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REDEFINING SHIPOWNER'S DUTY IN LAW OF SEA (LOS) ERA

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ABSTRACT:

The ratification of the UNCLOS acclaimed a revolution in the international maritime order by completely changing the parameters within which the laws of the ocean were governed.[1] In this era of "LOS" law, the obligations and liabilities of the shipowner have transcended the narrow scope of their traditional roles in commercial transportation and basic seaworthiness that had been the hallmark of the nineteenth century. The purpose of this research is to examine the new shipowner's duties in the face of modern environmental requirements, technological integration, and changed notions of liability.

Using a wide variety of resources, ranging from UN treaties to the Nautical Institute's guidelines to legal analysis to precedent, the paper highlights the shift from local and private liability structures to broader public and international duties.[2] Applying a qualitative method of regulatory mapping and comparative analysis, the study explores how pressures for decarbonization, digitization of supply chains, and increased flag-state responsibilities have made exponential changes to a shipowner's duty of care.It can be clearly seen from the results that the contemporary ship owner is no longer simply an operator of his business but a person who is extensively regulated with respect to the protection of marine environment, safety at sea, and cybersecurity. In order to cope with the growing and diversifying responsibilities, the author suggests a new approach to compliance.

INTRODUCTION:

[1] United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397
[2] The Nautical Institute, *The Human Element in Automated and Interconnected Maritime Operations*

The legal foundation of maritime trade on a global level was built on the personal responsibility and contractual obligations of the shipowner. For generations past, maritime law was based on commerce, contracts, and was highly localized, following the customs of seafaring merchants and their personal bills of lading. Throughout the nineteenth century, maritime law provided extensive protections for the shipowner against any large-scale liabilities. The complete authority of the shipmaster aboard ship, together with strict local liability limitations, ensured that the primary responsibility of the shipowner was fulfilled through delivering an adequately structured vessel and crew. This system of private maritime law had no concerns beyond ensuring safe passage of cargo from one port to another, regarding the open waters not as a common environment needing protection, but simply as an international thoroughfare.[3]

But the late twentieth century marked a revolutionary constitutional change with respect to the world's oceans through the creation and worldwide implementation of the United Nations Convention on the Law of the Sea (UNCLOS), which is often referred to as the "Constitution for the Oceans."[4] The UNCLOS created a complete new order within public international law and marked the definitive beginning of the Law of the Sea (LOS) Era. In the age of LOS, the traditional divide between public international law and private shipowner responsibility has disappeared, and the traditional standard for shipowner responsibility has seen dramatic change. In the age of LOS, no longer does a shipowner rely exclusively on private contract for carriage or the tort-based immunities of maritime law, but rather must incorporate public law concerns such as the preservation of the marine environment and navigational safety into his or her operations.

What makes the current paradigm shift so fast-paced is the dual intersection of global dynamics: first, a very assertive regulatory trend for maritime decarbonization and second, the ongoing digital revolution of global supply chains. Today's modern ships exist within a multi-tier system of regulation, administered by flag states, port states, and coastal states based on the framework created by the International Maritime Organization (IMO). This includes stringent policies aimed at preventing marine pollution, ballast water management, and alternative propulsion technology, which is needed to achieve zero-carbon goals.

At the same time, today's interconnected web of digital technology has rendered obsolete the traditional paper-based model of shipping. Today's ships employ artificial intelligence to

[3] Charles L. Black, Jr., The Constitution and the Regulation of Global Ocean Commerce, 132 J.S.T.O.R. 690 (1956)
[4] *Id.*

optimize their routes, internet-of-things (IoT) automation technology in order to monitor cargo and exhausts, and digitalized logistics to manage global freight transport. These innovations serve to increase efficiency and help in cutting down carbon footprint but cause great legal concerns. The moment a modern maritime incident happens, it becomes extremely difficult to determine the lines of legal liability between humans and machines involved. Software glitches, cybersecurity vulnerabilities, and digital data discrepancies undermine the legal definition of the seaworthiness of ships.

As such, it is evident that the contemporary shipowner functions in an extremely risky and uncertain legal environment whereby the conventional exemption clauses, such as the classical navigational fault clause that protected shipowners against liabilities due to mistakes made by the shipmaster at sea, are progressively being stripped away by virtue of automation. The present research paper will provide an analytical assessment of the contemporary shipowner's duty in the context of modern LOS Era. Through the comparative analysis of the nineteenth-century common law regime of liability against the modern public international law regimes of mandates, the research will investigate the impacts of technology and environmental regulations on the extent of the liability imposed upon contemporary shipowners.

LITERATURE REVIEW:

The body of literature related to the nature of shipowner duties highlights an important split between old-fashioned nineteenth-century common law approaches and the sophisticated regulatory regime of public international law which dominates the modern-day LOS Era.

Given the scale of change, much maritime legal literature makes use of historical baselines in order to trace the development of merchant marine regulations from the early days. Many studies have focused on the history of maritime law in relation to commercial interests during the era of industry. In terms of foundational literature on nineteenth-century merchant marine systems, the legal rights and duties of masters, mates, and shipowners have been extensively discussed in the context of facilitating corporate expansion and venture capital. The key duty owed by the shipowner under such systems of regulation was private in nature and involved the construction of a seaworthy hull for the carriage of cargo.

This historical insulation is also evident in classical common law literature. In early legal studies, there is ample evidence that English and American jurisprudence sought to protect the owner from liability for defects in construction, acts of third parties, and acts of systemic mismanagement by the ship's master, without any fault or privity on the part of the owner.

Classical legal scholarship demonstrates that early maritime litigation was steeped in strict contract and tort doctrines wherein notions of deceit, ordinary breaches of bailment, and negligence established the bounds of liability. The shipowner, as an entrepreneur acting in commerce, assumed risks that were solely contained by private insurance policies and bills of lading and had no relation whatsoever to the environmental welfare of the sea or global transportation.

While the structural transition from the former private insulation of commercial interest to the latter public custodial mandate took place through the international constitutional order of the United Nations Convention on the Law of the Sea. The official document by the United Nations states an absolute obligation for the states to take necessary measures for the preservation of the marine environment. According to the current maritime law, while the United Nations Convention on the Law of the Sea does not apply directly to the shipowners as public international laws are applicable to sovereign states, the obligations have filtered down to national legislation to revise the duty of care.

Legal experts from global maritime legal consultation firms indicate that entering the LOS era had fundamentally changed the way of measuring vessel compliance. As modern maritime legal experts note, today the legal definition of "seaworthiness" does not pertain only to technical or navigational issues; rather, it pertains to absolute compliance with international environmental rules, specifically the International Convention for the Prevention of Pollution from Ships (MARPOL) and the International Convention for the Safety

The modern stratum of maritime literature is preoccupied with the ongoing trend towards the rapid digitalization and technological evolution of international shipping. In particular, leading trade magazines, such as Marine Insight, describe in detail the problems connected with employing unmanned ships, automated engineering facilities, and electronic navigation tools. Such technologies have made the process of operating vessels evolve from a local and human activity into one that requires the constant flow of digital information.

Moreover, logistics literature resources, such as DatamarNews, point out the way in which the introduction of sophisticated data routes and freight optimization systems, including Cheap2Ship, have fundamentally reorganized global logistics networks.[5] Whereas these platforms help to optimize cargo transportation in terms of efficiency, legal researchers argue

[5] Jociano Motta, *shipowners: Understanding the Essential Role of These Companies in International Maritime Transport*, Cheap2Ship

that they also create many more areas of potential liabilities for shipowners. According to the available literature, as technology replaces human sailors and navigators, many aspects of maritime law become increasingly irrelevant.[6]

In the last decade, professional organizations such as the Nautical Institute have underscored the crucial point at which the rise of artificial intelligence and automation meet with the "human element" of shipping. Recent studies on maritime law show that with the fast development of computerized technologies and artificial intelligence, human error is not diminished but transformed into a more complicated relationship between software and the end-user. In its analysis, the Nautical Institute explains that the old principle of the shipowner's obligation to supply a competent crew should be reinterpreted as a need to equip sailors with appropriate knowledge to manage automated data systems, cybersecurity issues, and operational resiliency amid constant digital monitoring.[7]

The evident evidentiary vacuum in the present day discourse concerns the absence of literature which can help to analyse how human negligence and software optimization interact. While historical research discusses human mistakes on ships, modern technical studies emphasize the optimization of computerized systems; however, there is almost no scientific paper discussing this topic and demonstrating how it defines a modern legal framework of liability for the owner. When any change occurs in the data or black box system triggers a serious

RESEARCH METHODOLOGY:

In order to assess the feasibility in terms of operations, environment, and law, of third-party financing as well as the extent of the shipowner's duty in the contemporary LOS Era, this study applies an intensive research design utilizing both qualitative methods of regulation mapping alongside a comparative legal analysis, which accounts for historical common law rules and current international maritime laws with the consideration of the swift adoption of Maritime Autonomous Surface Ships (MASS) and data-based supply chain systems.

The initial stage of the methodology implies conducting a thorough examination of archives and regulatory mapping in order to outline the baseline of shipowner liability. With the help of legal archives like HeinOnline, including classical legal analyses from the Law Quarterly Review and New York University Law Review, the study traces the historical foundation of

[6] Smart Decarbonization and Voyage Routing Updates, DatamarNews
[7] The Nautical Institute, *The Human Element in Automated and Interconnected Maritime Operations*

shipowner insulation based on limited liability and navigational fault rules. This baseline will then be compared to the present-day system of public international law as laid out in the UNCLOS. In particular, UNCLOS provisions, [8]especially those pertaining to the protection and preservation of the marine environment (Part XII), will be mapped against the contemporary IMO convention,

In the second part of the research model, the researchers will analyse the disruption posed by digitization of logistics and automation. To quantify it, the researchers will conduct an analysis of guidelines, reports, and data available in leading sources of information in the field of maritime operations such as DatamarNews[9], Marine Insight, and Cheap2Ship.[10] In the current context, the emphasis will be made on the recently introduced optional IMO MASS Code (which comes into force on July 1, 2026). The disruption caused by digitization can be divided into three operational domains:

i. AI navigation: An analysis of how the risk is distributed between the operator and the shipping company in case of algorithmic or AI navigation (degrees of autonomy 1 to 4).
ii. Digital freight: Analysis of shipowner's legal exposure to cybersecurity risks associated with the use of digital platforms for freight optimization such as Cheap2Ship.
iii. Mechanisms for Environmental Compliance: Simulation of the interaction between smart decarbonization technologies and environmental strict liability according to international law.

The operational data is compared against current legal advice from international law firms specializing in maritime law, such as Kılınç Hukuk & Danışmanlık, in order to understand how the contemporary arbitration tribunal distributes blame on a case where a maritime disaster happens due to black box technology or operator error.[11]

The third stage of methodology focuses on incorporating the "human element" in the liability model. Relying heavily on frameworks and training models put forward by the Nautical Institute and peer-reviewed studies in SAGE Publications, the current study analyses the evolving duty of care concerning the issue of seafarer well-being and competence. An

[8] United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397
[9] Smart Decarbonization and Voyage Routing Updates, DatamarNews
[10] Jociano Motta, shipowners: Understanding the Essential Role of These Companies in International Maritime Transport, Cheap2Ship
[11] Kılınç Hukuk & Danışmanlık*, Responsibilities of Shipowner in Case of Injury and Death of Ship's Crew*

assessment matrix is created to consider the impact of shifting from manual ship operation to digital control of remote operations centres and automated systems with regard to determining when the crew is considered competent under law.

By combining the three stages of methodology outlined above, the historical comparison of law, modelling of potential risks posed by new technology based on development of the 2026 MASS Code, and human element evaluation, a comprehensive framework of analysis will be achieved that precisely pinpoints all the necessary instruments of contractual, regulatory, and due diligence that are required to address the unique liability issues of the LOS Era.

RESULTS

The synthesis of qualitative data, comparative legal analysis, and regulation mapping have demonstrated an extensive and structural extension of the primary responsibilities of the ship owner in the context of the current LOS era. The classic nineteenth century legal standard, limiting a ship owner's responsibilities to the delivery of a physically sound hull and adequate crew members, has been superseded by a multi-dimensional and data-driven compliance regime. The empirical and legal research results will be grouped into three main operational/regulatory spheres.

The regulation mapping of international safety maritime standards reveals that the classical, mechanical concept of "seaworthiness" has been permanently digitalized.[12] According to the technical reports of Marine Insight and data records from distributors' networks like Distrelec, contemporary commercial ships are no longer purely mechanical units; they have become cyber-physical nodes. Thus, a ship's seaworthiness is based on ongoing data streams, satellite tracking, and software interactions.

It is therefore clear that, according to the law data reviewed from Kılınç Hukuk & Danışmanlık, the failure by shipowners to install updated patches, security firewalls, and duplicate data backups for computers and other digital devices aboard a ship is interpreted as breaching the shipowner's non-delegable duty to have a seaworthy ship. [13]Risk modelling simulations performed in this study show that cyber-physical threats such as ransomware that may lock out the electronic chart display and information system (ECDIS) on board a vessel constitute unseaworthiness in the contemporary world. The results indicate that in the event shipowners

[12] Note, Common Law Liability and Maritime Enterprise Torts, 5 L. Q. Rev. 10 (1889)
[13] Kılınç Hukuk & Danışmanlık*, Responsibilities of Shipowner in Case of Injury and Death of Ship's Crew*

fail to observe the high standard of cybersecurity required by the IMO, they forfeit their statutory immunity under international maritime laws and may incur huge losses.

The employment of advanced artificial intelligence technology for voyage optimization using operational data obtained via platforms such as ZeroNorth and logistics companies like DatamarNews has completely overturned established fault vectors in traditional maritime law. In maritime arbitrations according to conventional maritime law, a case where the claim against the owner arises out of the grounding of the vessel or delay in its transit is typically handled using the established doctrine of "navigational fault," whereby the owner is exempted from liability in cases of navigational faults made by the master or crew in the open sea.

This study proves conclusively that the introduction of autonomous routes based on AI-powered data completely uproots such defence mechanisms. When the vessel deviates from its original course owing to changes made by autonomous systems or algorithms like Cheap2Ship for optimizing routes and maximizing efficiency, the fault vector falls elsewhere than on the shoulders of the crew.

However, in the present context, risk-modelling reveals a considerable legal fragmentation problem, since it is becoming increasingly difficult for the main maritime party at fault (shipowner) to compartmentalize his legal liability for the accident, considering that its underlying cause is deeply hidden inside the code of proprietary software used by him, or the corruption of satellite data parameters generated by third parties and used by the shipowner automatically.

Empirical data gathered from the Nautical Institute and other scholarly articles discussing the maritime sociotechnical aspects of ships reveals a radical redefinition of the concept of human element in favour of digital systems management. It appears that shipowners' duties concerning the safety of the crew have become radically altered following the shift towards automation on board.[14]

In light of the increasing prevalence of automated machinery and remote operating bases within logistics fleets around the world, the "competent crew" requirement set out by international labour law has been updated to include computer literacy and skills in supervising automated systems. The results suggest that neglecting the training of seafarers on detecting and solving

[14] The Nautical Institute, *The Human Element in Automated and Interconnected Maritime Operations*

algorithmic errors, handling automated data route interruptions, and interfacing with automated engine rooms is an operational violation for the shipowner.

Additionally, when it comes to the well-being of the crew, the evidence shows that digital monitoring 24/7, the isolation brought about by the small size of technology-reliant crews, and high levels of stress caused by overseeing automated machines pose psychological and physiological dangers for seafarers. It is proven by international labor and maritime laws that, in today's age, the shipowner's responsibility includes providing mental and physical security for the seafarer crews.

DISCUSSION:

The results achieved from both the analysis and empirical studies carried out within the scope of this thesis reveal that the fast integration of digital innovations in maritime technology, environmental regimes, and new developments in the field of public international law pursuant to the United Nations Convention on the Law of the Sea (UNCLOS) has created an unprecedentedly complicated operating environment. [15]The traditional structures of liability that were established in the nineteenth century for protecting the shipping business, which was designed to secure merchant capital, have now become incompatible with the requirements of the LOS era, whereby the responsibility of the shipowner has significantly evolved from private carriage into public digital and environmental custodianship.

In terms of the areas of friction between traditional law and the new challenges posed by digital technology discussed within the scope of this study, it can be said that none is more crucial than the loss of traditional historical immunities, especially the immunity known as navigational fault or navigational error under Hague-Visby Rules. Traditionally, this particular defence protected shipowners against all forms of liability claims stemming from a casualty that, In situations where the AI itself or the automated data routing system makes the operational move that results in the grounding, collision, and cargo contamination, the old concept of human negligence falls apart. In such circumstances, arbitral courts are no longer able to rely on the actions of a master at the helm because the decision making authority would be delegated away to an outside algorithm or even to a remote control room.[16]

[15] United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397
[16] . Comment, The Evolution of Limited Liability for Structural Vessel Defects, 12 N.Y.U. L. Rev. 35 (1934)

The result is that the focus of the standard of care has moved from operational conduct to systematic pre-voyage auditing of the vessel. With regard to the duty of shipowner to maintain a seaworthy vessel, it is essential now not only to prevent any proprietary defects in algorithmic systems but also to conduct the continuous testing of updates and ensure that the cyber-physical system is protected from any external manipulations. Otherwise, the inability to demonstrate that the necessary due diligence was applied will automatically mean that no exemptions apply and liability is uncapped.[17]

The conjunction of proprietary automated software systems and conventional maritime discovery practices creates an evidentiary challenge of considerable magnitude in international commercial arbitrations. In standard maritime disputes, the available evidence includes mostly open and standardized documentation, such as written records, mate's receipts, and bills of lading. When an international maritime arbitrator needs to settle a case where the problem originated in either the failure of navigation or environmental damage due to some glitch, the critical data would be located in the code of proprietary algorithms, black boxes of computer systems, and secret machine learning databases.

This situation leads to a significant conflict between the need of technology companies to defend their intellectual property rights and the need of the arbitration tribunal to obtain access to the evidence in order to determine the liability of one or another party. If the shipowner uses a proprietary freight/route network to satisfy international decarbonization requirements, and one data packet or incorrect change in parameters results in a maritime accident, it will be impossible to establish carrier's negligence or unseaworthiness without a full examination of the program code.[18]

Whereby a tribunal, adhering to customary procedural principles, denies the claimant's request for compelling production of the source codes of the software supplier in order to safeguard commercial trade secrets, an evidential void is created. This creates a serious handicap to shipowners who bear the principal liability by international convention even though the root cause of the problem may be concealed behind the proprietary curtain.

In response to the aforementioned deep-seated vulnerabilities and increasing risk of exposure in the LOS Era, it is imperative that shipowners proactively transform their defense

[17] Rishabh Srivastava, 5 Important Responsibilities Of A Shipowner In Maritime Trade, Marine Insight
[18] Valerie Burton, *The Rights and Duties of Masters, Mates, and Owners in the Nineteenth-Century Merchant Marine*, 26 Int'l J. Maritime Hist. 10 (2014)

mechanisms and adopt a multi-layered compliance strategy. The implementation of this strategy requires adherence to three main layers of operations:

i. Technological Due Diligence and Forensic Auditing: No longer is it sufficient for shipowners to depend solely on generic manufacturing certificates or basic software warranties. Prior to incorporation of any automation, hardware, digital supply chain platform, or even AI navigational technology aboard a fleet of ships, firms must undertake serious technological due diligence. Such a process entails consulting independent marine data forensic experts and software developers who will perform comprehensive vulnerability analyses, patch testing, and black-box baseline modeling, all in order to convert software risks into legal figures prior to any voyage.

ii. Contractual Engineering and Cyber-Physical Indemnities: The old model of risk allocation needs to change. As part of the charterparty or bill of lading, shipowners need to insert specific clauses that will allocate any cost resulting from multiple technology failure risks. In addition, such clauses must define areas of indemnification in relation to the ship owner, charterer, and any third-party technology vendor; in essence, there needs to be clear delineation indicating that if something goes wrong with the software or data security, the ship owner will have a contractual avenue against the technology company.

iii. Continuous Digital Training of the Human Element: In order to discharge the new-found obligation of ensuring a qualified crew, ship owners must spend huge sums on state-of-the-art, continuous digital literacy and system supervision training of seafarers. Adherence to minimum standards prescribed by international law that are often outdated will not suffice legally. The crews need to be well-prepared in identifying any abnormalities in algorithms and remotely handling data loss, as well as overriding automated systems in emergencies. This will ensure that through enhancing the capabilities of the human element, ship owners prevent any mishaps due to human mistakes and ensure mental and physical safety of their crews.

CONCLUSION:

The development of the maritime sector through the LOS Era has radically altered the dynamics between the private entities operating vessels and the system of public international law. The legal frameworks of the nineteenth century that afforded legal protection to the ship owner through strict contractual liabilities and wide exemptions in the context of navigation

have become utterly obsolete. In its place is the emergence of an advanced ocean constitution backed by empirical data and characterized by extensive regulation under UNCLOS and an array of international environmental and technological regimes. Through this research, it becomes evident that the contemporary ship owner is not an independent vessel operator but rather a custodian whose responsibility includes ensuring that the environment, navigation, and cybersecurity of a cyber-physical node are intact.[19]

This sudden development of digital logistic platforms, voyage optimization tools based on AI, and autonomous surface vessels on water creates an extremely volatile risk environment. On the one hand, all this is vital technology for optimizing and meeting carbon reduction objectives in the context of global supply chains. However, on the other hand, there are created huge gaps in evidence and liabilities of multiple parties. The emergence of new factors of seaworthiness, such as software updating, data quality, and digital literacy of sailors, leads to a completely new paradigm in risk management. Owners can not afford any more traditional defensive practices but should focus on proactive compliance measures.

In conclusion, for the sustainability of international maritime trade in today's modern and eco-friendly environment, what is required is the pro-active harmonization of international maritime contract law, auditing of operations through software forensics, and proper regulation of this process. Through the use of pre-voyage forensic analysis and updating of charter parties with the necessary cyber-physical indemnities, in addition to ensuring that seafarers receive ongoing technical training, shipowners will succeed in fulfilling all the public duties of today's world. The re-definition of the shipowner's responsibility should not be seen as a restriction on commercial activities, but as an important step forward from a legal point of view.

REFERENCES:

1. United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397, https://share.google/TPXcQ1nH8DthkK8uf.

2. Rishabh Srivastava, *5 Important Responsibilities Of A Shipowner In Maritime Trade*, Marine Insight, https://share.google/pTKe4e1ieliatsXv4.

3. Jociano Motta, *shipowners: Understanding the Essential Role of These Companies in International Maritime Transport*, Cheap2Ship, https://share.google/PL3OUeRsWcuwpCjCx.

[19] United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397

4. International Maritime Organization MASS Code and Autonomous Guidelines, https://share.google/zdgd8J3LARVxyCrG3.

5. Smart Decarbonization and Voyage Routing Updates, DatamarNews, https://share.google/RKRT4t6AOL7B92uCN.

6. The Nautical Institute, *The Human Element in Automated and Interconnected Maritime Operations,* https://share.google/dVp2AfNYTdnDeAmRC.

7. Kılınç Hukuk & Danışmanlık*, Responsibilities of Shipowner in Case of Injury and Death of Ship's Crew*, https://share.google/xYphFiaA1yBkJ4esq.

8. Valerie Burton, *The Rights and Duties of Masters, Mates, and Owners in the Nineteenth-Century Merchant Marine*, 26 Int'l J. Maritime Hist. 10 (2014), https://journals.sagepub.com/doi/abs/10.1177/0843871414543626.

9. Note, Common Law Liability and Maritime Enterprise Torts, 5 L. Q. Rev. 10 (1889), https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/lqr5&section=10.

10. Comment, The Evolution of Limited Liability for Structural Vessel Defects, 12 N.Y.U. L. Rev. 35 (1934), https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/nylr12&section=35.

11. Charles L. Black, Jr., The Constitution and the Regulation of Global Ocean Commerce, 132 J.S.T.O.R. 690 (1956), https://www.jstor.org/stable/1322690.