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CONTRACTUAL AND TORTIOUS MARITIME LIABILITY REGIMES AND THE INTRODUCTION OF AUTONOMOUS VESSELS

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Contractual and tortious maritime liability regimes and the introduction of autonomous vessels

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ABSTRACT

The introduction of autonomous ships for commercial operations will not remove contractual and tortious liability between contracting parties and third parties. Maritime law contains a mixture of fault-based liability (collision and carriage of goods) and strict liability (carriage of passengers and pollution). However, what is common to both is that liability is premised on human agency and choices. Autonomous vessels with self-learning capabilities fundamentally challenge traditional notions of agency choice and liability. This paper will examine to whom liability ought to be allocated in collision claims when the control of humans is removed.

For centuries, liability in collisions has been fault-based. The introduction of artificial intelligence is making the determination of fault or liability in negligence increasingly difficult. This paper questions whether fault-based liability for collisions involving ships navigated without human control is appropriate and suggests that strict liability may be the logical solution albeit with some difficulty.

Keywords: autonomous ships, MASS, collisions, fault, negligence, artificial intelligence, strict liability, limitation

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1 Introduction: Autonomous Ships

Any analysis of legal liability of autonomous ships must begin with a definition of what is meant by 'autonomy'. The International Maritime Organisation (IMO) has undertaken a scoping exercise on the implications of autonomous ships with respect to various international maritime conventions¹ and, at the time of writing, is beginning work on a voluntary code for maritime autonomous surface ships (MASS).

As part of this exercise, the IMO organised the various levels of autonomy as follows:

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.²

These are very broad categories and are only intended to guide the debate rather than form it.

¹ For a summary of the findings see <https://www.imo.org/en/MediaCentre/PressBriefings/pages/MASSRSE2021.aspx> accessed 17 March 2023.

² International Maritime Organisation 'Outcome of the regulatory scoping exercise for the use of maritime autonomous surface ships (MASS)' MSC.1/Circ.1638 3 June 2021.

1.1 Examples of the ships

Autonomous ships are already operating. For example, the *Mayflower*³ is a fully autonomous research ship (Degree Four) navigated by artificial intelligence. There are no crew onboard, and the ship navigates independently using a combination of radar, onboard cameras, sensors, and GPS.⁴ An operational decision manager⁵ evaluates the Collision Regulations (COLREGs), generating a ‘risk map’ to indicate unsafe situations, and the artificial intelligence makes a decision based upon this information to assess the options to avoid the danger. The on-board system takes these decisions *without* connecting to an on-shore computer. *The Mayflower* crossed the Atlantic from Plymouth, UK to Plymouth, USA in June 2022.⁶

Following the eruption of the underwater volcano, Hunga Tonga Hunga Ha-apai in Tonga, Sea-Kit’s *Maxlimer*, a 12m robotic vessel, conducted subsea surveys of the volcano.⁷ *Maxlimer* is operated remotely and is uncrewed. This would be characterised as operating at Degree Three in the IMO taxonomy.

On a larger scale, also in June 2022, ASKO Maritime AS took delivery of two electric, autonomous ferries to operate between the ports of Moss and Horten in Norway. Each ferry is 67 metres long, weighs 600 tonnes and can carry 16 trailers of cargo, each with a maximum capacity of 29 tonnes.⁸ Initially, these ferries will be manned with a crew of four. After two years, the on-board crew will be removed, and the ship will be monitored and operated by remote control on-shore.

Similarly, a maritime technology company, Ocean Infinity and shipbuilder VARD have designed a 78-metre offshore support vessel that will initially operate from a remote control

³ For information about the technology and the voyages undertaken see <<https://mas400.com>> accessed 17 March 2023.

⁴ Ibid.

⁵ This is not unique to autonomous ships and is used in a variety of business applications <<https://www.ibm.com/products/operational-decision-manager>> accessed 17 March 2023.

⁶ The voyage was not without its problems. Maritime Executive ‘*Mayflower* Autonomous Ship Completes Historic Crossing’ 1 July 2022. See <<https://maritime-executive.com/article/mayflower-autonomous-ship-completes-historic-atlantic-crossing>> accessed 17 March 2023.

⁷ Sea-Kit ‘Operating a USV on survey operations in Tonga from the UAE’ 13 September 2022. See <<https://www.sea-kit.com/post/operating-a-usv-in-tonga-from-the-uae>> accessed 17 March 2023.

⁸ Jasmina Ovcina Mandra ‘ASKO Maritime names two fully electric, autonomous “sea drones”’ Offshore Energy, 20 September 2022. See <<https://www.offshore-energy.biz/asko-maritime-names-two-fully-electric-autonomous-sea-drones/>> accessed 17 March 2023.

centre (RCC) with a skeleton crew onboard with a view to removing the on-board crew.⁹ The first ship was delivered to VARD in Norway in January 2023, where the fit-out of the robotics will be completed.¹⁰

In the first half of 2022, the *Yara Birkeland*, an electric, 80-metre cargo vessel with a cargo capacity of 120 TEU began commercial operations. Currently, the ship is crewed but will move to fully autonomous operations by 2024.¹¹

The latter three examples will be characterised as Degree Two in the IMO taxonomy of autonomy, but with crew removal, they would be characterised as Degree Three. It is, at this stage, essential to note that a ship may be operating at more than one of the degrees of autonomy at different stages in the voyage.

2 Liability for maritime claims

While an appropriate regulatory framework for autonomous ships is crucial, it is arguable that liability issues arising from introducing these novel craft are as important.¹² Currently, the liability regime for maritime claims is a mixture of fault-based, for example, collision claims and cargo claims, and strict liability, in the case of civil liability for marine pollution or personal injury to passengers.

Soyer posits that there are five reasons that a strict liability regime for autonomous ships is appropriate, thereby removing the fault-based regimes altogether. First, the complexity of the software will make it time-consuming and expensive to apportion fault between the different parties. Second, the ethical values of the person who designs the algorithms will be reflected in the software's decision-making. If the software makes a decision, reflecting the designer's ethics, that causes damage to a third party, it may be difficult for the court to determine fault. Third, if the artificial intelligence performs in a way that does not reflect the

⁹ See <<https://oceaninfinity.com/first-armada-ship-undergoes-sea-trials/>> accessed 17 March 2023.

¹⁰ See <<https://oceaninfinity.com/our-first-armada-ship-arrives-in-norway/>> accessed 17 March 2023.

¹¹ See <<https://www.yara.com/news-and-media/media-library/press-kits/yara-birkeland-press-kit/>> accessed 17 March 2023.

¹² Barış Soyer, 'Autonomous vessels and third-party liabilities: The elephant in the room' in B Soyer and A Tettenborn (eds), *New Technologies, Artificial Intelligence and Shipping Law in the 21st Century* (Informa 2019) 106-107.

intention of the designer as a result of self-learning, then allocating fault in the traditional manner will be almost impossible. Fourth, public perception, the risk posed by an autonomous system is less familiar than the risk posed by human behaviour. Ensuring a strict liability compensation regime is available may make the introduction of the ships more palatable to society generally. And fifth, the function of tort law itself is reflected in a court's philosophical and policy bias.¹³ The question whether tort was responsive to its social context and changing needs framed the debate about the definition of tort law in the early 20th century.¹⁴ The introduction of autonomous vessels and using artificial intelligence in navigation raise a similar question.

2.1 Fault-based liability for maritime claims

To be held liable in a collision claim or a cargo claim, the alleged wrongdoer must be at fault. Fault-based liability as a tort is established by the tortfeasor's failure to take reasonable care not to cause harm to the claimant. Lord Atkin, explained the basis of such liability:

The liability for negligence, whether you style it such or treat it as in other systems as a species of 'culpa', is no doubt based upon a general public sentiment of moral wrongdoing for which the offender must pay.¹⁵

At common law, the tort of negligence requires that everyone attains an objective standard of care or competence.¹⁶ Therefore, fault is standards-based. The *Oxford English Dictionary* provides these definitions: 'To come short of a standard; to make default, fail. To fail or omit to do something. To do or go wrong, to sin'. Honoré's analysis defines tortious conduct as conduct that is wrongful in itself,¹⁷ for example, a master not following the Collision Regulations (COLREGs) in circumstances where that is required is exhibiting wrongful conduct, but if no harm results, no liability is incurred. Or a cargo owner who fails to declare dangerous cargo before loading is exhibiting wrongful conduct but liability incurs only where damage is caused by this failure to declare. This can be contrasted with strict liability. When

¹³ Ibid, 106-107.

¹⁴ Paul Mitchell, *A History of Tort Law 1900-1950* (CUP 2014) 33.

¹⁵ *Donoghue v Stevenson* [1932] AC 562 (HL).

¹⁶ Antony M Honoré, *Responsibility and Fault* (Bloomsbury 2002) 14.

¹⁷ Antony M Honoré, 'The Morality of Tort Law – Questions and Answers' in David G Owen (ed), *The Philosophical Foundations of Tort Law* (OUP 1997).

imposed, the wrong consists in the harm caused by engaging in risky activities even if the conduct is not wrongful in itself.¹⁸ Honoré further suggests that when certain conduct (or omission) is deemed to be a tort, the legislature or courts mean that such conduct is wrongful and seek 'to forbid or discourage it or, at a minimum, to warn those who indulge in it of the liability they may incur.'¹⁹ Tort law additionally serves 'to define and give content to people's rights by providing them with a mechanism for protecting them and securing compensation if their rights are infringed.'²⁰ Liability imposes on a person an obligation to pay money by way of compensation for the infringement of another person's rights.

2.2 History of fault-based liability in maritime collisions

Before addressing whether a new strict liability regime is desirable, it is perhaps instructive to examine the history of maritime collision law to understand how the law incrementally adapts to the introduction of new technology. Historically, safety focused maritime law has evolved in response to accidents²¹ but with the adoption of artificial intelligence and the removal of human actors it may be inappropriate to adopt rules governing this technology on a comprehensive basis, without first determining how, and to whom, liability is allocated.

The principles of collision law have evolved over centuries and arguably reflect the type of vessels and voyages undertaken at the time. It is not necessary to trace the history of Roman and medieval Mediterranean collision law as this is thoroughly undertaken elsewhere²² save to acknowledge that at that time, collisions appeared to be governed the rules of liability (*culpa*) based on fault and that collisions mostly involved collisions in harbours.²³

¹⁸ Ibid.

¹⁹ Ibid.

²⁰ Ibid, (1).

²¹ High profile examples include The Safety of Life at Sea Convention (SOLAS), first adopted in 1914 in response to the *Titanic* disaster: see International Maritime Organisation (IMO) 'SOLAS' <<https://www.imo.org/en/KnowledgeCentre/ConferencesMeetings/Pages/SOLAS.aspx>> accessed 17 March 2023 and subsequent amendments in the form of the International Safety Management Code (ISM Code) following the catastrophic capsizing of the *Herald of Free Enterprise*, see IMO 'Safety of ro-ro ferries'. See <<https://www.imo.org/en/OurWork/Safety/Pages/RO-ROFerries.aspx>> accessed 17 March 2023.

²² See, eg, David R Owen, 'The Origins and Development of Marine Collision Law' (1977) 51 *Tulane Law Rev* 759.

²³ Ibid, 760-764.

Originating around 1150, the *Rôles d'Oléron*²⁴ contained a provision on collision based upon intentional fault:

Art XIV. If a vessel, being moored, lying at anchor, be struck or grappled with another vessel under sail, that is not very well steered, whereby the vessel at anchor is prejudiced, as also wines, or other merchandise in each of the said ships damnified. In this case the whole damage shall be in common, and be equally divided and appraised half by half; and the master and mariners of the vessel that struck or grappled with the other, shall be bound to swear on the Holy Evangelists, that they did it not willingly or wilfully. The reason why this judgment was first given, being, that an old decayed vessel might not purposely be put in the way of a better, which will the rather be prevented when they know that the damage must be divided.²⁵

This is said to be the first instance of the divided damages rule²⁶ even though the anchored vessel is without fault and even though both vessels are damaged. This is the first code that provides for a case where it is impossible to fix liability.²⁷ Scott points out that the origin of the divided damages rule is obscure but that it appears that it developed as a 'rough and ready mode of settling the dispute' in cases where there was doubt.²⁸

The Laws of Wisby, which borrowed heavily from the *Rôles d'Oléron*,²⁹ has a similar provision on collision law except cargo does not contribute to the payment of damages, and the striking vessel alone pays damages if it might have avoided the collision or if it was negligent:³⁰

²⁴ The introduction to Estienne Cleirac and Guy Miegé, *The Ancient Sea-Laws of Oleron, Wisby and the Hanse-towns still in force taken out of a French book, intitled, Les Us & Coutumes de la Mer* and rendered into English, for use of navigation (T Basset 1686) states 'The Laws of Oleron, which for the space of 500 years have generally been received by all the States of the Christian World that frequent the Ocean, for regulating Sea-Affairs, and for deciding Maritime Controversies.' Cleirac's *Us et Coutumes de la Mer* commented on the legal norms that had developed in northern and western Europe from the 12th century and was a valuable resource for many, including Lord Mansfield, who owned and consulted a copy of it: see Francesca Trivellato, "'Usages and Customs of the Sea'" Etienne Cleirac and the making of maritime law in seventeenth-century France' (2016) 84 *Legal History Review* 193, 194.

²⁵ *Ibid.* In *Boettcher v Carron Co* (1861) 23 D 322, 332, the Lord Justice-Clerk stated that Cleirac viewed equal division of damages as running 'parallel to the judgment of Solomon'. Cleirac is also cited in *Pole v Fitzgerald* (1750) Willes 641, 125 ER 1362 on insurance contracts, and in *Simonds & Loder v White* (1824) 2 B & C 805, 107 ER 582 on general average.

²⁶ See *United States v Reliable Transfer Co* 421 US 397 (1975), 401.

²⁷ Owen (n 22), 763.

²⁸ Leslie F Scott, 'Collisions at Sea where both Ships are in Fault' (1897) 13 *LQR* 17, 19.

²⁹ FR Sanborn, *Origins of the Early English Maritime Law and Commercial Law* (The Century Co 1930) 76.

³⁰ Owen (n 22), 764.

When a Ship under sail endamages another by running upon her, if the Master and Mariners of the first give it under their Oaths, that they did not do it wittingly or wilfully, and that they could not help it; In this case the damage shall be paid in common. But, if the said Master and Mariners decline taking their Oaths, the damage shall be wholly paid by the Ship that ran upon the other.³¹

Under the Rôles d'Oléron and the Laws of Wisby, the test of liability on the part of a moving ship striking an anchored ship (then the common type of collision) was whether the act was wilful. An oath of good intentions was sufficient to exculpate the moving ship. This test was an unrealistic measure of liability and the reference to oaths reflects the strong religious beliefs at that time.³²

The Code de Commerce of 1807 (the maritime law of Napoleon), contemplates collisions between two moving vessels by, explicitly providing for equal division where both vessels were underway.³³

In England, the first recorded judgment in a collision case was in 1538.³⁴ Concepts of negligence and fault appeared in 1544³⁵ but no fixed rule was established. In the 1648 case, *Harbyn c Berry*³⁶ damages were divided between both vessels when one vessel was lost (*The Thomas*) and the other (*The John*) escaped. More than 100 years later, *Wildman v Blakes*³⁷ held equal division of damages where there was mutual but unequal fault.

In 1798, regular reporting of the decisions of the High Court of Admiralty commenced³⁸ when Sir William Scott, Lord Stowell, began his term as judge of the High Court of Admiralty.³⁹ In

³¹ Cleirac (n 24), *The Laws of Wisby* LXX.

³² Ibid, Rôles d'Oléron XIV: 'the Master and Mariners of the Ship that struck or grappled with the other shall swear on the Holy Evangelists, that they did it not wittingly or willfully'.

³³ Code de Commerce 1807, Liv II, 407.

³⁴ *Spysall c Watters* (1538), RG Marsden, *Select Pleas in the Court of Admiralty* vol 1 (Selden Society 1894) 70, 200.

³⁵ *Cocke c Camp* (1544), *ibid*, 233.

³⁶ (1648) Burrell 234, 167 ER 551.

³⁷ (1789) Burrell 332, 167 ER 596.

³⁸ By Sir Christopher Robinson (later Admiralty Judge from 1822-1833) usually abbreviated C Rob. An earlier set by Hay and Marriott (from 1776-1779) was published in 1801.

³⁹ 1798-1827.

thirty years on the bench, Lord Stowell only decided five reported collision cases,⁴⁰ including *The Woodrop-Sims*,⁴¹ where his Honour provided four possible resolutions to collision cases. In the first,

it may happen without blame being imputable to either party; as where a loss is occasioned by a storm, or by any other *vis major*: in that case the misfortune must be borne by the party on whom it happens to light, the other not being responsible to him in any degree.⁴²

In other words, if the accident is inevitable, for example, because of a storm or other force of nature, the loss lies where it falls. There can be no recovery from the other vessel.

In the second,

a misfortune of this kind may arise when both parties are to blame, where there has been a want of due diligence and skill on both sides; in such a case the rule of law is that the loss must be apportioned between them as having been occasioned by the fault of both.⁴³

This means there is mutual fault, where there has been a lack of due diligence by both parties the damages are divided equally. Lord Stowell further provides that 'thirdly, it may happen by the misconduct of the suffering party alone; and then the rule is that the sufferer must bear his own burden.'⁴⁴ There is no recovery by damaged vessel from the other vessel. Finally, he states that 'it may have been the fault of the ship which ran the other down; and in this case the injured party would be entitled to an entire compensation from the other.'⁴⁵ Therefore, where it is the sole fault of the other vessel, the damaged vessel is entitled to full recovery.

⁴⁰ This surprisingly low number does not reflect a lack of collisions, rather cases involving collisions which occurred on inland waterways and harbours were heard in the common law courts. See Henry J Bourguignon, *Sir William Scott, Lord Stowell, Judge of the High Court of Admiralty 1798-1828* (CUP 2009) 97.

⁴¹ (1815) 2 Dods 83, 165 ER 1422.

⁴² *Ibid.*

⁴³ *Ibid.*

⁴⁴ *Ibid.*

⁴⁵ (1815) 2 Dods 88, 165 ER 1422.

What can be discerned from the foregoing is that fault as a determinant of liability is well established in the context of collisions. Roman law of collision was governed by the ordinary rules of 'culpa'⁴⁶ and express mention of negligence is found in the Digest of Justinian.⁴⁷ The Codes of Oléron and Wisby show little sign of Roman origin or influence but a later version of the Rolls of Oléron did contemplate 'default of the mariners'⁴⁸ and there is a reference to fault in the Laws of Wisby.⁴⁹ Although the Roman concept of fault and negligence was accepted for centuries by the civil law, negligence entailing civil liability was not recognised as a separate tort in the common law until around the middle of the nineteenth century;⁵⁰ nevertheless the concept of 'fault' is present in the collision judgments from the sixteenth century.

2.3 Modern collision law

Collision judgments increased with the advent of steam and the first decision to involve a steamship was *The Shannon (Pennefather)*,⁵¹ which established the rule that steam should give way to sail was established. Some twelve years later, Trinity House⁵² published the first Collision Regulations in 1840.⁵³ These were enacted in the Steam Navigation Act 1846,⁵⁴ later repealed by the Steam Navigation Act 1851⁵⁵ then replaced by the Merchant Shipping Act 1854.⁵⁶

⁴⁶ Sanborn (n 29), 16.

⁴⁷ Digest IX.2 (the *Lex Aquilia*): see Alan Watson (ed), *The Digest of Justinian* vol 1 (University of Pennsylvania Press 1985) 277 (tr Colin Kolbert).

⁴⁸ Cleirac (n 24), Rôles d'Oléron XIV.

⁴⁹ Ibid. See The Laws of Wisby LXX.

⁵⁰ See, eg, D Ibbetson, *A Historical Introduction to the Law of Obligations* (OUP 1999) 169-170. In *Blyth v The Company of Proprietors of Birmingham Waterworks* (1856) 11 Exch 781, 784; 156 ER 1047, 1049, Alderson B provided this definition: 'Negligence is the omission to do something which a reasonable man, guided upon those considerations which ordinarily regulate the conduct of human affairs, would do, or doing something which a prudent and reasonable man would not do.'

⁵¹ (1828) Hagg 173, 166 ER 208.

⁵² For a brief summary of the history of Trinity House, see Trinity House 'History of the Corporation' <<https://www.trinityhouse.co.uk/about-us/history-of-trinity-house/th500>> accessed 18 March 2022.

⁵³ See (1840) 1 W Rob 488, 166 ER 654, which contains the text of these Regulations.

⁵⁴ 9 & 10 Vict, c 100.

⁵⁵ 14 & 15 Vict, c 79.

⁵⁶ 17 & 18 Vict, c 104. Kenneth C McGuffie (ed), *Marsden's Law of Collisions at Sea* (11th edn, Stevens & Sons 1961) 609-610.

Failure to adhere to statutory standards then became virtually conclusive evidence of negligence. When the rules were inapplicable or did not cover a particular situation, the standard of due care was good seamanship.

From 1838-1867, Dr Lushington, described as the 'judicial architect of collision prevention rules',⁵⁷ presided over the High Court of Admiralty. In the *Duke of Sussex*,⁵⁸ he emphasised the need to comply with the Rules:

The rule in question emanates from the Trinity House; and although it cannot be said to constitute a law per se, it is nevertheless a rule to be observed, and it is important that it should be distinctly understood that in all future cases of this kind the Court will consider this rule of binding authority upon the owners of steam vessels; and if the masters of such vessels shall think fit not to comply with it, in so doing they will be guilty of unseamanlike conduct, and their owners will be responsible for the consequences that may result from their disobedience of it. The rule itself is drawn up with great precision, and may be understood without difficulty.⁵⁹

In *The Milan*,⁶⁰ Dr Lushington held that cargo could recover only half damages from the non-carrying ship in a both-to-blame collision. He admitted that this was contrary to the common law principle of joint and several liability, but applied the rule in *Hay v Le Neve*⁶¹, where cargo was awarded only half damages.⁶² This rule was continued in s 25(9) of the Judicature Act 1873⁶³ and enacted in section 1 of the Maritime Conventions Act 1911,⁶⁴ prior to the coming into force of the International Convention for the Unification of Certain Rules of Law with Respect to Collisions (Collision Convention) 1910.⁶⁵

⁵⁷ Owen (n 22), 769. See particularly FL Wiswall, *The Development of Admiralty Jurisdiction and Practice since 1800* (CUP 1970) ch 2.

⁵⁸ (1841) 1 W Rob 274, 166 ER 575.

⁵⁹ *Ibid*, 275.

⁶⁰ (1861) Lush 388, 167 ER 167.

⁶¹ (1824) 2 Shaw's Rep 395 (HL).

⁶² In *Hay v Le Neve*, the House of Lords had focused on whether Hay's vessel (two-thirds at fault) should pay two-thirds or half of Le Neve's damages. Dr Lushington represented Hay and argued successfully for half damages. According to Owen (see n 22, 771), it is possible that the United States would have become a party to the Collision Convention 1910 if Dr Lushington had represented Le Neve.

⁶³ 36 & 37 Vict, c 66.

⁶⁴ 1 & 2 Geo 5, c 27, s 1. This has now been re-codified in The Merchant Shipping Act 1995, c 21, Pt VII.

⁶⁵ On 1 March 1913.

3 Development of the Collision Regulations (COLREGs)

In order to determine fault in a collision, nautical standards of due care have to be established. These standards formed part of the general maritime law administered in England by the Admiralty Court.⁶⁶ Before the introduction of statutory rules in the mid-nineteenth century, customary standards of care applied.

As noted above,⁶⁷ Trinity House made the first effort to establish written steering rules in 1840 when the advent of steam was beginning to cause more severe and frequent collisions. Although the regulations had no statutory authority, they were enforced by the Admiralty Court.⁶⁸

The Steam Navigation Act 1846⁶⁹ was the first statutory ‘rule of the road’ and largely enacted the Trinity House rules, which required steamers to keep to the right.⁷⁰ The Act also empowered the Lords Commissioners of the Admiralty to regulate the lights of steam vessels. The 1846 Act was modified in 1851 and again in 1854 to cover sailing as well as steam vessels.⁷¹

However, these rules applied only to British vessels. The Sea Regulations 1863 were then issued as authorised by the Merchant Shipping Act 1862.⁷² These were the most complete regulations issued, covering steering rules for meeting, crossing, and overtaking, lights, fog signals, special circumstances, and the ‘general prudential’ rule; and they were the first to be adopted internationally.⁷³ By 1868, thirty-three maritime nations had notified Britain that they wished their ships to be bound by the rules even when they were beyond British jurisdiction. The United States adopted the rules for inland as well as sea-going vessels.⁷⁴

⁶⁶ Above, n 56, 424. The Admiralty Court ceased to exist after the reforms of the Judicature Acts, being absorbed into the Probate, Divorce and Admiralty Division, and then into the Supreme Court of Judicature, Queen’s (now King’s) Bench Division. See Wiswall (n 57) ch 4.

⁶⁷ See n 52.

⁶⁸ Above, n 56, 424-425. See, eg, *The Hope* (1840) 1 W Rob 154, 166 ER 531; *The Friends* (1842) 1 W Rob 479, 166 ER 651.

⁶⁹ Above, n 54.

⁷⁰ Above (n 56), 608.

⁷¹ *Ibid*, 609.

⁷² 25 & 26 Vict, c 63.

⁷³ Owen (n 22), 784.

⁷⁴ *Ibid*, 785.

Section 29 of the 1862 Act provided:

If in any case of collision it appears to the court before which the case is tried that such collision was occasioned by the non-observance of any regulation ... the ship by which such regulation has been infringed shall be deemed to be at fault, unless it is shown to the satisfaction of the court that the circumstances of the case made a departure from the rule necessary.

In other words, non-compliance with the rules raised a statutory presumption of fault. This presumption was altered by s 419(4) of the Merchant Shipping Act 1894:

Where in a case of collision it is proved to the court before whom the case is tried, that any of the collision regulations have been infringed, the ship by which the regulation has been infringed shall be deemed to be in fault, unless it is shown to the satisfaction of the court that the circumstances of the case made departure from the regulation necessary.

In 1889 a conference of maritime nations called by the President of the United States was held in Washington and agreement was finally reached on a new Code that became effective worldwide 1897.⁷⁵ In subsequent maritime conferences held in Brussels in 1910 and in London in 1948 and 1960, only minor changes were made in the rules.

3.1 Convention on the International Regulations for Preventing Collisions at Sea 1972

In 1972, the Inter-Governmental Maritime Consultative Organisation (IMCO)⁷⁶ called a conference that issued new rules that went into effect on 15 July 1977.⁷⁷ The Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREGs) was designed

⁷⁵ Ibid, 786.

⁷⁶ Changed to the International Maritime Organisation (IMO) in 1982.

⁷⁷ See Andrew Tettenborn & John Kimbell, *Marsden and Gault on Collisions at Sea* (15th edn, Sweet & Maxwell 2021) para 6-075.

to update and replace the Collision Regulations of 1960.⁷⁸ The COLREGs were the first to be enacted as an international treaty.⁷⁹ This means they can be amended and come into effect unless ‘more than one third of the Contracting Parties notify the Organisation of their objection’,⁸⁰ also known as the tacit acceptance procedure.⁸¹

The COLREGs include 38 rules divided into five sections: Part A – General; Part B – Steering and Sailing; Part C – Lights and Shapes; Part D – Sound and Light Signals and Part E – Exemptions. There are also four Annexes containing technical requirements concerning lights and shapes and their positioning, sound and signalling appliances, additional signals for fishing vessels when operating in close proximity, and international distress signals.

The COLREGs are given effect by the Merchant Shipping (Distress Signals and Prevention of Collisions) Regulations 1996⁸² and apply to UK registered ships in any waters wherever they may be and to all other ships when they are within the UK or its territorial waters.⁸³ They also include traffic separation schemes adopted by the IMO.⁸⁴ Compliance with those schemes is required by the principles of good seamanship even if, as with foreign ships outside UK waters, compliance is not compulsory.⁸⁵ The COLREGs provide guidance to mariners on how to prevent collisions at sea, and serve as the basis for apportioning blame when collisions do occur.⁸⁶

As autonomous and unmanned ships will operate in the same waters as manned ships, all vessels must follow the COLREGs and behave in an *expected* manner to avoid accidental collisions. However, suppose the system that is navigating autonomously slavishly follows the COLREGs where it would be safer to depart from them to avoid danger.⁸⁷ In that case, this could not only create dangerous situations but render the ship unseaworthy if the system

⁷⁸ International Maritime Organisation, Convention on the International Regulations for Preventing Collisions at Sea 1972 <imo.org/en/About/Conventions/Pages/COLREG.aspx> accessed 20 March 2023.

⁷⁹ Owen (n 22) 788.

⁸⁰ Art VI(4).

⁸¹ International Maritime Organisation, Conventions <imo.org/en/About/Conventions/Pages/Default.aspx> accessed 20 March 2023.

⁸² Merchant Shipping (Distress Signals and Prevention of Collisions) Regulations 1996, SI 1996/75.

⁸³ *Ibid*, reg 2.

⁸⁴ See COLREGs, r 10(a).

⁸⁵ *The Genimar* [1977] 2 Lloyd’s Rep 17, 25.

⁸⁶ See, eg, *The Nordlake and The Seaeagle* [2015] EWHC 3605 (Admlty), [2016] 1 Lloyd’s Rep 656, [190].

⁸⁷ COLREGs, r 2(b). See Marsden (n 77) para 7-053.

cannot make safe decisions. Given that a defective passage plan can render a ship unseaworthy⁸⁸ a system that cannot navigate to the standard of a prudent seafarer is likely to point to unseaworthiness.

Rule 2(b) of the COLREGs, the ‘general prudential rule’,⁸⁹ is particularly problematic for a vessel navigated at Degree Four. Rule 2(b) permits a departure from the COLREGs in certain circumstances:

In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.

Rule 2(b) does not permit a vessel to depart from the COLREGs because it is advantageous⁹⁰ and, for this reason, Dr Lushington stated that ‘you may depart, and you must depart, from a rule if you see with perfect clearness, almost amounting to a certainty, that adhering to the rule will bring about a collision, and violating a rule will avoid it’.⁹¹ Given that rule 2(b) only applies when there is an ‘immediate danger, perfectly clear’⁹² the navigation system will be required to take action that would be expected as meeting the standard of prudent seamanship.⁹³ A further challenge is that a departure from the COLREGs may not only be justified but may in fact be a duty and required in certain circumstances. In *The Tasmania*,⁹⁴ a case determining liability for a collision in the English Channel, Lord Herschell stated:

[The master] was not only justified in departing from [the rule], but bound to do so, and to exercise his best judgment to avoid the danger which threatened. But in estimating the conduct of the master, it must be remembered that it was the gross negligence of the other vessel which placed him suddenly in the difficult position of

⁸⁸ *Alize 1954 v Allianz Elementar Versicherungs AG (The CMA CGM Libra)* [2021] UKSC 51, [2021] 2 Lloyd’s Rep 613.

⁸⁹ Marsden (n 77) para 7-054.

⁹⁰ AN Cockroft and JNF Lameijer, *A Guide to the Collision Avoidance Rules* (7th edn, Butterworth-Heinemann 2012) 4. See also *Nautical Challenge Ltd v Evergreen Marine (UK) Ltd (The Alexandra 1 and Ever Smart)* [2021] UKSC 6; [2021] 1 WLR 1436, [65]-[67].

⁹¹ *The Boanerges and The Anglo-Indian* (1865) 2 Mar L Cas (OS) 239, 240.

⁹² *The Allan v The Flora* (1866) 14 LT 860, 861.

⁹³ See, eg, *The Dream Star* [2017] SGHC 200; [2017] 2 Lloyd’s Rep 538, [47].

⁹⁴ (1890) 15 App Cas 223 (HL).

having to judge when he was justified in departing from the rule and what manoeuvre he ought to adopt.⁹⁵

At Degree Three, there remains a human operator who is controlling the vessel from another location. Therefore, assuming communications are not lost, that natural person ought to be able to exercise judgment consistent with prudent seamanship. If they do not, then liability can be attributed in proportion to their fault in failing to do so. The difficulty with this rule at Degree Four, is that if the system is self-learning it will be impossible to interrogate the reason for its decision in the event of a collision. This leads to an ethical question whether autonomous ship be held to the same standards as a prudent mariner, or ought the standards be higher given that there is no risk to human life *on board* the autonomous vessel but potential risk to life *by* the autonomous vessel?

3.2 Industry Codes of Practice for MASS

The MASS UK Industry Conduct Principles and Code of Practice 2022⁹⁶ appears to agree:

Although the autonomous nature of the MASS operation may seem to negate some requirements, it is the crewless aspect that should demand increased awareness. Any procedures produced should pay particular attention to this detail, especially those systems and equipment procedures that are required to avoid collision.⁹⁷

The IMO is also developing a MASS Code which initially will be a goal-based instrument with a view to its adoption in the second half of 2024. Following this, a mandatory code will be developed and is expected to enter into force by 2028.⁹⁸ Potentially these goal-based codes will shape the development of the law in relation to collisions in a similar fashion to customary law prior to the mid-nineteenth century by providing accepted industry standards. However, establishing fault is likely to be difficult as discussed below.

⁹⁵ Ibid, 226.

⁹⁶ MASS UK Industry Conduct Principles and Code of Practice 2022 (V6), (Maritime UK 2022) <<https://www.maritimeuk.org/priorities/innovation/maritime-uk-autonomous-systems-regulatory-working-group/mass-uk-industry-conduct-principles-and-code-practice-2022-v6/>> accessed 20 March 2023.

⁹⁷ Ibid, [6.10.2].

⁹⁸ <<https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MSC-105th-session.aspx>> accessed 20 March 2023.

4 What is ‘accident’ and what does ‘fault’ mean

The *Oxford English Dictionary* defines accident, as ‘something that happens by chance or without expectation; an event that is without apparent or deliberate cause.’ In the context of collision, the definition provided is ‘an unfortunate and unforeseen event involving damage or injury.’

David G Owen,⁹⁹ looks at a similar definition, ‘a happening that is not expected’¹⁰⁰ from a philosophical perspective. He posits that truth is the only absolute ideal and that knowledge describes the state of possessing the ideal of truth.¹⁰¹ Because human choice is hampered by lack of knowledge, human ‘[a]utonomy therefore is facilitated by the promotion of truth.’¹⁰² The absence of ‘truth’ therefore has a role in causing accidents and determining blame. Owen, argues that accidental harm is attributable to the failure of at least one person, the actor or the victim, to expect the harm because they do not possess the truth about those things that caused the harm and uses the example of a collision of cars at traffic lights in illustration of this point.¹⁰³

Applying this theory and using an illustration of the collision situation that arose in *The Panther and The Ericbank*,¹⁰⁴ discussed below:

The *Trishna*, attempted to pass the *Panther* and the *Ericbank*, under tow, in breach of canal regulations. Let us assume that this was because the navigator of the *Trishna* was ignorant of the regulations and believed that because the ship had sounded its whistle it was safe to pass. On the other hand, let us assume the *Ericbank* did not respond to the whistle either because it believed the *Trishna* would know the regulations prohibited it from passing and assumed there was no need to respond, or did not know they needed to warn that they were under tow. *The Panther* damaged the *Trishna* by swinging out and failing to turn off its engine

⁹⁹ Not to be confused with David R Owen, extensively cited above.

¹⁰⁰ *Webster’s New World Dictionary of the American Language* (1964).

¹⁰¹ David G Owen, ‘Philosophical Foundations of Tort Law’ in AS Gold et al, *The Oxford Handbook of the New Private Law* (2020 OUP) 204.

¹⁰² *Ibid*, 205.

¹⁰³ *Ibid*.

¹⁰⁴ [1957] P 143.

because it did not know of the presence of the *Trishna*. The resulting collision, therefore, can be seen to be the result of the failure of all parties to possess the truth.

4.1 Collisions and tort law

When a collision occurs, the liabilities are determined in common law jurisdictions by the tort of negligence.¹⁰⁵ The issue of duty of care is rarely a problem and can be established under the neighbour principle laid down by Lord Atkin in *Donoghue v Stevenson*.¹⁰⁶ According to Marsden, success in an action in tort for damages arising out of a collision at sea depends on a claimant proving the facts giving rise to the tort. It must also prove that it has suffered the damage complained of, that the damage was caused by the tort, and that it is not too remote a consequence of the breach of duty.¹⁰⁷ The starting point is to establish which human agencies were responsible for the collision and whether their faults can be attributed to the shipowner. This will involve the application of the principles of vicarious liability.¹⁰⁸

According to Healy, the proportionate fault rule is necessary in collision law because:

... it makes little sense to say that in the event two vessels are at fault, each must be held strictly liable to the other and pay 100% of the other's damages. The result could be for example that in the event of a collision between a fishing vessel and a supertanker, due 20% to the fault of the fishing vessel and 80% to the fault of the supertanker, the fishing vessel could be fully liable for what might be relatively heavy damage to the supertanker whereas the owner of the supertanker would only be liable for the relatively minor damage to the fishing vessel.¹⁰⁹

Where the negligence arises by some person (or entity) other than a crew member, it becomes critical to establish whether the wrongdoer was acting as a servant or agent of the shipowner, or as an independent contractor. In the case of an independent contractor, the shipowner will be liable only if it is proved to have not taken reasonable care in choosing the

¹⁰⁵ See, eg, Marsden (n 77) para 5-003.

¹⁰⁶ [1932] AC 562 (HL). See also Ibbetson (n 50) 190-192.

¹⁰⁷ (n 77) para 5-003.

¹⁰⁸ See Simon Baughen, *Shipping Law* (7th edn, Informa 2019) 278.

¹⁰⁹ Nicholas J Healy 'The apportionment of risk between shipowners and third parties – Shipowner & Shipowner Collisions' CMI Yearbook Report of Proceedings at a seminar held in Aix-en-Provence 9-11 September 1976: Apportionment of risk in maritime law' available at <<https://comitemaritime.org/publications-documents/cmi-yearbook/>> accessed 20 March 2023.

contractor. The relevant test was set out in *Mersey Docks and Harbour Board v Coggins & Griffiths (Liverpool) Ltd.*¹¹⁰ In that case, the Harbour Board leased a mobile crane to a company of stevedores for the purpose of loading a ship. Along with the crane, the Harbour Board provided an operator who the contract stated should be the servant of the hirer. During the operation the operator negligently injured a third person. The House of Lords unanimously held that although the stevedore company was directing the operation of the operator and crane, it did not have the power to direct the operator as to *how* to operate the crane itself. This power remained with the employer, the Harbour Board. Thus the Harbour Board was vicariously liable for the negligence of the crane operator. Lord Uthwatt reasoned:

To establish the power of control requisite to fasten responsibility on him, the hirer must in some reasonable sense have authority to control the manner in which the workman does his work, the reason being that it is the manner in which a particular operation (assumed for this purpose to be in itself a proper operation) is carried out that determines its lawful or wrongful character.¹¹¹

4.2 Agents and contractors

This issue of agency and independent contractors is important in the event of a collision involving an autonomous vessel. In some circumstances, agency will be easily established. For example, Massterly is a company established specifically to offer services for owners of autonomous ships.¹¹² These services include the operation and monitoring of autonomous vessels from a remote operations centre.

At common law, agency is created by the conferring of authority by the principal on the agent, which may be express, or implied from the conduct or situation of the parties.¹¹³ An owner of an autonomous ship which appoints a company such as Massterly to operate the ship on their behalf has created an agency relationship by such appointment. As such, Massterly (as agent) is bound to act in accordance with the authority conferred upon it by the shipowner (as principal).¹¹⁴ The shipowner has the right to instruct Massterly and Massterly has express

¹¹⁰ [1947] AC 1 (HL).

¹¹¹ *Ibid*, 21.

¹¹² See <<https://www.massterly.com/what-we-do>> accessed 20 March 2023.

¹¹³ P Watts & FMB Reynolds, *Bowstead and Reynolds on Agency* (22nd edn, Sweet & Maxwell 2021) para 2.001.

¹¹⁴ *Ibid*, para 6.002.

authority to carry out operations. Therefore, in the event of a collision involving a ship that is caused by the default of a Massterly employee in a remote operations centre, the shipowner is liable.

The principal may have recourse against its agent depending on the terms of the contract. For example, BIMCO's Shipman 2009¹¹⁵ contains a clause excluding the agent's liability for acts or omissions of the crew:

... the Managers shall not be liable for any acts or omissions of the Crew, even if such acts or omissions are negligent, grossly negligent or wilful, except only to the extent that they are shown to have resulted from a failure by the Managers to discharge their obligations under Clause 5(a) (Crew Management).¹¹⁶

When a ship is operating at Degree Four, the right to control becomes more difficult to establish. At Degree Four, a ship is navigating autonomously. The MASS UK Code of Practice defines autonomy as follows:

'Autonomy' – In the context of ships, autonomy (e.g. as in 'Autonomous Ship') means that the ship can operate without human intervention, related to one or more ship functions, for the full or limited periods of the ship operations or voyage.¹¹⁷

The ship can operate without human intervention by using artificial intelligence (AI). The EU provides this definition of AI:

Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals. AI-based systems can be purely software-based, acting in the virtual world (eg voice assistants, image analysis software, search engines, speech and

¹¹⁵ Standard Ship Management Agreement.

¹¹⁶ BIMCO, Shipman 2009, cl 17(2)(b)(ii).

¹¹⁷ MASS UK Industry Conduct Principles and Code of Practice 2022 (V6), (Maritime UK 2022) <<https://www.maritimeuk.org/priorities/innovation/maritime-uk-autonomous-systems-regulatory-working-group/mass-uk-industry-conduct-principles-and-code-practice-2022-v6/>> accessed 20 March 2023.

face recognition systems) or AI can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications).¹¹⁸

The MASS UK Code of Practice provides a definition how AI works:

Artificial intelligence (AI) and machine learning (ML) are processes by which an IT system monitors large amounts of data and identifies trends and anomalies and can improve processes and performance, such as digital twin and predictive maintenance (PM).¹¹⁹

The development of AI is not within the control of the shipowner. The supplier of the software embedded in the hardware is initially in control but as the system self-learns based on the data it is gathering and monitoring, control moves to the developer. AI systems make decisions by running historical data through an algorithm but currently it is not possible to know how the system has made the decision. This is known as the black box of AI.¹²⁰

This lack of transparency is concerning and researchers are developing AI that is able to explain its decisions and in language that is understandable to humans.¹²¹ However, this does not solve the issue of the shipowner's lack of control over the system. Extending agency to artificial intelligence does not make sense unless the artificial intelligence can compensate the shipowner for potential breaches of that agency-principal relationship.

4.3 Liability for pilots

Pilotage is not regulated by international convention and falls within the authority of national states. In most situations, pilots are regarded as independent contractors. Section 16 of the Pilotage Act 1987¹²² renders the shipowner vicariously liable for the default of compulsory pilots. Prior to that, section 15(1) of the Pilotage Act 1913 provided that the shipowner was

¹¹⁸ European AI Alliance, 'On the EC's definition of AI, or How to define Artificial Intelligence as real and concerned with essence of Intelligence' <<https://ec.europa.eu/futurium/en/european-ai-alliance/ecs-definition-ai-or-how-define-artificial-intelligence-real-and-concerned.html>> accessed [date].

¹¹⁹ Above, n 97.

¹²⁰ Tom Cassauwers, 'Opening the Black Box of Artificial Intelligence' *Horizon Magazine* (European Commission 1 December 2020) <<https://ec.europa.eu/research-and-innovation/en/horizon-magazine/opening-black-box-artificial-intelligence>> accessed 22 March 2023.

¹²¹ Ibid.

¹²² C 21.

‘answerable’ for the negligence of a compulsory pilot.¹²³ In *Workington Harbour and Dock Board v Towerfield (Owners)*,¹²⁴ this wording was held to have the additional effect of precluding any claim by the shipowners against the pilot for damage to their vessel. The word ‘answerable’ was omitted from s 16 of the Pilotage Act 1987 and so a shipowner may now be able to claim against a negligent compulsory pilot. However, this is unlikely to be fruitful because of the very low limits of liability that pilots can invoke.¹²⁵

The use of compulsory pilots on autonomous vessels is problematic for vessels at Degrees Three and Four. If the vessel is cannot be boarded, let alone operated on-board, pilotage is impossible. If a human operator can board and override the system on the vessel, pilotage is technically possible. However, unlike traditional pilotage where the master is onboard and remains responsible for the vessel even though the pilot has control,¹²⁶ the pilot will be communicating with a remote operator. In this situation, if pilotage is compulsory,¹²⁷ a more logical solution would be to permit remote pilotage services.¹²⁸

4.4 Towage

Where pilotage (either onboard or remote) is impossible and if a coastal state’s navigation rules do not permit crewless vessels, it is possible that the vessel is towed to its berth.¹²⁹ Thus the law concerning towage is highly relevant for autonomous vessels.

The old maxim that the ‘tug is servant of the tow’¹³⁰ suggested that the ship under tow was always vicariously liable for the defaults of the tug. Although applied in *The Niobe*¹³¹ when

¹²³ See *Esso Petroleum Co Ltd v Hall Russell & Co Ltd (The Esso Bernicia)* [1989] AC 643 (HL).

¹²⁴ [1951] AC 112 (HL).

¹²⁵ The Pilotage Act 1987, s 22 limits the liability of an authorised pilot to £1000. In Singapore, the Maritime and Port Authority of Singapore Act 1996, s 72, limits the liability of an authorised pilot to S\$1000.

¹²⁶ *The Nord* [1916] P 53.

¹²⁷ Cf the Pilotage Act 1987, s 7.

¹²⁸ Assuring Autonomy International Programme, Demonstrator Project, Final Report, Remote Controlled and Autonomous Shipping: UK based study, <Remote-Control-and-Autonomous-Shipping-Final.pdf (york.ac.uk)> 12, accessed 21 March 2023.

¹²⁹ The *Mayflower* was towed to its berth in Plymouth, Massachusetts due to US Coast Guard requirements. See ‘Crewless robotic Mayflower ship reaches Plymouth Rock’ (WBUR News, 1 July 2022), <<https://apnews.com/article/technology-robotics-massachusetts-770d8f58943fb3c64f5caa691c450e5a>> accessed 21 March 2023.

¹³⁰ See, eg, *The Siquasi* (1880) 5 PD 241, 244. For more detailed discussion, see Simon Rainey, *The Law of Tug and Tow and Offshore Contracts* (4th edn, Informa 2017) para 2.44.

¹³¹ (1888) 13 PD 55.

the tow itself was not directly involved in the collision between the tug and the other ship, the principle that the tow is in control in a collision scenario was authoritatively overruled in *The Devonshire*.¹³² In that case, the *Leslie*, a dumb barge, was under tow when it collided with the *Devonshire* and sank. Both the *Devonshire* and the tug were at fault for the collision but the *Leslie* was innocent. The House of Lords held that where a collision occurs when the tow is in complete control of the tug, the tow cannot be held liable for the default of the tug. Lord Atkinson stated:

It must therefore ... now be taken as conclusively established that the question of the identity of the tow with the tug that tows her is one of fact, not law, to be determined upon the particular facts and circumstances of each case.¹³³

It is important to remember that the old common law maxim may be contractually incorporated. The UK Standard Conditions for Towage and other Services Revised 1986 contains the following clause:

Whilst towing or whilst at the request, express or implied, of the Hirer, rendering any service other than towing, the master and crew of the tug or tender shall be deemed to be the servants of the Hirer and under the control of the Hirer and/or his servants and/or his agents, and anyone on board the Hirer's vessel who may be employed-and/or paid by the Tugowner shall likewise be deemed to be the servant of the Hirer and the Hirer shall accordingly be vicariously liable for any act or omission by any such person so deemed to be the servant of the Hirer.¹³⁴

BIMCO's TOWCON 2021 does not deem the tug to be the servant of the tow but does contain a clause that places liability on the tow for 'loss or damage of whatsoever nature caused to or suffered by third parties or their property by reason of contact with the Tow or obstruction created by the presence of the Tow'.¹³⁵

¹³² [1912] AC 634 (HL).

¹³³ *Ibid*, 656.

¹³⁴ Cl 3.

¹³⁵ Cl 22(b)(ii)(2). For discussion see Rainey (n 130) para 4.125 et seq.

When a tow is partly responsible for a collision between a tug and another ship, blame will be apportioned between the ships. In *The Panther and The Ericbank*,¹³⁶ the *Panther* collided with a third ship (the *Trishna*) while towing the *Ericbank*. Each ship was responsible for the collision. *The Trishna* was at fault for passing the *Ericbank* in an improper place in the Manchester Ship Canal, the *Ericbank* was at fault for failing to signal to the *Panther* that the *Trishna* was passing, and the *Panther* was at fault for failing to stop its engines when colliding with the *Trishna* which resulted in the *Trishna* being holed and subsequently sinking.

Wilmer J held 'what applies to a crane and its driver should apply equally to a tug and its master'.¹³⁷ Following *Mersey Docks and Harbour Board v Coggins & Griffiths (Liverpool) Ltd*¹³⁸ his Honour further stated:

I find myself quite unable to hold that the crew of the *Panther* became in law the servants of the owners of the *Ericbank* so as to render the latter, and not the former, liable for a faulty manoeuvre within the province of the man in charge of the tug.¹³⁹

In a situation where an autonomous ship cedes all control to the tug as if it were a dumb barge, it is logical to conclude that in the event of a collision the tug and the autonomous vessel are one 'ship' with the tug being the navigating ship. However, the assumption that the tug has total control over navigation could be rebutted if the autonomous ship is particularly cumbersome or is using its own system to navigate. In any event, a company providing towage services could incorporate contractual liability for third party damage or loss.¹⁴⁰

5 Alternatives to fault-based collision liability

5.1. Strict liability (no fault)

¹³⁶ [1957] P 143.

¹³⁷ Ibid, 148.

¹³⁸ [1947] AC 1 (HL).

¹³⁹ Ibid, 148.

¹⁴⁰ Cl 22(b)(ii)(2).

Strict liability entails absolute liability for damage caused by an act even though the damage is the result of pure accident or another person's wrongdoing and is neither intentional nor negligent.¹⁴¹ The policy that frames strict liability is based on a number of factors, namely that

... all forms of economic activity carry a risk of harm to others, and fairness requires that those responsible for such activities should be liable to persons suffering loss from wrongs committed in the conduct of the enterprise.¹⁴²

Strict liability does not apply in collision cases because the inequities that could arise if absolute liability applied in cases of collision between vessels of greatly disparate values.¹⁴³ However, in the context of ships operating at Degree Four, strict liability seems to be the most appropriate way of determining liability in the event of a collision as it will be difficult, perhaps impossible, to determine fault when artificial intelligence is navigating the ship. A further argument supporting making the owner of an autonomous ship strictly liable for harm caused to third parties is that at this stage no-one can say definitively that such ships are safer than crewed ships. While there are statistics that point to the number of collisions caused by human error,¹⁴⁴ there are no converse statistics to indicate the number of collisions that have been averted by the presence of an onboard crew.

5.2 Peril of the sea (no fault)

As in marine insurance law, a collision could be considered a peril of the seas.¹⁴⁵ However, the only application of the concept in collision cases in admiralty has been to cases of 'inevitable accident' where it has been the accepted formula since *The Woodrop-Sims*.¹⁴⁶ The concept also appeared in the 'knock-for-knock' agreements covering collisions between vessels owned by Allied governments during World War II.¹⁴⁷ Knock-for-knock indemnities

¹⁴¹ See Michael A Jones (gen ed), *Clerk & Lindsell on Torts* (23rd edn, Sweet & Maxwell 2020) para 1-69.

¹⁴² *Carr v Brands Transport Ltd* [2022] EWHC 3167 (KB), [9] (Knowles J).

¹⁴³ Healy (n 109).

¹⁴⁴ One study suggests that human error is a primary factor in 75% of maritime accidents. See Carine Dominguez-Péry et al, 'Reducing maritime accidents in ships by tackling human error: a bibliometric review and research agenda' (2021) 6 J of Shipping and Trade 4.

¹⁴⁵ See, eg, *The Xantho* (1887) 12 App Cas 503 (HL), 509 (Lord Herschell).

¹⁴⁶ Above, n 41.

¹⁴⁷ For example, Executive Agreement Series 282, 'Certain Problems of Marine Navigation and Litigation. Agreement between the United States of America and the United Kingdom of Great Britain and Northern Ireland' 4 December 1942.

are also commonly used in offshore oil and gas contracts and in the Inter-Club New York Produce Exchange Agreement 1996 (as amended September 2011)¹⁴⁸ as a way to create certainty in respect of apportionment of risk. The effect of such clauses is that each party agrees to bear the risk of damage to its own property, pollution and injury to employees etc, by indemnifying each other against these risks, irrespective of whose fault caused the loss or injury.¹⁴⁹

These clauses apply in the performance of a contract. If an autonomous ship (or indeed a crewed ship) is involved in a collision that occurs in the performance of the contract, that collision would be within the clause. In *A Turtle Offshore v Superior Trading Inc*,¹⁵⁰ Teare J upheld a knock-for-knock clause in the then cl 18 of the TOWCON,¹⁵¹ despite the defendant's failure to perform its contract to the standard ('due diligence') required by the contract.¹⁵² However, this allocation of liability will only arise contractually. Liability for a collision that occurs between non-contracting parties or outwith the performance of the contract, for example, if the tow is abandoned in favour of a more lucrative contract, will be determined on a fault basis as the knock-for-knock clause is treated as a contractual exemption clause reflecting the contemplation of the parties that a breach of contract may occur.¹⁵³

5.3 General average (regardless of fault)

General average dictates that ship and cargo each contribute to expenses or loss according to its value, regardless of fault.¹⁵⁴ This is an ancient principle found in Justinian's Digest XIV.2.1 that 'the Rhodian law provides that if cargo has been jettisoned in order to lighten a ship, the

¹⁴⁸ *Ben Line Steamers Ltd v Pacific Steam Navigation Co (The Benlawers)* [1989] 2 Lloyd's Rep 51, 60; Howard Bennett (gen ed), *Carver on Charterparties* (2nd edn, Sweet & Maxwell 2021) para 5-248.

¹⁴⁹ Justin Williams and Tom Evans, 'Knock-for-Knock Clauses' (2016) 9 J of World Energy Law and Business 303.

¹⁵⁰ [2008] EWHC 3034, [2009] 1 Lloyd's Rep 177.

¹⁵¹ See now TOWCON 2021, cl 22.

¹⁵² Cl 13. See now TOWCON 2021, cl 14. See Rainey (n 130) para 4.192.

¹⁵³ *A Turtle Offshore v Superior Trading Inc* [2008] EWHC 3034, [2009] 1 Lloyd's Rep 177, [110].

¹⁵⁴ See, eg, *The Copenhagen* (1799) 1 C Rob 289, 293; 165 ER 180, 182.

sacrifice for the common good must be made good by common contribution'.¹⁵⁵ Rule A of the York-Antwerp Rules 2016¹⁵⁶ provides that:

There is a general average act when, and only when, any extraordinary sacrifice or expenditure is intentionally and reasonably made or incurred for the common safety for the purpose of preserving from peril the property involved in a common maritime adventure.

Rule B provides that 'when measures are taken to preserve the vessels and their cargoes, if any, from a common peril, these Rules shall apply.' If a ship is involved in a collision and cargo is lost, the cargo interests will not be liable in general average for the third-party liabilities because '[t]here is a general average act where any extraordinary sacrifice or expenditure is voluntarily and reasonably made or incurred in time of peril for the purpose of preserving the property imperilled in the common adventure.'¹⁵⁷ They may however be liable for salvage.¹⁵⁸

6 Recommendations

Fault-based liability for collisions has been in place for centuries but the removal of human actors from the navigation and control of a ship suggests that strict liability for autonomous ships in collision cases ought to be considered. Strict liability is applied to activities that are inherently dangerous or that an owner has control over something that is dangerous. For example, the UK Animals Act 1971¹⁵⁹ imposes strict liability upon the owner of an animal for any damage caused by animal, whether belonging to a dangerous species or not,¹⁶⁰ even if the owner has taken reasonable care to prevent the damage happening. In the maritime context, the the International Convention on Civil Liability for Oil Pollution Damage 1992 (CLC)

¹⁵⁵ Watson (n 47) 219 (tr Tony Weir). See also Richard Cornah at al, *Lowndes & Rudolf: The Law of General Average and the York-Antwerp Rules* (15th edn, Sweet and Maxwell 2018) para 0.001.

¹⁵⁶ The Comité Maritime International (CMI) acts as guardian of the York-Antwerp Rules (*Lowndes & Rudolf*, *ibid*, para 00.95), which are model contractual rules that apply in general average.

¹⁵⁷ Marine Insurance Act 1906 (6 Edw 7, c 41), s 66(2).

¹⁵⁸ York-Antwerp Rules 2016, Rule VI. See, generally, *Lowndes & Rudolf* (n 155) para 6.43. For a discussion of cargo liability for salvage and autonomous ships, see M Tsimplis, 'Carriage of Goods on Autonomous Ships' in S Girvin and V Ulfbeck (eds) *Maritime Organisation, Management and Liability: A Legal Analysis of New Challenges in the Maritime Industry* (Hart 2022) ch 12.

¹⁵⁹ C 22.

¹⁶⁰ See s 2.

places strict liability¹⁶¹ on the owners of ships¹⁶² that carry 'persistent hydrocarbon mineral oil'.¹⁶³

In the same way that a dog cannot be asked to explain why it bit someone, an autonomous system cannot be asked why it made navigational decisions. Both animals and artificial intelligence have autonomy and it is therefore just that damage caused to third parties by the use or operation of them ought to be compensated by their owners.

A shift from fault-based to strict liability has already been accommodated in the context of passenger vessels. The Protocol of 2002 to the Athens Convention relating to the Carriage of Passengers and their Luggage 1974¹⁶⁴ places liability on the carrier for the death or personal injury of a passenger caused by a shipping incident unless the carrier can prove that the incident:

(a) resulted from an act of war, hostilities, civil war, insurrection or a natural phenomenon of an exceptional, inevitable and irresistible character; or

(b) was wholly caused by an act or omission done with the intent to cause the incident by a third party. If and to the extent that the loss exceeds the above limit,¹⁶⁵ the carrier shall be further liable unless the carrier proves that the incident which caused the loss occurred without the fault or neglect of the carrier.¹⁶⁶

A similar regime is a practical solution. In adopting strict liability, the most straightforward approach for ships operating at Degree Four or where control of navigational decision-making rests with the system rather than a human is to channel liability to the shipowner (or demise charterer, where applicable) and not the producer of the system. However, the quid pro quo for the shipowner's strict liability should be limitation of liability.

6.1 In defence of strict liability and limitation

¹⁶¹ Art III.1.

¹⁶² See art I.1.

¹⁶³ Art I.5.

¹⁶⁴ The Athens Convention 1974 establishes a liability regime for damage suffered by passengers on seagoing vessels.

¹⁶⁵ The prescribed limits of liability in the 2002 Protocol are 250,000 units of account per passenger on each distinct incident.

¹⁶⁶ Art 3(1).

Autonomous vessels will operate alongside conventional vessels. The existing liability regime is understood and insurable. Marine insurance is critical for the operation of all shipping. Channelling liability to the owner for damage caused by an autonomous vessel does not upset the existing delicate balance between shipowners' liabilities for third-party losses as developed over centuries. Strict liability does not mean that the shipowner is always liable. Rather, the shipowner bears the burden of showing that it did not cause the plaintiff's loss instead of the claimant being required to establish a prima facie case of negligence.

The Convention on Limitation of Liability for Maritime 1976 (LLMC) and its Protocol of 1996 allow a shipowner to limit its liability for certain claims 'whatever the basis of liability may be'¹⁶⁷ for claims arising from 'any distinct occasion'.¹⁶⁸ The LLMC extends to 'any person for whose act, neglect or default the shipowner ... is responsible'¹⁶⁹ to prevent claimants from circumventing the limits in the LLMC by claiming against the shipowner's agents or servants. The shipowner is not responsible for the acts of the developer of the artificial intelligence which is neither agent nor servant of the shipowner but the supplier of a product.

If product liability is the basis for a claim against the designer of the system following a collision, this would circumvent the LLMC. The supplier of the system may well have an indemnity or 'hold harmless' clause in its supply contract with the shipowner and a claim based in product liability (which is not limited by the LLMC) could circle back liability to the shipowner. If this occurred, this would potentially expose existing manufacturers for claims arising from the operation of conventional vessels. When accommodating new developments, one eye must be kept on the existing legal framework to prevent unforeseen consequences on others.

Holding the shipowner strictly liable with a limitation on liability will prevent a chilling effect on the technology development. The shipowner may contractually hold the supplier liable if the product does not 'behave' as it ought. If the developers are potentially exposed to unlimited liability, insurance costs will increase, making the technology unfeasibly expensive.

¹⁶⁷ Art 2.1.

¹⁶⁸ Art 6.1. What is a 'distinct occasion' in this context is an interesting question and one which needs to be developed: cf *Strong Wise Ltd v Esso Australia Resources Pty Ltd* [2010] FCA 240, [2010] 2 Lloyd's Rep 555.

¹⁶⁹ Art 1.4.

The software developer or provider of the technology is not the servant or agent of the shipowner. Under a fault-based regime, if there is a collision that is caused by the negligence of the software developer, the shipowner will only be liable to the extent of its responsibility to exercise due diligence in the selection of that supplier.

6.2 Unresolved issues

The general function of tort law to discourage wrongful conduct could potentially be undermined by strict liability if this circumvents the producer of the artificial intelligence. There may be a multiplicity of artificial intelligence systems used in an autonomous ship. Ethics implications of the use of artificial intelligence must be part of the wider discussion about the development of a suitable liability regime for autonomous ships.

Further, it may be unjust to hold the shipowner of an unmanned ship strictly liable for a collision where an onboard crew would not have had any effect on the outcome. In fact, if the same incident occurred with a crewed ship, there would not have been fault on the part of the ship.¹⁷⁰

Allocation of fault-based liability may still be possible if the burden of proof is reversed. Negligence may be inferred from facts without the need for further proof and the doctrine of *res ipsa loquitur* could be useful for autonomous ships at Degree Four. This doctrine was stated by Erle CJ in *Scott v London and St Katherine's Dock Co*:¹⁷¹

There must be reasonable evidence of negligence. But where the thing is shown to be under the management of the defendant or his servants, and the accident is such as in the ordinary course of things does not happen if those who have the management use proper care, it affords reasonable evidence in the absence of explanation by the defendant, that the accident arose from want of care.

¹⁷⁰ Felix Collin 'Unmanned ships and fault as the basis of shipowner's liability' in H Ringbom et al, *Autonomous Ships and the Law* (Routledge 2021).

¹⁷¹ (1863) 2 H & C 596, 159 ER 665. See also Clerk & Lindsell (n 141) para 7-203.

The application of *res ipsa loquitur* places the burden on the defendant to prove that it was not negligent and appears to be connected with the principle that the burden of providing facts that are only within the knowledge of the defendant lies upon it.¹⁷²

7 Conclusion

The introduction of new technology in shipping is inevitable. The law governing collisions has developed incrementally with the introduction of new technology. Autonomous ships lack of human control and the pace of development of technology driving autonomy is fast outpacing legal discussions and considerations, becoming increasingly incomprehensible to laypersons.

Human error often causes collisions, but along with human error there is the human desire to avoid collisions. Seafarers' lives are at risk in a collision and they can be seriously injured. If at fault, seafarers can be punished. However, such risks do not apply to artificial intelligence. Until the use of autonomous ships are proved safer than crewed ships, the presumption ought to be that they are inherently dangerous. For these reasons, in the event of a collision caused by an autonomous ship, it is argued that strict liability, rather than fault-based liability, should be placed upon those who benefit from their operation.

¹⁷² See Marsden (n 56) 43.