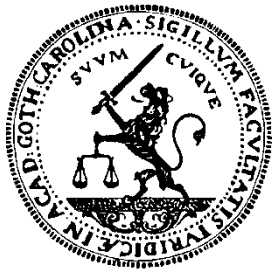

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Legal Analysis of Good Seamanship in Light of Autonomous Shipping

JURM02 Graduate Thesis

Graduate Thesis, Master of Laws program
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Contents

Summary

This thesis examines aspects of collision liability and navigational rights and freedoms of autonomous vessels. The thesis starts out with an introductory chapter which defines some terms and gives a short introduction to the field of regulatory maritime law. In the introductory chapter, the term “autonomous ship”, is defined as a “a ship which, to a varying degree, can operate independent of human interaction”. This definition was chosen because it was used by the International Maritime Organization (IMO) (an agency of the UN specialized in maritime issues). In the language of the IMO, autonomous vessels are called “Maritime Autonomous Surface Ship” and are abbreviated “MASS”. This abbreviation is used throughout this thesis.

In the same chapter, it is pointed out that the right to freely sail and navigate the world’s oceans is given to water-crafts that can be defined as “ships / vessels” in the terminology of the United Nations Convention on the Law of the Sea (UNCLOS). The question is then asked if MASS could fit into this definition. This question is answered affirmatively.

In the next chapter, the question is asked if MASS can live up to the obligation of what is called good seamanship, in rule 2 (a) of the International Regulations for Preventing Collisions at sea (COLREGs). It is found that this question cannot be answered conclusively, because it contains too many aspects. Therefore the discussion moves on to the obligation to keep a proper look-out (listed in COLREGs rule 5), which is a part of this obligation.

The question of proper look-out is discussed based on doctrine and case law from the United Kingdom, USA and Canada. It is concluded that MASS operating completely autonomously, without any human oversight, could not live up to this requirement, but that remotely controlled vessels without seafarers on-board could, provided that the technology of the ship was sufficient.

Sammanfattning

Denna uppsats behandlar vissa aspekter av ansvar för kollision och rättigheter och friheter att navigera, för autonoma fartyg. Uppsatsen börjar med ett inledande kapitel som definierar begrepp och ger en kort introduktion till de sjörättsliga aspekter som är relevanta för denna uppsats. Begreppet ”autonomt fartyg” definieras enligt den definition som har använts av Internationella sjöfartsorganisationen (IMO [FN:s sjöfartsorgan]). IMO har antagit begreppet “Maritime Autonomous Surface Ship”, [1] förkortat ”MASS”. Denna förkortning har använts genom denna uppsats.

I samma kapitel påpekas det att rätten till att fritt navigera på världshaven ges endast till de vattenfarkoster som kan definieras som ”ship / vessel”[2] i terminologin till FN:s havsrättskonvention. Därefter diskuteras frågan om MASS kan passa in i denna definition. Denna fråga besvaras jakande.

Nästa kapitel undersöker om MASS kan leva upp till kravet på gott sjömanskap, som ställs i regel 2 (a) i de internationella sjövägsreglerna (COLREGs). Slutsatsen dras att det inte är möjligt att svara uttömmande på denna fråga, varför en särskild del, plikten att hålla god utkik, som återges i COLREGs regel 5, väljs för ytterligare analys.

Plikten att hålla god utkik diskuteras utifrån doktrin och rättsfall från Förenade kungariket, USA och Kanada. Slutsatsen dras att MASS som opererar helt autonomt, utan någon mänsklig översikt, inte skulle kunna leva upp till denna plikt. Slutsatsen är dock att fartyg som övervakas av mänskliga operatörer i land kan leva upp till denna plikt. Detta förutsätter dock att teknologin på fartyget är av tillräcklig kvalitet och precision.

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[1] Fritt översatt: “maritim autonom ytfarkost”

[2] Fritt översatt: ”fartyg”, UNCLOS gör ingen distinktion mellan skepp och fartyg, se diskussion nedan, under 2.4.1 Defining MASS as ”ship” or ”vessel” under UNCLOS).

Acknowledgements

First, I’d like to thank the great staff at the library of Lund University, who have been very helpful in providing me with material for my research in this thesis.

Lastly and most importantly, I’d like to thank my excellent supervisor Olena Bokareva, who have provided me with great support, both in finding material for the research and by giving me ideas and inspiration for how to improve my writing and expand my legal knowledge. Without her, this thesis would not have been possible.

Abbreviations

ARPA	Automatic Radar Plotting Aid
COLREG	Convention on the International Regulations for Preventing Collisions at Sea, 1972
COLREGs	International Regulations for Preventing Collisions at Sea
IMO	International Maritime Organization
MASS	Maritime Autonomous Surface Ship
SBC	Shore-based Control Centre (for remotely controlling autonomous vessels).
STCW	Standards of Training, Certification and Watchkeeping for Seafarers, 1978
UNCLOS	United Nations Convention on the Law of the Sea
RO/RO vessel	Roll on / Roll off (ships that load and unload the cargo by rolling, for example, cars, trucks, trailers etc.)

1 Introduction

1.1 Background

Since the time of sailing ships, the number of crew required to handle a ship of a particular size has steadily diminished. Lord Nelsons Flagship the *HMS Victory* (launched in 1765), with a length of 70 meters and a displacement (weight)[3] of 2162 tons, notably had a crew of over 800 men.[4] This can be contrasted to the Maersk triple E-class (a class of large container vessels launched in 2013), with a length of 400 meters and a deadweight (cargo capacity)[5] of 160 000 tons, whose ships only have a crew of 13 men.[6]

As is evident, the decrease in crew numbers in relation to ship size, has been quite drastic seen from the time of *The Victory*, to the time of modern cargo ships. However, up until very recently, ships completely without crew on board has not been seen as a realistic prospect.[7] As will be elaborated below, this has many reasons, partly, to do with the fact that it was considered technologically impossible, but also because of legal issues and uncertainties.

Today, there exists both research projects on development of vessels with varying degree of autonomy and real-world applications from shipping

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[3] Erik Gregersen "tonnage", in *Encyclopedia Britannica*, https://www.britannica.com/technology/tonnage accessed on 2022-04-25.

[4] Amy Tikkanen, "Victory", in *Encyclopedia Britannica*, *https://www.britannica.com/topic/Victory-British-ship*, accesed on 2022-03-02.

[5] Id note 3, *supra*.

[6] Newatlas "The Triple-E Maersk container ship will be the world's largest ship and the most efficient", 2011-02-21, *https://newatlas.com/triple-e-maersk-worlds-largest-ship/17938/* accessed on 2022-03-02.

[7] Henrik Ringbom, Erik Røsæg, Trond Solvang, *Autonomous ships and the law*, London: Routledge, Taylor & Francis Group, 2021 at p. 3

lines, which are actually trying out these systems. Although the focus of a lot of these projects is to make vessels that can operate through artificial intelligence, make navigational decisions and act autonomously, the scope still seems to be confined to the framework of human oversight, at least in the projects examined in this thesis.

Among the companies working on real world applications of this technology is the fertilizer producer Yara in Norway. Yara has been developing *The Yara Birkeland*, which is an experimental ship, aimed at being the world's first autonomous container vessel (which also aims at being emission free). The vessel is built for transporting fertilizer from the factory in Porsgrunn, Norway, to the export port of Brevik, Norway. On November 18, 2021, *Yara Birekland* took its first trip, from Horten to Oslo (in Norway).[8] According to Yara, the ship will be operating commercially in 2022. The operation is now in a two-year testing period, which is meant to culminate in remotely controlled operation without crew onboard.[9] Another such project is the grocery wholesaler ASKO, which is commissioning an autonomous RO/RO vessel[10] to transport trailers with food across the Oslo Fjord. This vessel is expected to be delivered early in 2022. Kongsberg claims that this vessel will first operate with an onboard crew and will gradually make the transition to unmanned operation, albeit monitored from a shore-based control centre (SBC). The Norwegian marine systems provider Kongsberg, is part of both these projects, and is handling the

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[8] Yara.com "Yara Birkeland", *https://www.yara.com/news-and-media/press-kits/yara-birkeland-press-kit/*, accessed on 2022-03-02.

[9] Yara.com "Yara to start operating the world's first fully emission-free container ship", *https://www.yara.com/corporate-releases/yara-to-start-operating-the-worlds-first-fully-emission-free-container-ship/*, accessed on 2022-03-08.

[10] Se "Abbreviations", *supra*, for description. "John B. Woodward "Ship shore transfer" in, *Encyclopedia Britanica, https://www.britannica.com/technology/ship/Cargo-handlin*g accessed on 2022-05-19.

development and implementation of the technical systems required for autonomous / unmanned operation.[11]

Two of the research projects on autonomous shipping worth mentioning are the "Advanced Autonomous Waterborne Applications" (AAWA) initiative and the "Maritime Unmanned Navigation through Intelligence in Networks" (MUNIN) project. The AAWA initiative, which was concluded in 2017 was a joint research project with industry and universities, which aimed at developing specifications and a preliminary design for autonomous ships.[12] MUNIN project was a study with focus on the technological, legal and operational challenges to operation of autonomous vessels, which was partially funded by the European Union.[13]

A joint project by Rolls Royce and the Finnish state-owned ferry-company Finferries, called SVAN (Safer Vessel with Autonomous Navigation), aimed at further researching and testing the findings from the AAWA project, which was launched in 2015 and has already successfully demonstrated autonomous as well as remotely controlled navigation.[14] A trial navigation was conducted with the Finferries car ferry *Falco*. The

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[11] Kongsberg.com "Autonomous Shipping", *https://www.kongsberg.com/maritime/support/themes/autonomous-shipping/*, accessed on 2022-03-02.

[12] AAWA 2016 Position Paper, Remote and Autonomous Ships: The Next Steps by Rolls Royce (London 2016), *https://www.rolls-royce.com/~/media/Files/R/RollsRoyce/documents/customers/marine/ship-intel/aawa-whitepaper-210616.pdf*, accessed on 2022-03-05, at p. 5.

[13] Baris Soyer, Andrew Tettenborn, *Artificial Intelligence and Autonomous Shipping: Developing the International Legal Framework*, Oxford: Bloomsbury Publishing Plc, 2021, at p. 1

[14] EE World Online "World's First Fully Autonomous Ferry", *https://www.eeworldonline.com/worlds-first-fully-autonomous-ferry/* accessed on 2022-03-09

vessel navigated autonomously (with oversight from a SBC in Åbo, Finland), from Pargas

to Nagu in the Finnish archipelago on the 3rd of December 2018.[15] The return trip was done by remote control from the SBC in Åbo. [16]

Another company at the forefront of the development in autonomous shipping, is the Japanese shipping line NYK, which preformed a trial navigation with the RO/RO-vessel Irish Leader in 2019. The ship had a gross tonnage of 70 826 tones, the trial consisted in autonomous navigation of the vessel between China and Japan. The ship navigated autonomously at times (decisions being made by the ship's computer system), but the navigation was supervised by an on-board crew. [17] NYK was also involved in a research project focused on the development of crewless ships with remote operation in emergencies, called the DFFAS-Project (Designing the Future of Fully Autonomous Ship).[18]

As is evident, the area of autonomous shipping is a highly relevant subject, with a lot of projects going on all around the world. As will be discussed below, autonomous shipping presents a number of interesting legal issues that has yet to be conclusively settled. It will be the purpose of this thesis to

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[15] Rolls-royce.com "Rolls-Royce and Finferries demonstrate world's first Fully Autonomous Ferry", 2018-03-12, *https://www.rolls-royce.com/media/press-releases/2018/03-12-2018-rr-and-finferries-demonstrate-worlds-first-fully-autonomous-ferry.aspx* accessed on 2022-03-09.

[16] Finferries.fi "Falco världens första fullständigt autonoma färja", *https://www.finferries.fi/sv/aktuellt/pressmeddelanden/falco-varldens-forsta-fullstandigt-autonoma-farja.html*, (2018-03-12), acessed 2022-03-09.

[17] NYK.com "NYK Conducts World's First Maritime Autonomous Surface Ships Trial", *https://www.nyk.com/english/news/2019/20190930_01.html* accessed on 2022-03-08.

[18] NYK.com "NYK to Participate in Crewless Maritime Autonomous Surface Ship Trial Project", *https://www.nyk.com/english/news/2020/20200615_01.html* accessed on 2022-03-08.

examine and elucidate some aspects of the legal issues facing the operation of autonomous vessels.

1.2 Purpose and Research Question

This thesis discusses the legal challenges of autonomous shipping from the point of view of compliance to the Convention on the International Regulations for Preventing Collisions at Sea, 1972 (abbreviated COLREG).[19] In this thesis, the term "autonomous" is used in a broad sense, and encompasses both manned and unmanned vessels, operating with different degrees of autonomy. The definition of autonomous vessel used in this thesis is discussed more at length in section 2.3.

This thesis discusses the question of whether or not COLREG is applicable to autonomous vessels. It further examines if and how autonomous ships will be able to live up to the requirement of good seamanship, in rule 2 (a) of COLREG. As a part of this inquiry, the question of if autonomous ships would be able to comply with the requirement to keep a proper look-out in rule 5 of COLREG will also be discussed. In connection with the discussion on rule 5 of COLREG, the Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (abbreviated STCW)[20] will also be discussed. Some general background on the law of collision liability for ships will also be discussed, to give a meaningful framework to the rules of COLREG. Although COLREG is a treaty subject to public international law, collision liability remains a national law issue (as will be explained more below, under "1.4 Methodology and material"). Therefore, the general background on collision liability will be described from the

[19] Convention on the international regulations for preventing collisions at sea, 1972, I-15824 U.N.T.S. 1050.

[20] International Convention on standards of training, certification and watchkeeping for seafarers, 1978, I-23001 U.N.T.S. 1361 – 1362.

point of view of English and American law. The question of why these jurisdictions have been chosen, will also be discussed more below, under "1.4 Methodology and material".

COLREG regulates the navigation of vessels.[21] A prerequisite for any kind of navigation, is that the craft in question has the right to navigate and sail at all. Navigational rights and freedoms are contained in the United Nations Convention on the Law of the Sea (abbreviated UNCLOS)[22] and given to water-crafts that are considered "ships" or "vessels" under that convention.[23] Therefore, the question of whether unmanned watercrafts can be defined as "ships" or "vessels" within the terminology of the UNCLOS will also be discussed.

The questions that this thesis is trying to answer are therefore:

- Is COLREG applicable to autonomous ships?
- Can an unmanned ship be considered as ships under UNCLOS?
- Can unmanned ships live up to the requirement of good seamanship in COLREG r. 2 (a)?
- Can unmanned ships live up to the requirement to keep a proper look-out in COLREG r. 5?

1.3 Delimitations

This thesis attempts to answer the question of whether an autonomous ships as such would be able to comply with the material requirement of rule 2 (a)

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[21] IMO.org "Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs)", *https://www.imo.org/en/About/Conventions/Pages/COLREG.aspx*, accessed on 2022-04-15.

[22] United Nations Convention on the Law of the Sea, I-31363 U.N.T.S. 1833 – 1835

[23] Youri van Logchem, "International regulation of Shipping and Unmanned Vessels" in Baris Soyer and Andrew Tettenborn (ed), *Artificial Intelligence and Autonomous Shipping: Developing the International Legal Framework*, Oxford, UK: Hart Publishing. 2021 at p. 40.

and 5 of COLREG. It does not discuss who would be responsible in the case of a breach of any of these obligations. This means that the Convention for the Unification of Certain Rules of Law with respect to Collisions between Vessels (Brussels, 1910), will not be discussed. As will be shown below, the answer to the questions asked in this thesis to some degree hinges on the technological capabilities of the vessels in question. It will not be attempted to assess the technological capabilities of various autonomous vessels in this thesis. As far as the level of technology would be the determining factor to answer any of the questions raised above, this thesis will only try and answer these in a conditional way (for example that it would be possible for an autonomous vessel to comply with a given regulation, provided the technology was adequate). While the technological aspect certainly is interesting, in a shorter legal text such as this, limitations on space and time must be kept in mind. Therefore, the question of technology and technological description is left out of this thesis.

The legal instruments that will be the focus of this thesis have already been described above, and it is the aim of this thesis to limit its legal analysis to these precise rules and instruments and not to stray into other areas of law. It should be noted however, that in some instances shorter references might be made other legal instruments, that are somehow closely connected to the ones that are the focus of this thesis. It is also acknowledged that the area of autonomous shipping also relates to other areas of law, like cyber-security, possible concerns about environmental law and yet other areas, which will not be covered in this thesis.

1.4 Methodology and Material

This thesis uses the legal dogmatic method to elucidate the questions raised above. This means that the legal rules in question, will be analysed on the

basis of relevant legal sources.[24] The source of the rules discussed in this thesis is international conventions, as mentioned by article 38 (1) (a) of the Statute of the International Court of Justice (ICJ). The ICJ Statute is usually considered as equivalent to customary international law when identifying sources of international law and is therefore universally accepted as an authoritative starting point for identifying sources of international law.[25]

The interpretation of the treaties examined in this thesis will be conducted in accordance with articles 31 – 33 of the Vienna Convention on the Law of Treaties, 1969 (VCLT).[26] Although the VCLT is only applicable to treaties concluded after the entry into force of the VCLT[27] it is generally considered to have codified already existing customary international law.[28] Therefore, the VCLT's rules on treaty interpretation will be used as a basis for interpreting the treaties in this thesis, despite the fact that COLREG was concluded before the entry into force of the VCLT.[29]

As is required by article 31 (1) of the VCLT, a treaty should be interpreted "in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose".

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[24] Jan Kleinman, "Rättsdogmatisk metod", in Maria Nääv and Mauro Zamboni (ed), *Juridisk Metodlära*, 2nd edition, Lund: Studentlitteratur, 2018 at pp.. 27 – 28.

[25] Ulf Linderfalk, *Folkrätten i ett nötskal*, Lund: Studentlitteratur, 2006 at p. 95.

[26] Vienna Convention on the Law of Treaties, 1969 (VCLT), 1155 UNTS 331.

[27] VCLT art. 4.

[28] Olena Bokareva, *Uniformity of Transport Law through International Regimes*, Cheltenham, UK: Edward Elgar Publishing, 2019 at p. 128.

[29] UN.org "Convention on the international regulations for preventing collisions at sea, 1972", "Places / dates of conclusion", *https://treaties.un.org/Pages/showDetails.aspx?objid=08000002800fcf87&clang=_en* accessed on 2022-05-14; UN.org "Vienna Convention on the Law of Treaties", "EIF information", *https://treaties.un.org/Pages/showDetails.aspx?objid=080000028003902f&clang=_en* accessed on 2022-05-14.

As will be elaborated below, the treaties examined in this thesis were all drafted before autonomous vessels became a relevant subject and it is therefore difficult to apply the object and purpose of the treaty to the subject at hand. Therefore, recourse will be had to supplementary means of interpretation according to article 32 of the VCLT. The supplementary means of interpretation relied on will consist of the writings of leading legal scholars on the subject, documents from the IMO (explained below under "2.1 Introduction to Regulatory Maritime Law"), conclusions and findings from the two research projects, MUNIN and AAWA, mentioned above and some case law from England, USA and Canada. As pointed out by Bokareva, case law from different jurisdictions and writings of legal scholars have been considered as supplementary means of interpretation under art. 32 of the VCLT by UK courts.[30] As will be explained shortly, the judgements of UK courts in matters of maritime law is not without importance and therefore, this thesis will, based on the practice of the UK courts, also consider these sources as supplementary means of interpretation in accordance with article 32 of the VCLT. The findings of the above-mentioned research projects and the documents from IMO may be considered as legal doctrine and may therefore also be considered as a supplementary means of interpretation. The reason for the choice of these three jurisdictions will now be further elaborated.

First, however, a short explanation on the structure of COLREG is in order. COLREG is a treaty of public international law that contains rules regulating the navigational conduct of vessels. These rules are annexed to the convention and constitute the "International Regulations for Preventing Collisions at Sea" (in this thesis abbreviated COLREGs), which the parties to COLREG are obligated to give effect to. Thus, there is a distinction between COLREG (which is the whole treaty together with the annexes containing the rules) and the COLREGs (which refers only to the rules contained in the annexes and not the articles of the convention itself.)

[30] Bokareva note 28, *supra*, at p. 130.

Although COLREG is a treaty governed by public international law, the rules of COLREG come into effect only in national legal systems, as rules the breach of which, forms the basis of liability.[31] The content of the COLREGs makes it clear that they only assign responsibility to private entities, such as the vessel (which is owned by a ship owning company), the master or the crew.[32] So although the COLREG might be considered an instrument of regulatory law, it is rules come into effect only in in relations between subjects of private law. In this case then, the distinction between private and regulatory law might not be completely clear. It is however, the opinion of this author, that the interpretation of it has to be conducted as if it were a so called private law convention, because its rules only come to life in the interactions between subjects of private law.[33] Liability for subjects of private law is always a matter of national jurisdiction and legislation, as private individuals are not subjects of public international law.[34] As noted by Bokareva, there also does not exist any international tribunal that reviews private law decisions.[35] Because of these reasons, national courts are the

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[31] Reginald G. Marsden, Simon Gault, Steven J. Hazelwood, Andrew Tettenborn, *Marsden and Gault on Collisions at Sea*, 14th edition, London: Sweet & Maxwell, 2016 at p. 85; Nicholas J. Healy and Joseph C. Sweeney, *The Law of Marine Collision*, Centreville, Md: Cornell Maritime Press, 1998 at p. 40, p. 71.

[32] COLREGs rule 2 (a).

[33] Bokareva, note 28, *supra*, at p. 121; Proshanto K. Mukherjee, *Maritime legislation*, Malmö: World Maritime University, 2002 at p. 226.

[34] Linderfalk, note 25, *supra*, at p. 11 (It is true that private individuals can sometimes become subjects of public international law, through the legislation of a state, that confers on its subjects, rights, or obligations of international law. Even though in the case of COLREG, there exist no international tribunal which settles disputes on the breach of its rules, private entities are still made subjects to obligations stemming from an international agreement. However, this is still only played out within the framework of national legislation, as there is no way to enforce a breach outside the framework of a national legal system.)

[35] Bokareva, note 28, *supra*, at p. 126.

ones finally interpreting the meaning of its rules.[36] Therefore, national case law will be used to interpret its provisions. The national case laws that will be used, are English and American, supplemented by one Canadian case. England is generally regarded as a leading nation in maritime law, with more maritime disputes referred to arbitration in London than to any other venue worldwide.[37] USA is a common law jurisdiction as well and, as will be shown below, there exists a lot of similarities between English and American law, at least regarding the subject discussed in this thesis. From a linguistic point of view, it also makes sense to choose these jurisdictions, as English is a language which the author understands. As for the Canadian case, it was referenced by authoritative American legal scholars, thus indicating its close connection to the American law. It also provides especially good insight into possibility of using technical means instead of direct look-out, which is important to this thesis. It can therefore be justified to look at the obligation of proper look-out and good seamanship through the prism of English and American Law, with the supplement of one Canadian case. It can also be noted here, that both the UK[38] and the US[39] have a so called "dualist legal system" regarding implementation of international conventions. What this means, is that conventions such as COLREG have to be implemented through national legislation, to attain force of law domestically.[40] In the UK, COLREG is implemented through the Merchant Shipping (Distress Signals and Prevention of Collision)

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[36] Marsden, note 31, *supra*, at p. 151.

[37] Konrad Zweigert and Hein Kötz, *Introduction to Comparative Law*, Oxford: Clarendon Press, 1998, p. 42; London Maritime Arbitrators Association (the LMAA) "About", *https://lmaa.london/about-lmaa/*, accessed on 2022-05-11.

[38] Bokareva, note 28, *supra*, at p. 123.

[39] Healy and Sweeny, note 31, *supra*, at p. 71.

[40] Id, at p. 122.

Regulations 1989, regulation 4 (1) as amended. In the US, it is implemented through the International Navigational Rules Act of 1977.[41]

As will be seen below, rule 5 of COLREG is the legal rule that is discussed in most detail. Therefore, it is under this section that most of the case law will be discussed. In the discussion on rule 5, primarily two works will be relied on besides case law. These are the two books "The Law of Marine Collision", by Nicholas J. Healy and Joseph Conrad Sweeney, written from an American point of view and the book "Marsden and Gault on Collisions at Sea" by Reginald G. Marsden and Simon Gault et al, written from an English point of view. This thesis is also heavily indebted to these authors for the case law used. Both these works agree on the fact that the duty to keep a proper lookout, was also a duty in the common law, prior to entry into force of COLREG. Healy and Sweeney problematize the possible difference between the common law obligation and the positive obligation in rule 5 more than Marsden does. In Marsden's book, cases from before COLREG are used without any reference to the fact that these cases were judged on the bases of a common law rule, while the rule of COLREG is a positive statute.[42] This could indicate that Marsden considers them synonymous. Indeed, Healy and Sweeney also use cases from before COLREG to interpret rule 5, but only notices this difference, and states that these cases must then be used with a certain amount of caution.[43] With this in mind, this thesis will proceed from the assumption that there exists a sufficient similarity between the common law obligation to keep a proper look-lout, to the positive rule stated in COLREG, that older cases can be used to interpret this positive rule. Older cases will therefore also be used, because they might contain interesting insights.

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[41] Pub. L. No. 95-75, 91 Stat, 309; 33 U.S. Code §§ 1601-08.

[42] Marsden, note 31, *supra* at pp. 185 – 187.

[43] Healy and Sweeney, note 31, *supra*, at p. 93.

The UNCLOS and the other conventions beside COLREG mentioned above, will only be discussed more briefly, and to interpret these, only some legal doctrine will be used.

1.5 Outline

The thesis starts out in chapter 2 by giving a brief introduction to the field of regulatory maritime law. In this chapter, a brief introduction is given to the UN's maritime organization, the International Maritime Organisation. The term autonomous ship is defined and the definition is discussed. The question is then discussed if, according to this definition, it could be included in the term "ship / vessel" in the UNCLOS. The applicability of COLREG and the STCW is also discussed in this chapter.

Chapter 3 deals with the subject of collision liability and discusses the concept of good seamanship.

Chapter 4 deals with the concept of proper look-out, listed in COLREGs rule 5, from the point of view of UK, US and Canadian case law.

Chapter 5 sums up and concludes what have been discussed in the other chapters.

2 Legal Aspects of Autonomous Shipping

Before the subject of collision liability is discussed, it is necessary to give a brief legal background and to define some terms that will be used throughout this thesis. In this chapter, the terms “autonomous vessel” and “ship” and “vessel”, will be given a definition for the purpose of this thesis. As stated above, a prerequisite for navigation of any kind is that the watercraft in question has the right to navigate. As the rights and freedoms of navigation are contained in UNCLOS, this convention will also be discussed here. A brief introduction to the field of regulatory maritime law will also be given.

2.1 Introduction to Regulatory Maritime Law

Regulation of shipping is a broad field of law with many different aspects. The shipping industry has regulatory requirements of technical nature, with regards to the ships construction and function, it is subject to regulations from a labor-law point of view, there are regulations concerning the environment, and yet other types of regulations.[44] Some regulations are requirements of national law, others are requirements of international conventions. The focus of this thesis is, as mentioned above, some of the requirements of COLREG, STCW and UNCLOS. All of these are treaties of

[44] IMO.org “Conventions”, *https://www.imo.org/en/About/Conventions/Pages/Default.aspx* accessed on 2022-04-14; ILO.org “Maritime Labour Convention, 2006”, https://www.ilo.org/global/standards/maritime-labour-convention/lang--en/index.htm accessed on 2022-06-09.

international law. COLREG and STCW are both conventions under the oversight of the International Maritime Organization (IMO),[45] which has already been mentioned above. The IMO is, in its own words "the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of [...] pollution by ships."[46] In short terms, it is an agency of the United Nations that is specialized in regulating shipping. The IMO was created in 1958, in order to better harmonize and overlook the large numbers of international treaties related to shipping that had been developed since the 19th century. IMO is today responsible for more than 50 international conventions and agreements. What it means that a convention is under the "oversight" of the IMO, is that the IMO is responsible for updating that convention, by formulating amendments to it. For some of the conventions, these amendments then enter into force automatically, if none of the states party to it protest (known as "tacit acceptance procedure).[47] So, although the IMO as such is not a lawmaker and cannot alter any of the instruments under its oversight without the consent of the states parties to those conventions, it still has a lot of influence, as it is the party formulating the amendments to those conventions and issuing guidelines on the implementation of them, which are quite authoritative and considered as soft law instrument of international law.[48] Because of this special status of the IMO, material from it will be given attention in this thesis.

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[45] IMO.org "List of IMO Conventions", *https://www.imo.org/en/About/Conventions/Pages/ListOfConventions.aspx* accessed on 2022-04-14.

[46] IMO.org "Introduction to IMO", *https://www.imo.org/en/About/Pages/Default.aspx* accessed on 2022-04-14.

[47] IMO "Conventions", *https://www.imo.org/en/About/Conventions/Pages/Default.aspx* accessed on 2022-04-14.

[48] Ringbom et al, note 7, *supra*, at p. 62.

2.2 The Regulatory Scoping Exercise (RSE)

The Maritime Safety Comittee (MSC) of the IMO, recently conducted a "regulatory scoping exercise [abbreviated RSE] to establish the extent of the need to amend the regulatory framework to enable the safe, secure and environmental operation of entirely or partly unmanned […] (MASS) within the existing IMO instruments."[49] The RSE was proposed to the IMO in February 2017[50] and was completed in May 2021.[51] Shortly put, the RSE investigated the applicability of these instruments and whether and how they could pose a problem to the operation of autonomous vessels, and then proposed some ideas on how those problems could be settled.[52] Both member states and international organizations participated in the exercise by submitting proposals on the issues of the different instruments.[53] By the time of conclusion in 2021, over 120 documents had been published in connection with the RSE.[54] As stated above, the COLREG is a treaty under

[49] The term "MASS" is the IMO's abbreviated term for their definition of autonomous vessel, which will be described below.

[50] IMO Doc. MSC 98/20/2, 27 February 2017, Maritime Autonomous Surface Ships Proposal for a regulatory scoping exercise, Submitted by Denmark, Estonia, Finland, Japan, the Netherlands, Norway, the Republic of Korea, the United Kingdom and the United States, at p. 2, para 4.

[51] IMO.org "IMO's Maritime Safety Committee finalizes its analysis of ship safety treaties, to assess next steps for regulating Maritime Autonomous Surface Ships (MASS)" *https://www.imo.org/en/MediaCentre/PressBriefings/pages/MASSRSE2021.aspx* accessed on 2022-04-17

[52] Ringbom, et al. note 7, *supra*, at pp. 57 – 58.

[53] IMO Doc. MSC 98/23, 28 June 2017, Report of the Maritime Safety Committee on its Ninety-Eight Session, at p. 79, para 20.2.

[54] IMO Doc. MSC.1/Circ.1638, 3 June 2021, Outcome of the Regulatory Scoping Exercise for the Use of Maritime Autonomous Surface Ships, Appendix 3 at p. 97.

the overview of the IMO and is therefore one of the “IMO-instruments” covered by the RSE. As described above, the IMO has an important status in the field of regulatory maritime law. Therefore, information contained in these documents and conclusions reached by the RSE will be used throughout the thesis. The IMO also developed a definition of autonomous vessels (which will now be described), which will be used in this thesis.

2.3 Definition of “Autonomous Vessel”

For the purpose of the RSE, the term “Maritime Autonomous Surface Ship (MASS)” was defined as “a ship which, to a varying degree, can operate independent of human interaction”. This definition was then divided into 4 subcategories, based on the level of autonomy of the vessel. The IMO defined these as:

Table 1 - from "IMO Doc. MSC 100/20/Add.1, 12 December 2018, Report of the Maritime Safety Committee on its one Hundredth Session, Annex 2 “Framework for the Regulatory Scoping Exercise for the Use of Maritime Autonomous Surface Ships (MASS)”, at page 1"

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 ship is able to make decisions and determine actions by itself.

In the same document, the IMO also clarified that:

> The above list does not represent a hierarchic order. It should be noted that MASS could be operating at one or more degrees of autonomy for the duration of a single voyage.[55]

In this thesis, the definition of MASS and its subcategories, established by the IMO, will be used as reference. The abbreviation MASS will therefore from now on mean "a ship which, to a varying degree, can operate independent of human interaction" and the categories laid out in the table above will also be used as stated, to qualify what type of MASS is being discussed. When referring to the remote command central, wherefrom MASS degree 3 – 2 is operated, the term *Shore-based Control Center*, abbreviated *SBC*, will be used (as already used above). Consequently, the term *SBC-operator* will be used to denote the person operating a MASS of degree 3 – 2. This is the terminology used by Simon Baughen[56] and will be also be used here.

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[55] IMO Doc. MSC 100/20/Add.1, 12 December 2018, Report of the Maritime Safety Committee on its one Hundredth Session, Annex 2 "Framework for the Regulatory Scoping Exercise for the Use of Maritime Autonomous Surface Ships (MASS)", at page 1.

[56] Simon Baughen, "Who is the Master now?: Regulatory and contractual challenges of unmanned vessels", in Baris Soyer and Andrew Tettenborn (ed.), *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century*, Milton: Informa Law, 2019 at p. 131.

2.4 Navigational Rights and Freedoms of MASS

The public international rules concerning the rights and responsibilities of states with regards to the world's oceans are contained in the United Nations Convention on the Law of the Sea (UNCLOS), mentioned above. This area of law is usually referred to as "the law of the sea".[57] This convention contains a number of provisions dividing up the world's ocean into various zones, which in turn carries different legal rights and responsibilities for different states.[58] The convention also covers the duties of flag states with regard to ships flying their flags.[59] At the time of writing, the UNCLOS has 168 states parties to it[60] and it therefore seems justified to say that it governs the law of the sea in most parts of the world (completely besides the fact that at least some of its provisions are considered customary international law).[61] Part of the law of the sea regulated in UNCLOS relates to rights and freedoms of what is in the convention defined as "ships" or "vessels", to freely navigate different parts of the world's oceans. The UNCLOS divides the sea into a number of zones, not all of which are of direct interest to navigational rights. As pointed out by Andrew Serdy, the two zones "territorial sea" and "high seas" are the ones of most of interest to navigation, because the other zones mainly relate to economic exploration

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[57] Andrew Serdy "Public International Law Aspects of Shipping Regulation" in Yvonne Baatz (ed.), *Maritime Law*, 5th edition, London: Informa Law, 2021 at p. 337, p. 339.

[58] UNCLOS, Preamble.

[59] UNCLOS art. 94.

[60] United Nations Treaty Collection, "United Nations Convention on the Law of the Sea", *https://treaties.un.org/pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XXI-6&chapter=21&Temp=mtdsg3&clang=_en#1* accessed on 2022-04.15.

[61] Serdy, note 57, *supra*, at p. 337.

of the resources in the ocean.[62] The freedom of navigation in waters forming international straights is also of interest, although these do not constitute a zone of their own, but only contains an additional right of passage in straights which are used for international navigation, but which waters are constituted of another zone.[63] In short terms, the territorial sea of a state can be said to stretch 12 nautical miles from the low water line of the cost of that state.[64] On the inside of the territorial sea is the internal waters of the costal state.[65] The high seas is defined negatively as all parts of the sea that is not included in any other zone.[66] The internal waters of a state is from the point of view of the law of the sea considered as part of the coastal states internal territory and the state retains full sovereignty inside its territorial waters, of which its ports also form a part. [67] This means that the costal state has full rights to deny access to its internal waters to foreign ships.[68] The territorial sea is also governed by the sovereignty of the costal state, with the exception that ships have what's called a "right of innocent passage".[69] This means that ships have the right to navigate through the territorial sea for the purpose of a continuous and expeditious travers.[70] The high seas are open to

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[62] Serdy, note 57, *supra*, at p. 339.

[63] UNCLOS art. 37, art. 34

[64] UNCLOS art. 4, art. 5 (The starting point for the measurement of the territorial sea depends on what is called "baselines" in the UNCLOS. The baseline is normally, but not always, measured form the low water mark of the coast-line of the costal state. For a fuller understanding of the concept of baselines, the reader is referred to a comprehensive reading of section 2 of UNCLOS.)

[65] UNCLOS art. 8.

[66] UNCLOS art. 86.

[67] Serdy, note 57, *supra*, at p. 339, p. 343.

[68] Serdy, note 57, *supra*, at p. 343.

[69] UNCLOS art. 17.

[70] UNCLOS art. 18.

all states which have a freedom of navigation on it.[71] Van Logchem argues that this freedom of navigation is also confined to vehicles that can be defined as ships and would therefore not be open to unmanned crafts, if they could not be defined as ships.[72] The international straights mentioned above also contain a right of transit passage for ships,[73] which means navigation for the purpose of continuous and expeditious passage.[74]

From what have just been said, it can be concluded that whether or not a MASS of degree 1 – 4 could be considered a ship under the UNCLOS will have a great impact on the right of MASS to freely navigate the oceans of the world. The question of defining MASS as a ship under the UNCLOS will now therefore be discussed.

2.5 Defining MASS as "Ship" or "Vessel" Under UNCLOS

UNCLOS, part 1, article 1, which deals with use of terms and contains some definitions, does not mention "ship" or "vessel", or give any definition to these terms. They do however, both appear in several places throughout the convention. Some examples include article 91 (about the rights of states party to the convention to grant its flag to ships registered there), 92 (about the legal status of ships on the high seas), article 94 (concerning the duties of the flag states), 97 (about jurisdiction in the matter of collision on the high seas) and many other places. The usage of double terms (ship / vessel),

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[71] UNCLOS art. 87.

[72] Youri van Logchem, "International Law of the Sea and Autonomous Cargo 'Vessels'" in Baris Soyer and Andrew Tettenborn (ed), *Artificial Intelligence and Autonomous Shipping: Developing the International Legal Framework*, Oxford: Hart Publishing, 2021 at p. 45.

[73] UNCLOS art 38 (1)

[74] UNCLOS art. 38 (2)

is however, only the case in the English version, all other versions of UNCLOS use only one term to convey the concept that is meant by ship or vessel. During the drafting of UNCLOS, there was some discussion in the English committees, as to what word should be used and that "vessel" might be broader. In the drafting however, the terms were used inconsistently and no clear distinction was upheld.[75] Robert Veal and Michael Tsimplis concludes that UNCLOS intentionally left a definition of these terms out, in order to give the flag states total discretion to define "ship" / "vessel".[76] Youri van Logchem, in an analysis of the term "ship" / "vessel" in UNCLOS, argues however, that the word "ship" entails some minimum requirements on what type of thing a flag state is allowed to register as a ship. He references the international minimum requirements on manning etc., that is contained in the "International Convention for the Safety of Life at Sea (SOLAS), 1974.[77] He further concludes that the underlying implication of UNCLOS is that a watercraft must have a crew in order to be defined as a "vessel" or a "ship". He points out several provisions in UNCLOS that assume the presence of a crew on board, among others art. 27 and 28 (1), which refers to costal states' criminal jurisdiction on board vessels. He also brings up article 91 of UNCLOS, which talks about flag states requirements to register a ship. He also concludes that interpreted according to the ordinary meaning of the words, the words "ship" / "vessel" must refer to a watercraft that necessarily has the presence of a master and crew on board. Although the words "ship" / "vessel" in itself does not include onboard manning according to the dictionary, he thinks that it is the context of the treaty as a whole, with several provisions (mentioned above), implying manning of different kinds, that necessitates that it should be

[75] Youri van Logchem, note 72, *supra*, at pp. 35 – 36.

[76] Robert Veil and Michael Tsimplis "The integration of unmanned ships into the *lex maritima*", *Lloyd's Maritime and Commercial Law Quarterly*, 2017 at p. 309.

[77] International Convention for the Safety of Life at Sea, 1974, A-18961 U.N.T.S. 1991.

interpreted in this way.[78] On the other hand, Anna Petrig, draws another conclusion in the interpretation of UNCLOS. She states that the meaning of not defining "vessel" or "ship" in UNCLOS, is that it was supposed to carry different meanings in different parts of the convention. In the case of art. 101, regarding piracy, she is of the opinion that the references to crew in relation to ship, in the context of UNCLOS, can also encompass personnel at an SBC, remotely operating the vessel. She states that the definition of ship at the time of drafting UNCLOS, was supposed to be technologically neutral and open to new kinds of technologies and that at the time of the adoption of UNCLOS in 1982, the drafters must have realized that crew functions might be done remotely in the not so distant future. She also relies on the wording of article 101, which only mentions "persons on board", in relation to the victim ship [of piracy] (UNCLOS 101 (a) (i)).[79] Citing the AAWA position paper, Oda Loe Fastvold also concludes that MASS should be considered "ships" under UNCLOS, and that they should be subject to the same regulatory obligations as their manned counterparts.[80] Ringbom also concludes that MASS should be considered as ships under UNCLOS.[81]

Despite some convincing arguments on both sides, the conclusion of this thesis is that MASS of all degrees (1 – 4) should be considered as ships under the scope of the UNCLOS. As Petrig points out, the UNCLOS was also adopted in the 1980's, in a time where MASS had already been thought of (if not yet technologically possible). As the exclusion of MASS from the definition of vessel in UNCLOS would create a whole series of legal

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[78] Youri van Logchem, note 72, *supra*, at p. 40.

[79] Anna Petrig, "Autonomous offender ships and international maritime security law", in Henrik Ringbom, Erik Røsæg, Trond Solvang (ed.), *Autonomous ships and the law*, London: Routledge, Taylor & Francis Group, 2021 at p. 32 ff.

[80] Oda Loe Fastvold, *Legal Challenges for Unmanned Ships in International Law of the Sea*, UiT The Arctic University of Norway, 2018 at p. 19.

[81] Henrik Ringbom, "Legalizing Autonomous Ships", *Ocean Yearbook 34*, June 2020 at p. 441.

problems, if they ever became prevalent, it is not likely that the drafters of UNCLOS would have liked to exclude MASS from its definition of vessel. Petrig's view that the convention was supposed to be technologically neutral and include MASS under vessel / ship, therefore seems the most reasonable. Taken all together it is therefore reasonable to assume that a definition of vessel under UNCLOS would include MASS.

It is therefore submitted that MASS would fall under the public international law definition of both ship and vessel / ship, under the UNCLOS. This would mean that MASS of all degrees would enjoy all the navigational rights and freedoms that is granted to ships.

2.6 Applicabillity of COLREG to MASS

Since COLREG is the instrument of primary concern for this thesis, it is now time to address whether the COLREGs are applicable to MASS.

Rule 1 (a) of the COLREGs states that the rules of COLREG applies to "[...] all vessels upon the high seas and in all waters connected therewith, navigable by seagoing vessels." It therefore follows, that if MASS would be considered a vessel, in the context of the COLREGs, then the COLREGs must be applicable to it.

Rule 3 (a) of COLREG defines vessel as "[…] every description of water craft, including non-displacement craft, WIG craft and seaplanes, used or capable of being used as a means of transportation on water." In this definition, the presence of a crew is not mentioned at any place. Simon Baughen states that MASS would be included under the scope of COLREG.[82] Xiang-Yu Zhou et al, also state that MASS would necessarily

[82] Baughen, note 56, *supra*, at p. 133.

have to comply with the COLREGs[83] and must therefore also think that it falls under COLREG's definition of a vessel. Lucy Carey also reaches the same conclusion.[84] As was also concluded in the initial discussion above, it also seems that MASS should be considered as a "ship / vessel" under the scope of the UNCLOS. It is therefore submitted that MASS should be considered a "vessel" under COLREG and thus, that the COLREGs should be applicable to MASS of all degrees (1 – 4).

2.7 Applicability of the STCW to MASS

As will be further elaborated below, regulation A-VIII/2, part 4-1 of the STCW Code, is relevant to the interpretation of rule 5 of COLREG, which it is the purpose of this thesis to explore. Therefore, the applicability of the STCW to MASS will now be considered. Before this, a quick clarification on the structure of the STCW, which might be a little bit confusing, is in order.

The convention is composed of 16 articles, which contains general information about the overarching legal aspects of the treaty itself (entry into force, ratification etc.).[85] The technical rules which comprise the body of the convention, is entered as annexes to the convention, but also form an integral part of the convention.[86] In addition to the convention itself, the STCW instrument also contains the STCW Code, which contains

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[83] Xiang-Yu Zhou et al, "A Study of the Application Barriers to the Use of Autonomous Ships Posed by the Good Seamanship Requirement of COLREGs", The Journal of Navigation (2020), 73, 710 – 725, at p. 714.

[84] Ms Luci Carey, "All Hands off Deck? The Legal Barriers to Autonomous Ships", NUS Law Working Paper Series, No 2017/011, August 2017, http://law.nus.edu.sg/cml/wps.html at pp. 10 – 11.

[85] STCW Convention, articles I – XVII.

[86] STCW Convention art. I (1).

regulations that further specify the requirements of the regulations in the Convention, and which are referenced throughout the regulations of the Convention.[87] The STCW Code is divided into 2 parts, A and B, of which part A is mandatory.[88] Part B contains recommendations for the implementation of the Code and the Convention.[89] The regulation in question is part of part A of the STCW Code, and is therefore a mandatory requirement for states party to the STCW convention. When the term "STCW" is used without qualification in the following, it refers to the whole STCW instrument in its entirety.

Firstly, it needs to be stated that the STCW does not concern vessels or ships as such, but rather the seafarers manning those vessels. It is therefore a little bit strange to speak about the applicability of the STCW to MASS as such. A better question would perhaps be if it would be applicable to SBC-operators. However, the provision that is of interest here relates to the duty to keep a proper look-out. As will be further described below, it is not completely clear whether this duty relates specifically to a person or only to a function to be performed, which might be performed by an autonomous computer system, or by an SBC-operator. With this in mind then, the applicability of the STCW to MASS as such will be discussed.

The instrument applies to seafarers "[…] on board seagoing ships]"[90] and would hence not be prima facie applicable to MASS. However, Luci Carey argues that the convention will probably be expanded to apply to remote operators, given the purpose of the convention and also the fact that flag states are allowed to create special types of educations to adapt to new kinds

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[87] IMO.org "International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)", *https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Conv-LINK.aspx* accessed on 2022-03-09.

[88] STCW Code, A (introduction) (1).

[89] STCW Code B (introduction) (1).

[90] STCW Convention, art. III.

of technology.[91] Baughen on the other hand thinks that this would rule out its application to MASS.[92] The regulatory scoping exercise recently conducted by the IMO concluded that regarding MASS degree one (operating autonomously at times, but with crew onboard), the STCW would be applicable in its entirety. Although it concluded that some modifications might need to be made, the suggestion was that this could be accomplished through amendments to the existing convention. Regarding MASS degree two and three (remote controlled with / without crew onboard) it proposed two different views on the STCW. According to the first view, the remote operators would be considered seafarers, and the convention hence would be applicable to them. In this case, new definitions and provisions could be established in order to include the remote operator in the STCW. According to the second view, they would not be considered seafarers and new requirements for their training and competence would have to be added, either through amendments to the STCW or through the creation of a new instrument.[93] The position of the Regulatory Scoping Exercise regarding the applicability of the STCW to MASS is therefore ambiguous.

The status of the applicability of the STCW to MASS of various degrees is therefore unclear. For the time being, it can be left undecided whether the STCW would be applicable to MASS in its entirety, only to some categories of MASS, or not applicable at all. The relation between the STCW and COLREG, which will be discussed more below, in chapter 4, is not completely clear and perhaps applicability is not needed in order for the STCW to still effect the rules of COLREG. Therefore, the conclusion here, is that the applicability of the STCW to MASS is not clear.

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[91] Carey, note 65, *supra*, at p. 9.

[92] Baughen, note 39, *supra*, at p. 138.

[93] IMO Doc, MSC.1/Circ.1638, note 54, *supra*, at pp. 82 – 83.

3 Collision Liability

3.1 Introduction

In both English and American Law, liability for collision between ships is based on some form of negligence. Strict liability based on statutes may be applicable in the case of collision between ships and fixed installations of different kinds. [94]

Collisions between ships can either be due to negligence of the ship owning company (lack of required maintenance etc.), or due to negligence in navigation, on the part of the master and the crew. In this thesis, only negligence in navigation is of interest. Negligence in general requires the breach of some standard of conduct. In the case of navigation, the required standard of conduct is either a breach of statutory regulation for collision prevention, with the force of law, or, what is in maritime law called "good seamanship". Michael Tsimplis states this to mean that "the ordinary skill, care and nerve of each seaman according to his rank, is required", and sees this as the "duty of care that is owed by every ship to all other users of the seas", which was mentioned in *The Hua Lien*.[95] The duty of good seamanship involves observance of local and international navigational rules, among other things.[96] American law also distinguishes a third

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[94] Thomas J. Schoenbaum and Jessica L. McClellan, *Admiralty and maritime law*, 5th edition, St. Paul, Minn: West, 2012 at p. 760; Michael Tsimplis, "The Liabilities of the Vessel" in Yvonne Baatz (ed.), *Maritime Law*, 5th edition, London: Informa Law, 2021 at p. 248, citing "*Esso Petroleum Co Ltd v Southport Corporation* [1956] AC 218"; "*Crown River Cruises Ltd v Kimbolton Fireworks Ltd* [1996] 2 Lloyd's Rep 533".

[95] Tsimplis, note 94, *supra*, citing "*Mobil Oil Hong Kong and Dow Chemical (Hong Kong) v Hong Kong United Dockyards (The Hua Lien)* [1991], 1 Lloyd's Rep 309, 328–32".

[96] Michael Tsimplis, note 94, *supra*, at p. 250; Marsden, note 31, *supra*, at p. 96, citing "*The Albion* [1951] 2 Lloyd's Rep. 471".

category of standard of conduct, consisting of customary rules of navigation.[97]

The statutory rules of navigation that will be discussed here are the ones contained in COLREG. This treaty prescribes, through a series of rules, how ships should act when in risk of collision with one and other. As well as containing a set of rules prescribing determined actions in determined situations, it also contains a general reference to the "ordinary practice of seamanship" in rule 2 (a). As will be elaborated more below, rule 2 (a) is generally considered the rule of "good seamanship".

3.2 Good Seamanship

3.2.1 Common Law

As was mentioned above, negligence in navigation is attributable to one of two things.[98] It can be either due to a breach of:

1. Statutory (or customary) navigational rules with force of law, or,
2. The duty of good seamanship.

What the first point consists of is rather straight forward and easy to grasp; it is simply all the statutory rules which it is required to follow in navigation, because they are applicable in that case. Most notable of these are the COLREGs, which are accepted by most maritime nations, including

[97] Schoenbaum, note 94, *supra*, at p. 761.

[98] As was stated above, American law also has the third category of "customary rules of navigation". However, the object here is to explicate the concept of good seamanship, and as this third concept is also based on rules (albeit customary instead of statutory), it makes little difference for this thesis, whether a distinction is made between two or three categories. This does not affect the content of the duty of good seamanship.

the US and the UK and which regulates navigation on the high seas. In most countries they also govern navigation in internal waters.[99]

The second point on the other hand, might not be as straight forward. What does it mean to exercise good seamanship? In a single sentence, it means that one should not be negligent when navigating. But this does not explain very much, since this obligation is precisely one *source* of negligence. A more adequate way to state this, might be that the duty of good seamanship, is *all other negligence in navigation, which does not consist of transgressing a statutory rule of navigation*. Simply put, it is the maritime law language for the negligence that is not based on transgression of a statutory rule. As this obligation then encompasses *all other negligence*, it is obviously not possible to give an exhaustive account of what good seamanship is, or rather, what this obligation contains. However, a lot of its aspects are known, from case law and from doctrine, and these aspects, it is possible to say something about.

Firstly, the duty of good seamanship requires the observance of rules laid down for public safety. In the context of navigation, these are the statutory rules for navigation, most notably the COLREGs, but it may also be other local rules.[100] At times it may also contain the duty to observe navigational rules without the force of law.[101] This has the consequence that the COLREGs might be applicable even though it is not applicable by force of statute.

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[99] Schoenbaum, note 94, *supra*, at p. 762.

[100] Marsden, note 31, *supra*.

[101] Marsden, note 31, *supra*; Tsimplis, note 94, *supra*, at p. 249.

3.2.2 COLREG Rule 2 (a)

As well as in common law, there exists an obligation of "good seamanship" in COLREG rule 2 (a).[102] Both English and American scholars seem to see this duty as synonymous with the respective common law duties of good seamanship.[103] However, Marsden writes that one view of COLREG r. 2 (a), is that the rule should be seen only as a compliment to the other rules (of COLREG), that can be used to cover situations not covered by the other rules. If this was the case, then there would indeed be a distinction between the English common law duty of good seamanship, which would encompass all of the rules in COLREG, as well as other navigational statutes, navigational warnings, and a lot more – and the rule of good seamanship in COLREG rule 2 (a), which would only encompass the situations not covered by the other specific rules in COLREG. However, he also states that another view of that rule is that it is the underlying principle of all the other rules of COLREG, which form part of, but not the whole, of the duty of good seamanship. He concludes his argumentation by noting that both views have some degree of accuracy.[104] Tsimplis, commenting on this view, reaches the conclusion that the latter view (holding rule 2 (a) as the underlying principle of COLREG), cannot be correct, since paragraph b of rule 2 in certain circumstances requires maneuvers which might be incompatible with good seamanship.[105] However, he also notes that COLREG r. 2 (a), should nevertheless be seen as "the overreaching standard and that compliance with the COLREGs will be means of discharging this

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[102] Though r. 2 (a) of COLREG does not specifically refer to "good seamanship" but rather to "the ordinary practice of seamen", this rule is referred to, both in English and American literature as the "rule of good seamanship".

[103] Marsden, note 31, *supra*, at p. 66; Robert P. McCleskey Jr.; Jeremy A. Herschaft, "Unique Features of Maritime Collision Law", Tulane Law Review 79 (2005) 1403 at p. 1410.

[104] Marsden, note 31, *supra*, at p. 165.

[105] Veal and Tsimplis, note 76, *supra*, at p. 324.

duty in most, but by no means all cases."[106] It can be noted here that according to the wording of rule 2 (b), it does not exactly state that maneuvers required by it may be incompatible with good seamanship, as Tsimplis states, but rather, that it requires the departure from "these Rules" at certain times, in order to avoid immediate danger. The wording "these Rules" is obviously a reference to the rules of COLREG. Since rule 2 (a) is also a rule of COLREG, it is therefore not a strange conclusion to establish, as Tsimplis did, that the requirement to make departure from "these Rules", should be seen as a requirement to make a departure from the duty of good seamanship. However, another interpretation is also possible. It might be considered that what is referenced in r. 2 (b), talking about "these Rules", is in fact the material provisions of COLREG (namely the steering and sailing rules, and the rules for shapes and lights) and not the duty of good seamanship stated in 2 (a). A reading of 2 (a) and (b) together, may support such a conclusion. Rule 2 (a) makes a distinction between "these Rules" on the one hand, and, "the ordinary practice of seaman" on the other hand. Taken together with rule 2 (b), the more correct interpretation seems to be that what rule b is sometimes requiring a departure form, is only the material provisions of COLREG, and not the duty of good seamanship in 2 (a). Rather then, rule 2 (b), should be interpreted as a specific way of expediating the duty of good seamanship, in cases where strict adherence to the material provisions of COLREG is not enough or would be dangerous. Indeed, this is also how Marsden interprets it, as is evident from the fact that he states that "The duty of those in charge of a ship to navigate her with due regard to the ordinary rules of seamanship will be further referred to under the "general prudential rule (2 (b))."[107] Therefore, rule 2 (a) is probably best looked at as the underlying principle of COLREG, encompassing all of its rules, but also other obligations with their origins in case law. This view is certainly compatible with the view that this rule is synonymous with the

[106] Id p. 325.

[107] Marsden, note 31, *supra*, at p. 122 in fine – 123.

common law duty of good seamanship, while the former (that it is only filling in the gaps), seems to be harder to reconcile with this notion. However, what Marsden might have meant (when stating that both views have a degree of accuracy), is perhaps simply that in the case of litigation concerning a collision, rule 2 (a) will not be used as the basis for liability in case a more specific rule of COLREG has been breached in a negligent way, which was causative to the incident. Seen in this way, both views indeed do hold some degree of accuracy – at the same time, it is the underlying principle of it all, but it only comes to play in case there is a hole to fill in the rest of the regulations. This view would also be reconcilable with the view that rule 2 (a) of COLREG is more or less synonymous with the common law duty of good seamanship. If this is accepted, then the only difference seems to be, that the common law obligation can be applicable in a case where the COLREGs are not. In such a case, compliance with COLREG is required, even though the rules themselves are not applicable, because they form part of the duty of good seamanship.[108]

3.3 Conclusion

In conclusion, both the UK and the US seems to equate the duty of good seamanship in their respective common laws, with the duty of good seamanship in r. 2 (a) of the COLREG. In both jurisdictions, it seems to encompass both the adherence to statutory rules of navigation and can also make applicable rules of navigation which does not have force of law or is not applicable in the specific case.

Since it has been established, that the rule of good seamanship in COLREG 2 (a), contains all of the obligations of COLREG as well as other aspects, it is, as has already been pointed out above, not possible to give an exhaustive

[108] Marsden, note 31, *supra*, at p. 149; McCleskey and Herschaft, note 103, *supra*, at p. 1410; Healy and Sweeney, note 31, *supra*, at p. 75.

account of the content of the whole rule and of MASS compliance to it. One aspect of that obligation will therefore have to be chosen for further analysis.

The obligation to keep a proper lookout, listed in COLREG rule 5 is interesting in many ways. Marsden for example states that this rule is one of the rules most clearly reflecting the duty of good seamanship.[109] In the literature on MASS, it has also been given quite a lot of attention. It is therefore interesting to look at how MASS of degree 1 – 4 could live up to this obligation, and how this would differ between the different categories. Therefore, rule 5 of COLREG will be further elaborated upon, by looking at what has been said in the literature on MASS, in the regulatory scoping exercise at the IMO and in case law. US and UK case law will be used for this purpose, supplemented by one Canadian case.

[109] Marsden, note 31, *supra*, at p. 96.

4 COLREG Rule 5 – Look-out

4.1 Introduction

Rule 5 is, as the name says, the rule of COLREG requiring ships to keep a proper lookout. As stated above, under "Comments on Methodology and Material", The discussion on the content of rule 5 is based on the books "The Law of Marine Collision", by Nicholas J. Healy and Joseph Conrad Sweeney, written from an American point of view and the book "Marsden and Gault on Collisions at Sea" by Reginald G. Marsden and Simon Gault et al, written from an English point of view and on case law from the England, the US, and Canada. Before the content of rule 5 is discussed, a brief comment on the material used here is provided.

In their discussion of rule 5, it can be noted that both Marsden and Healy and Sweeny seemingly speak of two distinct concepts, without separating them. On the one hand, they speak about the duty to keep a proper look-out. On the other hand, they speak about the person of the look-out, which may or may not be required to fulfill the duty to keep a proper look-out.[110] The reason for the lack of this distinction might be found in the fact that the literature in question was written without the concept of MASS in the minds of the authors. Both Marsden and Healy and Sweeny, seems to proceed from the assumption that there will always be a human person keeping the look-out (whether this be the officer of the watch alone, or a specific person assigned to this task). As those books were written some years back, when MASS was not as relevant of a subject as it is today, this assumption is perfectly justified and natural. When considering the operation of a

[110] It is true that Healy and Sweeny in their treatment of the issue does make this distinction, but on the treatment of the content of rule 5, they do not uphold a sufficiently clear distinction to make it clear and unambiguous to discern what is being discussed and how the two concepts relate to one another.

conventional ship, it is unnecessary to make such a clear distinction. The reason is that a conventional, manned vessel, will always have some human person preforming the duty to keep a look-out. It is therefore natural to describe how the duty to keep a look-out, might be carried out, by reference to the person keeping the look-out. For the subject of MASS, however, such a distinction is imperative, as the question is precisely how this obligation might be fulfilled, or in what way it could not be fulfilled, without a human performing it. In analyzing older case law and doctrine, it is then necessary to clearly separate exactly (1) what the duty to keep a proper look-out contains (2) what part of this duty only pertains specifically to the person of the look-out and (3) whether or not this can be fulfilled without a human person. What this means, is that previous cases and doctrine has to be deconstructed, through the utilization of an anachronistic mode of interpretation (as these questions where probably not present in the minds of the authors, at the time of writing). It is true that some modern literature, written from the perspective of MASS does in fact make this distinction, for example in the report on the AAWA project. But also there, too little emphasis is put on this, and the distinction is not upheld clearly enough.

With these assumptions in mind, the content of rule 5 and in what way the obligation it mandates, can be fulfilled by a MASS, and how this might differ between autonomy of degree 1 – 4, will now be discussed.

4.2 The Content of Rule 5

Rule 5 reads:

> Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.

The text of the rule is quite clear; the obligation of the rule is to appreciate the situation and assess the risk of collision. The rule further specifies that

this should be done through the use of sight and hearing and all available means appropriate in the prevailing circumstances and conditions.

A coherent reading of the rule, with all of its parts together, makes it hard to interpreting it as anything other than requiring a human person to at least be present somewhere in the process. The overall objective of the rule, to "appreciate" [the situation], is defined by Oxford English Dictionary as "to understand that something is true".[111] The word "understand" is further defined as "to know or realize how or why something happens, how it works or why it is important".[112] "Know" is defined as "to have information in your mind as a result of experience or because you have learned or been told it".[113] "Mind", is then defined as "the part of a person that makes them able to be aware of things, to think and to feel".[114] This shows that several stages had to be gone through to finally get to a word that directly referred to a person. This also shows that interpreted strictly according to the ordinary meaning of the words, the overall duty of rule 5 does require human judgement. This is also supported by Clarke J.'s statement in *The Golden Polydinamous*, where the look-out was held faulty because of the officer's failure to notice the ships course alteration and "appreciate what

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[111] Oxford English Dictionary, search term "appreciate", *https://www.oxfordlearnersdictionaries.com/definition/american_english/appreciate* accessed on 2022-04-12. There are three different meanings listed, but it is obvious that this is the meaning of the word that is meant here, and the other meanings therefore does not need to be discussed.

[112] Oxford English Dictionary, search term "understand", *https://www.oxfordlearnersdictionaries.com/definition/english/understand?q=understand* accessed on 2022-04-12.

[113] Oxford Learner's Dictionary, search term "'know", *https://www.oxfordlearnersdictionaries.com/definition/american_english/know_1* accessed on 2022-04-12.

[114] Oxford English Dictionary, search term "mind", *https://www.oxfordlearnersdictionaries.com/definition/english/mind_1?q=mind* accessed on 2022-04-12.

was happening".[115] Marsden, who referenced this case, also concluded that the duty to keep a proper look-out, could be summed up as "appreciation of what is taking place' by officers in charge of the watch."[116] Oda Loe Fastvold also argues that rule 5 in combination with rule 2 of COLREG requires human judgement.[117] A report submitted by Denmark during the RSE, on the regulatory barriers to MASS, also concluded that the reference to "a full appraisal of the situation and of the risk of collision" necessarily refers to human competence.[118] Bernard Eder also argues that the lookout requirement, together with rule 2, requires human input and could not be satisfied by a completely autonomous vessel, but might be fulfilled by remote operators.[119] It is therefore clear that overall structure of the rule, seems to at least require a human person to be a part of the process, and more specifically, requires him to interpret the data. It is therefore submitted that the duty to keep a proper lookout, does require a human person, at least to finally interpret the data. In reference to what was said above, about the need to make a clear distinction between the person of the look-out and the duty to keep a proper look-out, it is now established that the duty of look-out at least in one sense requires a person of the look-out. Some further elaboration on the concept of the person of the look-out is necessary to better explain what is meant by the statement that the duty to keep a proper look-out requires a person of look-out in one sense. The problem is that the person of the look-out is also spoken of in two ways seemingly without distinction both by Marsden, Healy and Sweeney and case law.[120] In the

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[115] *The Golden Polydinamous* [1993] 2 Lloyd's Rep. 464 at pp. 477 – 478.

[116] Marsden, note 31, *supra*, at p. 185.

[117] Fastvold, note 80, *supra*, at p. 40.

[118] IMO Doc. MSC 99/INF.3, 18 January 2018, Final Report: Analysis of Regulatory Barriers to the use of Autonomous Ships, Submitted by Denmark, at p. 47.

[119] Sir Bernard Eder, "Unmanned Vessels: Challenges Ahead", [2019] L.M.C.L.Q. 47 at pp. 54 – 55.

[120] Marsden, note 31, *supra*, at pp. 185 - 187; Healy and Sweeny, note 31, *supra*, at p. 97.

first way, it relates to the human person responsible for interpreting the data and accessing the situation. This is the sense in which the term is used by Marsden when referring to the officer of the watch above. In the second sense, it is used to describe a specific person, who is conducting the physical act of looking out, through the direct use of sight and hearing.[121] In some cases, for example on smaller vessels, these two functions can be combined in one person, [122] but the two concepts as such are still distinct. What has been established here then, to clarify, is that the person of the look-out in the first sense of the term is required by the overall requirement of rule 5, which requires the situation to be accessed. Whether or not rule 5 requires the person of the look-out in the second sense of the term, depends on whether this is required by the reference to "sight and hearing" or "all available means appropriate" in the rule, which will be discussed below.

Therefore, it can be concluded that MASS degree 4 could not comply to COLREG in its current version, as there is no way to get around the fact that human judgement would be needed. However, the question still remains if remotely controlled vessels would be able to comply. Whether or not this is possible, depends on whether the two requirements of using sight and hearing and all available means appropriate, could be fulfilled remotely. This will now be further discussed.

4.2.1 "All Available Means Appropriate"

This part of rule 5, has been interpreted in both English and American cases, as including the use of radar and ARPA, [123] if fitted and when this would be

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[121] Marsden, note 21, *supra*, at pp. 187 - 188.

[122] Healy and Sweeny, note 21, *supra*, at p. 95.

[123] Automatic Radar Plotting Aid: system for automatic radar plotting (an extra function on a radar), see "Norvald Kjerstad, *Elektroniske og akustiske navigasjonssystemer: for maritime studier*, 6th edition, Bergen: Fagbokforl., 2019 at p. 2-89."

of use to navigation. In *The Thomaseverett*,[124] it was not considered necessary to use radar, because the visibility was good, and because the other vessel had been seen. Rule 5 might also require the use of shore-based radar, through seeking advice form a land-based traffic information central, such as a VTS,[125] about how to proceed. For example, in *The Nordic Ferry*,[126] a ferry navigating in fog, which made their radar ineffective, was supposed to have sought such advice from traffic control on shore. In *Wakefield v. The Veendam*, a fishing vessel was held liable for failing to use the radar in fog.[127]

The use of radar is specifically the subject of rule 7 (b) of COLREG, which is probably best viewed as a specification of when and how the radar should be used. Marsden for example cites the same cases under rule 5 and rule 7 (such as the *Nordic Ferry Case*, on the obligation to use shore-based radar), indicating that the latter might be considered as a specific instance of the former. The relationship between r. 7 (b) and r. 5, can therefore be viewed as the following:

- Rule 5 is the general requirement to keep a proper look-out
    - This involves the use of radar when necessary.
- Rule 7 (b) is the requirement to use the radar properly when appropriate
    - This is also a requirement of proper look-out (r. 5).

Healy and Sweeney also treat the requirement to use radar in rule 5, only under the discussion on rule 7.[128]

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[124] *The Thomaseverett* [1981] 1 Lloyd's Rep. 1.

[125] Vessel Traffic Services (marine equivalent of air traffic control), see IMO.org "Vessel Traffic Services", *https://www.imo.org/en/OurWork/Safety/Pages/VesselTrafficServices.aspx* accessed on 2022-04-24.

[126] *The Nordic Ferry* [1991] 2 Lloyds Rep. 591.

[127] *Wakefield v. The Veendam*, 1980 AMC (WD Wash. 1980).

[128] Healy and Sweeney, note 31, *supra*, at p. 94.

The requirement to use "all available means appropriate", is a reference to the use of technical means of accessing the situation. Thus, it seems that the requirement of using all available means appropriate, could be fulfilled by remote operated ships, as long as the technology was adequate and at least as good as that in place on existing ships. There is seemingly no reason why ships developed today for sailing with various degrees of autonomy would not be able to have technology as good as that already in place on existing ships. Therefore, it can be concluded that MASS all the way up to degree 3 would be able to comply. As MASS degree four could not live up to the general requirement of human assessment discussed above, it can therefore not comply to any of the requirements of rule 5, because it fails to live up to the basic requirement. The requirement of sight and hearing, however, poses a seemingly bigger issue for MASS operation, and will now be discussed.

4.2.2 "Sight and Hearing"

In both English and American case law and literature, it has been established that the look-out duty contains both the use of sight and hearing, and that the use of radar, although also a requirement of this duty, is no substitute for the use of sight and hearing.[129] Healy and Sweeny also notes that when radar was first put into use on merchant ships, following World War II, there was a speculation in law, that this might serve as a substitute for the use of sight and hearing. This later proved to be wrong.[130] It is therefore clear that the reference to sight and hearing cannot be fulfilled by use of the radar. This probably means that the reference to the use of sight and hearing at least requires a way of perceiving the external world more akin to human sight and hearing (that is, a human person perceiving the

[129] Marsden, note 31, *supra*, at p. 185, citing "*The Esso Wandsworth* [1970] 2 Lloyd's Rep. 303", *The Arietta* [1970] 1 Lloyd's Rep. 70"; Healy and Sweeny, note 31, *supra*, at p. 93.

[130] Healy and Sweeny, note 31, *supra*, at p. 93., citing "*The Anna Salen*, [1954] 1 Lloyd's Rep. 475 (Adm.)"

sound and the sight, through the direct exercise of his natural faculties of sight and hearing), than what can be obtained through the radar. However, it does not answer conclusively, if this perception has to be direct, or whether it can be obtained through technical means, such as a camera or a microphone, which would allow for this obligation to be fulfilled remotely. This would depend on whether the requirement to use sight and hearing, actually requires that the real world is perceived directly, through the faculties of sight and hearing, or whether or not the sight and hearing in question can be of a representation of reality, rather than the actual real world itself. What is meant here, by representation of reality and the real world itself, can further be explained by looking at the difference between the use of a radar, the use of camera image displayed on a screen and the direct use of sight. When using a radar, the human person operating the radar does "see" the information on the radar screen, which is a representation of reality. But he does not see the real world directly, through his own eyes. When seeing an image on a screen, which was recorded by a camera, he also sees a representation of reality, and not the real world itself directly. Only when looking directly out from the bridge of the ship with his own eyes, does the person of the look-out see the real world directly. In order to answer whether the sight and hearing in rule 5 needs to be direct, or can be obtained through technical means, that the questions that has to be asked is:

> Does the obligation to use sight and hearing, under the obligation to keep a proper lookout under rule 5 of COLREG, require that the real world is perceived directly, by a human person, through his natural faculties of sight and hearing, or is it sufficient, to substitute for this direct perception, the human perception of a representation of reality, provided that it is adequate with regards to detail and accuracy?

To answer this, English and American case law will be examined. The STCW Code Section A-VIII/2 Rule 4-1, which is closely related to rule 5 of CORLEG (and specifically to the person of the look-out in the second sense of the term) will also be discussed to elucidate this question. The discussion

will begin with an analysis of the relationship between rule 5 of COLREG and the STCW Code Section A-VIII/2 Rule 4-1.

The rule in question is part of chapter VIII, which regulates "standards regarding watchkeeping" and section A-VIII/2 which deals with "watchkeeping arrangements and principles to be observed". The rule is thus situated among the rules dictating how to conduct a navigational watch. It states certain requirements on how a proper look-out should be maintained. Although it contains a direct reference to COLREG rule 5 in para 14, the two conventions as such are still two separate treaties of international law. It would therefore be misleading to say that the STCW Code Section A-VIII/2 Rule 4-1 is some kind of specification of COLREG rule 5. It is as such, a distinct and separate obligation which follows from a separate treaty. Shortly put, rule 5 of COLREG requires vessels to keep a proper look-out and the STCW Code Section A-VIII/2 Rule 4-1 prescribes requirements for how a look-out must be conducted. Therefore, it could be argued that it in theory would be possible to comply with rule 5 of COLREG, without complying to the STCW Code Section A-VIII/2 Rule 4-1. In practice however, this provision of the STCW is probably more likely to be seen a specification of how to properly live up to the requirements of COLREG rule 5. In a questionnaire conducted by the Comté Maritime International (CMI)[131] as part of the RSE, regarding the possibility of indirect look-out by technical means to conform to the requirement of COLREG rule 5, the response from Germany notably emphasized that COLREG rule 5 is often read together with Section A-VIII/2 Rule 4-1 of the STCW Code.[132] Healy and Sweeny also refer to this provision of the STCW

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[131] The CMI is an international organization based in Antwerp which goal is to "[…] contribute by all appropriate means and activities to the unification of maritime law in all its aspects." (Comitemaritime.org "About us", *https://comitemaritime.org/about-us/* accessed on 2022-04-14.)

[132] IMO Doc. MSC 99/INF.8, 13 February 2018, Regulatory Scoping Exercise for the Use of Maritime Autonomous Surface Ships (MASS) - Work conducted by the MI International Working Group on unmanned ships, submitted by CMI, at p. 11.

when discussing the content of rule 5 of COLREG.[133] It is therefore possible that this provision of the STCW could constitute either a "relevant rule of international law applicable in the relations between the parties" according to the VCLT art. 31 (3) (c) or a supplementary mean of interpretation according to VCLT art. 32. A requirement for a treaty constituting a "relevant rule of international law applicable in the relations between the parties", according to the VCLT art. 31 (3) (c), is that all the parties to the convention being interpreted, are also parties to the treaty used as means of interpretation.[134] As Monaco is party to COLREG,[135] but not the STCW, it is clear that Section A-VIII/2 Rule 4-1 of the STCW Code, cannot constitute a "relevant rule of international law" according to VCLT art. 31 (3) (c). However, it is still probable that it would constitute a supplementary mean of interpretation, according to VCLT art. 32.[136] A number of different scenarios is therefore possible with regards to the relationship between STCW Code Section A-VIII/2 Rule 4-1 and COLREG rule 5. Either, the two obligations are completely separate, and does not affect each other as such, or, the STCW provision has some status as an authoritative source for the interpretation of rule 5 according to the VLCT. If the STCW is applicable to MASS and the two obligations are found to be separate, then, it would be possible for MASS operation to comply with COLREG rule 5 without complying to STCW Section A-VIII/2 Rule 4-1, which would be a separate issue. If the STCW is not applicable to MASS operation and the two obligations are considered separate, then STCW Section A-VIII/2 Rule

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[133] Healy and Sweeny, note 31, *supra*, at p. 95.

[134] Linderfalk, note 25. *supra*, at p. 88.

[135] IMO.org. "Status of Conventions", *Ratifications by State*, https://www.imo.org/en/About/Conventions/Pages/StatusOfConventions.aspx, accessed on 2022-04-25.

[136] Linderfalk, note 25, *supra*, at p. 89, states that treaties regarding the same subject, but where not all the parties to the interpreted treaty are parties to the treaty that is being used as means of interpretation, might constitute a supplementary mean on interpretation according to art. 32 of the VCLT.

4-1 would not be of any concern whatsoever to MASS operation. If the obligation of the STCW should be considered a supplementary means of interpretation of COLREG rule 5 according to the VCLT as described above, then the light that this rule could shed on the content of rule 5, would still have to be weighed against all the other means of interpretation, such as the case law discussed below, the opinion of legal scholars and the overall purpose of the rule. It is therefore not clear that STCW Section A-VIII/2 Rule 4-1 would necessarily be of any concern whatsoever to MASS. That being said, it is still interesting discuss the content of this STCW provision in relation to the requirement of sight and hearing in COLREG rule 5, as the question of how the former could affect the latter is obviously not clear.

STCW Section A-VIII/2 Rule 4-1 contains requirements on how a proper look-out must be kept. This provision also seemingly confuses the duty to keep a proper look-out, with the person keeping the look-out. Para 14 of this provision only deals with the duty to keep a proper look-out in itself, and covers the purpose of the look-out duty. Para 15 and 16 then clearly speaks about the person of the look-out, in the second sense of the term (a person using direct sight and hearing to perceive the external world). Para 15 states that the look-out should not be assigned any other task then looking out. Para 16 covers the fact that the look-out should be a separate person from the officer of the watch and the helmsman, it also contains exceptions for when the officer of the watch alone can fulfill the function of the person of the look-out. From a coherent reading of this provision, it is clear that this provision does require the person of the look-out in the second sense of the term. Germany's response to the CMI's questionnaire also concluded that this provision "clearly speaks of a person",[137] supporting this conclusion. However, there still might be a possibility for MASS to comply to the STWC, even though strict adherence to this provision is not possible. The thing is that the STCW, through article IX of the Convention, permits member states to adopt other educational or training arrangements

[137] IMO Doc. MSC 99/INF.8, note 110, *supra*, at p. 11.

(equivalents), “adapted to technical developments and to special types of ships”. It is in the view of this author, not only possible, but even probable, that MASS would constitute such a technical development or special type of ship. A comprehensive reading of STCW Section A-VIII/2 Rule 4-1 makes it clear that the purpose of this provision, just as with COLREG rule 5, is the attainment of situational awareness. Although the rule does prescribe a specific way of attaining this, through the person of the look-out in the second sense of the term, a teleological interpretation of the rule in combination with article IX of the STCW convention, is probably likely to allow for an electronic look-out to be considered an equivalent to the requirement of the direct look-out.

Rule 5 of COLREG read together with the STCW Section A-VIII/2 Rule 4-1, should therefore probably not require direct look-out. The person of the look-out in the second sense of the term, should therefore not be required by the requirement to use sight and hearing in rule 5 of COLREG, as interpreted in accordance with STCW Section A-VIII/2 Rule 4-1. The discussion will now move on to the interpretation of the sight and hearing requirement of COLREG rule 5 according to case law.

4.2.3 Selected Case Law Analysis

In the Canadian case “*The Triton – The Baranof*”,[138] form 1953, the look-out was held to be insufficient, partly because of excessive use of the radar. The case in question involved a collision between the two vessels *The Baranof* and *The Triton*. *The Baranof* was an American combined cargo and passenger ship of 4 990 GT,[139] en route from Seattle, Washington to Alaska, with passengers and cargo onboard. *The Triton* was a Greek cargo ship of

[138] *The Trition – The Baranof* [1953] Can. Exch. 74.

[139] Gross tonnage (abbreviated GT); the volume a ship’s enclosed spaces in cubic meters (Gregersen, note 3, *supra*, accessed on 2022-04-25.)

7250 GT, underway from Campbell River B.C., to Japan, via way ports, carrying a cargo of 9 600 tons of iron ore. The collision took place in the Strait of Georgia, shortly after midnight on July 25th. On each vessel, two officers where in charge of the navigation, during the time leading up to the collision. At the time of collision, the bridge of *The Triton* was manned by pilot Green and second officer Fatsis, the bridge of the Baranof was manned by pilot Landstrom and 3rd officer Flaherty. About 30 minutes before the collision, the bridge of the Triton was manned by Pilot Simpson, who was subsequently relieved by pilot Green.[140]

The situation started with the sighting of *The Baranof*, by pilot Simpson and second officer Fatsis, at about 11:45 pm. *The Baranof* was approximately 1 ½ points to the starboard bow of *The Triton* at the time of sighting, and *The Baranof's* starboard light were also sighted, through binoculars, by officer Fatsis. The officer and the pilot on board *The Triton*, concluded correctly that the ships would pass safely starboard to starboard if course and speed were maintained, and that consequently no action was necessary. *The Triton* therefore maintained her course and speed.[141]

The Baranof's side of the story was harder to determine with certainty, as there were inconsistencies in different testimonies of the different people on the bridge, but also in different testimonies given by the same people at different times. The court concluded however, that the situation could most likely be summed up as follows. The officer and pilot of *The Baranof*, claimed that *The Triton* was cited on the starboard bow, that *The Baranof* made an alteration to port, that the courses where then such as to allow the vessels to pass safely port to port, but that *The Triton* then made a sudden alteration to port, so as to put the vessels on a sudden collision course. The officer and pilot of *The Triton* did not mention at any time, that the red

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[140] *The Triton*, note 138, *supra*, at p. 1.

[141] Id. at p. 2 (para 7).

navigation light of *The Triton* had been sighted at any time.[142] The court concluded that the actual turn of events was probably closer to the following.

Pilot Landstrom of *The Baranof* was preoccupied with the radar, on which he first observed *The Triton* at 5° on his starboard bow, but did not realize yet that it was actually another vessel. The preoccupancy with the radar, on the part of the pilot, prevented him from looking out (the visibility was good on the night in question). The 3rd officer did look-out and observed the masthead lights of *The Triton*, but did not report this to the pilot. The court concluded that pilot Landstrom was preoccupied with the radar, and left the look-out to the 3rd officer, who then failed to report to him.[143]

The court then discussed the use of radar, and cited this paragraph by Mr. James H. Hamilton, form Harbour & Shipping of January 1953, p. 17:

> In a recent collision case in the United States courts the judge made the remark that radar "is a very good working cane but a very bad crutch". His intention was no doubt to call to mind the fact that the introduction of radar as an aid to navigation did not warrant the assumption that the international "Regulations for Preventing Collisions at Sea" are by-passed or in any way changed by reason of the additional and valuable assistance which radar provides.[144]

The court then concluded that this was a good summation of the radar's true function. The judge further concluded that:

> I think the Pilot was at fault, on that fine summer's night, in paying so much attention to radar, and so little to what his eyes could have seen ahead of his vessel.[145]

An important conclusion to be drawn from this case, is that what is being discussed, all throughout the case, is actually the vigilance and the overall appreciation of the situation, and how well this is being done. Indeed, the

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[142] *The Triton*, note 118, *supra*, at p. 3.

[143] Id at p. 4 (para 15).

[144] Id.

[145] Id at p. 4 (para 16).

judge stated that "*The Baranof's* navigators failed to keep a vigilant and competent lookout". It is also evident, from the quotation above, that the failure to look out and actually see what was going on, was a considered faulty because it led to a situational awareness that was worse than it would have been had he actually looked out. From this, it seems that what is actually required is the attainment of situational awareness. At the time of this incident, in 1954, the technical means of look-out available for the vessel in question was the radar. The radar in this case did not suffice to provide situational awareness on a level equal to that of the use of sight in combination with the radar – the use of sight was therefore required. This means that, at least from what can be understood of this case, that what is really the central thing is the attainment of situational awareness, rather than any specific way of attaining it. This can be seen from the way the court is formulating its conclusions, and from what the court emphasizes in its assessment. When the court is discussing the fact that the pilot should have looked up from the radar, and that he was overly preoccupied with the radar, it is always in relation to the fact that he is missing what is going on and judging the situation wrongly. It is never spoken of as an isolated requirement that is totally and completely absolute, without any reference to its purpose. Therefore, it would probably be okay to use information provided by a camera (or other equivalent technological means), provided that it is accurate and detailed enough, instead of direct sight. On the basis of this case then, it can then be concluded that the obligation to keep a proper look-out, does not require the direct use of sight and hearing, but that the substation of this, with the sight and hearing of a representation of reality (possibly by a camera image), would be acceptable, provided that the image is detailed and accurate enough. Therefore, it is submitted that the person of the look-out in the second sense of the term (a person actually looking out and using direct sight and hearing), is not required by the reference to sight and hearing in COLREG rule 5. From what can be inferred from this case, it would be sufficient that there was a person of the look-out in the first sense of the term (a person accessing the overall situation), provided that this person was provided with sufficiently detailed

and reliable information from technical means, such as cameras or microphones.

Another interesting case is the US case *The Wilson Victory*, regarding the collision between the steamer *The Wilson Victory* and the trawler *The Bucentaur*. *The Bucentaur* was a trawler of 105 feet of length and a beam of 21 feet.[146] The Wilson Victory was a combined cargo and troop ship of 455 feet in length and 62 feet in beam.[147]

In the early morning of May 21st, *The Wilson Victory* was en route from Bremerhaven, Germany to New York City USA, with a stop in Dover, England. The Bucentaur was on her way from Lowestoft, England to the fishing grounds around the pit boy in the North Sea.[148]

The navigational watch on *The Wilson* victory consisted of a North Sea pilot, the Master, and a look-out.[149] *The Bucentaur* was hit by *The Wilson Victory* at 03:46 in the morning (German Double Summer Time). At the time of the collision, the fog was dense, not allowing visibility of more than half a mile. At the time of the collision, the look-out of the *Wilson Victory* was stationed at the bridge, the radar was being used, and the pilot and the master were also observing the situation. The look-out was held faulty, because the look-out was not placed in the bow of the ship, where, according to the court, he should have been stationed.

In this situation, what is discussed by the court is both the duty to keep a proper look-out and also the specific requirement of the position of the person of the look-out. The two issues are here, as discussed above, intertwined,

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[146] *Irene M. WOOD, as Personal Representative and Administratrix of the Estates of William J. Besford, et al., Libellants (Wood) v. UNITED STATES of America, Respondent, and Consolidated Fisheries, Ltd., Respondent-Impleaded, and Two Other Actions (US)*, 125 F. Supp. 42, 1955 A.M.C. 142, at p. 4.

[147] *Wood v. US*, note 126, *supra*, at p. 5.

[148] *Wood v. US*, note 126, *supra*, at p 4.

[149] *Wood v. US*, note 126, *supra*, at p 5.

because the court is elaborating on how to maintain a proper look-out, by reference to the person of the look-out. A careful reading of the court's formulations can however separate the two issues. The court states that:

> When proceeding in fog or conditions of reduced visibility, the maintenance of 'a proper lookout' as demanded by Article 29 requires that a lookout be stationed as far forward as possible […].[150]

However, it also points out that:

> Although no statutory rule requires the maintenance of a lookout in the bow of a ship, many decisions in our courts have established that as the proper place for one best to observe objects on or at the surface of the water.[151]

The purpose of having a look-out stationed in the bow is to "best to observe objects on or at the surface of the water". It is not simply an absolute rule with no regard to its purpose. From this, it is clear that what is actually contained in the duty to keep a proper look-out, is, just as was established in the case above, is the attainment of situational awareness. Most of what is discussed in this case regarding the faulty look-out has to do with the position of the person of the look-out. However, taken together, it is clear that it is the purpose that counts. The person of the look-out was required to be in the bow to attain the best possible situational awareness. It is therefore likely, also from this case, that direct sight and hearing would not be a requirement, if sufficiently accurate and effective technological means existed, to transfer this information to a remote operator. A representation of reality would therefore be sufficient, provided it is adequate in detail and accuracy. This means that the person of the look-out in the second sense of the term would probably not be required.

Another interesting case is *The Firedog*,[152] an English case referenced by Marsden. This case concerned a collision between the two vessels *The*

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[150] *Wood v. US*, note 126, *supra*, at p 10.

[151] Id.

[152] *The Firedog*, (1950) 84 Ll.L.Rep. 496, 502, affd. [1951] 2 Lloyd's Rep. 205, CA.

Firedog and *The Lake Cowichan*. *The Lake Cowichan* used its engines, when still being at anchor, in a way that brought the ship to collide with *The Firedog*. The court concluded that the engines had contributed to bringing the *The Lake Cowichan* closer to the other vessel, then what would have been the case if it had just "swung to her anchor" unassisted by the engines. The look-out was held faulty "in a broad way" for "a complete lack of appreciation that here engine movements might have the effect of bringing the head of *The Lake Cowichan* appreciably nearer the line of advance of the Firedog". [153] Also in this case, what is emphasized is the attainment of situational awareness. By what can be understood from this case, the person of the look-out in the second sense of the term would not be required.

In summation then, the requirement to use sight and hearing in COLREG rule 5 would probably not require the direct use of sight and hearing. It would not require the person of the look-out in the second sense of the term. Therefore, provided the technological means of perceiving the situation that the MASS was equipped with was sufficiently accurate and precise, also remote controlled vessels without crew onboard could comply with this requirement. It thus goes without saying that also all the lower levels of MASS would be able to comply. As previously stated, MASS degree four would fail to meet the requirement of human judgement and would therefore not be able to comply with any of the requirements of COLREG rule 5, because it fails to comply to the basic overall requirement. It is therefore the conclusion that MASS degree 1 – 3 would be able to comply with the requirement to use sight and hearing of COLREG rule 5, but that MASS degree 4 would fail to comply with this requirement.

[153] *The Firedog*, (1950) 84 Ll.L.Rep. 496, 502, affd. [1951] 2 Lloyd's Rep. 205, CA.

5 Summary and Conclusions

As has been established above, the overall requirement of rule 5, to appreciate the situation, does require human judgement and it is therefore not possible for MASS degree 4 to comply with rule 5 of COLREG. However, the question of whether this could be done remotely, by a shore-based operator, was seemingly answered positively, from findings in doctrine and case law and by reference to the STCW. As mentioned above, this question was also raised in CMI's questionnaire. The questionnaire was sent out to 52 national maritime aw associations (MLA) which are members of the CMI. 19 responses were received from the MLAs of: Argentina, Brazil, Canada, China, Croatia, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Malta, the Netherlands, Panama, Singapore, Spain, the United Kingdom and the United States .[154] The results were the following:

> Six MLAs stated that the requirement to maintain a proper lookout could or could probably be satisfied by transmission of data to a shore-based crew (Arg, Dut, Fin, Fre, Jap, Pan). Two MLAs stated that it is unknown but likely (Bri, Can). Two MLAs stated that it is possible that the requirement would be satisfied by such transmission (Spa, US). Three MLAs stated that the requirement could not be satisfied by transmission to a shore-based individual (Iri, Ita, Mal). Six MLAs did not take a position (Bra, Chi, Cro, Den, Ger, Sin).[155]

Interestingly, the Canadian MLA specifically stated that the requirements of Canadian case law would allow for remote operation, thus supporting the conclusion reached above form the discussion of *The Triton*.[156]

Some other authors who have covered the subject of MASS compliance with rule 5 of COLREG have also reached this conclusion. Soyer and Tettenborn who discuss this subject, concludes that, although Rule 5

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[154] IMO Doc. MSC 99/INF.8, note 137, *supra*, at p. 2.

[155] IMO Doc. MSC 99/INF.8, note 137, *supra*, at p. 10.

[156] Id.

requires human action, personnel at an SBC could satisfy such a requirement, but that autonomous vessels would not be able to comply.[157] Baughen also agrees with this position.[158] As mentioned above, Bernard Eder argues that a remotely controlled vessel, without crew on-board, might be able to comply with COLREG r. 5. Denmark's report submitted to the Regulatory Scoping Exercise, discussed above, also concluded that:

> To the extent that it is technologically possible to replace human vision and hearing with cameras, sensors, radars or other technical means (electronic lookout), it is our conclusion that electronic lookout will be possible under COLREG, regulation 5, provided that the electronic solution corresponds at least to human vision and hearing and offers the same level of safety.[159]

In summation, it was concluded that that MASS degree 2 – 3 (remotely controlled, with / without manning), would be able meet the requirement of COLREG rule 5, if the technology was sufficient. MASS degree 4 (fully autonomous ships), could not live up to the requirement, because of the lack of human control and competence.[160] The AAWA project report also reasoned along the lines of situational awareness. It concluded that rule 5 of COLREG might be interpreted as referring to a function, rather than a person. It also found that a correct appreciation of the risk of a collision, rather than how this is done, was the central thing. It concluded that so called electronic lookout might be acceptable, if it provides good enough situational awareness to the remote operator. [161] Contrary to this, Xiang-Yu Zhou et al stated that lookout "by sight" in COLREG r. 5, should be defined as visual observation and "by hearing" as "aural ability", in the direct sense. They therefore concluded that rule 5 of COLREG would require the physical presence on board the vessel of a crew member capable of

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[157] Soyer and Tettenborn, note 13, *supra*, at p. 133.

[158] Baughen, note 56, *supra*, at p. 134.

[159] IMO Doc. MSC 99/INF.3, note 118, *supra*, at p. 17.

[160] IMO Doc. MSC 99/INF.3, note 118, *supra*, at p. 48.

[161] AAWA Position Paper, note 12, *supra*, at p. 46.

performing those lookout tasks.[162] In accordance with this view, Ringbom also concluded that the look-out requirement in rule 5 would have to be adjusted, in order to allow for vessels without any physical crew on board. In relation to this, he mentions that SOLAS has already been amended in this way, to adapt to modern ships and modern technology. An example of this, cited by him, is Regulation V/19(2.1.8) of SOLAS, which requires ships with enclosed bridges, to have in place technical means of detecting sounds and their direction, in lieu of the regular use of hearing, which is impaired because the bridge is enclosed.[163]

As stated, the sight and hearing requirement, is that which has been the subject of most discussion, because it is the most unclear. As has been shown, different positions have been reached by different commentators. Most commentators are also not completely certain in their judgements, but only conclude that it is probable that rule 5 will be interpreted in a certain way. This is of course only natural, as this issue has not yet been tried in any court of law and no amendment has been made to COLREG to clarify this issue. It is submitted first of all that because of this, it is not possibly to conclude anything with certainty with regard to this issue. The best that can be attained is probability. What the law will finally be is for the courts to determine. However, from the material presented, it is still interesting to speculate on how rule 5 probably will be interpreted. As can be seen above, this is a somewhat complicated issue, that also depends on the interpretation of other international conventions, most notably, Section A-VIII/2 Rule 4-1 of the STCW Code, as discussed above. As stated, this rule from the STCW could probably be interpreted to allow for the operation of MASS, up to degree 3, with the use of the so called equivalencies. It should of course be noted that this does not pose a permanent solution in the view of this author, as it would require that an exemption be made from the rules of the STCW. In the long run, it is therefore better to amend it to better integrate MASS

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[162] Xiang-Yu Zhou et al, note 83, *supra*, at p. 716.

[163] Ringbom, note 81, *supra*, at p. 439.

into its framework. This could also solve the problem of applicability, which at the moment is unclear, as discussed above.

Regarding the interpretation of case law, it is submitted that so far as the cases examined in this thesis goes, they do seem to allow for the operation of MASS, up to degree 3 as well. This is also supported by the opinion of the Canadian MLA in the CMI's questionnaire. It should be noted however, that the interpretation of older case law poeses some special problems, as has been discussed in the introduction to rule 5. As was there noted, a fundamental presupposition of the courts and also of the commentators citing these court decisions, seem to have been the presence of a person keeping the look-out (both in the first and second sense of the term). As was also noted, what has been attempted here, is a deconstruction of that case law and an attempt to apply its findings to the problem of MASS. It should be noted that this process necessarily carries with it an imprecision and makes the conclusions drawn from it less certain. However, it is the view of this author, that it might still be a useful way to gain at least a probable conclusion concerning the issue at hand. As stated, in all of the cases, what seems to have been the fundamental issue really stressed by the courts, have been the attainment of situational awareness, and not the specific issue of who was keeping the look-out or where such a person was stationed. It seems, in the view of this author, that what is really the issue is the attainment of situational awareness, and that this could be done remotely, provided that the technology was sufficient. It is therefore submitted that the issue of compliance to rule 5, of MASS up to degree 3, is technological rather than legal.

It is thus the final conclusion of this thesis, that rule the overall obligation of rule 5, the duty to appreciate the situation, does require human judgement and that MASS degree 4 would therefore not be able to comply. The conclusion is further that the appreciation in question has to be done both by sight and hearing and all available means appropriate. It is also the conclusion that both these requirements can be fulfilled remotely and that

compliance to rule 5 consequently would not pose a problem for MASS all the way up to degree 3.

To summarize in one sentence then: Rule 5 of COLREG would not allow for operation of MASS degree 4, but MASS degree 1 – 3 would be able to comply wiht this rule.

Conclusively, a short recap of the conclusions reached throughout this thesis is in order. In the beginning of the thesis the following questions were asked:

1 Is COLREG applicable to autonomous ships?
2 Can an unmanned ship be considered as ships under UNCLOS?
3 Can unmanned ships live up to the requirement of good seamanship in COLREG r. 2 (a)?
4 Can unmanned ships live up to the requirement to keep a proper look-out in COLREG r. 5?

Regarding the first question, it was concluded above that the COLREGs would most probably be applicable to MASS of degree 1 – 4, since they are applicable to "all vessels" and since "vessel" is defined so broadly, within the terminology of COLREG, it is, as stated above, the view of this author that they would be applicable to MASS of all degrees.

The second question, was, as can be seen in the discussion above, perhaps not as clear as the first. Part of this was due to the fact that UNCLOS does not contain any definition of "ship / vessel", as does COLREG. There was also seemingly more divergence among different commentators. However, it is, as stated above, the conclusion of this author, that MASS of degree 1 – 4 could be defined as "ship / vessel" within the terminology of the UNCLOS. The primary reason for this being that the UNCLOS is in the view of this author is best viewed as an open document which definitions should be more or less technologically neutral and should be able to accommodate newer technology such as MASS without the need for amendments.

The third question is a bit special, as it cannot be answered conclusively. As was described above, under "3.2 Good Seamanship", the obligation of good seamanship under COLREG rule 2 a is all-encompassing as it includes every possible source of negligence. It was therefore concluded that it could

not be answered whether it is possible to comply to the whole of this obligation. Therefore, the answer to this question is indeterminable. However, it was also concluded that an important aspect of the duty of good seamanship is the duty to keep a proper look-out, which is listed in COLREG rule 5, which is considered under the fifth and final question. In summary, the view of this author regarding the possibility of MASS to live up to rule 5 of COLREG, hinges on the need for human judgement in the fulfilment of the requirement to make a full appraisal of the risk of collision. This would make it impossible for MASS degree 4 to comply to rule 5 of COLREG. However, as long as there was a human person overseeing the operation, it is the view of this author that the look-out function could be carried out remotely, thus allowing for operation of MASS degree 1 – 3 to comply with rule 5 of COLREG.

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