existing legislation handle the challenges of the future?", 25.

fault-based liability regime of the shipowner, the need of identifying the figure of the shipowner as such arises. Here, it is essential to distinguish his own faults or privity with the faults committed by his assistants.

Where the shipowner is an individual, it may not be too difficult to trace his faults of privity relating to his liability. However, where shipowners are corporate entities, it is necessary to look for individuals employed by the corporate shipowner with an executive hierarchy or senior management. Hence, the action of somebody for whom the company is liable because his action is the very action of the company[49]. Thus, the faults of the shipowner are identified with the decisions or actions made by the company's organs (board or management) as the owning corporation of the ship as well as the faults of other manager personnel with significant level of responsibility[50]. For instance, errors by an operating manager will result in fault-based liability of the shipowner[51].

Therefore, the difference between the fault-based liability of the shipowner and vicarious liability is that, in vicarious liability the injurious act cannot generally be traced back to the shipowner himself or to senior employees. So, the shipowner is liable for his employees' errors through vicarious liability[52]. However, fault-based liability for the shipowner arises in cases where the shipowner himself, e.g. the board of directors or the operating manager, has exercise fault. For instance, in cases where he is at fault in choosing an incompetent shipyard to carry out reparations in the vessel or in instructing the crew regarding safety procedures to be followed on board.

Hence, if the shipowner has behaved in a culpable manner, both by act or omission, and has caused damage to a third party, he is to be held liable for the damage. This liability is imposed on the basis that the shipowner should have foreseen that his action could result in damage or injury[53]. Here, the duty of care of the shipowner to work with due diligence becomes relevant.

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[49] Xia Chen, "*Liability of Maritime Claims: A Study of US Law, Chinese Law and International Conventions"* (The Netherlands: Kluwer Law International, 2001), 62 – 63.
[50] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 356.
[51] Ibidem, 191.
[52] Ibidem 191.
[53] Ibidem, 189 – 190.

The duty of care requires the shipowner to take all reasonable steps to avoid any causation of harm and foresee possible damages that can be caused through the activity being undertaken. The duty of care might vary depending on the nature of the kind of business and in the steps to be taken as a precaution[54].

Here, the burden of proving the negligent act or omission of the shipowner relies on the injured party seeking recovery. Furthermore, the claimant must also prove that the loss or damage he has suffered has been caused by the negligence of the tortfeasor. On the contrary, the shipowner, to be discharged from liability, must try to undermine the proof presented by the injured party. For instance, by demonstrating that the alleged negligent action complied with the required standard of care[55] and therefore, the damage caused could not have been prevented.

6.2 Particularities of Remote-Controlled Vessels

Evaluating the shipowner's negligent behavior in unmanned vessels will be to a great extent related to his failure to make sure that the correct software technology is installed on board the vessel or to comply with the Classification Society standards when hiring an operator to control the navigation of the ship. If the shipowner's failure to exercise due diligence in any of his acts or decisions derives in a casualty with damages to a third party, fault or negligence liability should be imposed to the shipowner. In order to evaluate the existence of negligence, his failure will be compared with what could be expected from a normally intelligent and insightful person or company in such a situation[56].

In essence, if the shipowner himself has committed any fault or negligence and that has resulted into a casualty, fault-based liability will be imposed to him and he will have to compensate the damages caused to third parties. Hence, here we do not appreciate any changes in comparison with shipowner's liability in traditional vessels. Furthermore, if a failure of the software has derived into a casualty and no fault or negligence is detected

[54] Sharma, "Maritime autonomous surface ships: caught between the devil's advocate and the deep blue sea", 32.
[55] Osmo, "Shipowner's liability for unmanned ships. Can existing legislation handle the challenges of the future?", 19.
[56] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 277.

in the decisions or actions taken by the shipowner, the error in the software is to be regarded as a technical failure. From this evaluation, it can be concluded that a fault-based liability approach could remain to be effective by including the particularities of the remote-controlled vessels in the formula, such as setting the standards for the duty of care of the shipowner.

6.3 Particularities of Autonomous Vessels

As in unmanned vessels, assessing whether there has been any fault or negligent act or omission on behalf of the shipowner of an autonomous vessel will be mostly related to the failure to detect any errors in the software that could have been prevented or rectified prior to the commencement of the navigation of the vessel. If the shipowner's failure to make sure that the correct software technology is installed on board the vessel or to comply with the Classification Society standards when updating the IT system derives in a casualty with damages to a third party, fault or negligence should be deemed to exist.

Thus, the duty of care of the shipowner in autonomous vessels will be primarily focused on the adequacy of the software the vessel is using for her operation. However, the extent of this duty is still uncertain, as there are no official regulations or protocols nor precedent cases where this is determined yet. Several classification societies have issued guidelines for autonomous shipping where the programming of the navigation and the maintenance of the system are regulated[57]. Hence, the extent of the duty of care of the shipowner will certainly be related with the fulfilment of the degree of maintenance required by the classification societies as well as the guidelines issued by the manufacturers of the software installed on the vessels. If these standards of care are not fulfilled, fault-based liability may be imposed on the shipowner. Nonetheless, the burden of safety imposed on the autonomous shipowner cannot be absolute[58].

For the purpose of studying the cause that led to a casualty, the data registered in the computer will have to be carefully analysed. If it is discovered that the accident

[57] Among others, DNVGL and Bureau Veritas Guidelines referenced above in foot notes 9 and 10.
[58] Drummond, "An evaluation of the collision and strict liability framework for the shipowner with respect to autonomous vessels: A Norwegian Perspective", 21.

occurred due to a failure in the system that could have been prevented by the shipowner himself because, for instance, he failed to follow the duty of care imposed by the Classification Society, the autonomous shipowner will be liable on the basis of fault-based liability.

7. Strict Liability

7.1 Norwegian Regulation

Strict liability regime may be based on statute or may have been developed by the courts through precedent. Essentially, strict liability arises when the shipowner is held responsible for the damage caused by operating his vessel without the need of a culpable conduct on his behalf[59].

The rules developed by the courts on strict liability for dangerous enterprises are based on the premise that persons particularly engaged in dangerous activities must expect damage occasionally to result. It seems more appropriate for the particular business to carry the loss than third parties who have been damaged accidentally. Moreover, in the maritime context, the Norwegian Supreme Court has imposed strict liability on the shipowner in cases of collisions between a vessel and land-based structures due to technical errors in the colliding vessel[60]. This strict liability approach is certainly an exception arising from the existence of a technical problem in the vessel. In other cases where the manned vessels have collided with other land-based installations but without technical errors, no strict liability has been imposed on the shipowner[61].

On the other hand, strict liability approach has been established under statutory provisions, for instance, oil pollution, wreck removal, transport of hazardous substances or dangerous goods or in emergency situations. Concretely, shipowner's strict liability for oil pollution is governed by Chapter 10 MC. This chapter is divided in two parts. The first one is concerning pollution of oil as fuel by any type of vessel, which is governed by

[59] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 192 – 193.
[60] ND 1921.401 NSC NEPTUN (collision with a bridge due to technical problem on the vessel), ND 1952.320 NSC SOKRATES (collision with a dock due to technical problem on the vessel).
[61] ND 1958.587 NCA LEDA, ND 1973.348 NSC UTHAUG.

the Bunkers Convention 2001[62], and the second one is concerning pollution of oil transported in bulk as cargo in tanker vessels, governed by the CLC Convention 1992[63]. Here, in essence, liability is imposed on the shipowner by law on the basis of the pollution caused whether by bunker oil escaping from any type of vessel or by oil escaping from tanker vessels (either oil as fuel or in bulk), regardless of fault.

In essence, this liability regime may be considered the outcome in practice of setting a very high standard of care on the shipowner's behalf. Strict liability is a successful mechanism to ensure that injured parties are fairly compensated when their damage is caused by a vessel, whether this vessel was at fault or not[64]. The shipowner is therefore the player bearing the inherent risk of maritime activities[65].

7.2 Particularities of Remote-Controlled and Autonomous Vessels

Shipowner's strict liability regime in the context of remote-controlled and autonomous vessels should not present any relevant challenges, as the basis of this liability rests on the specific damage occurring and not on the assessment of fault committed. Hence, for strict liability purposes it is irrelevant whether human or technology intervened in the cause of the accident or how navigation is carried out. If the foreseen damage, either by a statutory provision or by precedent case law, has been made by the vessel, strict liability will be imposed on the shipowner, regardless of the level of autonomy and manning of the ship. Therefore, the fact that there is no human presence on board and that navigation is performed remotely or autonomously by decision-making system, should not interfere in the application of the existing strict liability regime[66].

[62] International Convention on Civil Liability for Bunker Oil Pollution Damage (BUNKER) adopted on 23 March 2001 and entered into force on 21 November 2008
[63] International Convention on Civil Liability for Oil Pollution Damage (CLC) adopted on 27 November 1992 and entered into force on 30 May 1996.
[64] Drummond, "An evaluation of the collision and strict liability framework for the shipowner with respect to autonomous vessels: A Norwegian Perspective", 44.
[65] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 192.
[66] Drummond, "An evaluation of the collision and strict liability framework for the shipowner with respect to autonomous vessels: A Norwegian Perspective", 44.

8. Contractual Liability for Cargo Damage

8.1 Norwegian Regulation

The shipowner may be held liable based on the clauses agreed between the parties on the contractual relationships the company has entered into. Hence, the shipowner's contractual liability will mostly depend upon the type of contract and the conditions and terms that have been agreed. This liability will arise when the contract is not properly performed. Nonetheless, certain restrictions to this freedom of contract have arisen over time. This is partly a result of strict construction by the courts, but in particular due to mandatory legislation[67].

Here, special reference to contractual liability for cargo damage carried under bill of lading is made. The MC sets out the shipowner's -when acting as carrier- duties of care concerning the goods, as preserving them while they are under his custody. If the cargo is delivered damaged due to negligence of a crew member, for whom the shipowner is responsible, liability will arise on the shipowner under Section 275 MC in contracts where Norwegian law is applicable. Moreover, this provision establishes that the shipowner must prove that he and his servants have acted reasonably. Thus, the basic rule is that the shipowner is liable for negligence, for which the burden of proof is reversed.

Furthermore, the MC establishes in Section 276 paragraph 1, that the carrier[68] is not liable for losses resulting from fault or neglect in the navigation or management of the ship, on the part of the master, crew, pilot or tug or others performing work in the service of the ship. Therefore, if the shipowner is able to demonstrate that the fault or neglect comes from a navigational error of a crew member (not from the shipowner himself), he will be exempted from liability provided that the vessel was seaworthy at the commencement of the voyage[69].

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[67] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 332.

[68] According to Section 251 MC, the carrier is the person who enters into a contract with a sender for the carriage of general cargo by sea. The carrier for the purpose of the contract of carriage of goods does not necessarily have to be the shipowner of the vessel, however, for the analysis of this matter it is presumed that the carrier and the shipowner are the same actor/company.

[69] According to Section 276 paragraph 3 MC, this exemption from liability does not apply to contracts of carriage by sea in Norwegian domestic trade. Hence, it is applicable for international trades governed by Norwegian Law. In Norwegian domestic trade shipowner's liability for cargo damage is merely fault-based without any exemptions applicable.

8.2 Particularities of Remote-Controlled Vessels

The application of this liability regime to remote-controlled vessels does not require main changes as the fault or negligent acts committed by the remote operator from the RCC may be regarded as fault committed by personnel for whom the shipowner is responsible for. This is because regardless of the existence of an employment contract between the remote operator and the shipowner, the former is performing work in the service of the ship owned by the shipowner. As the shipowner is responsible for the acts of the remote operator, Section 275 MC can be applied without any issues in remote-controlled vessels.

Further, Section 276 MC, where exemptions from liability are regulated, can still be applied, with the particularity that, the first exemption regarding "*fault or neglect in the navigation or management of the ship on the part of the master, crew, pilot or tug or others performing work in the service of the ship*", would have to include decisions taken by the remote operator as well.

The operator is expected to assume the duties of the master and perform them from ashore. Therefore, here a discussion may be opened as to whether the remote operator will be considered as "master" and/or "crew" or within the term "others" in Section 276 MC. In this regard, the role and duties of the master are outlined in Sections 136 to 142 MC. These Sections foresee the structure when the master is unable to perform his duties and the authority he holds. Out of these provisions there is not a requirement that the master must be on board the vessel to perform his tasks. In fact, the provisions regulating the master's role should be open to interpretation in light of modern technological improvements. Hence, nothing prevents under Norwegian law that the role of the master is assumed by the operator, as he also complies with the rules related to the role of the master in Chapter 6 MC[70].

Under the interpretation made in this chapter, it may be concluded that if cargo is damaged due to a negligent decision taken by the remote-operator during the course of the navigation, the shipowner would be exempted from liability towards the cargo

[70] Drummond, "An evaluation of the collision and strict liability framework for the shipowner with respect to autonomous vessels: A Norwegian Perspective" (master thesis, University of Oslo, 2019), 31 – 32.

interests under Section 276 paragraph 1 MC, provided that the vessel was seaworthy at the commencement of the voyage.

8.3 Particularities of Autonomous Vessels

For autonomous vessels, the question is whether the wrong navigational decisions of the software are to be considered a “nautical fault” or rather a “technical defect”. In case they are considered nautical fault, he would be exempted from liability under Section 276 MC whereas if it is a technical defect, the shipowner would instead be liable.

If the incorrect navigational decisions taken autonomously where considered as technical defect, the autonomous shipowner would be in disadvantage compared with shipowner of traditional vessels, as the former would never be able to be exempted from liability for cargo damage cases under Section 276 paragraph 1 MC. Additionally, as the system is taking all responsibilities of the master and crew concerning the navigation and management of the vessel, it would be reasonable that its decisions concerning navigation fall under the exemption as well.

Hence, the author suggests that as long as the autonomous ship is seaworthy at the commencement of the voyage, in cases where the decision-making system performs an inadequate maneuver that results in damage to cargo, the shipowner may claim exemption from liability towards the cargo interests.

Nonetheless, if it is discovered that the decision-making system was wrongly pre-programmed or designed, the shipowner would not be able to benefit from the exemption established in Section 276 MC as the failure would have existed prior to the commencement of the voyage. Hence, in these scenarios, technical failure would be deemed to exist in the technology installed on the vessel and therefore, shipowner’s liability would arise.

9. P&I Insurance in Remote-Controlled and Autonomous Vessels

9.1 Introduction

The shipowner's possibility of covering his risk and exposure to liability through insurance is decisive for commercial shipping. Particularly, with autonomous and remote-controlled vessels, it is essential to detect whether the existing P&I insurance policies provide coverage to the shipowner's new liability nuances.

In this regard, clarity and certainty about the regulatory framework of the shipowner's liability regimes and his exposure to additional risks is a precondition for a well-functioning and effective insurance market for autonomous and remote-controlled vessels[71]. Nonetheless, despite the existing uncertainty on the regulatory framework of these vessels, P&I insurance cover for autonomous and remote-controlled vessels is already available[72].

In this chapter, the current P&I insurance system will be analysed to determine whether the current coverages offered are well-equipped to accommodate autonomous and remote-controlled vessels or if there is any significant barrier. Here, the aim is to ascertain if adjustments and clarifications are necessary to be introduced in the terms, conditions and concepts. For this study, Gard Rules 2020[73] will be the point of reference. Furthermore, due to its particularities, insurance for liability arising from collisions or striking will also be addressed under the provisions of Chapter 13 of The Nordic Marine Insurance Plan of 2013, Version 2019 (NP)[74], which is the primarily regulatory framework for collision liability under Norwegian law. In this regard, the relationship between Hull and Machinery insurance (hereinafter "H&M insurance") and P&I insurance will also be presented.

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[71] Danish Maritime Authority, "Analysis of regulatory barriers to the use of autonomous ships – final report" (Denmark, 2017), last accessed May 1st 2020, https://www.dma.dk/Documents/Publikationer/Analysis%20of%20Regulatory%20Barriers%20to%20the%20Use%20of%20Autonomous%20Ships.pdf

[72] Shipowners' Mutual Protection and Indemnity Association (Luxemburg), "Liability insurance for owners and operators of maritime autonomous vessels", July 2018. Last accessed May 4th 2020, https://www.shipownersclub.com/insurance/autonomous/

[73] Gard Rules for P&I 2020, available at http://www.gard.no/Content/29167884/Rules%202020_web.pdf

[74] The Nordic Marine Insurance Plan of 2013, Version 2019, available at http://www.nordicplan.org/The-Plan/

9.2 P&I Insurance backdrop

Prior to examine the scope of cover, it is relevant to contextualize the regulatory framework of P&I insurance under the Norwegian perspective. The Norwegian insurance contracts are commonly regulated by the Nordic Insurance Contracts Act (ICA)[75] and its provisions are mandatory for the benefit of persons having a right against the insurance company. However, Section 1-3 paragraph 2 letter c) includes an exception where the ICA may not apply to insurance connected to ships registered in Norway. The reasoning behind this exception is that the shipowners, as assureds, traditionally are much more professional players in the insurance markets than other groups of assureds. Thus, the protection afforded by the ICA is not needed for marine insurance[76]. In relation to P&I insurance for ocean going ships, the ICA will thus only constitute declaratory background law. All major Norwegian P&I insurers have utilised this liberty to the maximum extent[77]. In this regard, Gard Rule 90 excludes the application of ICA in its coverage.

Besides the ICA, there is the NP which includes a section common to all types of shipowner insurances and separate chapters regulating each type. Concretely, Chapter 3, establishes the duties of the person effecting the insurance and of the assured – subjective responsibilities. Chapter 13 NP regulates H&M insurer's coverage of liability arising from collision and striking. Here, it is important to outline the distinction between H&M insurance and P&I insurance.

P&I insurance is intended to cover a shipowner's liability towards third parties and it generally excludes damage to the assured's own property or direct loss of the shipowner's company, whereas H&M insurance is primarily an insurance of the assured's vessel as its primary asset. These two types of insurance interact in the area of collision and striking liability. Under Norwegian H&M insurance terms, the liability cover provided is for 4/4ths – 100% of the own ship's liabilities towards the other vessel or fixed or floating object. Hence, H&M insurer provides coverage for the loss or damage

[75] The Nordic Insurance Contracts Act of 19 June 2009 No. 77, available in English at https://cefor.no/globalassets/documents/industrypolicy/nordic-insurance-contracts-acts/insurancecontractsact_09-06-19_.pdf

[76] Trine-Lise Wilhelmsen and Hans Jacob Bull, *Handbook on Hull Insurance*, (Oslo: Gyldendal, 2017)

[77] Atle J. Skaldebo-Rod, "The Norwegian Supreme Court clarifies the applicable statute of limitations for direct actions against P&I insurers", 6th February 2020, https://bahr.no/en/newsletter/the-norwegian-supreme-court-clarifies-the-applicable-statute-of-limitations-for-direct-actions-against-pi-insurers/

caused by the physical contact between the hull of the insured vessel, or equipment permanently affixed to the vessel, and third-party property[78]. As mentioned, this coverage is regulated under Chapter 13 NP, concretely in Clause 13-1 first paragraph. However, Clause 13-1 second paragraph NP lists several exceptions and limitations that apply to the scope of such liability cover[79]. Thus, in all the listed liabilities that H&M insurance does not provide coverage, the P&I insurer will respond acting, somehow, as a complementary insurance.

The explanation for this tradition is that when the need for cover of the collision damage risk arose, P&I insurance had not yet been established, therefore it seemed natural to place this liability risk on H&M, the only insurance available. Even if it would have been logical to establish the entire liability risk with one group of insurers, such a change is unrealistic because the traditional market allocation is firmly entrenched internationally[80].

Furthermore, it should be clarified that the provisions of the NP are not binding for the assured unless it is incorporated in the actual P&I insurance contract. Hence, the relationship between the assured and the insurer will be governed by the policy, which will also refer to the applicable law and conditions to the insurance. Moreover, even though the conditions or terms for P&I insurance are not standardised formally, in reality, there is a great similarity between the conditions for P&I insurance provided by the associations who are members of The International Group[81]. The reason behind this is because providing the same or similar coverages enables the P&I Clubs to pool their risks. The purchase of re-insurance cover allows them to provide a broader cover.

9.3 Scope of cover of P&I insurance

P&I insurance is the central liability insurance in the shipping industry. Nonetheless, in some scenarios it also covers loss, damage and expenses incurred by the

[78] Gard Guidance to Masters, "The difference between P&I and Hull and Machinery insurance", last accessed May 26th 2020, http://www.gard.no/web/publications/document/chapter?p_subdoc_id=6221&p_document_id=6208
[79] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 665 – 666.
[80] Ibidem.
[81] Ibidem, 680.

member. Moreover, as a general rule, liabilities must be expressly mentioned in the conditions and terms in order to qualify for cover. Hence, P&I insurance still does not attain the character of a general liability insurance, even though it has attracted even more novel elements of liability insurance in its coverage over time. The main point here is that insurance is always effected for the individual vessel, and not for the assured as such. Accordingly, a precondition for P&I cover is that the incurred liability has direct connection to the operation of the insured vessel (Gard Rule 2.4.a). The insurance does not apply to the shipowner's business activities as such. Therefore, liability connected to the general running of the assured's shipowning company is not covered, e.g. the running of the shipowner's offices on land[82].

Furthermore, this liability must be imposed on the assured in terms of "legal liability". Thus, an ex gratia payment made by the assured with no legal basis will fall outside the insurance cover[83]. It is also important to remark that it is irrelevant whether one is dealing with contractual or non-contractual liability or the basis of the liability, as coverage is provided once liability foreseen in the conditions has been incurred[84]. Despite this, regarding contractual liability, if he assured has undertaken contractual liability which is more far reaching than what would follow from statutory law, the P&I insurer remains free from liability, unless the clause of the contract has been preapproved by the insurer (Gard Rule 55.a)[85].

Besides the above, another relevant characteristic of P&I insurance is that, in principle, the coverage is effected without sum insured. Hence, the insurer is liable to the member for an unlimited amount. There are however some limitations to this generality, in Gard Rules all the limitations are specified in Chapter 2[86].

9.3.1 Subjective conditions of cover

Before concluding an insurance contract is important for the insurer to obtain the best possible information about the risk to be undertaken. It is also important for him that

[82] Ibidem, 616 – 617.
[83] Ibidem, 683.
[84] Ibidem, 616 – 617.
[85] Ibidem, 683.
[86] Ibidem, 684.

the risk exposure does not change significantly during the insurance period. Here, the assured and the person effecting the insurance are required to actively provide information concerning the risk exposure and potential changes in such exposure[87]. Part I Chapter 3 NP imposes several conditions and duties for cover on the assured common to all insurance types. In Part I Chapter 3 of the Gard Rules these provisions are established as well.

9.3.1.1 Duty of disclosure

Clause 3-1 NP imposes an active duty of disclosure for the person effecting the insurance in relation to all circumstances which are material to the insurer. This duty applies at the moment the contract is concluded (or renewed); therefore, information subsequent changes or new circumstances are not included within this duty[88] and must be assessed according to the rules concerning alteration of risk[89].

When the person effecting the insurance becomes aware that he has provided wrong information, he has the duty to notify this to the insurer. However, this may entitle the insurer to cancel the insurance contract pursuant to Clause 3-4 NP.

The duty of disclosure is established in Gard Rule 6.

9.3.1.2 Alteration of risk

The change of risk arises when there is an alteration in the circumstances which, according to the contract, form the basis of the insurance and alters the risk contrary to the implied conditions of the contract. In this regard, Clause 3-8 second paragraph NP lists several circumstances which shall be deemed to be an alteration of risks: a change of the State of registration, of the manager of the vessel or of the company which is responsible for the technical/maritime operation of the vessel or a change of classification

[87] Ibidem, 630 – 631.
[88] Ibidem, 633.
[89] The Nordic Marine Insurance Plan of 2013, Version 2019, "Commentary: Section 1: Duty of disclosure of the person effecting the insurance", last accessed 27th May 2020, http://nordicplan.org/Commentary/Part-One/Chapter-3/Section-1/#-3-1

society. Other relevant changes that may affect the insurance are regulated in Clauses 3-14 to 3-21 NP.

Both Clause 3-9 and Gard Rule 7, establish that where there is an alteration of the risk which has been intentionally caused or agreed to by the assured and the insurer would not have accepted the entry at the same conditions if it had known of such an alteration prior to the conclusion of the contract of insurance, the insurer is free from liability to the extent that the liability, loss, cost or expense incurred by the assured was caused or increased by the alteration.

9.3.1.3 Identification

Section 6 of Chapter 3 NP establishes identification issues and relate to which persons are to be identified with the person effecting the insurance or the assured under the insurance contract. Here, the question is to what extent the insurer may invoke against the person effecting the insurance or the assured, errors or negligence committed by someone else, i.e. to what extent are the assured and the person effecting the insurance to be identified with their helpers, employees, etc.[90]

Concretely, Clause 3-36 NP regulates the identification between the assured with his servants. The main rule here is that there shall be no identification with the master or crew in respect of faults or negligence committed "in their service as seamen". The reason for this provision is that faults or negligence committed by the master and crew are one of the risks for which the shipowner should have unconditional marine insurance cover. The faults of the crew and master committed as seamen must be distinguished from errors relating to the commercial functions that the master may assume on behalf of the shipowner. Identification issues with respect to commercial errors must be resolved according to Clause 3-36 second paragraph NP. This paragraph states that the insurer may invoke against the assured faults and negligence committed by any organisation or individual to whom the assured has delegated decision-making authority concerning functions of material significance for the insurance. Thus, the crucial factor will then be

[90] The Nordic Marine Insurance Plan of 2013, Version 2019, "Commentary: Section 6: Identification", last accessed 27th May 2020, http://nordicplan.org/Commentary/Part-One/Chapter-3/Section-6/#-3-36

whether the master or crew have been given decision-making authority in matters of material significance for the insurance[91].

In view hereof, the Commentary of the NP states that as long as the master or crew have acted according to instructions from the organisation on land or with its consent, any error or negligence must be assessed as if it was committed by the organisation on land itself. If the insurer does not manage to provide the proof to the contrary, it must be assumed that the error or negligence has been committed by the people on board and therefore, the error cannot be invoked against the assured[92].

9.3.2 Risks covered

In this section, the main liabilities covered by P&I insurance are analysed by reference to Part II Chapter 1 of the Gard Rules.

9.3.2.1 Collision liability

As mentioned in sub-chapter 9.2 of this paper, liability for damages resulting from collisions between vessels or fixed or floating objects is primarily covered H&M insurance, governed by Chapter 13 NP. Nonetheless, the P&I insurer will cover the damages to the injured third party, if and to the extent that such liability is not covered under the H&M policy: either because it has exceeded the sum recoverable -*excess liability*- as established in Clause 13-3 NP, or because it is an exclusion of coverage under H&M of those listed in Clause 13-1 second paragraph NP.

In essence, Clause 13-1 second paragraph NP establishes important limitations with respect to the types of loss covered by the H&M insurance. Among others, liability arising whilst the vessel is towing, liability for personal injury, loss of life and loss suffered by passengers and crew, damage to cargo, pollution liability, wreck removal etc., all resulting from a collision or striking where the liability is imposed on the assured. The basis of this liability might be based on fault or negligence of someone onboard the vessel or strict[93].

[91] Ibidem.
[92] Ibidem.
[93] Falkanger, Bull and Brautaset, *Scandinavian Maritime Law, The Norwegian Perspective,* 667.

Consequently, as the H&M insurance excludes and limits from the scope of cover several liabilities, P&I insurance will indemnify the assured when he incurs in these liabilities. Gard Rules 36 and 37 regulate this regard.

9.3.2.2 Pollution liability

Gard Rule 38 states that the P&I will cover liability, costs and expenses arising in consequence of the discharge or escape from the vessel of oil or any other substance. Here, both liability for the actual losses incurred by third parties and expenses in connection with measures to prevent or minimize such liability will be covered. Fines imposed on the member due to oil pollution are covered under Gard Rule 47.1.c. Furthermore, Gard Rule 53.1 establishes a sum limitation of each incident, specified in Clause 2.c Appendix III.

9.3.2.3 Liability for claims relating to persons

Here, it must be distinguished among several groups of people. First, Gard Rule 27 establishes liabilities in respect of the Crew. The crew is defined in Gard Rule 1.1 as to include "*officers, including the master, and seamen contractually obliged to serve on board the Ship, including substitutes and including such persons while proceeding to or from the Ship*". Hence, any liability related to the crew's hospital expenses, repatriation, illness or death, damages to personal effects, etc. is covered by P&I insurance provided it arises under the terms of a crew agreement or contract of service or employment.

Liability in respect to passengers is regulated in Gard Rule 28, and it includes injuries, illness, death, damage to personal effects, deportation, loss caused by delay, etc. Moreover, Gard Rule 29 governs liability for other persons carried on board. For instance, the P&I insurer will cover liability arising out of injury, illness, death or damage to personal effects of a close relative of a member of the crew, when his/her presence has been approved by the Club.

The P&I insurer will also cover liability for persons not carried on board. Gard Rule 30 states that there is coverage provided that the liability arises under the terms of a contract or indemnity and would not have arisen but for those terms.

9.3.2.4 Liability for cargo damage

According to Gard Rule 34, the P&I insurance's coverage of liability for cargo damage arises in claims related to cargo intended to be, being or having been carried on the vessel. This includes, loss, shortage, damage or any other responsibility arising out of any breach by the member. Nonetheless, certain exclusions are specified in the provision concerning liabilities arising out of the carriage of cargo in which the member may incur.

9.3.2.5 Other liabilities

Gard Rules also provide coverage to other types of risks. Among others, liability for damage to property (Rule 39), obstruction and wreck removal (Rule 40), general average (Rule 41), salvage (Rule 42), towage (Rule 43), legal costs and enquiry expenses (Rules 44 and 45 respectively), expenses and costs incurred in measures to avert or minimize loss (Rule 46) and fines (Rule 47).

Furthermore, Gard Rule 50 provides coverage to damages to member's own property in cases where the vessel has caused damage to property, other than cargo, belonging to the member due to a collision or obstruction, as if it were property belonging to a third party.

9.3.2.6 Exclusions

Gard Rule 63 provides a varied and somewhat random mix of claims that are either excluded from the coverage available or which constitute exceptions to such cover. Nonetheless, the list detailed in the Rules will not be addressed further in this paper as it does not involve relevant problems for the purpose of autonomous and remote-controlled vessels.

9.4 Particularities of Remote-Controlled and Autonomous Vessels

9.4.1 Subjective conditions of cover

The author of this paper considers that the content of the duty of disclosure will still be effective when issuing P&I insurance policies for remote-controlled and autonomous vessels, including, nonetheless, the new circumstances of these ships. As described above, this duty relates to the submission of all relevant information to the insurer at the moment the contract is concluded, however, there is not a comprehensive enumeration of the concrete data that shall be put forward to the insurer. Hence, as the scope of this duty is broad and varies on a case-by-case basis, no relevant changes are required in the wording of the clause. For these new vessels, insurers will certainly require all material information about the IT system installed on the vessel and also licenses and certificates of the remote operator and the RCC ashore.

Furthermore, it is relevant to note that to the extent remote-controlled and autonomous vessels will navigate using different levels of autonomy and manning, the insurer could invoke the existence of alteration of risk if any circumstances have differed from what has been put forward when the insurance contract was concluded, and this creates a change in the risk. For instance, if the shipowner changes the remote operator company or individual in charge of the operation of the vessel or the software manufacturer of the decision-making system.

Ultimately, it is relevant to examine the identification of the remote controller and his role within the shipowner's company: whether his actions are to be deemed as "*service as seamen*" and therefore the insurer cannot invoke them against the assured, or if his errors or negligence must be assessed as if it was committed by someone to whom the assured has delegated decision-making authority concerning functions of material significance for the insurance.

The author is of the opinion that the decisions taken by the remote operator strictly related to the performance of the navigation should not be invoked by the insurer, as the purpose of his decision-making authority is comparable to the service as seamen carried out by the crew on board a traditional vessel. However, if the shipowner has delegated

further commercial functions to the remote controller of any material significance for the insurance, his negligent actions then shall be deemed to be as faults of the shipowner (assured) himself and therefore, identification will exist.

9.4.2 Risks covered

When reviewing the liabilities covered by P&I Insurance, and concretely, Gard's insurance conditions, the author does not find any obstacles or inconvenience in applying the existing wording and coverage in relation to collision, pollution and cargo liabilities described above to remote-controlled or autonomous vessels. Part II Chapter 1 of the Gard Rules does not impose any exceptions or requirements which involve or concern the level of manning or autonomy of the vessel. Furthermore, Gard Rules concerning collision, oil pollution and cargo liabilities do not relate in their wording the P&I coverage to the type of legal liability imposed on the member – the shipowner. As mentioned above, when liability foreseen in the conditions has been incurred, there is coverage, regardless of the liability regime imposed on the member. Therefore, in the case that remote-controlled or autonomous vessels entail any changes in the shipowner's liability regime, this would not restrict the coverage of the member's collision, oil pollution or cargo liabilities by the P&I insurer.

Nonetheless, where amendments become particularly relevant is in liability in respect of persons. Here, crew, passengers and other personnel on board were analysed as well as liability for persons not carried on board. For both remote-controlled and autonomous vessels these provisions would have to be suited or amended as to include the specialties of each of these vessels.

Regarding remote-controlled vessels, where there is no human presence on board the vessel performing their duties and the navigation is carried out remotely, the definition of crew provided would become obsolete as being "on board" is a condition to qualify as crew. Furthermore, Rule 27 providing coverage for the liability in respect of crew would have to be amended as to include the remote operator instead of traditional crew, as his tasks and duties are the same as the function of traditional crew but adapted remotely. Nonetheless, the modification of the wording of this Rule and the definition of crew

should not present relevant challenges; the types of liability listed may have to be adapted to those incurred by a remote-controller and considering he will be in an onshore office.

Liability for the remote-operator could also be included in Rule 30 – "Liability for persons not carried on board". However, this liability is restricted to a contractual or indemnity basis. Hence, it would be more clear-cut to regulate remote-controller's liability under the amended Rule 27, which provides a broader scope of cover and foresees more liability scenarios.

Furthermore, Rule 29 – "Liability for other persons carried on board", may still be of use for remote-controlled vessels changing however the sense of its coverage. This provision may be suitable to provide coverage to possible liability incurred concerning persons that may go on board the vessel to carry out reparations in cases of failure of the technology or equipment or in cases of emergency while the vessel is en route.

Liability in respect of passengers established in Rule 28 may remain untouched.

Concerning fully autonomous vessels, Rules 28 and 29 follow the same idea as in remote-controlled vessels. However, Rule 27 concerning liability in respect of crew would be of no use as an artificial intelligence system is expected to carry out all the crew's and master's duties. For the P&I insurer, high costs and claims should be reduced in this regard.

However, at least at their early stages, autonomous and unmanned vessels are expected to operate on different levels of autonomy depending on the circumstances or the moment of the journey. Accordingly, there will most likely exist a combination of these two approaches in the same insurance policy.

Furthermore, another particularity of these type of vessels is that they will generate much more operational data in which the insurer can rely to clarify circumstances and determining fault if an accident occurs. Hence, insurers may include as part of their conditions access to operational data in connection with claims handling and, subject to the level of autonomy, the data will replace the statements of crew and master. Consequently, this will cause that insurers will be increasingly data driven in connection

with underwriting and renewal and the insurance products and premiums will be relying on the data available[94].

10. Conclusion

Having performed an analysis of the existing legal framework regulating the shipowner's liability regimes and the new concerns remote-controlled and autonomous vessels entail, as well as the P&I insurance perspective of the matter, it is necessary to address here the final conclusions of the questions giving purpose to this study, which are:

Determining which legal challenges remote-controlled and autonomous vessels involve concerning shipowner's liability regimes and whether these new issues are covered under P&I insurance.

Primarily, as it has been discussed in Chapter 2, differentiating the degrees of autonomy and manning of the vessels during a concrete moment of the voyage is the starting point to understand the legal consequences these intelligent vessels entail. Essentially, the issue and the nature of the cause that gives rise to shipowner's liability will vary depending upon whether the vessel was using a fully autonomy mode or a remote controlled one.

In addition to this point, it has been discussed that, even though human errors will be reduced with the implementation of these new vessels, accidents will still be present in autonomous and remote-controlled vessels because, ultimately, the autonomous navigation systems or the remote-control mechanism to navigate the vessel are developed or handled by humans. Therewith, these vessels entail a change on the risks arising from their new modes of operation.

Regarding the different liability regimes that the shipowner is exposed to, the analysis has showed some relevant outcomes. About shipowner's vicarious liability in

[94] Jesper Thomas Rokkjær and Bjarke Holm Hansen, "Autonomous ships – Civil liability and insurance", December 2018, last accessed 21st May 2020, https://iumi.com/news/iumi-eye-newsletter-december-2018/autonomous-ships-civil-liability-and-insurance

remote-controlled vessels, the main point is that, under the opinion of the author, Section 151 MC can still be applicable without further amendments to faults committed by the remote controller, as the key requisite is that he is performing work in the service of the vessel. This provision has the term “others”, which leads to an open interpretation of the players that may be included within the shipowner’s scope of responsibility under vicarious liability.

As to shipowner’s vicarious liability in the context of fully autonomous vessels, the author believes that when damages are caused to a third party due to an error in the software that could have been prevented either by the shipowner’s personnel or by the manufacturer/developer, the shipowner should remain vicariously liable towards the injured third party. Moreover, concerning the autonomous decision-making system, the perspective adopted by the author is that it should be regarded also within the term “others” of Section 151 MC. Accordingly, the wrong navigational decisions that it takes should be regarded as faults committed by those performing their duties in the service of the ship and should give rise to shipowner’s vicarious liability as well.

Concerning collision liability, in both remote-controlled and fully autonomous vessels, the main finding was that when the failure of the system could not have been prevented nor foreseen, the shipowner should be free from liability, as no fault nor negligence have been committed. Here, the same arguments as in traditional vessels were followed. Nonetheless, in fully autonomous ships, it has been clarified that if the collision was caused due to a poor navigational decision taken by the decision-making software, shipowner’s fault-based liability under Section 161 MC arises.

Shipowner’s own fault liability in the scenario of remote-controlled and autonomous vessels will most likely be related to failure to act with due diligence and due care in relation to the adequacy of the software the vessel is using for her operation. However, no relevant challenges were found here.

In regard to strict liability, as it arises statutes and precedent case law, and its basis is not related to the level of autonomy, manning nor type of vessel, but on the nature of the damage caused to a third party, no issues were identified in this point.

Regarding cargo damage liability, the discussion around remote-controlled vessels was that shipowner's liability under Section 275 MC would remain applicable as well as the exemptions in Section 276 MC. Here, the damages caused to a cargo interest party by the faults of the remote-controller can be equally compared to those by the crew and master in traditional vessels. However, in fully autonomous vessels, the decisions taken by the software technology can be either considered as technical failures or as nautical faults. The results in each of the scenarios lead to a big difference concerning shipowner's liability. It was concluded by the author that it would be more appropriate to consider the poor navigational decisions of the software as nautical faults so that the shipowner can benefit from the exemption established in Section 276 paragraph 1 MC.

To conclude, this paper highlighted the possible amendments that P&I insurance coverage should introduce to fit autonomous and unmanned vessels more adequately within its wording. In essence, these types of vessels do not present barriers concerning the duty of disclosure, alteration of risk or identification. Nonetheless, these subjective conditions of cover will include the particularities of the new technology and mode of navigation within their purposes. It is only in the identification of the remote operator with the assured that remote-controlled vessels may involve further debate.

Moreover, the discussion confirms that, as P&I insurance provides coverage regardless of the liability regime imposed on the member and regardless of the autonomy and manning degree of the vessel, there are not exclusions as to coverage in relation to the particularities of remote-controlled and autonomous vessels. With that said, the provisions regarding the crew and master as well as the one concerning personnel not carried on board the vessel, will most probably be amended when concerning these new types of vessels. An adjusted wording of the definition of "crew" and of the listed risks covered when thinking of the remote-controller and the fact that he is in an onshore office carrying out his duties, would be appropriate. Furthermore, the possibility of incurring in liability in relation to personnel who might go on board to carry out reparations due to a failure in the software in exceptional circumstances, is a risk that should be foreseen and properly addressed in the policy.

REFERENCES

Bureau Veritas. “Guidelines for Autonomous Shipping: Guidance Note NI 641 DT R00 E”. Published December 2017. https://www.bureauveritas.jp/news/pdf/641-NI_2017-12.pdf

Bureau Veritas. “Guidelines for Autonomous Shipping: Guidance Note NI 641 DT R01 E”. Published October 2019. http://erules.veristar.com/dy/data/bv/pdf/641-NI_2019-10.pdf

Chen, Xia. “Liability of Maritime Claims: A Study of US Law, Chinese Law and International Conventions” Limitation of liability for maritime claims: a study of U.S. law, Chinese law, and international conventions. The Netherlands: Kluwer Law International, 2001.

Collin, Felix. “Maritime Product Liability at the Dawn of Unmanned Ships – The Finnish Perspective”. Research paper Series 2/2018. University of Turku. 2018.

Danish Maritime Authority. “Analysis of regulatory barriers to the use of autonomous ships – final report”. Published 2017. https://www.dma.dk/Documents/Publikationer/Analysis%20of%20Regulatory%20Barriers%20to%20the%20Use%20of%20Autonomous%20Ships.pdf

DNVGL. “Class Guideline – Autonomous and remotely operated ships”. Published September 2018. http://rules.dnvgl.com/docs/pdf/dnvgl/cg/2018-09/dnvgl-cg-0264.pdf

Drummond, David Mikal. “An evaluation of the collision and strict liability framework for the shipowner with respect to autonomous vessels: A Norwegian Perspective”. Master thesis. University of Oslo. 2020.

European Commission. “AUTOSHIP – Autonomous Shipping Initiative for European Waters”. Last modified 18 March 2020. https://www.autoship-project.eu/the-project/.

European Maritime Safety Agency (EMSA). “Annual Overview of Marine Casualties and Incidents of 2019”. Published 17 July 2018. https://sectormaritimo.es/wp-content/uploads/2019/11/Annual-Overview-of-Marine-Casualties-and-Incidents-2019.pdf

Gard Guidance to Masters, “The difference between P&I and Hull and Machinery insurance”. Last modified, 26 May 2020. http://www.gard.no/web/publications/document/chapter?p_subdoc_id=6221&p_document_id=6208

IMO Press Briefings. “IMO takes the first steps to address autonomous ships”. Published 25 May 2018. http://www.imo.org/en/MediaCentre/PressBriefings/Pages/08-MSC-99-MASS-scoping.aspx

Kongsberg Marine. “Autonomous ship project, key facts about Yara Birkeland”. Last modified 18 March 2020, https://www.kongsberg.com/maritime/support/themes/autonomous-ship-project-key-facts-about-yara-birkeland/.

Kongsberg Marine. “Automatic ferry enters regular service following world-first crossing with passengers onboard”. Published 13 February 2020.

https://www.kongsberg.com/maritime/about-us/news-and-media/news-archive/2020/first-adaptive-transit-on-bastofosen-vi/.

Lee, Tuan Khee. "Liability regime of autonomous ship: the Scandinavian perspective. How the liability regimes shall be regulated in the Scandinavian region?". Master thesis. University of Oslo. 2016.

Maritime Unmanned Navigation through Intelligence in Networks (MUNIN). "Welcome to the MUNIN Project web page". Last modified 18 March 2020. http://www.unmanned-ship.org/munin/

Navas, Paula. "Legal challenges of liability in collisions arising from the development of autonomous and unmanned shipping". Master thesis. University of Oslo. 2019.

Viljanen, Mika. "Legal Implications of remote and autonomous shipping: Liability Rules" Advanced Autonomous Waterborne Applications (AAWA) Position Paper, Remote and Autonomous Ships: The Next Steps", Rolls Royce (2016): 49 – 54. https://www.rolls-royce.com/~/media/Files/R/Rolls-Royce/documents/customers/marine/ship-intel/aawa-whitepaper-210616.pdf

Osmo, Iselin Landa. "Shipowner's liability for unmanned ships. Can existing legislation handle the challenges of the future?". Master thesis. University of Bergen. 2017.

Ringbom, Henrik. "Regulating Autonomous Ships—Concepts, Challenges and Precedents, Ocean Development & International Law" Ocean Development & International Law 50, no. 2-3 (2019): 5, doi: 10.1080/00908320.2019.1582593.

Rokkjær, Jesper Thomas and Hansen, Bjarke Holm "Autonomous ships – Civil liability and insurance", Published December 2018. https://iumi.com/news/iumi-eye-newsletter-december-2018/autonomous-ships-civil-liability-and-insurance

Rødseth, Ørnulf Jan and Nordahl Håvard, "Definition of autonomy levels for merchant ships", Norwegian Forum for Autonomous Ships. Published 10 October 2017. http://nfas.autonomous-ship.org/resources/autonom-defs.pdf

Sharma, A.V. Raghav. "Maritime autonomous surface ships: caught between the devil's advocate and the deep blue sea". Master thesis. World Maritime University. 2019.

Shipowners' Mutual Protection and Indemnity Association (Luxemburg). "Liability insurance for owners and operators of maritime autonomous vessels". Published July 2018. https://www.shipownersclub.com/insurance/autonomous/

Skaldebo-Rod, Atle J. "The Norwegian Supreme Court clarifies the applicable statute of limitations for direct actions against P&I insurers". Published 6 February 2020. https://bahr.no/en/newsletter/the-norwegian-supreme-court-clarifies-the-applicable-statute-of-limitations-for-direct-actions-against-pi-insurers/

Wilhelmsen, Trine-Lise and Bull, Hans Jacob. *Handbook on Hull Insurance*. Oslo: Gyldendal, 2017.

Laws and Regulations

- The Norwegian Maritime Code, 24 June 1994, nº 39 with amendments including Act 7 June 2013 nº 30
- Convention for the Unification of Certain Rules of Law with Respect to Collisions (Brussels, 23 September 1910)
- International Regulations for Preventing Collisions at Sea (1972)
- International Convention on Civil Liability for Bunker Oil Pollution Damage (2001)
- International Convention on Civil Liability for Oil Pollution Damage (1992)
- The Nordic Marine Insurance Plan of 2013, Version 2019 & Commentary.
- The Nordic Insurance Contracts Act of 19 June 2009 No. 77
- Gard Rules for P&I 2020

Cases

- ND 1958.587 NCA - LEDA
- ND 1973.348 NSC - UTHAUG
- ND 1921.401 NSC - NEPTUN
- ND 1952.320 NSC - SOKRATES
- ND 1971.36 NCS - MARNA HEPSØ
- ND 1990.362 NCA - ODDTUN
- ND 1980.277 NCC - HAUGLAND