Liability of Autonomous Ship: The Scandinavian perspective

*How the liability regimes shall be regulated in the Scandinavian region?*

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1 Introduction

1.1 Background

The topic of autonomous ships, also known as unmanned ships, has been discussed extensively in the past few years. Major economic powers\(^1\) such as the European Union and China\(^2\) have already been carrying out research and development to realize the concept of autonomous ship. Though the concept of autonomous ships might seem implausible to most people headway into such technology has in fact been made attainable. As mentioned by Roll Royce at the Autonomous Ship Technology Symposium on June 2016, this very idea could be a reality in 2020 at the earliest.\(^3\) The introduction of autonomous ships can bring to all involved parties a lot of advantages, which, of course, include reducing the operating cost for the shipowners, increasing the earning capacity of the vessel and minimizing marine accident risks, to say the least. A research paper conducted by Rolls Royce has indicated that the mere act of forgoing the bridge infrastructure can result in up to 5% conservation in mass before cargo loading, thus saving around 12-15% of fuel consumption.\(^4\)

According to the definition provided by the European Technology Platform - Waterborne TP, an autonomous ship is described as a ship which uses wireless technology to monitor and control functions both on and off board.\(^5\) This also includes the usage of advanced decision support systems to operate ships remotely under semi- or fully autonomous control. The description implies that two generic alternatives are combined in an autonomous ship. The first one refers to the Remotely Operated Vessels (ROV) - a ship where the tasks of operating the ship are performed via a remote control mechanism, for example by a shore-based...

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\(^1\) Maritime Unmanned Navigation through Intelligence in Networks  
[http://www.unmanned-ship.org/muin/](http://www.unmanned-ship.org/muin/)

\(^2\) China developing unmanned ships  

\(^3\) Rolls-Royce publishes vision of the future of remote and autonomous shipping  

\(^4\) Rolls-Royce Drone Ships Challenge $375 Billion Industry: Freight  

\(^5\) The Autonomous Ship  
controller. The other one refers to the Automated Vessel (AV) - an automated ship programmed with the advanced decision making systems on board which will undertake all the operational decisions without the need of involvement from any human operator. The definition of autonomous ship is thus not exclusive as it is very likely that the autonomous ship will be a conglomeration between the two, whereby such operating system systems are interchangeable during a single voyage, depending on traffic area.

Despite current available technology and potential benefits for stakeholders, the introduction of autonomous ships has yet to make any significant headway. This is partly due to the presence of various uncertainties that needs to be clarified prior to actual deployment, especially from the legal perspectives. As a background, the maritime industry is well known to have one of the most stable legal systems in place. Detailed rules and regulations outlined within the industry were adopted from the international conventions, such as the International Convention for the Safety Of Life At Sea’ (SOLAS), the International Convention on ‘Standards of Training, Certification and Watch-keeping’ (STCW), the ‘International Convention for the Prevention of Pollution from Ships’ (MARPOL) and the ‘Maritime Labour Convention’ (MLC). These four main conventions are also known as the four pillars of the international regulatory regime for the shipping industry. They address different problems within the maritime industry, and have been adopted by most countries in the world. In the past decades, even though ships have undergone numerous technological advancements, effectively reducing the need of human intervention at every iteration whilst becoming more sophisticated and reliable in the process, the onus of liability as laid down by the law that governs the shipping industry has remained unchanged.

1.2 Objective

Undeniably, the conventions have been revised from time to time in order to cope with the constant change in business needs and technical development. However, one fundamental feature underlines all four conventions, which is the implication of a working crew on board

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6 Van Hooydonk, E. “The law of unmanned merchant shipping – an exploration”, p.403
7 A Student Perspective: The four pillars of the international regulatory regime for quality shipping and the Greek paradigm https://maritimeatgreenwich.wordpress.com/2014/04/14/a-student-perspective-the-four-pillars-of-the-international-regulatory-regime-for-quality-shipping-and-the-greek-paradigm/
the ship. Hence, should there be an absence of a crew working on board, there is a possibility that the current conventions used to govern the maritime industry become inapplicable and obsolete. The first part of this thesis will therefore examine the applicability of the current conventions in the context of autonomous ships.

The operation of autonomous ships can be advantageous to shipowners due to cost saving and better safety assurance. Nevertheless, this shift may introduce new challenges and drawbacks that should be considered in tandem. One of the most significant issues that concern shipowners is the liability arisen due to the collision of autonomous ships. As mentioned above, the maritime industry is currently covered by very comprehensive law conventions, which includes the apportionment of liabilities among players. In other words, everyone is familiar with the current “game rules”. The introduction of autonomous ships may introduce upheavals to the current conventions, bringing forth more uncertainties to the industry. This uncertainty deters shipowners from adopting this new technology despite the potential benefits. This thesis thus aims to discuss and elucidate the restructuring in shipowner’s liability due to the introduction of such technology, with the hopes of minimizing such uncertainty. The discussion will be made mainly from the Scandinavian perspective since the liability regimes may vary a lot among countries. The autonomy level of ship is also crucial to determine how the liability is to be regulated. Therefore, the discussion will be made on two main prototypes of autonomous vessels – Remotely Operated Vessel (ROV) and Automated Vessel (AV). Apart from the liability on the part of shipowners, the thesis will also explore the liability of some main players, such as the shipbuilders who design the vessels, as well as the classification societies that approve the usage of autonomous ships.

1.3 Methodology

The topic of an autonomous ship is a relatively new concept, which might explain why studies conducted on this area have been scarce, particularly in the legal field. Hence, the discussion of this thesis will mainly be based on the findings on the white paper published by the Advanced Autonomous Waterborne Application (AAWA). AAWA is a group formed by several big companies such as Roll-Royce, Deltamarin, Immarsat, DNV GL and NAPA to

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8 Remote and Autonomous Ships – The Next Step
determine the feasibility of unmanned ships in the real world. Apart from that, this thesis has also referred to some very few legal articles that are related to autonomous ships such as “The Law of Unmanned Merchant Shipping – An Exploration”\textsuperscript{9} published by Professor Dr. Eric von Hooydonk on how autonomous ships should be deemed as ordinary ship and thus subject to the same sets of rules.

The liability of the autonomous shipowners is explained based on the applicability of current conventions and Scandinavian maritime law regimes. The European Law has also been a main influence to the development of Scandinavian law in the last decades, given that all the Scandinavian countries are either a member of European Union (EU) or European Economic Area (EEA). The discussion will therefore include applicable EU directive whenever necessary. Further notes will be made on the potential shift of liability in the future.

1.4 Limitations of study

In this thesis, the shipbuilder is viewed as a single entity which is responsible from the initial design up to the manufacturing of the autonomous vessel. However, in reality, it is very likely that the manufacturing process is going to involve other stakeholders, such as the programmers, physical ship manufacturers, equipment developers, to name but a few. Each of these separate corporate entities will definitely add more complexities to determine how the liability should be distributed. Hence, for the sake of simplicity, all those parties will be viewed as shipbuilder.

Of the above stakeholders, the programmer of an autonomous ship is accorded a role unparalleled in the traditional maritime domain. He would be developing the navigating system based on the inputs of the past experiences and hypothetical situations. Clearly, the programmer has a more profound bearing on the ship’s navigational safety than the ordinary shipbuilder.

\textsuperscript{9} Van Hooydonk, E. “The law of unmanned merchant shipping – an exploration”
2 Autonomous Ship

2.1 Definition of Ship

Technology has contributed to the increase in productivity and reliability across industries. The maritime industry is one of the best examples, as technology has facilitated the transition to motor propulsion and the usage of the Global Positioning system (GPS), just to name a few. Not only has technology improved a ship’s functions, it has also altered the interpretation of what a ship is. Just a few centuries ago, a ship was simply defined as a floatable object made out of wood and propelled by manpower. In the terms of today’s international law, however, the same thing can hardly be considered a ship anymore. The definition of ship has indeed evolved over time. Therefore, what is the most important aspect when determining if a vessel is really a ship? Currently, there is not a universal definition of ‘ship’. All international conventions pertaining to public and private maritime matters have prescribed their own interpretations of what a ship is. This will be further discussed below. Even on a national level, each country has also established its definition of a ship. Hence, it is essential to find out whether autonomous ships are categorized as ships by existing definitions, and consequently, if current conventions are still applicable in the case of autonomous ships.

Under international law, the term “ship” is in fact not strictly defined. The terms “ship” and “vessel” are used interchangeably. For instance, in the United Nations Convention on the Law of the Sea (UNCLOS), the term is not defined at all even though it has been widely used. In other conventions such as the International Regulations for Avoiding Collisions at Sea (COLREGS), a ship is defined as “every description of watercraft, including non-displacement craft and seaplanes, used or capable of being used as a means of transportation on water”.

Many other important international conventions related to the carriage of goods

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14 COLREGS Part A – Rule 3
by sea such as the Convention on Maritime Liens and Mortgages, Hague Rules, Rotterdam Rules, and so forth have also had the similar definition of ship.\textsuperscript{15}

Similarly, the conventions that related to the liability of shipowners, such as the International Convention on Civil Liability for Oil Pollution Damage \textsuperscript{16}, International Convention on Civil Liability for Bunker Oil Pollution Damage \textsuperscript{17}, International Convention on Liability and Compensation for Damage in Connection With the Carriage of Hazardous and Noxious Substance by Sea \textsuperscript{18}, etc, have defined the ship as “any seagoing vessel and seaborne craft, of any type whatsoever”, solely based on its functionality. In short, the crew is not mentioned in any of the definitions of ‘ship’. It is clear that autonomous ships have not been excluded to be categorized as a ship. In other words, an autonomous ship will be considered a ship under international law. Therefore, the current relevant conventions would apply accordingly even though there is no crew working on board.

Shipping is a global business. Ships travel from countries to countries, continents to continents. Hence, it is important to determine if an autonomous ship can be viewed the same on the national legislation level to ensure that it is not restricted to navigate to certain ports due to its advanced technology. On the national level, most countries have their own sets of maritime rules adopted from the ratification of international conventions. Some of them may even go a step further to adopt more stringent rules to ensure the utmost level of safety and environmental protection. It is impossible to list down all the countries’ maritime laws. In this thesis, only the main big economic power or maritime nations like the United States of America, China, United Kingdom, etc are used as illustration. The reason of this selection is the influencing power of these nations is crucial to shaping of the maritime law order. In the United States, the word ‘vessel’ implies ‘every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water’.\textsuperscript{19} On the other hand, according to the Maritime Code of the People’s Republic of China a ‘ship’ is one of any ‘sea-going ships and other mobile units’. However, the definition does not include ships or craft to be used for military or public service purposes, nor small ships of less than 20

\textsuperscript{15}Van Hooydonk, E. “The law of unmanned merchant shipping – an exploration”, p.407 - 408
\textsuperscript{16}International Convention on Civil Liability for Oil Pollution Damage, London 1992 Article 1/1
\textsuperscript{17}International Convention on Civil Liability for Bunker Oil Pollution Damage, London 2001 Article 1/1
\textsuperscript{18}International Convention on Liability and Compensation for Damage in Connection With the Carriage of Hazardous and Noxious Substance by Sea, London 1996 Article 1/1
\textsuperscript{19}U.S.Code Title 1 Chapter 1 § 3
tons gross tonnage’.\textsuperscript{20} This definition is very similar to that stated in the Norwegian Maritime Code, specifying that the minimum length of vessel to be 15 meters.\textsuperscript{21} Other maritime nations such as the United Kingdom Merchant Shipping Act defines a ‘ship’ as ‘every description of vessel used in navigation’ \textsuperscript{22} while the Dutch Civil Code defines ‘ships’ to be ‘all things, not being aircraft, that according to their construction are intended for floating, and that do float or have been floating’.\textsuperscript{23} As shown above, there are no semantic obstacles to prevent autonomous vessels from being considered normal ships on a national level. Autonomous ships sailing to most ports will be treated as normal vessels as well.

To sum up, it is safe to assume that an autonomous ship is viewed as a normal ship based on the current interpretations under international law and national legislations. Most of the current maritime conventions are still applicable to autonomous ships without a profound need to overhaul the current system. The elimination of a crew on board does not lead to any foreseeable issues in applying the current convention or national law on the autonomous ship itself. The only potential problem is with the flag state of the autonomous vessel. Therefore, the autonomous shipowning company has to be more transparent in order to fulfill the requirement of establishing a genuine link between the flag state and the ship. Although it is clear that autonomous ships will be governed by the existing rules and regulations, it is conceivable that new rules will be imposed on them, both in the eye of the public law and private contracts, to ensure that the safety of the shipping business is not compromised. It is true that even though the definition of ‘ship’, based on those conventions, does not include the crew, most of them do contain certain provisions that directly refer to the responsibilities of the crew. Therefore, clarifications regarding the treatment of such provisions in the absence of a crew should be addressed by the respective lawmakers, on whether the rules should be simply ignored or be overridden by new provisions if autonomous ship is implemented. In the next section, the crew’s role, in particular the master’s, will be discussed to determine if retention of these provisions is essential.

\begin{flushright}
\textsuperscript{20} Maritime Code of the People’s Republic of China § 3 \\
\textsuperscript{21} Norwegian Maritime Code § 11 \\
\textsuperscript{22} United Kingdom Merchant Shipping Act 1995 Part 1 – Preliminary \\
\textsuperscript{23} Dutch Civil Code § 8.1
\end{flushright}
2.2 Role of Master

Master, sometimes also referred to as the Sea Captain, is the highest ranked member on a ship. “Master Under God” was once a term used to describe the almighty role of a Master due to his authority over and responsibility for the ship. A Master is responsible for the safety of the ship along with everyone on board the vessel. Apart from that, Master also once served the position to represent the owner’s best interest during decisions-making processes in the distant port in respect of business dealing, stores and provisions purchasing. Nevertheless, with the advent of radio and instant communication, the once all-encompassing role has gradually been curtailed. Nowadays, the Master is simply a person who takes order from the head office to navigate the vessel safely from one port to another. On the sea, the Master will be taking orders on nautical and operational matters. At the port, the appointed port agents will be representing the shipowner to make all necessary arrangements for the ship when she is there. Even the storage plan and all the necessary shipping documents such as the Bill of Lading can also be processed by the shore based office. The role of Master is indeed gradually downgraded. When the autonomous ship is deployed, it would seem that this role will be totally superseded. However, upon closer inspection, this is not entirely true.

The implementation of autonomous ships does not mean that all the crew’s responsibilities are gone, especially for the ROV-type autonomous vessel. The crew’s duties are however being transferred to the shore based controller. Theoretically speaking, the shore based controller should be bound to all the conventions related to the current crew’s responsibilities. Therefore, it is indeed essential to ensure that all the conventions’ wordings concern the shore based controller. For example, the STCW Convention clearly states that the standards for the training, qualifications and certification apply only to ‘seafarers serving on board seagoing ships’. \(^{24}\) The definition needs to be broader so as to include the shore based controller and therefore ensure that this personnel in this role is well trained in accordance to the international standards.

\(^{24}\) International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Article III


3 Current Liability Regimes

Shipping, like any other kind of business, is not risk free. Hence, it is always essential for those parties who have direct interest in the shipping operations know the allocation of their risks, especially the shipowner’s. Owning a vessel comes with certain responsibilities. Most of the times, the responsibilities are detailed in the contracts. The contractual responsibilities will then determine the liabilities of each party. The contractual relationship can be between the shipowner and the cargo owner, between the shipowner and the tug owner, or between the shipowner and the crew, so on and so forth. However, not all liabilities are stated in the contracts. The shipowner is sometimes also liable for the damage toward the third parties that are not specified in the contract. One great example of non-contractual liabilities would be the environmental pollution caused by the vessel. There are also other kinds of liabilities that the shipowner has when he is running a vessel. Those liabilities can be categorized into different groups such as damages to the others’ properties, personal injuries and etc.

The traditional approach in the view of Scandinavian Law to determine if there is liability for damage is triggered by negligence.\(^{25}\) It means if anyone has caused damages to other parties due to his or her culpable manner, he or she is therefore liable for the damage. There must be both causation and negligence in order to hold the tortfeasor liable for the damage. The burden of proof lies on the tortfeasor. If the tortfeasor fails to prove that the accident is not due to his negligence act, he will be liable for the damage. It is also a requirement that the damage is sufficiently proximate. In other words, the tortfeasor should have foreseen the damage will result. Besides the liability triggered by negligence, there are also other forms of liability recognized by the Scandinavia in the context of maritime law, such as the strict liability and vicarious liability.

Nevertheless, one of the unique characteristics of the maritime law is that there is limitation of liability for the shipowner. Hence, shipowner can usually invoke the limitation of liability to protect himself from being fully exposed to the huge amount of financial claims. This particular section focuses on the current liability regimes of the shipowner in order to have a better understanding on how the liability regimes of autonomous ship will be reconstructed.

3.1 Vicarious Liability of Shipowner

Like all other businesses, the shipowner as an employer has a vicarious liability for the crew working on board who are actually his employees\(^\text{26}\). In other words, the shipowner is liable for the crew’s fault. In the Scandinavian region, the vicarious liability of a shipowner does not only cover the crew, but also all the personnel who are performing service to the ship.\(^\text{27}\) The reasoning behind this is that most of the times, errors that cause accidents are made by those related parties instead of the shipowner himself. The vicarious liability of shipowner will therefore ensure that the injured parties are able to seek compensation from the shipowner who has sufficient cash reserves to pay for the damage. Hence, generally speaking, the shipowner has a rather strict liability toward any incidents caused by his vessel due to the vicarious liability\(^\text{28}\).

3.2 Contractual Liability toward Cargo Damage

Once the cargo is loaded on board, the shipper will receive a bill of lading or seaway bill issued by the Master as a receipt. Apart from serving as a receipt, the bill of lading or seaway bill is also a contract for the carriage of goods. The contract of carriage details out the responsibilities of the shipowner toward the cargo carried on board. The shipowner is therefore liable for the cargo damage as pursuant to the contract of carriage issued. There are four main international sets of rules which commonly apply to the carriage of goods by sea, namely the Hague Rules 1924, Hague-Visby Rules 1968, Hamburg Rules 1979 and Rotterdam Rules 2009. Each of the rules has different interpretations on how the responsibilities should be allocated among the shipper and carrier. Currently, all the Scandinavian countries are still using the Hague-Visby Rules as the main rules in their maritime code. Even though all the Scandinavian countries have not ratified Hamburg Rules so far\(^\text{29}\), all of them have in fact incorporated some of the provisions of Hamburg Rules to

\(^{27}\) Norwegian Maritime Code § 151  
\(^{28}\) Ulbeck V., “Liability of the shipowner” 2014 Slide 2  
http://www.uio.no/studier/emner/jus/jus/JUS5402/h14/undervisningsmateriale/liability-of-the-shipowner_vibeu.pdf  
modify the liability system in the Hague-Visby Rules.\textsuperscript{30} Norway, in particular, has even gone one step further to apply Hamburg Rules to its domestic sea transport.\textsuperscript{31}

### 3.2.1 Exemption of Liability

One classic example of an exemption clause can be shown in the event of cargo damage. The exemption clause is a very useful tool for the shipowner since many accidents could be easily traced back to nautical fault. The exemption clause clearly states that “Neither the carrier nor the ship shall be responsible for loss or damage arising or resulting from act, neglect, or default of the master, mariner, pilot, or the servants of the carrier in the navigation or in the management of the ship”. Therefore, in the situation like cargo damage due to the crew’s negligence on the navigational error of vessel, the shipowner can still exempt himself from the liability as stated in the Hague Visby Rules provided that the vessel is initial seaworthy.\textsuperscript{32} The exemption clause is very much favorable for the shipowner since it can release the shipowner from the liability toward the damage of cargo on board. This specific exemption clause has been removed away from the Hamburg and Rotterdam Rules. Hence, the liability of shipowners toward the cargo damage in the Norwegian domestic sea trade is exclusively based on fault without any exemptions being allowed.\textsuperscript{33}

### 3.2.2 Limitation of Liability

Even though the shipowner will not be able to invoke the exemption of liability, he will still able to have the limitation of liability in the event of cargo damage. The limitation amount varies depending on which sets of international rules are used. For the Hague-Visby Rules adopt the limits of 2 Special Drawing Rights (SDR) per kilo or 667 SDR per package\textsuperscript{34}. The shipowner can always limit his liability for the damage to the cargo unless the damage is caused by himself willfully or through gross negligence and with the knowledge that such loss would result.\textsuperscript{35}

\textsuperscript{31} Norwegian Maritime Code § 276
\textsuperscript{32} Hague-Visby Rules Article IV
\textsuperscript{33} Yang Y., “The abolition of the nautical fault exemption: To be or not to be”, p.17
\textsuperscript{34} Hague-Visby Rules Article IV (5)
\textsuperscript{35} Hague-Visby Rules Article IV bis
3.3 Liability toward Personal Injury

Personal injury includes the injury of crew and passengers on board the vessel. Personal injury liability varies among countries, some countries are still relying on a traditional negligence test and some have adopted statutory strict liability. In Scandinavian countries, personal injury liability is a strict liability.\textsuperscript{36} Similarly, such claim has also a limitation amount as stipulated in Convention on Limitation of Liability for Maritime Claims (LLMC).\textsuperscript{37}

3.4 Collision Liability

Despite having the most sophisticated communication equipment on board, collision of vessels still happens frequently mainly due to the heavy concentration of vessels in certain areas and traveling in high speed during bad weather.\textsuperscript{38} Collision of vessels usually refers to the actual physical contact of two vessels regardless of whether they are moving or staying stationary. Sometimes, it can also be referred as collision even though there is no direct physical contact between the vessels, for instance when damage is caused by the striking of an object due to the maneuvering of another vessel.

3.4.1 Fault-based Liability

Matters of collision are currently governed by the Brussels Collision Convention 1910. The convention is based on the concept of fault. In the event of a collision between vessels, the shipowner is only liable for the damage to the collided vessel if the cause of damage is due to his responsibility or that of the parties whom he is vicarious liable for. The International Rules for Prevention of Collision at Sea (The Rules of the Road) is usually used to determine if there is negligence.

\textsuperscript{36} EU Regulation 392/2009 and The Athens Convention 2002  
\textsuperscript{37} LLMC Article 3a  
\textsuperscript{38} Falkanger T., Bull, H.J., Brautaset, L. “Scandinavian maritime law - the Norwegian perspective”. Universitetsforlaget 2011, p.226
3.4.2 Limitation of Liability

The limitation of collision liability is covered by the property damage section in Convention on Limitation of Liability for Maritime Claims (LLMC)\(^{39}\). The limitation is based on the GRT of the vessel.

3.5 Pollution Liability

Shipping has always been connected to the source of environmental pollution at sea, such as oil spill, discharge of polluted substances, etc. In the past few decades, there have been several catastrophic events like Torrey Canyon (1967) and Amoco Cadiz (1978) which had contributed to increasing regulations to tackle the pollution problems caused by the shipping sector.

3.5.1 Strict Liability

There are several conventions that are associated to the pollution liability of shipowner in different scenarios. For oil pollution, it is currently governed by the International Convention on Civil Liability for Oil Pollution Damage (CLC) while for bunker oil pollution, it is covered by the International Convention on Civil Liability for Bunker Oil Pollution Damage 2011 (Bunker Convention). Nevertheless, the liability of shipowner with regard to these two kinds of pollution is strict unless the shipowner can prove that the accident is caused by the act of war, intention act of third parties or negligence of the government.\(^{40,41}\)

3.5.2 Limitation of Liability

The limitation for oil pollution scenario has its own special limitation rules as stipulated in the CLC Convention Article 5. On the other hand, the bunker oil pollution incidents shall follow the same limitation amount like the other maritime claims in LLMC.\(^{42}\)

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\(^{39}\) LLMC Article 3b

\(^{40}\) CLC Convention Article 3

\(^{41}\) Bunker Convention Article 3

\(^{42}\) Bunker Convention Article 6
3.6 Other Liabilities

3.6.1 Damage to Land Infrastructure
As for damage to the other land infrastructures, there is no any liability convention covering it at this moment. The liability of a shipowner in such circumstances is currently determined by ordinary tort law. Under some jurisdictions like the United Kingdom, the shipowner is strictly liable for the damage to the pier but it is different in the Scandinavian region. For instance the Norwegian court will only impose strict liability if there is a technical failure of vessel. It is interesting that the strict liability is only imposed when the ship damages land based installations like piers and bridges. If the ship damages other properties, the court will still apply the fault-based liability even with the presence of technical failure. On the other hand, the other Scandinavian countries do not have the strict liability regime like Norwegian Law on this matter but instead they impose a very high standard of care on the owner to impose the liability.

3.6.2 General Economic Loss
Accidents may sometimes also lead to subsequent economic loss of other parties. Those parties can therefore claim for damages based on general tort law. Whether or not the damages can be claimed for usually depends on the remoteness of the damage.

All these maritime claims have limitation amount under the same category as indicated in the LLMC. The liability regimes of the shipowner are very comprehensive as mentioned above. With the exemption clauses and limitation amount, it is undisputed that the shipowner is well protected by the current regimes. This current position may be altered once the autonomous ship is introduced. Hence, the next section will discuss on how the new liability regimes will be based on the two kinds autonomous vessels – ROV and AV mentioned earlier.

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44 Harbour Dock Piers Clauses Act (HDPCA)1847 Sec 47
45 ND 1952.320 NSC Sokrates
46 ND 1973.348 NSC Uthaug
47 ND 1995.163 DSC Bravur
4 Liability of Autonomous Shipowner

As mentioned in the previous section, there are two kinds of autonomous ship – Remotely Operated Vessel (ROV) and Automated Vessel (AV). Both these vessels have the common characteristic of no crew working on board but the operation of these two vessels is totally different. For ROV, the operation of the vessel is done remotely by an operator on shore (will be referred as onshore controller from now on). The onshore controller will be in charge of all navigation of the vessel through the remote system. Basically, the concept of this kind of autonomous ship is just transferring the duties of the crew to the onshore controller. On the other hand, AV is a fully automated vessel. The vessel will be maneuvered based on the sophisticated artificial intelligence equipped on board. Unlike the ROV, the duties of the crew in AV are completely replaced by the robotic system. Hence, the shipowner has actually only limited or even no control to his own vessel. In this case, it may be hard to establish any fault or negligence on the shipowner. Hence, even though the autonomous ship is still governed by the current maritime conventions, it creates more uncertainties to the maritime industry on how the liability of shipowners shall be regulated.

It is essential for the shipowner to understand their stand and exposure to the liability due to the implementation of autonomous vessel. After all, they are the parties who are going to purchase those vessels and run them in the real business world. The discussion will be separated into two parts due to the different in nature of these two kinds of autonomous vessel.

4.1 Liability of Remotely Operated Vessel (ROV)

4.1.1 Contractual Liability

Ideally, the Master should follow the voyage instruction and perform the voyage according to the good seamanship manner. Nevertheless, sometimes the Master or crew may commit some errors due to lack of communication with the operator which subsequently lead to damage to the cargo. The transfer of crew duties back to shore means that the possibility to commit error will be substantially reduced. The onshore controller will be relying on all the sensors on board and navigate the ROV more safely according to the voyage plan. It is undoubted that even though the autonomous ship is introduced, it is the duty of carrier to work due diligence
to make the ship seaworthy. ROV should be equipped with the satisfactorily functional IT mechanism and well trained shore based controller when it is introduced. The duty of care for an autonomous shipowner should be exactly like an ordinary shipowner since basically both are providing the same services. It is not fair to expect a ROV shipowner to exercise a higher duty of care than the others. If the autonomous ship is seaworthy, the exemption clause should be applied accordingly to the autonomous shipowner for situations when the shore based controller commits the nautical fault which subsequently leads to the damage of the cargo. Therefore, there is not much change on the contractual liability for ROV-owner.

4.1.2 Non-Contractual Liability

Even though the autonomous ship can reduce the human error factor, it is unavoidable that collision accidents will still occur in the near future. Unlike damages to the cargo, there is no exemption clause for the shipowners to escape from the liability of collision of vessels. As mentioned in the previous section, the current regime for collision liability is based on negligence. Hence, if the onshore controller commits the error which leads to the collision with other vessels, the ROV shipowner shall be liable for the damage. The onshore controller is expected to follow the Rules of the Road to avoid being branded as negligent. The Rules of the Road was designed for the Master or the crew to carry their duties accordingly to avoid the collision of vessels. In spite of that, the rules are still applicable to ROV since those mentioned jobs such as maintaining a proper look out, safe speed, giving ways to other vessels can still be controlled by the onshore controller. As long as the onshore controller is fulfilling the duties as mentioned in the Rules, the ROV should not be deemed sailing negligently.

It is also possible that the onshore controller has already fulfilled his duty to navigate the ship but accident still happens due to the malfunction of sensors. In this case, the causation of the accident is viewed as the technical defect of the vessel. Whether or not the causation is technical defect is very important since it may change the liability regime from fault-based to strict. The damage to the land infrastructure is a very good example to illustrate this in the context of Norwegian Law. It is a strict liability to the owner if the ship collides with land infrastructures and the causation is the technical failure of the vessel. Nevertheless, the

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48 COLREGS Part B
49 ND 1952.320 NSC Sokrates
Norwegian court is not going apply strict liability on the same event with the absence of the technical failure.\(^{50}\)

For other relevant economic loss, there are no differences between damages is caused by the crew or the shipowner himself. Therefore, the transfer of role to the shore based controller has no effect to this kind of liability. Same goes with the environmental pollution and personal injury which are strict liabilities for the shipowner. In other words, the liability of ROV toward those damages remains the same.

### 4.1.3 Role of Onshore Controller

Once the ROV-typed autonomous ship is introduced, the shore based controller shall be also a party to whom the shipowner is vicariously liable of. For ROV-type autonomous vessel, the duty of crew will be all transferred to the onshore controller. Since the crew’s responsibilities are transferred to the shore based controller, he shall be responsible for any of the navigational and management of the ship. The central problem is to establish if the onshore controller can still be viewed as “crew” in general. The onshore controller has indeed retained the role of the Master or crew to navigate the ship as discussed in the first chapter. The difference between them is while one is working at the shore based office, the later is working on board the vessel. Therefore, they should be viewed to be the same party.

However, it is important to note that the exemption clause in the event of cargo damage only covers nautical error committed by the crew but not the shipowner himself.\(^{51}\) In other words, the right to invoke the exemption clause is lost if the errors are considered as privity. In the context of Scandinavian Law, if a person has a fairly significant level of responsibility in the company commits the fault, it will be viewed as the shipowner himself who commits the fault.\(^ {52}\) Hence, the identification of the shore based controller is very important. The ROV owner may not be able to invoke the exemption clause for nautical fault of the ROV if the shore based operator is having roles other than navigating the vessel remotely in the office. Whether or not if the exemption clause can be invoked depends a lot on the circumstances. The burden of proof is on the shipowner to show that it is a nautical fault. It is indeed slightly more difficult for the ROV shipowner to establish the proof. Nevertheless, as long as the

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\(^{50}\) ND 1958.587 NCA Lena  
\(^{51}\) Hague-Visby Rules Article IV 2(a)  
\(^{52}\) Falkanger T., Bull, H.J., Brautaset, L., “Scandinavian maritime law - the Norwegian perspective”, Universitetsforlaget 2011, p.194
autonomous shipowner can prove that the shore based controller is solely in charge of the navigation of vessel but not anymore, the exemption clause should apply accordingly.

The role of the onshore controller also has impact on the marine insurance. If it is the crew’s negligence which has led to the collision, the shipowner can still claim from the insurer for instance if he has purchased the Nordic Marine Insurance Plan. The marine insurance is determined based on the risks of the business. The new role of shore based controller definitely generates new risks. Even though the shore based controller is going to be regarded as “crew” in the context of law, the insurer is very likely to have opposing views due to the new change. Just take the Nordic Marine Insurance Plan as an example again. In § 3-36 of NMIP, it states that “The insurer may not invoke against the assured faults or negligence committed by the ship's master or crew in connection with their service as seamen.” The shore based controller is working at the shore and cannot be considered as a seaman. The fault of on shore controller is therefore deemed as the shipowner’s own fault if based on the current clause. Therefore, the current clauses must be updated to ensure coverage. Nevertheless, this should not be view as an obstacle for the unmanned ship. The premium for unmanned ship is expected to reduce in the long run due to the better safety record of this type of ship.

To briefly sum up above, ROV is an autonomous ship which still needs to be manually controlled. The main difference is the transfer of duty of the crew to the shore based operator. The relationship between the owner and the shore based controller has to be clear in order for the owner to retain the same liability. The job scope of shore based controller should be limited to only navigational and management of ship. Therefore, the shore based controller can still be viewed as “crew” and able to invoke the exemption clause based on nautical fault like the same contractual liability as before. For non-contractual liability like collision liability and pollution liability, the ROV owner is going to have the same liability as other ordinary shipowner.

4.2 Liability of Automated Vessel (AV)

4.2.1 Contractual Liabilities

53 Nordic Insurance Plan § 3-36
54 Sage-Fuller B., “Legal Framework for Unmanned Vessel” Slide 14
Unlike ROV, AV is a fully automated vessel. The vessel is installed with advanced system for dynamic positioning and navigation without any human interference. In cargo damage cases, the AV owner has the burden of proof to prove that the accident is caused by the causes mentioned in the exemption clause such as the navigational error or fire if he wants to be exempted from the liability. The malfunction of the system installed is very hard to be associated as a nautical fault. Instead, it will be deemed as a technical defect of the vessel. Technical defect of the AV is not one of the causes mentioned in the exemption clause. Therefore, the AV-owner is unable to invoke the exemption clause to shield himself from the damage of cargo. Compared to the ordinary shipowners, the AV-owner is definitely having disadvantage on this matter since it is very common for the ordinary shipowners to exempt liability based on the nautical fault.\textsuperscript{55} Clearly, if the advanced system is properly made, AV should be the safest vessel since the vessel will be 100\% free from human error risks. However, the reality is this will never happen since at the first place, the system installed is made by human. There are also scenarios where the system has been designed wrongly or the programmer does not anticipate such events will occur at all. If that is the case, it is very unlikely that the exemption clause can be invoked in the event of cargo damage claim.

4.2.2 Non-contractual Liabilities

For cases that involve fault based liability like the collision of vessels, the liability of the shipowner is based on the degree of fault. The starting point is for the shipowner to prove that the accident is not due to the negligence act of himself or the parties to whom he is responsible for. As mentioned in the previous chapter, both causation and negligence must present to hold the shipowner liable for the damage. However, this will create some problems if the same shall be applied on AV for any collision incidents of AV in the future.

In the case ND 1971.36 NSC MARNA HEPSØ, the judge had concluded that both the colliding vessels had to bear their own losses since it was an unavoidable accident. There was no fault committed by anyone on board and the cause of the accidents was the technical failure of reverse engine. Now, let’s apply the case on AV. The first requirement to trigger the fault-based liability – causation is easy to fulfill. If the causation is the system error of the AV, the error will be viewed as the technical defect of AV. The main problem is to fulfill the

second requirement - negligence. The AV-owner just has to prove that there is no any negligence act done by his side. Since there is no negligence committed by the AV-owner, there will not be liability. If the collision is between two AVs, there is not a big issue since both parties will just bear their own losses. However, if it is a collision between an AV and other ordinary vessels, then it may create unfairness to the ordinary shipowner. The ordinary shipowner is very likely to bear more responsibilities than the AV-owner in this case since there are always duties faults being allocated on the crew on board and therefore lead to more faults, for instance the violation of not taking precautionary manoeuvres to avoid the collision.\(^{56}\) It is definitely unfair for the ordinary shipowner to absorb the costs.

As a result, there should be a very high standard of care being imposed on the AV-owner to prevent them avoiding all liabilities easily by simply claiming no negligence has been triggered. The technical defect of AV can be traced back to the origin. If the defect is due to the shipowner’s own failure on supervising or poor selection of shipyard, then the AV-owner will be liable for the damage.\(^{57}\) Whether or not the implementation of AV is beneficial to the shipowner is dependent on the shipyard that designs and manufactures the ship. Imposing high standard of care to the shipowner is common in the Scandinavian region. In the case ND 1995.163 DSC BRAVUR, the shipowner was found liable for the faulty design of the pneumatic cylinder. The court concluded that the shipowner should have undertaken the inspection of ship and thus identified the design error. The high standard of care can be deemed as a virtual strict liability to the AV-owner. In other words, the AV shipowner can be liable in the event of collision of vessels. The AV-owner is definitely much better off by transferring all the liabilities to the others and at the same time enjoying the economic advantages of running an AV if they are being subject to the same standard of care like ordinary ship. This scenario is unlikely to happen to ensure the fairness and equilibrium among players in this industry. This is definitely a part that the lawmakers have to figure out before the implementation of AV.

In the event of collision between AV with other land infrastructures, the liability regime in the Scandinavian region is rather strict. In such cases, the current shipowner has already borne more responsibilities for the damage due to the technical defect error of the vessel. For instance, in the light of Norwegian Law, the shipowner has a strict liability toward the

\(^{56}\) International Rules for Prevention of Collisions at Sea (The Rules of the Road) Rule 17

damage if it is caused by the technical defect of the vessel. Therefore, if the installed navigational system of the AV has gone wrong and thus led to a collision to land infrastructure, it is a strict liability to the shipowners which is the same as a normal vessel. The other Scandinavian countries are not going to apply strict liability to the AV-owner in the event of collision with land infrastructures but the high standard of care being imposed will generate the same effect like the strict liability on the AV-owner.

For the cases of personal injury, the liability is a strict liability. It is true that there will be no crew on board after the implementation of autonomous ship and therefore less personal injury incidents will occur. Nevertheless, it is still essential to take the passengers on board the automated cruise ships or other personnel who are providing services to the ship when the AV is at port into account. The likelihood of cruise ships being fully automated is very low due to the nature of business. The AV-owner cannot escape liability since it is a strict liability for personal injury claim. For environmental liability, the current regime is already a strict liability. Hence, the AV-owner will have the same liability as the ordinary shipowner if the AV causes any pollution damage.

It is important to note that the above discussion is all based on the causation of initial programming error of the AV and the error is not known before the incident occurs. If the causation is due to the programming error that has actually been found out earlier but no action is taken by the AV-owner, then the culpable manner of AV-owner will definitely be considered as a negligence act.

4.2.3 Shift toward Strict Liability

Replacement of work on board by technology has been a normal trend in the past decades, for instance the implementation of radar system, GPS system, etc. This is to make shipping become more reliable by eliminating the human error factor. However, the technology replacement should not imply that the shipowner has no responsibility afterward. The responsibility of the shipowner due to the advanced equipment should be increased by offsetting the economic advantages which he has gained. It is unsure how the new liability for the AV shipowner will be. Nevertheless, in the context of Norwegian law, it is very likely that strict liability will be imposed on the AV-owner. The trend can be found on the previous

58 ND 1952.320 NSC SOKRATES
cases of other autonomous machinery failure when they were first introduced. For instance in the case Rt-1957-1097, the court had held the building owner liable for the technical failure of the elevator and in the case Rt-1948-1111, the court had also held that the autonomous tram owner had to be liable for the damage caused even though it was a technical failure of the tram. It seems that this trend will continue and be applied on the autonomous ship. The other Scandinavian countries may apply the same strict liability doctrine or a very high standard of care on the autonomous shipowner to harmonize the system. For the sake of simplicity, it is perhaps best to apply strict liability on the AV owner.

4.2.4 Limitation of Liability

Limitation of liability is a common characteristic in the context of maritime liability regardless if it is strict or fault based liability. The limitation amount for damage caused by autonomous ship shall be the same as the damage caused by the other ordinary vessels according to the current applicable maritime conventions. Due to the fact that the damage cannot be fully recovered due to the limitation of liability, there is a possibility that the injured parties will seek the compensation from other relevant parties instead. The shipyard is very likely to be claimed against due to their negligence designing and manufacturing of the AV. The manufacturing of a ship involves a lot of parties, which include the shipyard, various equipment providers, system developers, etc. In this thesis, the discussion will discuss their liabilities as a whole. Apart from shipbuilder, the classification societies approving the design of autonomous ships are also a potential party.

To conclude, the liability issue of an AV-type of autonomous ship is obviously far more complex than the liability of ROV. If solely based on the current conventions, the AV-owner is going to lose some of the benefits such as the loss of invoking exemption clauses. The liability regime for the AV may shift toward strict liability to ensure fairness and equilibrium of the industry in the Scandinavian countries. There is a possibility that injured parties seeking compensation for damages from other relevant parties due to the limitation amount imposed. The next section will therefore discuss the liability toward the other two relevant parties – Shipbuilder and Classification Societies.

59 See Chapter 3
5 Liability of Related Parties

The liability of AV is definitely far more complex than the ROV. The autonomous ship is something that is unparalleled to anything previously. Although it has been discussed previously that the shipowner will be strictly liable for the damage, it does not prevent the injured parties to seek compensation from other relevant parties directly based on other rules. The main reason is that there is no limitation amount for those claims as they are not considered as maritime claims. For instance, the parties can claim damages from the shipbuilder based on the product liability regimes. The product liability regimes are slightly differed in each parts of the world. Hence, the next section will further discuss this matter in the Scandinavian countries and see how the liability to the AV shipbuilder would be imposed. Apart from the shipbuilder, the classification societies who approve the design of AV are also a potential party that may be sought compensation from. Many relevant parties in the shipping industry are still relying on the certificates issued by a classification society as an expressed warranty that the vessel is seaworthy for example, marine insurance companies. If the classification societies have issued the certificate to an AV, the quality of the AV should be up to a certain standard. Therefore, if damages occur, the injured parties will seek compensation from the classification societies.

5.1 Liability of Shipbuilder

Like all other manufacturing businesses, the shipbuilder is liable for the products which he manufactures. In this case, it is the Automated Vessel. The extent of product liability in the context of Scandinavian Law is not fully known since it has not been discussed much and there is no any precedent case before. However, this kind of liability is very common in certain nations. The product liability rules are slightly differed among nations. The United States is the first country to impose the strict regimes of product liability on the manufacturer. There are three major types of product liability in the USA: three major types of product liability claims: 1) Manufacturing defect, 2) Design defect, 3) Marketing defects, i.e. Failure to provide adequate warning. Hence, as long as the injured parties can show that the autonomous ship is unreasonably dangerous and defective based on any of the three types, the ship builder shall be strictly liable for the damage.

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60 Ulfbeck, V. “Maritime Product Liability”, p.66
61 Restatement of the Law, Third, Torts: Products Liability § 2
In Europe, all the EU countries are subjected to the Product Liability Directive 1985. It is also a strict product liability scheme to ensure that damage can be recovered from the producer of the defective goods. Not all Scandinavian countries are in the European Union - Norway and Iceland. Nevertheless, they will be bound by the same rules since they are a part of the European Economic Area (EEA). The directive details the minimum requirements of the product liability but each member states can impose even stricter regulations on top of it. The member states have also the right to impose its own limitation of liability. Basically, most jurisdictions have already imposed strict liability on the manufacturers to ensure the safeness of the products.  

The Product Liability defines a product as “all movables”. Ship definitely falls into this category. Also the Norwegian preparatory has also supported the same. Therefore, autonomous ship builder, theoretically speaking, can be bound by product liability and be liable for the damage toward the injured parties. Based on the product liability, the injured parties are able to claim full damage from the ship builder instead of the limited amount set by those current maritime conventions. This huge incentive will definitely contributed to the parties to claim damages from the shipbuilder in the events of damages caused by AV in the future.

In order to prevent enormous product liability, it is very common for the ship builder to incorporate some exclusion or limitation clauses like the warranty provision clause in the shipbuilding contract. The warranty provision clause shall state the period of time of which the ship builder is fully liable for repairing the ship produced. The logic behind that clause is rather straight forward: the ship builder fixes any defects of the ship for a defined period of time and he is only responsible up till the expressed terms stated in the contract. All further liabilities arisen should be excluded. The ship builder’s strict liability is therefore replaced by those clauses. However, can the AV ship builder really escape from all the additional liabilities if the damages are caused by the AV herself? The answer to this question is very depending on how the warranty clause is construed. Nonetheless, if the damages are due to the “direct” consequences of the design defect of the AV, the exclusion of liability based on the warranty provision clause shall not be able to be invoked.

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62 Warranty claims in shipbuilding contracts [http://www.gard.no/web/updates/content/20822944/warranty-claims-in-shipbuilding-contracts](http://www.gard.no/web/updates/content/20822944/warranty-claims-in-shipbuilding-contracts)
63 EU Directive 85/374/EEC Article 2
64 NOU 1980:29, p.99
65 NEWBUILDCON Form Clause 35
66 NEWBUILDCON Form Clause 37
An alternative to the above situation is to have a clear exclusion clause with an exhaustive list of damages that shall be excluded. The clear exclusion clause is undeniably the best method for shipbuilders to be excluded from liability but whether or not it can be incorporated will also depend on the market situation. To sum up, the AV ship builder is responsible for the ship that he has produced. Relying on solely the warranty clause will not help the ship builder to escape the liabilities toward the parties. Even if the ship builder is liable, it is possible for him to set up a cap on his own liability toward any damages in the shipbuilding contract. Applying product liability rules in the context of maritime law has not been done in Scandinavian countries\(^67\) before but the incentive, i.e. full damage covered, will definitely make the injured parties proceed to try on claiming damage based on the faulty programming design of AV.

**5.2 Liability of Classification Societies**

The classification societies play a very important role in ensuring the safety of ships. Arguably, the classification societies are the only party in the shipping industry that has the best knowledge, experience and expertise needed to meet public expectations of ship safety. As the world demands higher standards of ship safety, operational and environmental protection, the burden of making it happen will inevitably fall primarily on class.\(^68\) The main role of the classification societies is to inspect the vessel and ensure the vessel is up to a certain standard by corresponding to the rules set by the classification societies. If the vessel fulfills the requirements, a class certificate will be issued. The class certificate serves the function of proofing the particular ship is fit for service. The role of classification societies to ensure the safeness of the maritime industry is expected to continue even after the introduction of autonomous ship.

There are several reasons which have contributed to the injured parties seeking claim from classification societies. First of all, there is no limitation of liability for the classification societies like what the shipowners are usually having.\(^69\) Therefore, the classification society that has the deep pocket is required to pay for the full claim if they are found liable. Many parties are relying on the class certificate issued, for example the marine insurance companies.

\(^{67}\) Ulfbeck, V. “Maritime Product Liability”, p.79

\(^{68}\) Are classification societies above the law? [http://www.maritimeadvocate.com/classification/are_classification_societies_above_the_law.htm](http://www.maritimeadvocate.com/classification/are_classification_societies_above_the_law.htm)

\(^{69}\) Lagoni N., “Liability of Classification Societies”, Springer., 2007, p.299
The class certificate is a proof to show that the ship is in the conformity to the international requirements of maritime safety. The reliance interest on the class certificates has thus led to the liability arisen.

There are two main types of liabilities to the classification societies: Contractual liability and liability toward the third parties. Regarding the contractual liability, it will the same for autonomous shipowner. The AV owner just needs to prove the classification societies have failed to perform required diligence as indicated in the classification agreements in order to seek damage.\(^70\) Generally speaking, it is very hard to hold the classification societies liable. However, it is still a common practice for the classification societies to incorporate some limitation or exclusion clauses. The unambiguity of the clauses shall determine if they are applicable. Sometimes even when there is no unambiguity of the clauses, it is still possible for the court to set aside the clauses especially for the non-contractual third parties. In the case ND 1993.243 NCC, the court has held the limitation clause to be invalid since it was so unreasonable.

In the context of European Law, any injured parties are allowed to seek compensation from the classification societies if they are able to prove that the damage is caused by the negligence act of the classification societies.\(^71\) Therefore, classification societies are also liable to third party if they perform their certification service negligently. It is important to note that it is always the shipowner’s duty to ensure that the ship is seaworthy.\(^72\) The class certificates that have been issued by the societies do not serve the role to ensure the seaworthiness of that ship since shipowner is the one directly controlling the vessel and he should be performing his duty to ensure that.\(^73\) The classification societies have always been criticized to have the immune from any liability claim. However, this is not entirely true. The third party liability of the classification societies has been contested several times in the courts.\(^74\) The current trend in the international law seems to be moving to find the classification societies to be held liable to third parties due to the ever changing and increasing role played by classification societies and the reliance placed on their certificates and surveys by third parties.\(^75\) The third party liability will be based on normal tort law.

\(^70\) De Bruyne J., “Liability of Classification Societies: Developments in Case Law and Legislations” p.225
\(^71\) EU Directive 391/2009 Preamble No.18
\(^73\) Miscallef D., “A legal analysis of the Limitation of Liability of Classification Societies” p.224
\(^74\) See Erika and Prestige Cases
\(^75\) Vaughan B., “The Liability of Classification Societies”, p.10
Therefore, this is definitely going to motivate the third parties to seek damage from the classification societies based on the negligent certified AV. Of course, the injured parties have to show that they have suffered a non-remote consequential damage due to the classification societies’ action in order to claim their damages successfully. Currently, there is no any international rule to govern the third party liability of classification societies.\footnote{De Bruyne J., “Liability of Classification Societies: Developments in Case Law and Legislations” p.233}

Up till now, there are no any set of rules being published by any international organization like IMO on the aspects of approving the autonomous ship. The classification societies are drafting their own set of rules to inspect the autonomous ship. Any discrepancies on drafting the rules may be deemed as the causation of the damage caused by autonomous ship in future. After all, the classification societies should be fulfilling their responsibilities that the safety aspect of the shipping industry is not compromised with the AV approved by them.

On the other hand, there are also several arguments that oppose that the classification societies should bear more responsibilities. Classification societies are not the guarantors of safety of life or property at sea.\footnote{Miscallef D., “A legal analysis of the Limitation of Liability of Classification Societies” p.224} The classification societies have indeed no control over every single steps in the designing and manufacturing of the AV. The responsibility to ensure the vessels’ design should ultimately rest on the shipbuilders’. Therefore, holding them liable for the malfunction of AV is totally unfair. Even if the classification societies are going to be liable, they should be entitled to a certain limitation amount such as the shipowner to ensure the balance of interest.

The liability of classification societies to the autonomous ship, if any, will certainly become an insurance cost and the same will be passed on to the owners through class fees. If the liability of classification societies is growing too big, the best alternative for them is to withdraw or limit the services of issuing the class certificates to the autonomous ships. Marine insurers, government authorities and charterers will never deal with ships without class. In this case, there is no way the autonomous ship will be implemented.
6 Conclusion

The implementation of autonomous ship is definitely going to change the current liability regimes of the shipowners. Most of the current conventions related to the carriage of goods by sea are still applicable since there is no any universal definition indicating a ship must have crew working on board. However, some of the conventions have to be modified slightly in order for the autonomous ship to fit in perfectly, for instance the STCW Convention. The liability of autonomous ship can be very different based on the autonomy level. The ROV-type autonomous vessel is expected to have the similar liability regime like the ordinary vessel since the only difference between them is the transfer of duties from the crew to the shore based controller. Nevertheless, the identification of the new role – shore based controller is crucial to determine the liability of the ROV-owner.

On the other hand, the liability of AV-owner is more complicated due to the unparalleled role of automated system installed. The liability of the AV-owner is very likely to be shifted to be a strict liability in the Scandinavian region to compensate the economic advantages which the owner has gained from the AV. It is expected that the injured parties will be unable to fully claim the damage from the AV-owner due to the limitation of liability. Hence, the other relevant parties which are related to the manufacturing of the vessel will be the potential parties to be claim against. The shipbuilder shall be liable for his error during the manufacturing of autonomous vessel based on the marine product liability. The classification societies are also a potential party to be claimed by the third parties due to their special role and unlimited liability. The likelihood of classification societies to be successfully claimed is very low currently but the recent trend shows that the classification societies are more prone to be liable for the third parties’ damage. The distribution of liabilities among parties must be determined before the autonomous ship is going to roll out in the future. The most important part is to ensure the fairness and safety of shipping industry is not compromised.

The autonomous ship that will be sailing is very likely to be a combination of ROV and AV depends on the traffic conditions at the sea. Even though the determination of autonomous ship liability is not an easy job, it should not be viewed as an obstacle to the introduction to the real market in near future. Instead, the tremendous advantages should be something all stakeholders looking forward to achieve.
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