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M.Sc IN SHIPPING MANAGEMENT

SAFETY MANAGEMENT PRACTICES TOWARDS PREVENTING INJURIES AND ACCIDENTS: THE CASE OF THE SHIPPING INDUSTRY.

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In

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Contents

Abbreviations

SMS - Safety Management System

PDCA Cycle - Plan-Do-Check-Act Cycle

ISPS – International Ship and Port Facility Security

ISM- International Maritime Organisation

PSC- Port State Control

ILO - International Labour Organization

IMO - International Maritime Organization

MARPOL – Marine Pollution Prevention Convention

MLC – Maritime Labour Convention

SOLAS – Safety of Life at Sea

STCW – Standards of Training, Certification and Watchkeeping for Seafarers

IACS- International Association of Classification Societies

IAIN - International Association of Institutes of Navigation

LMIS- Lloyds Maritime Information Services

OBO- Oil Bulk Ore

FSA- Formal Safety Assessment

DOT- Department of Transport

SAMSA- South Africa Maritime Safety Security

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Abstract

This paper discusses the basic philosophy of maritime accident prevention, the actual facts relating to accidents, the international regulatory framework, the psychology of safety, fatigue, occupational accidents, the organization needed to prevent accidents, and the various methods of educating and training employees.

A detailed analysis of all international regulatory framework such as the IMO, SOLAS, STCW, ISPS and MARPOL are the key to this thesis along with an analysis of three major accidents that have taken place in the shipping industry, those of the bulk carriers M/V Derbyshire (1980), M/V Treasure (2000), and M/V Harita Bauxite (2013). All three bulk carriers sank in different sea areas and different periods of time due to bad weather, after having been subject to severe damages in their hull. An analysis of incident was conducted, in order to analyze the accidents under discussion. According to the analysis, the accidents occurred mainly because of the structure of vessels, with their hulls not being appropriate and cargo hatch covers not being strong enough to resist to the pressures imposed by large and aggressive waves, while in the case of M/V Harita Bauxite the cargo was found to be to too wet for the hull to withstand the vessel's heavy rolling in rough weather. The accidents are not the only to be reported due to the same reasons, and they were all meant to lead the International Maritime Organization (IMO), to amend its conventions and develop new and stricter regulations regarding vessels' design and structure, as well as cargo storage and handling in the very sensitive and important case of bulk carriers. The fact that the accident of M/V Harita Bauxite happened recently in 2013 indicates that lessons have not yet been learned, thereby indicating that IMO has to become stricter and more efficient as far as the rapid implementation of its conventions and regulations is concerned.

Περίληψη

Αυτή η εργασία συζητά τη βασική φιλοσοφία της πρόληψης ναυτικών ατυχημάτων, τα πραγματικά γεγονότα που σχετίζονται με τα ατυχήματα, το διεθνές κανονιστικό πλαίσιο, την ψυχολογία της ασφάλειας, την κόπωση, τα εργατικά ατυχήματα, την οργάνωση που απαιτείται για την πρόληψη ατυχημάτων και τις διάφορες μεθόδους εκπαίδευσης και εκπαίδευσης των εργαζομένων.

Μια λεπτομερής ανάλυση όλου του διεθνούς ρυθμιστικού πλαισίου όπως ο IMO, η SOLAS, η STCW, η ISPS και η MARPOL αποτελούν το κλειδί για αυτή τη διατριβή μαζί με μια ανάλυση τριών μεγάλων ατυχημάτων που έχουν συμβεί στη ναυτιλιακή βιομηχανία, αυτά των πλοίων μεταφοράς χύδην φορτίου M/ V Derbyshire (1980), M/V Treasure (2000) και M/V Harita Bauxite (2013). Και τα τρία πλοία μεταφοράς χύδην φορτίου βυθίστηκαν σε διαφορετικές θαλάσσιες περιοχές και διαφορετικές χρονικές περιόδους λόγω κακοκαιρίας, αφού υπέστησαν σοβαρές ζημιές στο κύτος τους. Πραγματοποιήθηκε ανάλυση του συμβάντος, προκειμένου να αναλυθούν τα υπό συζήτηση ατυχήματα. Σύμφωνα με την ανάλυση, τα ατυχήματα συνέβησαν κυρίως λόγω της δομής των πλοίων, με το κύτος τους να μην είναι κατάλληλο και τα καλύμματα των καταπατών φορτίου να μην είναι αρκετά ισχυρά ώστε να αντιστέκονται στις πιέσεις που επιβάλλονται από μεγάλα και επιθετικά κύματα, ενώ στην περίπτωση του βαποριού Harita Bauxite βρέθηκε το φορτίο να είναι πολύ υγρό για να αντέξει το κύτος του σκάφους στη βαριά κύλιση του πλοίου σε δύσκολες καιρικές συνθήκες. Τα ατυχήματα αυτά, δεν είναι τα μόνα όπου έχουν αναφερθεί για τους ίδιους λόγους και αιτίες, και όπου όλα υποτίθεται είχαν σκοπό να ακολουθήσουν τον Διεθνή Ναυτιλιακό Οργανισμό (IMO), να τροποποιήσει τις συμβάσεις του και να αναπτύξει νέους και αυστηρότερους κανονισμούς σχετικά με το σχεδιασμό και τη δομή των πλοίων, καθώς και την αποθήκευση του φορτίου και του χειρισμού του στην πολύ ευαίσθητη και σημαντική περίπτωση των πλοίων μεταφοράς χύδην φορτίου. Το γεγονός ότι το ατύχημα του M/V Harita Bauxite συνέβη πρόσφατα το 2013 υποδηλώνει ότι τα διδάγματα δεν έχουν ακόμη παρθεί, υποδεικνύοντας έτσι ότι ο Διεθνής Ναυτιλιακός Οργανισμός (IMO) πρέπει να γίνει αυστηρότερος και αποτελεσματικότερος όσον αφορά την ταχεία εφαρμογή των συμβάσεων και των κανονισμών του.

1. Introduction

Not only in the Maritime Industry safety is the most important factor, but also in the other industries. Terminology, acronyms, and definitions exist in workplace health and safety. First, incidents and accidents are extremely common and often interchanged. Accidents as an unplanned and unexpected occurrence, which upsets a planned sequence of work are resulting as an event with undesirable consequences to people, property, or the environment. Incidents are an instance of something happening, an unexpected event or occurrence that does not result in serious injury or illness but may result in property damage. Another definition that must be declared is the Near miss, which is an incident with no consequences, but that could have reasonably resulted in consequences under different conditions. As a result, an incident may include a near miss, in which someone narrowly avoids damage or disease. However, if a significant injury occurs, we are dealing with an accident. Therefore, all accidents are incidents, but not all incidents are accidents. Shipping accident has been the main concern in the maritime industry as it leaves negative impact to many parties. Specifically, shipping accidents potentially harmful as it may cause loss of life, loss of property, and marine pollution (Ceyhun, 2014). While there is no way to eliminate accidents, there are certain plans, actions, and preparations that can be taken to reduce them such as: knowing the Hazards, creating a Safe Work Area, Using Safe Lifting Techniques, Personal Protective Equipment, Education and Training. Finally, the traditional approach regarding safety is defined by its opposite, by the lack of safety, while a new approach is that safety is defined by its presence where the focus is on the everyday situations where things go right as they should.

Also, the concepts "safety" and "security" are commonly misunderstood, particularly when translated. They are discrete in shipping, and they are subject to separate laws. “Safety Incidents” are caused with no intention for example structural failure, weather conditions, human error, while “Security Incidents” are caused with intention like terrorist attacks or piracy.

Another discussion that must be done is about “Risk”. Some questions that have been raised are: What is a Risk? Why do we need Risk and, how to work with Risk? Risk has to be identified, measured and of course must be reduced in a systematic, acceptable and cost-effective way. First, “Risk” is the combination of the frequency and the severity of the consequence (MSC Circ 1023/MEPC Circ 392, IMO). All the above questions are to be answered according to the ISM Code which safety with a Risk Management approach is mandatory factor for the ISM Code. Huge role plays the safety culture which frequently used in maritime business. It follows a new mentality where everyone is involved through a Safety Management System (SMS) and creates an atmosphere where all people have confidence to report safety concerns without fear of blame. The Safety Management System according to the ISM Code is a continuous improvement and should be organized in the context of the PDCA Cycle.

Throughout maritime history, and until recently, the crew's safety and health standards were not properly safeguarded by a robust regulatory framework. Strict, but only in terms of preventative measures, not in terms of penalties or punishments for shipowners or seafarer employers. At the start of the twentieth century, all parties involved in seaborne trade, such as flag nations, international organizations, shipping firms, and seafarers' syndicates, agreed that it would be in their mutual interest to develop new strong norms and standards for maritime safety. Later, health provisions offered greater details regarding the working conditions aboard ships. This unified regulatory framework was first introduced into maritime society in 1948, when the United Nations signed an agreement in Geneva that led to the establishment of the International Maritime Organization (IMO). Furthermore, IMO standards established a common and agreed ground among most parties, resulting in increased safety at sea and a more advantageous environment for maritime trade in general.

The Organization's mission is " to provide the mechanism for cooperation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, the efficiency of navigation and prevention and

control of marine pollution from ships". The Organization is also authorized to handle administrative and legal issues relating to these goals. (IMO, 2022)

The IMO has created a plethora of regulations, norms, and resolutions known as "Maritime Regulations." The International Convention for the Safety of Life at Sea (SOLAS 1974), which was the IMO's first assignment, is the most important of all treaties dealing with marine safety. The IMO then concentrated on topics such as international maritime traffic facilitation, load lines, and the transport of risky goods, as well as a modification of the system for estimating ship tonnage. Following SOLAS, the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STCW) was adopted on April 28, 1978, to establish the minimum requirements for seafarer training, certification, and watchkeeping, with the primary goal of promoting the safety of life and property at sea and the protection of the marine environment.

Although safety was and remains IMO's most important responsibility, a new problem began to emerge, the pollution. The growth in the amount of oil being transported by sea and in the size of oil tankers were of particular concern and together with a series of tanker accidents was born the need to prevent oil pollution. For this reason, the main international convention covering prevention of pollution from Ships, 1973, as amended by the Protocol of 1978 relating thereto (MARPOL 1973/1978) not only accidental and operational oil pollution but also pollution by chemicals, goods in packaged form, sewage, garbage, and air pollution (IMO,2022).

MLC 2006 was approved in February 2006 in Geneva by the International Labour Conference (ILC) of the International Labour Organization (ILO) under article 19 of its Constitution. Following SOLAS, MARPOL, and STCW, the Maritime Labour Convention of 2006 specified more completely seafarers' employment and social rights, making working conditions safer, healthier, and more equitable. According to Article IV of the MLC, 2006, every seafarer has the right to a safe and secure workplace that meets safety requirements, to fair working and living circumstances on board ship, and to health protection, medical treatment, welfare measures, and other types of social protection.

In 1989, the IMO Resolution A.647(16) "Guidelines on Management for the Safe Operation of Ships and for Pollution Prevention" was the first set of management guidelines for the maritime industry. The compliance with the guidelines was voluntary. In 1993, the IMO Resolution A.741(18) made a shift from the IMO philosophy of hardware regulations to the software element of ship management. The International Safety Management Code (ISM Code) is the current form of the International Management Code for the Safe Operations of Ships and for Pollution Prevention. The implementation of the ISM Code was compulsory by SOLAS '74 and in 1994 was incorporated into SOLAS through Chapter IX. The ISM Code became mandatory for passenger ships, oil tankers, gas carriers, bulk carriers, and high-speed cargo craft over 500 GT but in 2002 became mandatory for all ship types over 500 GT. Commitment from the top is the key to successful safety management. Individual dedication, competence, attitudes, and motivation determine the end result in areas of safety and pollution control (Assist. Pr. Karakasnaki, 2022).

The pillars of foundation for Safety and Environmental Protection are Prevention, Reaction, and Continuous Improvement. The principles of the ISM Code are individual tailoring of the system to the Company's operational parameters, promoting individuals responsibility (just culture), recognizing the commitment of Top Management, self-monitoring and adjustment as necessary, risk assessment approach, self-assessment continuous improvement, external verification of the system and confirmation of compliance by certification.

The ISM Code, being the major subject of this research, will be discussed more analytically and dissected subsequently, along with additional safety procedures for preventing and avoiding accidents.

The goal of this thesis is to analyze the safety management practices that are applicable to the maritime industry. The most important organizations such as IMO will be introduced. So, at first the thesis will try to present to the reader all the international organizations and the key regulations that rule the international maritime law. This happens although it is a lot of wording, so it is clear what should

and should not happen in everyday life at sea, in order to establish safety procedures. After most of the regulations' organizations have been covered, such as IMO, ISM, ISPS, SOLAS, MARPOL etc, the safety and security meanings should be cleared up. The role of the flags is also to be presented.

Some accidents will lead the way to understand how safety measures, not only make the job of the workers in maritime industry less fatal, but also how it can increase their everyday productivity, due to less fatigue, stress etc. The way people that work in the industry interact with the rules and regulations and the measure to which these rules and regulations are being applied by the shipping companies are to be researched.

The below three points are to be discussed in the thesis:

- the maintenance and promotion of workers' health and working capacity
- the improvement of the working environment and work to become conducive to safety and health
- the development of work organizations and working cultures in a direction that supports safety and health at work.

2. IMO – International Maritime Organization

The International Maritime Organization (IMO) is a specialized department of the United Nations charged with overseeing maritime security, safety, and the reduction of ship-related air and marine pollution. IMO is the international standard-setting institution for the safety, security, and environmental performance of international shipping. Its primary duty is to provide a fair and equal efficient regulatory framework for the shipping sector that is widely supported and put into practice. Its purpose is to level the playing field so that ship operators cannot resolve their financial problems by merely making savings and sacrificing environmental, safety, and security performance. This strategy also promotes efficiency and creativity.

The accepted treaty legally formed the IMO, which was the outcome of an international conference held in Geneva in 1948 under U.N. elections. The IMO

convention went into effect in 1958, and the inaugural conference was held the following year. The major mission of the International Maritime Organization (IMO) was to revise and approve a new version of the International Convention for the Safety of Life at Sea (SOLAS), which is regarded as the most significant treaty dealing with maritime safety. Following completion of the above in 1960, the IMO launched an endeavor to address regulatory concerns such as international marine traffic facilitation, load lines, and the carrying of hazardous commodities and cargo. Furthermore, the tonnage measurement of vessels was evaluated and amended.

The IMO's primary mission, safety, was eventually superseded by pollution problems and the ongoing need for environmental protection. The MARPOL 73/78 treaty was established in the aftermath of the Torrey Canyon catastrophe in 1967, when 120.000 tons of oil leaked and several steps were implemented to prevent accidents and their detrimental consequences. Except for accidental and operational oil pollution, the International Convention for the Prevention of Contamination from Ships, 1973, as amended by the Protocol of 1978, includes pollution by chemicals, packaged products, sewage, waste, and air pollution.

Except for the concerns of Life at Sea (SOLAS) and Pollution (MARPOL), the IMO implemented a number of measures concerning compensation for individuals who have suffered financial harm as a result of pollution, search and rescue, help to people in distress, and safety and security management. The International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers, which went into force in 1978, was the third and most important convention approved by the IMO. STCW regulations increased seafarer standards and, for the first time, empowered the International Maritime Organization (IMO) to monitor government activities with Parties required to report information to IMO on their compliance with the Convention. Appendix No. 1 includes a complete list of IMO Conventions.

IMO now has 174 State Members and three Associate Members, as well as an Assembly, a Council, and five main Committees: (The Maritime Safety Committee; the Marine Environment Protection Committee; the Legal Committee; the Technical Cooperation Committee and the Facilitation Committee) and a number of Sub-Committees that assist the work of the main technical committees. The IMO

Assembly, which meets every two years, adopts the IMO Strategic Plan. The Strategic Plan includes, among other things, the Organization's goal and vision, strategic orientations, performance indicators, and a list of deliverables.

2.1. Adopting a Convention

Regulating and implementing a Convention is a time-consuming operation with numerous details, thus just the fundamental framework to be stated is thought relevant. As previously stated, the IMO's major committees, which are comprised of all member nations that participate equally, are responsible during their sessions for proposing and drafting regulations in the form of conventions, rules, and recommendations. Following that, a UN conference is organized in which all members (IMO members and non-members alike) are asked to analyze and review the proposed maritime legislation. Then it is up to member states to decide whether to ratify and accept the proposed regulations or portions of them. Each convention specifies the method must be followed before it becomes effective. However, the official ratification of a convention might take several years since implementing a regulation can be expensive, discouraging some governments from ratifying it. As a result, international marine legislation implementation may be a lengthy or even incomplete process.

Furthermore, in many circumstances, private stakeholders (classification societies, insurers, P&I clubs, etc.) are asked to participate in various committees without having a vote right since some legislation have a significant impact on their activities. This might complicate the appropriate procedure. When a new regulation becomes effective, flag states, coastal governments, and ship operators are led and informed on how to apply the new requirements. This is accomplished by incorporating the restrictions into national legislation and making them mandatory for ships flying the state's flag or ships flying a different flag accessing the state's coastlines, as well as with necessary inspections. Crew members must comply with all applicable IMO requirements at the end of the implementation phase.

2.2. ISM Code - International Safety Management Code

The ISM Code is an international mandatory standard for the safe management and operation of ships and environmental protection. In matters of safety and pollution prevention it is the commitment, competence, attitudes, and motivation of individuals that determine the result. The ISM Code consists of two parts: a) the implementation and b) the certification and verification. The implementation of the Code states that it is the companies' duty to establish Safety Management Systems.

On that point, it is useful to mention some definitions for avoiding any misunderstandings. What is a system? A system is a set of resources that have been brought together in an organized and coordinated way to perform a particular function or to achieve a specified outcome. This includes the ship and its equipment, people, office staff, paperwork, methods of communication, and so on. (Assist. Pr. Karakasnaki,2022).

Therefore, the company must: a) Establish and implement policies for achieving the safety objectives, b) provide the necessary resources and shore-based support, and c) a person or more, who is working onshore should be designated to link the personnel on the vessels with the highest level of management, d) Recruit trained, qualified, certified and physically fit seafarers, e) Ensure adequate shore support to enable the DPA to perform its functions, f) Ensure that the Masters are qualified, share policies for quality and safety of the Company, have the necessary support from the shore based organization, and g) Provide all the necessary training to its employees.

The second part of the ISM Code, as I mention before, concerns the certification and verification; this means that the measures are available to administrators (states) for forcing companies act upon their obligations under Part A.

Regarding the certificates there are the Document of Compliance (DOC), which issued to a Company which complies with the requirements of this Code and it is valid for a period not exceeding five years. It is issued by the State authority or by a Recognized Organization. It is available for the ship types in the document and has annual verification. The DOC may be withdrawn if the annual verification has not

been carried out and if there is evidence of major non-conformities. Also, another document is the Safety Management Certificate (SMC), which is issued to a ship that signifies that the Company and its shipboard management operate in accordance with the approved safety management system and it can be used for up to five years. There may be an intermediate verification, in between the 2nd and 3rd anniversary date of the certificate. The original copy of the SMC must be available on board. The SMC may be withdrawn if the intermediate verification has not been carried out if there is evidence of major non-conformities and finally if the Document of Compliance has been withdrawn. There is also the Interim Document of Compliance, which is used when a company is being founded for the first time or when new ship types are being added to a current Document of Compliance. The Interim Document of Compliance shall be granted for a maximum of 12 months. There is also the Interim Safety Management Certificate, which applies to new ships when they are delivered, when a company assumes responsibility for the operation of a ship that is new to the company, or when a ship changes flag. The Interim Safety Management Certificate should be valid for no more than 6 months. All verifications required by the ISM Code must be carried out according to procedures acceptable to the Administration.

2.2.1 – ISM Code Objectives

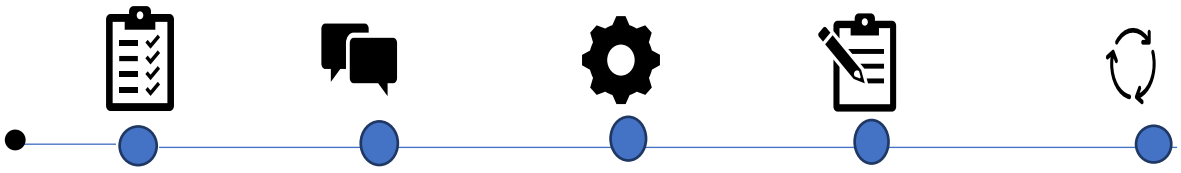
The ISM Code must assure safety at sea, prevent human injury or loss of life, avoid damage to the environment, avoid damage to property, provide for safe practices in ship operation and a safe working environment, and assess all identified risks to its ships, personnel and the environment. Also, must establish safeguards against all identified risks, continuously improve safety management skills, be prepared for emergencies, comply with mandatory rules & regulations, and finally to take account of all applicable maritime codes, guidelines, and standards. The instrument used to describe and implement the Safety Management System is called "Safety Management Manual". The main purpose of the Manual is to provide a) To personnel work instructions, methods, and tools to monitor and improve work processes, b) To Masters a description of actions and measures to be taken on board,

c) To external organizations a complete picture of the company's SMS, and d) to auditors (internals/externals) to verify the correct implementation of SMS through the PDCA Cycle.

2.2.2 – Types and Phases of Audits

According to the ISM Code (Par 12.4), the audits and possible corrective actions should be carried out in Risk-Based in accordance with documented procedures. There are four types of Audits and five Audit phases. Let's start with the types which are: 1) Internal Audits, 2) Second Party - External Audits,3) Third-Party-External Audits, and 4) Risk-Based Audits. The Internal Audits include vessel ISM Internal Audits, vessel ISPS Internal Audits, vessel MLC Internal Audits, and vessel ISO standard(s) Audits. In the Second Party, there is a Subcontractor auditing and a Manning Agent Audit while in the third Party there are Class Audits, Flag Administration Audits and Client Audits. Finally, in the Risk-Based there are the Navigational Audit, Mooring Audits, the Cargo/Bunkering Audits and the Engineering Audits.

The five Audit phases are planning, preparation, conduct, reporting and follow up as shown in the below Appendix No.1.



Appendix No. 1

2.3. SOLAS – Safety of Life at Sea

The SOLAS Convention is widely regarded as the most significant international treaty governing merchant ship safety. First used in 1914, as a result of the Titanic disaster. The second and third modifications were accepted in 1929 and 1948, respectively, and the fourth in 1960, culminating in the 1974 Convention, which has since been modified and changed on multiple times. The current version of the Convention is known as SOLAS, 1974, as revised.

The primary goal of the SOLAS Convention is to establish minimal safety-compatible requirements for the design, maintenance, and operation of ships. The Convention specifies a variety of certificates as evidence that the standards have been met, and it is the responsibility of Flag States to ensure that ships flying their flag comply with them. If there are strong reasons to suspect that a ship and its equipment do not substantially comply with the standards of the Convention, control provisions also permit Contracting Governments to inspect the ship. This process is referred to as port State control. The present SOLAS Convention begins with Articles describing general obligations, modification procedures, and other topics, followed by an Annex divided into 14 Chapters as listed below.

Chapter I - General Provisions

Chapter II-1 - Construction - Subdivision and stability, machinery and electrical installations

Chapter II-2 - Fire protection, fire detection and fire extinction

Chapter III - Life-saving appliances and arrangements

Chapter IV - Radiocommunications

Chapter V - Safety of navigation

Chapter VI - Carriage of Cargoes

Chapter VII - Carriage of dangerous goods

Chapter VIII - Nuclear ships

Chapter IX - Management for the Safe Operation of Ships

Chapter X - Safety measures for high-speed craft

Chapter XI-1 - Special measures to enhance maritime safety

Chapter XI-2 - Special measures to enhance maritime security

Chapter XII - Additional safety measures for bulk carriers

Chapter XIII - Verification of compliance

Chapter XIV - Safety measures for ships operating in polar waters

2.4. ISPS Code – International Ship and Port Facility Security (ISPS) Code

Since the Assembly's twenty-second session adopted resolution A.924(22) in November 2001, on the review of measures and procedures to prevent terrorist acts that jeopardize the security of passengers and crews as well as the safety of ships, the IMO's Maritime Safety Committee and its Maritime Security Working Group have been hard at work developing the ISPS Code The code's creation is the pinnacle of their efforts.

The new regulation is a modification to the 1974 Safety of Life at Sea (SOLAS) Convention. This new law is officially known as the International Code for the Security of Ships and Port Facilities (ISPS Code).

It is critical to understand the distinction between safety and security. Safety and security are two distinct challenges, and IMO took this into account while developing new regulations. Prior to the adoption of the ISPS code, the SOLAS had a chapter (Chapter XI) including particular measures to improve marine safety. In December 2002, Chapter XI was renamed Chapter XI-1, and a new chapter (Chapter XI-2) on specific measures to improve marine security was added. As an addition to this new chapter, the ISPS code has been included.

As stated in previous chapters, in general, safety is reducing the risk or occurrence of loss, injury, or death caused by some accidental events or natural causes such as natural disasters, whereas security is reducing the risk or occurrence of loss, injury, or death caused by deliberate or intentional actions.

Chapter XI-2 applies to passenger and cargo ships with a gross tonnage (GT) of 500 or more, as well as high-speed vessels, mobile offshore drilling equipment, and port facilities that serve such ships on international journeys.

The ISPS Code is divided into two sections, A and B. The former part (A) is compulsory, and outlines detailed maritime and port security-related requirements, while the latter part (B) is not; and it is just a guideline on how to meet the requirements and obligations set out within the provisions of Part A. It is acknowledged, however, that the extent to which the guideline applies may vary based on the nature of the port facilities as well as the ship, its trade, and cargo. Despite this, once the code was adopted, the United States proclaimed that compliance with Part B would be essential for all US flag ships as well as all foreign flag ships entering the United States.

2.4.1 ISPS Code goals

Essentially, the ISPS code has been implemented to ensure that the security of ships and port facilities, both aboard and at port/ship interfaces, is always in place. Because the heart of the ISPS code is built on risk management activities, constant risk assessments must be performed at regular intervals to ensure the security of seaborne cargo. As a result, the primary purpose of the ISPS code is to develop a consistent and worldwide framework for risk assessments in the marine transportation business. As stated by IMO, the general goals of the ISPS code are as follows:

1. To establish an international framework involving collaboration among Contracting Governments, Government agencies, local administrations, and the shipping and port industries in detecting and assessing security threats and taking preventive measures against security incidents affecting ships or port facilities used in international trade;
2. To identify the appropriate duties and responsibilities of all parties involved in maintaining maritime security at the national and international levels;

3. To facilitate the early and effective gathering and exchange of security-related information;
4. To establish a framework for security evaluation so that strategies and procedures may be put in place to respond to changing security levels;
5. To guarantee confidence that appropriate and proportional maritime security measures are in place.

2.4.2 ISPS Code contents

As it is already mentioned before, there are two sections to the ISPS code: A and B. The first part (A) is obligatory, but the second part (B) is optional and just serves as a guide for putting the security rules in part A into practice.

Part A

This portion of the ISPS code is divided into 19 parts and two appendices. The parts provide definitions, applications, duties of charged parties, and technical information concerning the Code's requirements.

1. General
2. Definitions
3. Application
4. Responsibilities of Contracting Governments
5. Declaration of Security
6. Obligations of the Company
7. Ship Security
8. Ship Security Assessment
9. Ship Security Plan
10. Records
11. Company Security Officer
12. Ship Security Officer
13. Training, drills and exercises on ship security

14. Port Facility Security
15. Port Facility Security Assessment
16. Port Facility Security Plan
17. Port Facility Security Officer
18. Training, drills and exercises on port facility security
19. Verification and Certification for ships.

Part B

This introduction (Part B) briefly describes the processes that are expected to be designed and implemented in order to achieve and maintain compliance with the requirements of Part A and Chapter XI-2 of this Code, as well as the major components on which guidance is offered.

Part B of the ISPS code, like Part A, consists of 19 sections[1] and two appendices. In certain sense, implementing part A without considering part B seems a vain effort. Additionally, it lays out crucial factors that must be taken into account when deciding how to implement the recommendations regarding ships and port facilities.

2.4.3 Functional requirements

This Code incorporates a variety of functional requirements to carry out its goals. They consist of, but are not restricted to:

1. gathering and assessing information about security threats and exchanging such information with appropriate Contracting Governments;
2. requiring the maintenance of communication protocols for ships and port facilities;

[1] Sections 7, 11, 12, 14, and 19 are devoid of any extra information. Sections 8, 9, and 13 give relevant advice for parts 7, 11, and 12, and sections 15, 16, and 18 provide relevant guidance for section 14. Section 19 has no further instruction.

3. preventing unauthorized access to ships, port facilities, and their restricted areas;
4. preventing the introduction of unauthorized weapons, incendiary devices, or explosives to ships or port facilities;
5. providing a means for raising funds for ships and port facilities.
6. establishing security plans for ships and port facilities based on security assessments; and
7. mandating training, drills, and exercises to ensure familiarity with security plans and procedures. (ISPS 2003)
8. requiring ship and port facility safety plans based upon protection tests;and
9. requiring training, drills and physical activities to make certain familiarity with security plans and procedures. (ISPS 2003)

2.4.4 Important Definitions

For the purpose of this part, unless otherwise specified, the following rules apply:

1. The International Convention for the Safety of Life at Sea, as modified, is referred to as the Convention.
2. Regulation refers to a Convention regulation.
3. A chapter of the Convention is referred to as a chapter.
4. Ship security plan (SSP) refers to a plan prepared to assure the implementation of measures on board the ship that are aimed to safeguard passengers, cargo, cargo transport units, ship's stores, or the ship from the dangers of a security event.
5. Port facility security plan (PFSP) means a plan developed to ensure the application of measures designed to protect the port facility and ships, persons, cargo, cargo transport units and ship’s stores within the port facility from the risks of a security incident.
6. Port Facility Security Assessment (PFSA) is a risk assessment of all components of a port facility's functioning to determine which portions are most vulnerable to attack.

7. Ship security officer (SSO) means the person on board the ship, accountable to the master, designated by the Company as responsible for the security of the ship, including implementation and maintenance of the ship security plan and for liaison with the company security officer and port facility security officers.
8. Ship Security Assessment (SSA) is an examination of the susceptible areas of a ship's construction or operation. A SSA must involve an on-site security survey, according to section A of the ISPS code. It should take into account the people, activities, services, and operations that must be safeguarded. It should also include any potential dangers and weaknesses that may arise for the ship while she is at dock, anchor, or at sea. Threats that may occur when she is at the ship/port interface must also be considered. The ship security assessment is an essential and integral part of the process of developing and updating the ship security plan, therefore it shall be reviewed periodically.
9. Company security officer (CSO) means the person designated by the Company for ensuring that a ship security assessment is carried out; that a ship security plan is developed, submitted for approval, and thereafter implemented and maintained and for liaison with port facility security officers and the ship security officer.
10. Port facility security officer (PFSO) means the person designated as responsible for the development, implementation, revision, and maintenance of the port facility security plan and for liaison with the ship security officers and company security officers.
11. Security incident means any suspicious act threatening security of ships.
12. Designated Person Ashore (DPA) is one of the key roles for the proper implementation of the Company’s Safety Management System onboard the vessels. DPA is required to not only to ensure effective implementation of the company's safety management system but also it requires to be based ashore for developing and implementing safety culture within the company. The role and responsibility of the DPA is to verify and monitor every operation happening in a vessel, regarding safety and or environmental issues. He is the link between the vessel and the office.

13. The security level specifies the degree of danger that a security incident will be attempted or occur. Levels 1-2-3 have been reached.
14. Security level 1 denotes the minimum suitable protective security measures that must be maintained at all times.
15. Security level 2 refers to the level at which necessary additional protective security measures must be maintained for an extended length of time due to the increased danger of a security event.
16. Security level 3 denotes the level at which additional specialized protective security measures must be maintained for a limited amount of time when a security event is likely or imminent, even if the exact target cannot be identified.
17. The Contracting Government (CG) is responsible for the implementation of Port Facility Security Officer (PFSA) at ports located within its jurisdiction, and may delegate this responsibility to a Recognised Security Organization (RSO).
18. Declaration of Security (DOS) is a document that may be required for a port visit when specific security requirements exist. The Declaration address the security requirements that could be shared between a port facility and a ship, or between ships, and states the responsibility for each.

2.4 MARPOL – Marine Pollution Prevention Convention

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the primary international convention addressing the prevention of maritime environment contamination by ships due to operational or accidental causes. The 1978 Protocol was enacted in reaction to a series of tanker incidents in 1976-1977[2].

[2] The SS Torrey Canyon was an oil tanker of the LR2 Suezmax class with a cargo capacity of 120,000 short tons (110,000 t) of crude oil. On March 18, 1967, she was shipwrecked off the western coast of Cornwall, England, producing an environmental disaster by emptying the whole cargo into the sea. That incident triggered a chain reaction of events that resulted in the adoption of MARPOL

"As the 1973 MARPOL Convention had not yet entered into force, the 1978 MARPOL Protocol absorbed the parent Convention. The combined instrument entered into force on 2 October 1983. In 1997, a Protocol was adopted to amend the Convention and a new Annex VI was added which entered into force on 19 May 2005. MARPOL has been updated by amendments through the years. The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes." (IMO, 2022)

Annex I - Regulations for the Prevention of Pollution by Oil (entered into force 2 October 1983)

Annex II - Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (entered into force 2 October 1983)

Annex III - Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992)

Annex IV - Prevention of Pollution by Sewage from Ships (entered into force 27 September 2003)

Annex V - Prevention of Pollution by Garbage from Ships (entered into force 31 December 1988)

Annex VI - Prevention of Air Pollution from Ships (entered into force 19 May 2005)

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2.5 STCW – Standards of Training, Certification and Watchkeeping for Seafarers

The 1978 International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers was approved on July 7, 1978, but did not enter into force until April 28, 1984. The major goal of the Convention is to enhance the safety of life and property at sea, as well as the conservation of the maritime environment, by establishing in common accord worldwide standards of training, certification, and watchkeeping for seafarers. Amendments have been made to that law in 1991, 1994, 1995, 1997, 1998, 2004, 2006, 2010, 2014, 2015, 2016, and 2018. The Manila amendments, which were accepted on June 25, 2010, and are expected to enter into force on January 1, 2012, marked a substantial reform of the STCW Convention and Code.

Among the amendments approved are several significant changes to each chapter of the Convention and Code, including:

• Improved procedures to avoid fraudulent activities related with competence certifications and to strengthen the evaluation process (monitoring Parties' compliance with the Convention);

• Revised requirements for work and rest hours, as well as new requirements for the prevention of drug and alcohol abuse, as well as updated standards relating to medical fitness standards for seafarers;

• New certification requirements for able seafarers;

• New requirements for training in modern technology such as electronic charts and information systems (ECDIS);

• New requirements for training in marine environment awareness and leadership and teamwork;

• New requirements for security training, as well as provisions to ensure that seafarers are properly trained to cope if their ship is attacked by pirates;

• Introduction of modern training methodology, including distance learning and web-based learning;

• New training guidance for personnel serving on board all types of tankers, including new requirements for personnel serving on liquefied gas tankers;

The regulations contained in the Convention are supported by sections in the STCW Code. In general, the Convention sets out the fundamental standards, which are subsequently expanded upon and clarified in the Code. Part A of the Code is mandatory. A set of tables provides a detailed description of the minimal criteria of competence necessary for seagoing staff. For instance, the master and deck department requirements are covered in Chapter II of the Code. Part B of the Code is Part A's recommendation/explanations guidance. The proposed actions are not required, it is just recommended, and the examples are just meant to provide examples of how some Convention requirements can be met. But generally speaking, the proposals describe a policy that has been agreed through IMO meetings and contact with other international organizations.

2.6 COLREGs – Convention on the International Regulations Preventing Collisions at Sea, 1972

In this chapter, an analysis is needed in order to point out how important factor is the human element. If somebody do research about maritime accidents, he can find many cases regarding collisions and groundings. The increasing cases of such incidents have exposed the disregard of some navigation officers and masters of the IMO guidelines for voyage planning.

This convention was approved on October 20, 1972, and went into effect on July 15, 1977. The 1972 Convention was intended to revise and replace the 1960 Collision Regulations, which were approved concurrently with the 1960 SOLAS Convention. The acceptance of traffic separation plans was one of the most significant changes in the 1972 COLREGs. The COLREGs have 41 regulations separated into six parts, which are as follows:

Part A General

Part B - Steering and Sailing

Part C - Lights and Shapes

Part D - Sound and Light signals

Part E - Exemptions; and

Part F - Verification of compliance with the provisions of the Convention.

To be more analytic:

Part A - General (Rules 1-3)

Rule 1 states that the rules apply to all vessels upon the high seas and all waters connected to the high seas and navigable by seagoing vessels.

Rule 2 covers the responsibility of the master, owner and crew to comply with the rules and,

Rule 3 includes definitions.

Part B - Steering and Sailing (Rules 4-19)

Section I – (Rules 4-10) Conduct of vessels in any condition of visibility.
Section II - (Rules 11-18) Conduct of vessels in sight of one another.
Section III - (Rule 19) Conduct of vessels in restricted visibility.

Rule 4 states that the section applies under any visibility circumstance.

Rule 5 states that "*every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision".* (IMO, 2022)

Rule 6 addresses safe speed. It states that " *Every vessel shall at all times proceed at a safe speed...*" The Rule specifies the variables that should be considered while calculating safe speed. Several of them expressly pertain to radar-equipped warships.

Rule 7 addresses the possibility of collision and advises that ""*assumptions shall not be made on the basis of scanty information, especially scanty radar information*"

Rule 8 specifies how to prevent a collision.

According to Rule 9, a vessel traveling in a narrow channel or fairway must stay “as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable." *The same Rule obliges a vessel of less than 20 metres in length or a sailing vessel not to impede the passage of a vessel "which can safely navigate only within a narrow channel or fairway."* (IMO, 2022)

The Rule also prohibits ships from passing via a small channel or fairway "*"if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway*." A change to Rule 8 in 1987 designated the meaning "not to obstruct." A new paragraph (f) was introduced to emphasize that a vessel that was obligated not to obstruct the passage of another vessel should take early measures to ensure sufficient sea room for the other vessel's safe passage. When there was a risk of collision, such a vessel was required to fulfill this commitment by taking avoiding action in line with the steering and sailing regulations. (IMO, 2022)

Rule 10 of the Collision Regulations addresses the behavior of vessels in or near the Organization's traffic separation systems. Regulation 8 of Chapter V (Safety of Navigation) of SOLAS recognizes IMO as the sole institution authorized to deal with international measures pertaining to ship routing.

A study conducted by the International Association of Institutes of Navigation (IAIN) in 1981 can be used to assess the efficiency of traffic separation strategies. This revealed that there were 60 collisions in the Strait of Dover between 1956 and 1960; twenty years later, with the implementation of traffic separation measures, this number was reduced to only 16.

Rule 10 states that when traffic lines have to be crossed by ships, then this should happen "as nearly as practicable at right angles to the general direction of traffic flow." This helps neighboring ships understand the crossing vessel's intentions and direction while also allowing the vessel to cross the lane as fast as feasible.

Fishing vessels "must not obstruct the passage of any vessel following a traffic lane," yet fishing is not prohibited. This is in accordance with Rule 9, which specifies that "a fishing vessel should not obstruct the passage of any other vessel sailing inside a narrow channel or fairway." The regulations were changed in 1981. Two paragraphs were added to Rule 10 to exclude vessels whose maneuverability is

reduced "when engaged in an operation for the safety of navigation in a traffic separation scheme" or while engaged in cable laying.

The regulations were revised once again in 1987. It was emphasized that Regulation 10 only applies to the Organization's (IMO) traffic separation schemes and does not relieve any vessel of her obligations under any other rule. It was intended to highlight that if a vessel is required to cross traffic lanes, it should do so as close to right angles to the general direction of the traffic flow as possible. Regulation 10 was changed again in 1989 to specify which vessels may utilize the "inshore traffic zone."

According to Rule 11, the clause applies to vessels that are visible to one another.

Rule 12 specifies what action should be done when two sailing vessels approach one another.

Overtaking is covered under Rule 13; the overtaking vessel must remain out of the way of the vessel being overtaken.

Rule 14 addresses head-on collisions.

Rule 15 governs crossing circumstances, while Rule 16 governs the action to be performed by the give-way vessel.

Rule 17 addresses the stand-on vessel's actions, including the provision that the stand-on vessel may take action to prevent collision by her manoeuvre alone if it becomes clear that the vessel obliged to remain out of the way is not taking adequate action.

Rule 18 deals with vessel responsibility and contains regulations for vessels to stay out of the path of others.

According to Rule 19, every vessel should travel at a safe speed that is appropriate for the conditions and visibility. A vessel that detects another vessel by radar should decide if there is a risk of collision and, if so, take evasive action. A vessel receiving another vessel's fog signal should reduce speed to a minimum.

Part C - (Rules 20-31) Lights and Shapes

Rule 20 says that lighting regulations apply from sunset until dawn. Definitions are provided in Rule 21.

Rule 22 addresses light visibility, stating that lights must be seen at minimum ranges (in nautical miles) established by the kind of vessel.

Rule 23 governs the carriage of lights by power-driven boats on the move.

Rule 24 addresses lighting for towing and pushing vessels.

Light requirements for sailing vessels underway and vessels under oars are covered by Rule 25.

Rule 26 addresses the lighting standards for fishing vessels.

Rule 27 applies to vessels that are not under command or have limited maneuverability.

Rule 28 addresses light requirements for boats with draught restrictions.

Rule 29 addresses the lighting standards for pilot boats.

Rule 30 addresses lighting regulations for moored and aground boats.

Light requirements for seaplanes are covered in Rule 31.

Part D - (Rules 32-37) Sound and Light Signals

Rule 32 defines the terms whistle, short blast, and protracted explosion.

According to Rule 33, boats 12 meters or longer must carry a whistle and a bell, while vessels 100 meters or longer must also carry a gong.

Rule 34 addresses maneuvering and warning signs, such as whistles or lights.

Rule 35 governs the use of sound signals in low-visibility situations.

Rule 36 governs the use of signals to draw attention.

Rule 37 deals with distress signals.

Part E - (Rule 38) Exemptions

Rule 38 states that ships that conform with the 1960 Collision Regulations and were built or were under construction when the 1972 Collision Regulations went into effect may be excused from various light and sound signal requirements for specific periods.

Part F– (Rule 39-41) Verification of compliance with the provisions of the Convention

The Rules, which were enacted in 2013, include obligations for mandatory audits of Convention Parties.

The Rules, which were enacted in 2013, include obligations for mandatory audits of Convention Parties.

Rule 39 has definitions.

Rule 40 states that Contracting Parties must follow the Code for Implementation provisions in carrying out their obligations and responsibilities under the current Convention.

According to Rule 41 on Verification of Compliance, every Contracting Party is subject to IMO audits on a regular basis.

3 ILO – International Labour Organization

The International Labour Organization (ILO) was born in 1919 as part of the Treaty of Versailles[3] that ended World War I, to reflect the belief that universal and lasting peace can be accomplished only if it is based on social justice. (ILO, 2022). The Organization has contributed to historically significant turning points like the Great Depression, decolonization, the founding of Solidarno in Poland, and the overthrow of apartheid in South Africa, as well as to the current effort to create a strong ethical

[3] At the closing of World War I, the victorious Allies agreed to a series of peace accords that would be imposed on the vanquished Central Powers at a peace conference in Paris, France. The Treaty of Versailles, signed in June 1919 in the Palace of Versailles in Paris, was the most important of these. (History.com 2009)

and effective framework for a fair globalization. It is one of the oldest organizations of the United Nations system and it is unique due to a tripartite structure as a result of the process, with representatives of governments, employers, and workers serving in its executive body. Security, humanitarian, political, and economic factors served as the motivation for the founding of the ILO. Against the backdrop of worker exploitation in the then-industrializing countries, the ILO's founders understood the value of social justice in securing peace. Additionally, there was a growing awareness of the economic interconnectedness of nations and the necessity of cooperation to achieve parity in working conditions across nations striving for the same markets.

The ILO Constitution was drafted in early 1919, with representatives from nine countries: Belgium, Cuba, Czechoslovakia, France, Italy, Japan, Poland, the United Kingdom, and the United States chairing the Labour Commission, and was initially composed of representatives from nine countries: Belgium, Cuba, Czechoslovakia, France, Italy, Japan, Poland, the United Kingdom, and the United States. Since then, the ILO has grown to 187 members, with the most recent being The Kingdom of Tonga, who joined on February 24, 2016. In 1926, an Expert Committee was formed to oversee the implementation of ILO standards. The Committee, which still exists today, is made up of independent jurists who examine government reports and provide their own report on the implementation of ILO Conventions and Recommendations to the Conference each year. The ILO became a specialized agency of the newly founded United Nations in 1946.

"The ILO accomplishes its work through three main bodies which includes governments', employers' and workers' representatives:

- *the International Labour Conference sets the International Labour standards and the broad policies of the ILO. It meets annually in Geneva. Often called an international parliament of Labour, the Conference is also a forum for discussion of key social and Labour questions.*

- *the Governing body is the executive council of the ILO. It meets three times a year in Geneva. It takes decisions on ILO policy and establishes the program and the budget, which it then submits to the Conference for adoption.*

- *the International Labour Office is the permanent secretariat of the International Labour Organization. It is the focal point for International Labour Organization's overall activities, which it prepares under the scrutiny of the Governing Body and under the leadership of the Director-General."* (ILO, 2022)

A supervisory mechanism serves to guarantee that conventions are adequately implemented by member nations who ratify them, which is backed by International Labour Standards. The ILO monitors the implementation of standards in member countries on a regular basis and gives recommendations on how they might be improved. If there are any issues with standard implementation, the ILO aims to assist nations through social dialogue and technical support.

Following the approval of Conventions and Recommendations by the International Labour Conference and acceptance by States, the ILO has established a variety of methods for monitoring their implementation in law and practice. There are two types of oversight mechanisms:

- The regular oversight system: assessment of periodic reports provided by Member States on the steps they have taken to implement the requirements of the ratified Conventions.

- Particular procedures: a general representations and complaints procedure, as well as a special procedure for freedom of association

Since 1919, the International Labour Organization (ILO) has maintained and developed a system of eight "fundamental" Conventions, covering subjects considered to be fundamental principles and rights at work: freedom of association and the effective recognition of the right to collective bargaining; the abolition of all forms of forced or compulsory labor; the abolition of child labor; and the abolition of employment discrimination. The International Labour Organization Declaration on Fundamental Themes and Rights at Work (1998) also addressed these principles. Following the approval of the 2014 Protocol to the 1930 Forced Labour Convention, a ninth ILO instrument was deemed "essential." The International Labour Convention adopted a Resolution on the inclusion of a safe and healthy

working environment in the ILO's framework of fundamental principles and rights at work during the 110th Session of the International Labour Conference in June 2022. As a result, the International Labour Organization Declaration on Fundamental Principles and Rights at Work, 1998, has been amended to reflect this, and the Occupational Safety and Health Convention, 1981 (No. 155) and the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187) are now regarded as fundamental Conventions under the 1998 Declaration, as amended in 2022.

The fundamental instruments are:

1. Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)

2. Right to Organize and Collective Bargaining Convention, 1949 (No. 98)

3. Forced Labour Convention, 1930 (No. 29) (and its 2014 Protocol)

4. Abolition of Forced Labour Convention, 1957 (No. 105)

5. Minimum Age Convention, 1973 (No. 138)

6. Worst Forms of Child Labour Convention, 1999 (No. 182)

7. Equal Remuneration Convention, 1951 (No. 100)

8. Discrimination (Employment and Occupation) Convention, 1958 (No. 111)

9. Occupational Safety and Health Convention, 1981 (No. 155)

10. Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)

3.1 MLC – Maritime Labour Convention, 2006

The International Labour Conference (ILC) of the International Labour Organization (ILO) adopted the Maritime Labour Convention 2006 (MLC, 2006) in 2006, and it entered into force on 20 August 2013, one year after registering 30 ratifications from countries representing more than 33% of the world's gross

tonnage of ships, becoming binding in international law MLC, 2006 was established at the worldwide level by government, employer, and worker groups to define basic working and living standards for all seafarers engaged on ships flying the flags of nations that had signed the Convention. With 96 ratifications[4] of the MLC and many changes, the Convention is likely to obtain universal ratification from relevant ILO Members in the near future.

"The Convention mandates that commercially operated ships of 500 gross tonnage or over and governed by its provisions will, if they operate on international voyages, be required to carry, among other things, two specific documents: a Maritime Labour Certificate (MLC) and a Declaration of Maritime Labour Compliance (DMLC) providing prima facie evidence that the ships are in compliance with the requirements of the Convention. These two documents will be subject to inspection when ships enter the ports of other countries that have ratified the Convention. In addition, ships flying the flag of countries that have not ratified the Convention will also be subject to inspection with respect to working and living conditions for seafarers when they enter ports of countries where it is in force. This "no more favorable treatment" approach, is an important aspect to help ensure fair competition for ship-owners that comply with the Convention." (ILO, 2022)

The comprehensive Convention enshrines seafarers' rights to decent working and living conditions in almost every aspect of their working and living conditions, including, among other things, minimum age, hours of work or rest, wage payment, paid annual leave, repatriation at the end of contract, onboard medical care, the use of licensed private recruitment and placement services, accommodation, food and catering, health and safety protection, accident prevention, and seafarer safety. (ILO, 2022) The MLC, 2006, addresses core concepts and rights at work, such as the right to a safe and secure workplace, fair working and living conditions on board ship, health protection, and welfare measures. These fundamental rights are outlined in the first four titles of the Convention (Titles 1–4), whereas the Convention's

[4]The Cook Islands became the 96th ILO Member State to ratify the MLC, 2006 Convention as modified on December 18, 2019.

inspection and enforcement provisions are outlined in Title 5. Visvikis and Panayides (2017)

1. Title 1. Minimum requirements for seafarers to work on a ship
2. Title 2. Conditions of employment
3. Title 3. Accommodation, recreational facilities, food and catering
4. Title 4. Health protection, medical care, welfare and social security protection
5. Title 5. Compliance and enforcement Appendixes

The most crucial of these articles will be evaluated in terms of how it differs from other major conventions (SOLAS, MARPOL, and STCW), thus it is critical to understand what led ILO to decide to adopt MLC and why that change was made.

3.2 MLC – Completing the Gap

Despite the National Seamen's Codes Recommendations as a legal instrument defining rights and obligations in the maritime industry, as well as the further modification of the three IMO conventions (SOLAS, MARPOL, and STCW), there was still a significant need for developing a stricter framework for occupational safety and health conditions of seafarers working environment. This idea was made over a century ago, but it was not just the horrific conditions that happened on board ships in recent decades that prompted the ILO to create the new Convention (MLC, 2006).

One key issue that had to be addressed was the globalization of shipping, not in terms of transportation but of the increasing engagement of non-traditional shipping nations, seafarers of various nationalities, port authorities, and third parties in the business. As a result, a Convention with broader acceptability was required, addressing concerns such as effective enforcement and compliance from the

majority of ILO members at the same time. Furthermore, there was a clear need to provide a more effective protection of seafarers' rights to decent employment, as well as to assist shipowners and governments in implementing and supervising appropriate application of applicable rules.

Going further into the primary causes for the desired adjustment, we should express them clearly, as indicated by ILO's presentation of MLC's thorough summary on November 18th, 2013.

- *Many of the existing ILO instruments needed to be updated to reflect the working conditions in the industry*
- *Changes in ownership, financing and the rise of the ship management companies resulting in significant shifts in the labor market for seafarers*
- *Development of consciously composed mixed nationality crews in highly organized network linking shipowners, ship managers, crew managers, labour supplying agencies*
- *Increased internationalization of ship registries and "flag of convenience"*
- *A need to provide a "level playing field" and avoid exploitation of workers*
- *Increased stress and complexity in the maritime workplace that has an impact on the health and social security of workers*
- *The high level of detail combined with the large number of Conventions led to problems for compliance and enforcement and relatively low ratification level for some key Conventions* (ILO, 2013)

4. Safety-related concepts in Shipping

4.1 What is safety

Safety is a perceived quality that determines the extent to which the management engineering and operation of a system are free from danger to life, property the environment. Safety is the degree of freedom from danger and harm. (Assist. Pr. Karakasnaki 2022)

4.1.1 Safety versus Security incidents

All the safety incidents caused with no intention such as weather conditions, structural failure or by a human error while on the other hand, the security incidents caused with intention such as the piracy or a terrorist attack.

4.2 What is an accident

Accident is an event with undesirable consequences to people, property, or the environment.

4.3 Reasons of accidents

There is a strong belief among researchers that humans contribute to some 80% of industrial accidents, including those occurring in shipping. The goal of investigating the causes of maritime accidents is to figure out what went wrong in a specific situation and what can be done to enhance shipping safety in the future. Because such an approach implies that some error occurred, it should not be seen as learning from the mistakes of others. Mistakes are errors, and errors, whether deliberate or unintentional, can be penalized. Finding someone to blame allows one to quickly consider the work done and stop looking for latent reasons of an accident, thereby adhering to the "bad apple" theory.

The bad apple theory is known as the Old View theory which maintains that:

- Complex systems would be great if it were not for the unpredictable behavior of some unreliable people (Bad Apples) in it;
- Human errors cause accidents: humans are the dominant contributor to more than two thirds of them;
- Failures come as unpleasant surprises. They come as a surprise and have no place in the system. The only way the system may fail is because individuals are inherently unreliable.

As it is mentioned before, the common belief is that human error accounts for around 80% of all marine accidents. A proclivity to give such computations can also

be found not only in maritime industry but also in other industries too. Instead of human error we should be talking about management system failures.

People do not normally damage the ship and its environment on purpose. There are two causes that a person makes a damage. First, is the “Direct” cause which is an action of an individual and the “Root” cause that may be happened due to absence or failure of one or more management controls. Due to the presence of specific factors, humans may be forced to do the wrong action.

Another reason of accidents is the wrong notion that the safety costs, so people do not take the proper measures. A dedicated approach to safety should be seen as a cost-saving practice not as cost. Some categories of costs are Management costs, such as personnel change or training, Out-of- pocket expenses, such as insurance or healthcare, Direct expenses such as cost of repairs, Wasted Time such as detentions and last but not least the additional expenditures such as surveys, fines or legal actions.

4.2 Human Errors and Factors

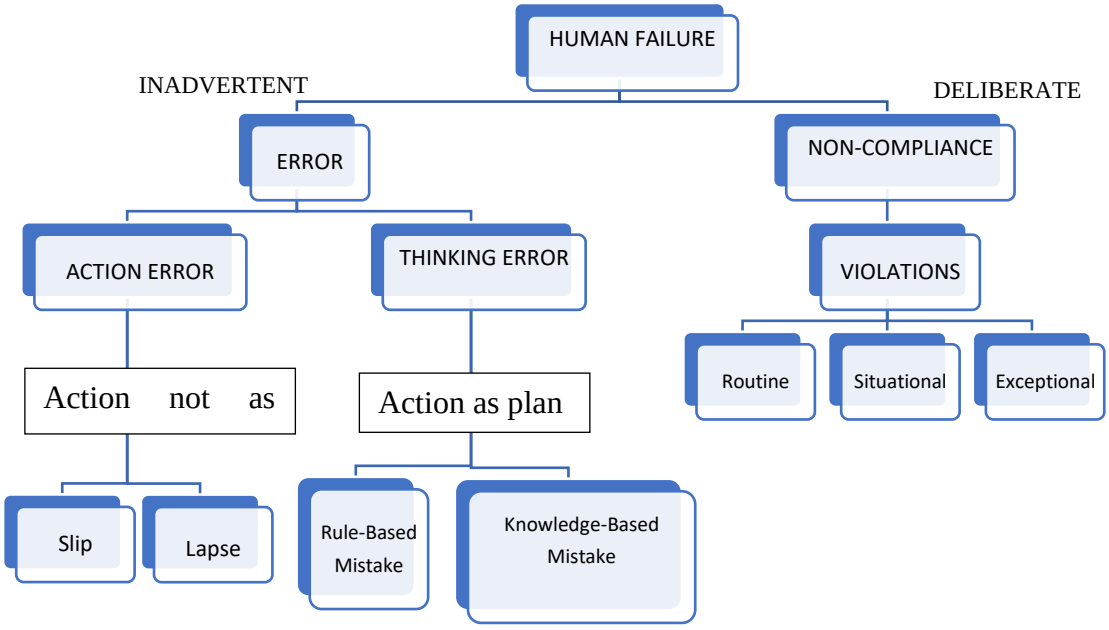
The maritime sector of the twenty-first century faces significant obstacles. For example, 25 years ago, the average cargo ship would have had a crew of 40 to 50 people (Grech & Horberry, 2002). Today, technological developments have contributed to reduced manpower, with some Very Large Crude Carrier (VLCC) crews numbering as few as 22. The technical developments have two sides. The frequency and severity of shipping incidents have decreased as a result of innovations in ship design and navigational aids. In turn, the decrease in technological failures has exposed the true extent of human error's role in accident cause.

Merchant shipping is recognized for having a high risk of fatal casualties due to organizational errors and marine disasters. Common accidents, including as collisions, allisions, and groundings, have decreased; this is due to improved technology in navigation aids. This is the outcome of improved shipping safety performance. As previously stated, the most prevalent human factors reasons were

erroneous judgment and ineffective lookout or watchkeeping, followed by inability to comply with laws.

A mention to what is human error it is of importance. Human error is not a random event. Human error refers to something having been done that was "not intended by the actor". Human error is defined as the failure to carry out a given task that may have a negative impact on people, property and equipment, disrupt scheduled activities, or both. The human error categories are slips, lapses, mistakes, and violation. Slips occur when we intend to perform one action, but instead do another. Generally, it requires attention. Lapses are defined as forgetting one or more steps in a process. Perhaps you have had the experience of going off to another room to accomplish something, only to realize you have forgotten what you meant to do. In other words, lapse is the failure which involves memory. Mistakes are understood as a faulty plan. Mistakes are the human errors in the planning process; no deliberate decision to act against a rule. A mistake can be a Rule based that following the wrong set of rules in known situations or a Competence based mistake which is in unknown or not familiar situations making wrong decisions. Some examples of mistakes are the application errors, the environment errors, wrong assumptions, poor understanding of one another's roles, mistaken belief that it is impossible to specify non-functional requirements in a verifiable form, lack of awareness of sources of requirements, not having a clear distinction between client and users, information management errors, problem-solution errors, inadequate requirements, and process syntactic errors. Last, there is the violation which is a deliberate decision to act against a rule or plan. All the above information can be seen in the Appendix No.2.

HUMAN FAILURE TYPES



Appendix No.2

Furthermore, it must be acknowledged that there are distinctions in taxonomy relating to how people might cause accidents to occur. Human mistake, human aspect, human action, and human element are some of the most commonly used phrases in the marine realm. An International Maritime Organization employs the latter (IMO). These terms have distinct meanings and are occasionally used interchangeably. This problem is well-known for causing misunderstanding and jeopardizing the quality of human reliability evaluation. For example, the human factor was previously a scientific study of how humans and robots interact. This word is exclusively used in the scientific sector; it does not address how individual, group, and organizational factors may impact performance or safety. Human factors, on the other hand, relate to environmental, organizational, and job elements, as well as human and individual traits that impact workplace behavior in ways that might affect health and safety (HSE 1999). Meanwhile, human mistakes are defined as acts that, as previously said, are assessed to vary from some form of reference

act, but can also be regarded as a departure from acceptable or desirable conduct on the part of an individual that might result in unacceptable or unpleasant effects. Furthermore, it is mentioned a distinction between human factors and human mistakes or failures in such a way that the human factors might cause the human errors. Human factors are therefore classified as latent causes of accidents, whereas mistakes are classified as active causes.

The factors that are contributing to human errors can be categorized as personal, organisational, job, and working conditional factors. The personal factors can be the reduced ability, the lack of motivation, incompetence, improper qualification stress or the fatigue. By the term organisational factors, we mean the inadequate management, the lack of resources, the lack of supervision, or leadership. Job factors are an inadequate purchasing & maintenance, tools and equipment, excessive wear and tear, and an inadequate engineering. Last but not least, working condition factors are the inhouse conditions, the ergonomics, and the weather conditions.

To summarize, the average human contribution to accidents was found to be 70.2% in records referring to human mistake and 88.9% in those referring to human component.

As it was mentioned in the chapter 2.7 regarding cases of collisions and groundings, navigators must prioritise ship's speed changes when it is in narrow waters. On the other hand, according to COLREG Rule 13 (Overtaking issues), the Australian authorities described some hazards. First of all, a lack of communication between vessels and pilots increases the potentials for an incident. Vessels altering course or speed in close to another vessel, should give a call on the radio before manoeuvre. Furthermore, the other vessel should confirm that is aware of their intentions and is safe to proceed. In addition, when overtaking, pilots should also be mindful of not reducing speed too soon after conducting the overtaking manoeuvre. To conclude, pilots and Captains must follow the requirements and obligations relevant to manoeuvring and overtaking according to the COLREGs.

As I have already mentioned in previous chapters, there are many accidents that have been caused due to the collision with another vessel. Let's go back to 1979, the

Liberian tanker "Gino" collided with the Norwegian tanker "Team Castor" on 28 April 1979 off Ushant, France. She sank a few hours after the collision with the oil remaining in the cargo tanks. According to reports, the "Gino" was carrying around 32,000 tons of carbon black feedstock when she collided, with an additional 1,650 tons of bulk oil spilt following the crash. (Liberian Registry, 1980). By the end of 1979, it was unknown how much pollution harm this occurrence would produce. The vessel Team Castor was the give-away vessel in the crossing scenario and was required to remain clear of Gino pursuant to the norms of the IMO's conventions against collisions at sea (COLREGs), as indicated in chapter 2.7. That day, several early examinations of the disaster suggested no efforts to secure the cargo off the vessel, therefore it was left within the tanks. This is an example that demonstrates that the collision was caused by human error. That accident had had no significant environmental implications, nor had it resulted in any social, political/regulatory, or economic reactions, nor had it resulted in any loss of life. It was designed as a non-hazardous event, and Gino's wreck was left to rot on the 130m deep bottom 30nm off Ushant Island, France. The concern that has arisen, however, is "could the corporation have done something to avert the accident?"

4.3 Actors in shipping that influence safety

Many factors in shipping can have an impact on safety, such as the shipbuilder, who can affect safety through vessel technical standards, or the shipowner, who selects whether technical standards will be minimum requirements. In order to profit, a shipowner can also affect safety by picking crew or a management firm for the crew and operation of the boats, as well as making decisions about operational and organizational safety rules. The Cargo Owner is another player who is accountable for the payment of transportation services and therefore for the quality and safety of the vessel's operation. Furthermore, the Cargo Owner may conduct independent assessments of the shipper's quality. Insurers also play an important role. He bears the majority of the risk on behalf of the shipper and cargo owner (i.e vessel, cargo or to a third party). He may also conduct independent assessments of the shipper's

quality. Another player is the management business, which is in charge of crewing, operating, and maintaining the vessel on behalf of the shipowner.

On the other hand, there are the flag states who control the vessels, the crew and management standards who play huge role in safety. Furthermore, the classification societies can undertake some control functions on behalf of the flag states. Also, the classification society can take the control of the technical standards of the vessels son behalf of the insurer. Last but not least, the port administration is in charge of safety in port and harbour approaches. Furthermore, the port administration may oversee maritime safety standards and, in severe instances, refuse entrance to inferior boats.

4.4 Key stakeholders' tasks in shipboard operation

4.4.1 Flag States' Role

Each and every merchant ship must register with a state of their choosing. The ship is then required to fly that state's flag and adhere to all of its laws and regulations. When deciding how to judge a case, the court takes into consideration the ship's flag.

The ship will abide by the maritime laws of the flag state nation when operating in international waters, and it will also benefit from several safeguards and preferential treatment options such as tax, certification, and security privileges.

The importance of ship registration can be seen in a number of areas, including vessel acquisitions, newbuilding deliveries, finance, leasing, and the relative importance of owners and mortgagees.

The term Flag State came to existence because of the usage of flags as the symbol of the nationality or tribe the ships belong to from the early days. The flag has come to be an officially sanctioned and very powerful symbol of the State and is the visible evidence of the nationality conferred by the State upon ships registered under its national law. The ship's flag displays the nationality of the ship, under whose laws the ship is plying in the international waters. However, it should be noted that not all vessels are registered to their Shipowners' country of origin. While the process

of registering a ship to a state other than that of the ship's owner is known as the Flag of Convenience (FOC), the country under whose registration such vessels operate is referred to as a flag state.

4.4.2 Port State Control Objective – PSC objective

The objective of the Port State Control (PSC) is first the improvement of safety and environmental protection and second the elimination of substandard ships.

4.4.2.1 Port State Control (PSC) tasks

Port State Control (PSC) is the inspection of foreign ships in national ports to verify that the condition of the ship and its equipment comply with the requirements of international regulations and that the ship is manned and operated in compliance with these rules and regional co-operation in the control of ships. A very important note must be done and refer to that the primary responsibility for ships' standards rests with the flag State - but port State control provides a "safety net" to catch substandard ships.

4.4.3 Classification Societies – Definition

A ship's registration plays a crucial role in assuring the ship's safety and security, as well as considerably contributing to the conservation and preservation of the maritime environment.

According to IMO rules, all ships must be surveyed to guarantee that the ships under their register/flag are structurally sound and adhere to design and safety requirements, as well as to provide certifications establishing a ship's seaworthiness.

The aforesaid survey and inspection are the responsibility of the vessel's Flag State. This is accomplished through the process of ship classification.

Ship classification is defined as "*the verification of the structural strength and integrity of the essential parts of a ship's hull and its appendages, as well as the authentication of the reliability and function of its propulsion and steering systems, and power generation, alongside other features and auxiliary systems built into the ship to maintain essential onboard services for safe operation* ".

As per the IMO, "The Flag State ("Administration") may "entrust the inspections and surveys either to surveyors nominated for the purpose or to organizations recognized by it" (SOLAS Chapter 1, regulation 6)

These "recognized organizations" are frequently Classification Societies in actuality.

4.4.3.1 Classification Societies' purpose

Classification societies are organizations that create and implement technical standards for ship design, building, and survey, as well as conduct surveys and inspections on board ships. Based on the accumulation of maritime knowledge and technology, the purpose of a Classification Society is to provide classification, statutory certification, and services as a Recognised Organisation acting on behalf of a flag Administration, as well as assistance to the maritime industry and regulatory bodies in the areas of maritime safety and pollution prevention.

Its objectives are as follows:

• to publish its own classification rules relating to ship design, construction, and survey;

• to apply, maintain, and update these rules and regulations;

• to verify compliance with these rules during construction and on a regular basis throughout a classed ship's life; and

• to publish a register of classed ships.

Classification societies check and survey ships at all phases of construction, development, and operation to guarantee that the ship's design, components, parts, materials, and any machinery placed on board satisfy the criteria.

The Classification Society issues a Classification Document for the inspections and surveys performed, and this certificate must be carried on board the ship at all times for inspections by Port State Controls or other authorities. A Classification Society is not controlled by any shipowner, shipyard, or other business entity involved in the commercial production, outfitting, maintenance, or operation of ships.

However, it is important to note that classification organizations have no influence over how a vessel is run and maintained between annual assessments, and so safety is dependent on good maintenance and operation by shipowners or operators, as well as the competency of seafarers on board.

Shipowners and operators must also notify their classification organization immediately if any flaws are discovered that may affect class or if any damages are caused. If classification societies become aware of certain problems, they have the authority to suspend, remove, or amend class if the requirements for class maintenance are not met.

4.4.3.2 International Association of Classification Societies – IACS

International Association of Classification Society (IACS) is a not-for-profit membership organisation of classification societies. IACS mission is to establish, review, promote and develop minimum technical requirements in relation to the design, construction, maintenance and survey of ships and other marine related facilities and, to assist international regulatory bodies and standard organisations to develop, implement and interpret statutory regulations and industry standards in ship design, construction and maintenance with a view to improving safety at sea and prevention of marine pollution (IACS 2022). It consists of 11 members.

The International Maritime Organization (IMO) and the International Labour Organization (ILO) establish the legislative criteria for shipping, taking into account

ship safety and security, as well as maritime environment preservation. IACS assists IMO by serving as the Organization's technical adviser, an independent connection that provides IACS Members with direct access to the creation of international regulatory instruments and a unique route for sharing technical information with the industry.

IACS's preparation and acceptance of Unified Interpretations (UIs) - Resolutions adopted on issues resulting from implementing IMO approved rules - further enhances worldwide and consistent application of IMO regulations. IACS also sets, examines, promotes, and develops Unified Requirements (URs) in regard to ship design, building, maintenance, and survey on subjects directly related to or covered by particular Rule requirements and classification society procedures.

To improve safety even further, IACS provides technical assistance to international and regional regulatory bodies, standards organizations, and flag State Administrations in the development, implementation, and interpretation of statutory regulations and industry standards in ship design, construction, and maintenance.

IACS examines ship safety and maritime environment preservation in the aggregate and, especially in these difficult times, works diligently to assure the global shipping industry's continuous safe operation.

In its support to authorities, notably the IMO and ILO, and industry, IACS adheres to the following values:

1. Leadership: the capacity to think ahead and collaborate with authorities and industry on ideas that successfully promote marine safety, environmental protection, and sustainability.

2. Technical knowledge: collective and individual knowledge and experience that leads to the formulation, acceptance, and execution of technical norms and regulations that reflect current practice and evolving societal expectations, hence facilitating innovation and new technologies.

3. Quality performance: Members' commitment to defining and adhering to the highest global quality standards.

4. Transparency: the ability to provide advice on the implementation of regulations, interpretations, or enhancements thereof, if a need is identified, so that practical solutions can be effectively developed in collaboration and with the support of other stakeholders, thereby increasing trust in the class. (IACS 2021)

5 Maritime Accidents: Analysis of the accidents of three bulk carriers; MV Derbyshire (1980), MV Treasure (2000), and MV Harita Bauxite (2013)

Bulk carrier accidents are not new in the history of the global maritime industry, while it is very disappointing that they still happen nowadays, whereby IMO has developed a number of regulations and conventions to safeguard safety at sea and protection of crews, passengers, cargoes, and the environment. In particular, this research project is occupied with the specific case of bulk carriers, which, as it happens with tankers and passenger ships, have been historically involved in numerous accidents, whose causes may be identified in terms of human errors, inappropriate ship designs, bad weather conditions, inappropriate cargo storage and handling, or a combination of the above. Given the above, the analysis of these bulk carries accidents have taken place, in order to provide answers to the following questions:

- What were the features of the ships that got involved in the accidents under discussion, what were the environmental conditions when the accidents took place, and what were the consequences of the accidents?
- What actually happened in these accidents?
- What were the functional errors and the basic reasons that led to the accidents?
- Where there any violations of IMO regulations and conventions identified?
- What could have been done in order for the accidents to have been prevented?
- What were the international responses to the above accidents and what are the lessons learned?

- What are the implications of such accidents for ship owners, crews, and maritime regulatory authorities?

5.1 Bulk Carrier Safety and Accidents – Background

Bulk carriers have sailed in international seas since the 1950s. In the end of 2014, more than 5,500 ship sailed and traded across international seas, highly contributing to the trade of bulk commodities worldwide, which drove growth of the global shipping industry during the turbulent conditions of the crisis that has hit the world and the global shipping industry since the second half of 2008 (UNCTAD, 2013). During the last years, bulk carriers have attracted serious interest, mainly because of the numerous –and many of them deadly- accidents they have been involved in. Bulk carriers form a very special case of ships, given that their safety is not only determined by their structure and operation, or the skills and performance of their crews, but also by the way their cargo is stored and handled (Zera, 1996). To be more specific, bulk cargoes need to be stored and handled with great care, so that the danger of shifting during a voyage, which would lead to stability problems of bulk carriers, is eliminated (Isbester, 1993).

A number of accidents have been reported in bulk carriers, with many of them having taken place during the late 1980s and the 1990s. The main reason for such accidents has been the bad technical condition of ships, due to their age and the structural damages they had suffered (Zera, 1996). The bulkhead between numbers one and two holds at the forward end of the vessel, as well as the ship's double bottom, are the most susceptible portions of a bulk carrier. If corrosion or any other type of damage occurs in such areas, it is almost certain that a ship will be subject to very intense danger of flooding and eventually sinking. According to official data provided by Lloyd’s Maritime Information Services (LMIS), 240 bulk carriers sank during the period 1980-1991, many of them because of bad weather conditions, and many of them leading to the loss of hundreds of human lives and millions of tons of cargo. Despite the reduction in the number of bulk-carrier accidents in 1992 and

1993, mainly due to the implementation of stricter safety regulations, the case was worsened again after 1994, with a 50% increase in accidents being reported, the most famous being those of Leros Strength (lost off the Norwegian coast), Albion Two (lost near the coast of Brittany), and Flare in 1998, all of them attributed to ships' structural failure. During the 2000s, the number of bulker accidents was reduced, with a 20% reduction being reported in 2012, leading to a number of 98 total losses of ships within a global context. In 2013, bulk-carrier accidents were further reduced by 43% (ibid, 2014).

5.2 The accidents of M/V Derbyshire, M/V Treasure and M/V Harita Bauxite

5.2.1 M/V Derbyshire

Following a chronological order, the first accident that this research project examines is the sinking of M/V Derbyshire. The MV Derbyshire is the largest British-registered commercial ship ever lost at sea. She was built in 1976 as an oil/bulk/ore (OBO) carrier. She was a Liverpool-registered ship owned by the local enterprise Bibby Line. More over a third of the crew on her final journey were from Liverpool. She went down in the South China Seas during Typhoon Orchid in September 1980, en route from Canada to Japan. All 44 individuals onboard were killed, including 42 crew members and two spouses. Each year in the 1980s, around 17 bulk ships were lost (Kanishka, 2019). Derbyshire's departure was notable for the following reasons:

- She was just four years old at the time.
- She was piloted by an experienced captain and crew.
- She was constructed by a British shipyard.
- Lloyds Register assigned her the highest grade for commerce ships, A1.

The Derbyshire's final trip began on July 11, 1980, when she sailed from Canada to Japan with 157,446 tons of iron ore. The vessel sank on 9th September 1980, when it was hit by Typhoon Orchid, while sailing south of Japan with iron ore cargo from

Sept Iles, Canada, to Kawasaki, Japan, putting to death her 42 crew members and two of their wives. M/V Derbyshire, registered in Liverpool, was the largest British ships ever totally lost at sea. The investigations regarding the causes of the accident were long delayed, and they concluded that the sinking occurred due to structural failure of the ship, with seawater getting into the ship and making it trim through nine ventilator openings, whose closing appliances were found to be missing. Despite rumors, crew members were not found to be responsible for the accident (Mearns, 1995). Not as usual, 'MAYDAY' distress signal was not heard. The accident and sinking of M/V Derbyshire was meant to be the reason for an even wider examination of bulk carriers' safety within an international context. Specifically, Formal Safety Assessment (FSA) studies were also utilized, in order to identify the causes of accidents and the conditions of ships, as a means of further assessing the changes that needed to further take place in the international shipping regulatory framework (George, 2005). Peter Ridyard, the father of the Derbyshire's 4th Engineer, was a skilled ship surveyor. He was sure that a ship like the Derbyshire should not have sunk, so he gathered data on the damage done to her sister ships. He sent this information to the Department of Transport (DOT) in September 1982 and again in June 1983, but received no response. Derbyshire may have been lost owing to damage in front of the bridge around frame 65, according to a draft study published by the DOT in July 1985. The Derbyshire Family Association was outraged when, in March 1986, the DOT published the study in a greatly altered version, claiming that the ship's loss may have been due to a variety of other factors. Further amendments to the particular chapter of SOLAS for bulk carriers were adopted in 2002, including the obligation of carriers to be equipped with alarm and high-level monitoring systems, in order for water ingress to be detected more easily (Dr. A. Alexopoulos, 2014). The Tyne Bridge, one of Derbyshire's five sister ships, faced heavy weather in the North Sea in March 1982, and her deck plating began to fracture slightly ahead of the bridge in a region known as frame 65. The remaining four sister ships were contacted. Each discovered identical damage in the same spot. It was discovered that Derbyshire has a similar but smaller problem in the same place. (MV Derbyshire, 2012)

5.2.2 M/V Treasure

M/V Treasure sank on 23rd June 2000, while carrying iron ore from China to Brazil. The accident happened very close to the coast of South Africa. A hole was developed in the hull of the vessel, which was the initial cause of the sinking, the main one being that the ropes that were used during towage broke, causing the vessel to drift eastward and finally sink. Except for the total loss of the ship, there was an oil spill of 1,300 tons of oil, which affected both the South African coast and about 1,200 penguins living there. Treasure was carrying 1,300 tons of bunker oil, 400 tons of which, or around 2,680 barrels, spilled into the water off the shore. Kuswag VII, the Department of Environmental Affairs oil pollution patrol aircraft, observed the pear-shaped slick at midday, measuring about 3 by 4 nautical miles. The spilt oil was the ship's own fuel oil, which was among the heaviest and most viscous commercial fuels available from petroleum. Bunker oil, commonly known as fuel oil, is what remains after distillation removes the lighter fractions. Because their boiling temperatures are too high to recover, the heaviest components in crude petroleum are not distilled. As a result, bunker oil is often darker in color, denser, and a far more dangerous pollutant than less dense oils. (gasoline, kerosene, diesel, and so on). (Los Angeles Times, 2000).

Divers verified the ship sustained structural damage while sinking, and oil globules were rising from fractures in the hull, according to South African Maritime Safety Authority (SAMSA) spokesperson Pim Zandee. It was also stated that engine room vents, which were leaking a continuous stream of oil, had been sealed off, significantly lowering the quantity of oil contaminating the surface. The diving crew kept plugging oil leaks from the wreck. The diving crew reported three days after the disaster that very little oil was flowing from the ship (Kanishka, 2019). Workers piling kelp coated with oil into trucks and sucking up pools of oil with specially equipped vacuums were two of the tactics employed to clean up the oil disaster. Furthermore, booms were utilized to prevent the oil from entering Cape Town Harbor. Bio-Matrix, a South African business, was hired to assist clean up the oil slick that was damaging the penguins' habitats. The business employed a Canadian product called Bio-Matrix, which is built of sphagnum moss qualities that are

known for their inherent capacity to absorb oil. Bio-matrix works by encapsulating oil and preventing it from absorbing water. Bio-Matrix is also useful in breaking down and digesting oil. The African penguin rescue campaign was one of the largest bird rescue projects ever conducted, owing to the efforts of numerous individuals and professional teams. The rescue attempt included cleaning and rehabilitating already-oiled birds as well as catching non-oiled birds as a precaution. Within 10 days following the Treasure leak, 20,251 oiled African penguins were admitted to the Cape Town rehabilitation clinic, with 90% of the oiled birds successfully rehabilitated and discharged. Another 19,500 non-oiled penguins were successfully moved. (Cohen, 2000)

5.2.3 M/V Harita Bauxite

Finally, M/V Harita Bauxite sank on 17th February 2013 off Cape Bolinao, North West Luzon, Philippines, while carrying nickel ore from Indonesia to China. The Philippine Coast Guard was notified at 09:20 LT on February 17 13 by a report from the Chinese bulk carrier Jin Cheng (IMO 9244271, dwt 52961), which said that the vessel rescued 10 individuals from two life rafts 22 miles off Cape Bolinao, north west Luzon, South China Sea. Ten Myanmar nationals were rescued from the 24-crew bulk ship HARITA BAUXITE, which sunk 12 miles off the coast of Bolinao on the night of February 17. A vessel in way from Obi, Indonesia, to Ningbo, China, encountered engine failure and significant rolling in bad weather. Most likely, the vessel was loaded with coal or ore, the cargo was relocated, and the vessel capsized. One of the ten recovered was already dead or died later, and two were wounded. The Coast Guard transported injured seamen to the hospital. 14 sailors are missing; search and rescue operations were underway during the day on February 17, and will begin with daybreak on February 18 (Voytenko, 2013). Except for an engine failure, in order for which to be repaired the vessel was stopped at sea, the accident is said to have been caused because of the cargo that was found to be too wet for the hull to withstand the vessel's heavy rolling in rough weather (Maritime Accident, 2013). As the Principal Surveyor of Atlantic Marine Associates, John Poulson, reports, it took less than thirty minutes for the vessel to

sink, giving no time to crew members and the Master to do nothing to save her (Poulson, 2013). The accident of the M/V Harita Bauxite (together with that of Trans Summer) was one of those that increased international attention to the very big importance of handling cargoes properly, addressing the need for the high moisture content of cargoes to be considered as a major cause of ship accidents (Dr. A. Alexopoulos, 2014).

5.3 Methodology

Secondary data was collected, in order to provide the analysis of the three accidents of the bulk carriers M/V Derbyshire, M/V Treasure and M/V Harita Bauxite. The data was mainly collected from Internet sources and websites occupied with maritime accidents, as well as informational websites covering daily news within an international context. The main limitation regarding secondary data that was used for the analysis is that the analysis relied on information published by websites and Internet sources, rather than official reports and documents, which would constitute research results more reliable. What is more, another limitation has been that it was not possible to conduct primary data, in order to gain deeper insights regarding the conditions under which the accidents were held, as well as their causes.

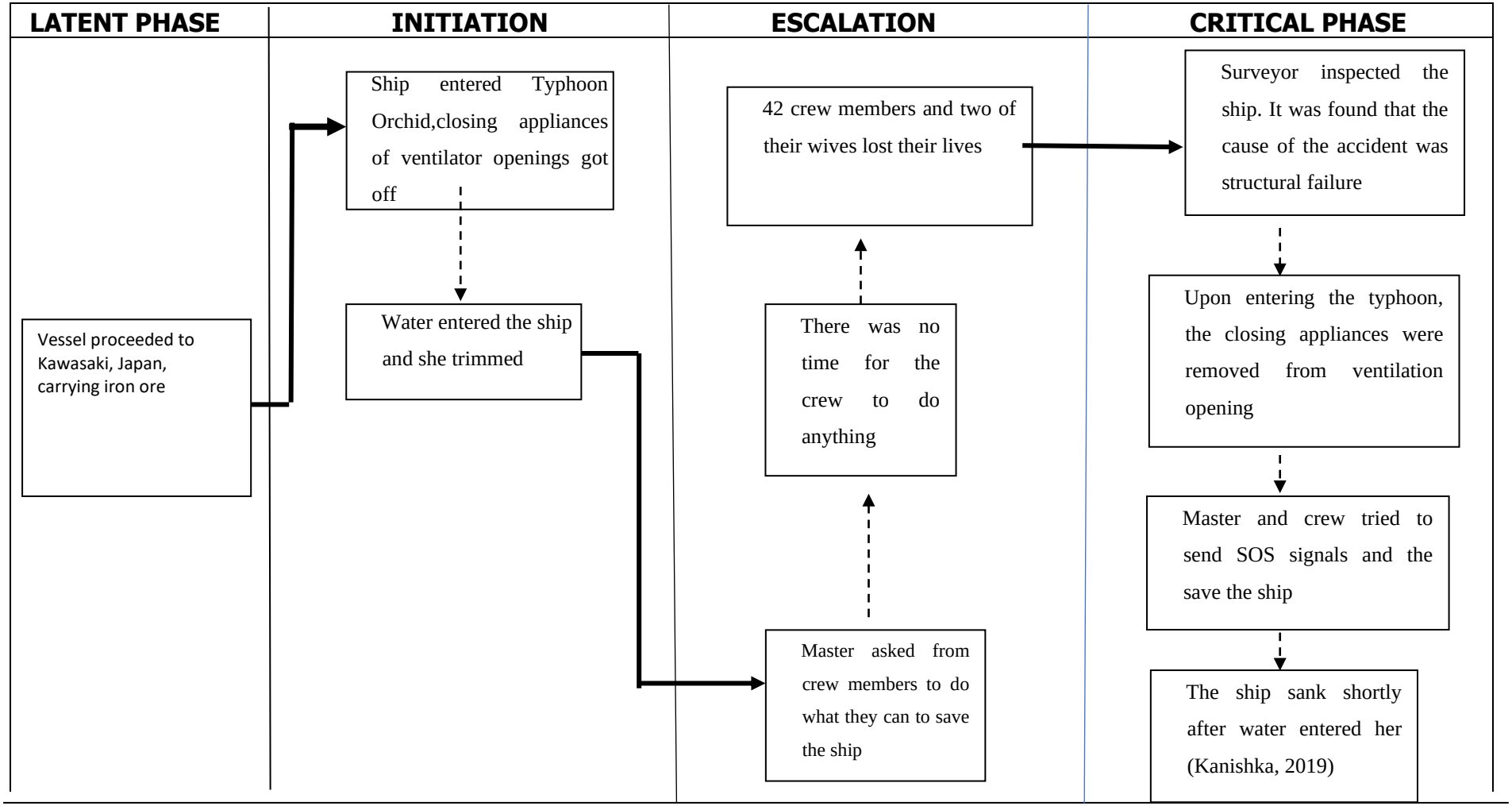
As far as data analysis is concerned, the analysis of incidents aims at offering a pragmatic analysis of ship accidents, aiming at identifying both preventive and consequence reducing measures, by relating actions or decisions to events. The particular methodology is subject to a number of specific documentation modules. More specifically, the methodology initially involves the development of a fact sheet structure, whereby vessels' name and specifications, manning information, the environmental conditions when the accidents occurred and their consequences are documented (Knoke and Yang, 2008). Then, a diagram is designed, as a means of illustrating what really happened in the accidents. Finally, a tree that breaks down the causal factors in terms of task errors, internal failure mechanisms, basic causes and potential measures is designed, in order to analyze why an accident happened and what could have been done, in order to prevent it (Trucco, 2008). Despite the

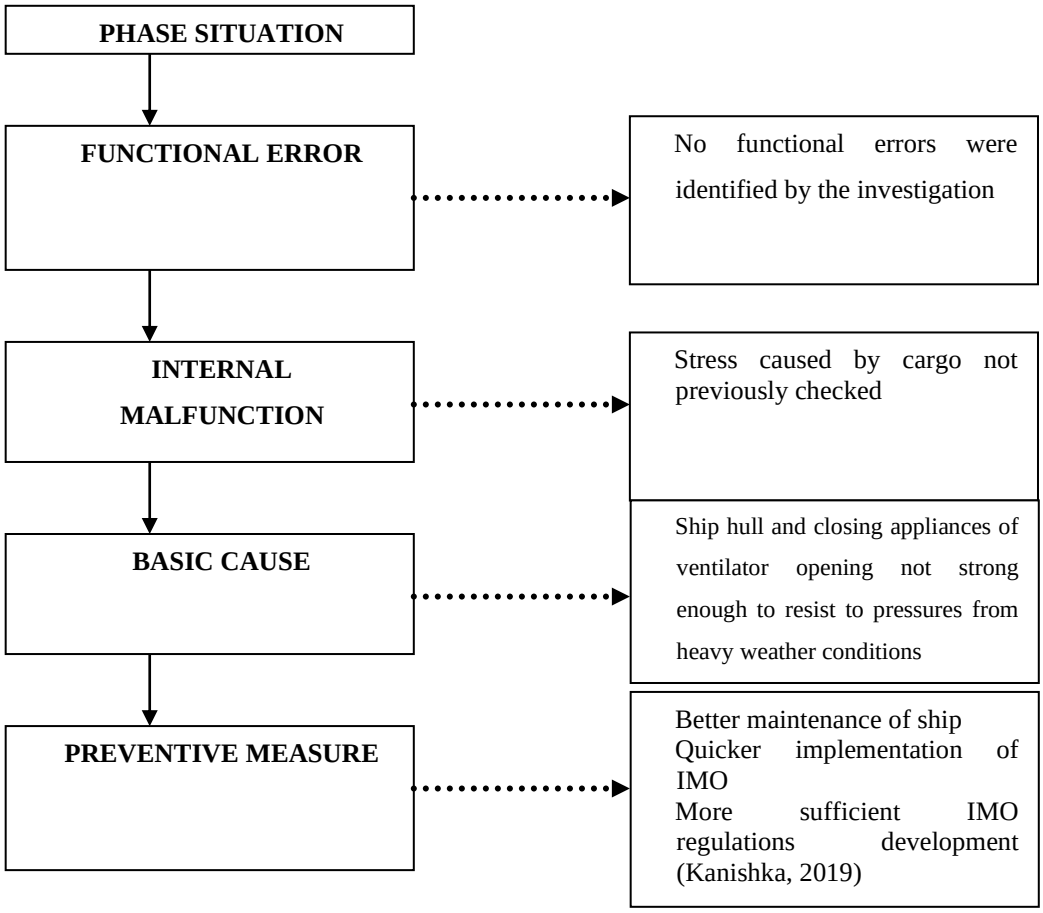
overall effectiveness of the analysis of the incidents, its main limitation is that it takes into account only ship factors, when assessing an accident, its causes, and its consequences. However, there are much more than that to analyze, especially in cases where accidents occur near ports or coast lines (Dr. A. Alexopoulos, 2014).

5.4 DATA ANALYSIS – M/V Derbyshire – M/V Treasure – M/V Harita Bauxite

- **M/V Derbyshire**

Module	Description
Identification	MV Derbyshire Y/B 1975 Liverpool Class: Bridge-class combination carrier Sinking, loss of 44 lives due to structural failure in bad weather conditions Seawater got into the ship, she trimmed and sank South of Japan
Vessel	DWT: 169,044 NRT: 67,429 Port of Liverpool UK Flag IMO number: 7343805 Bibby Line
Environmental conditions	Bad weather conditions, Typhoon Orchid
Manning	42 crew members
Consequences	Ship, cargo, and all crew members lost Wider examination of bulk carriers' safety Introduction of Formal Safety Assessment (FSA) Further amendments to SOLAS(Kanishka, 2019)

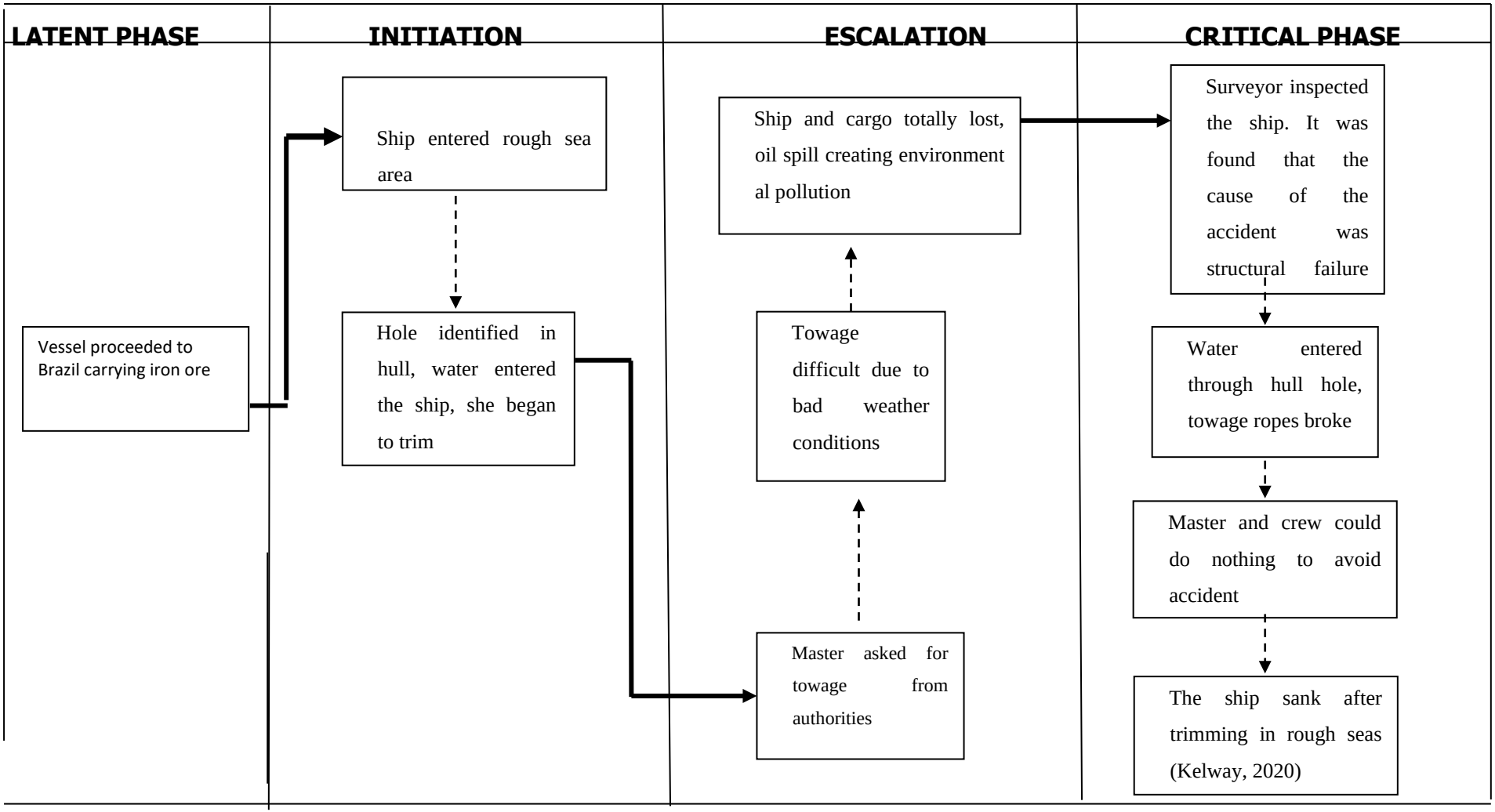

LATENT PHASE
INITIATION
ESCALATION
CRITICAL PHASE
Vessel proceeded to Kawasaki, Japan, carrying iron ore
Ship entered Typhoon Orchid,closing appliances of ventilator openings got off
Water entered the ship and she trimmed
Master asked from crew members to do what they can to save the ship
There was no time for the crew to do anything
42 crew members and two of their wives lost their lives
Surveyor inspected the ship. It was found that the cause of the accident was structural failure
Upon entering the typhoon, the closing appliances were removed from ventilation opening
Master and crew tried to send SOS signals and the save the ship
The ship sank shortly after water entered her (Kanishka, 2019)

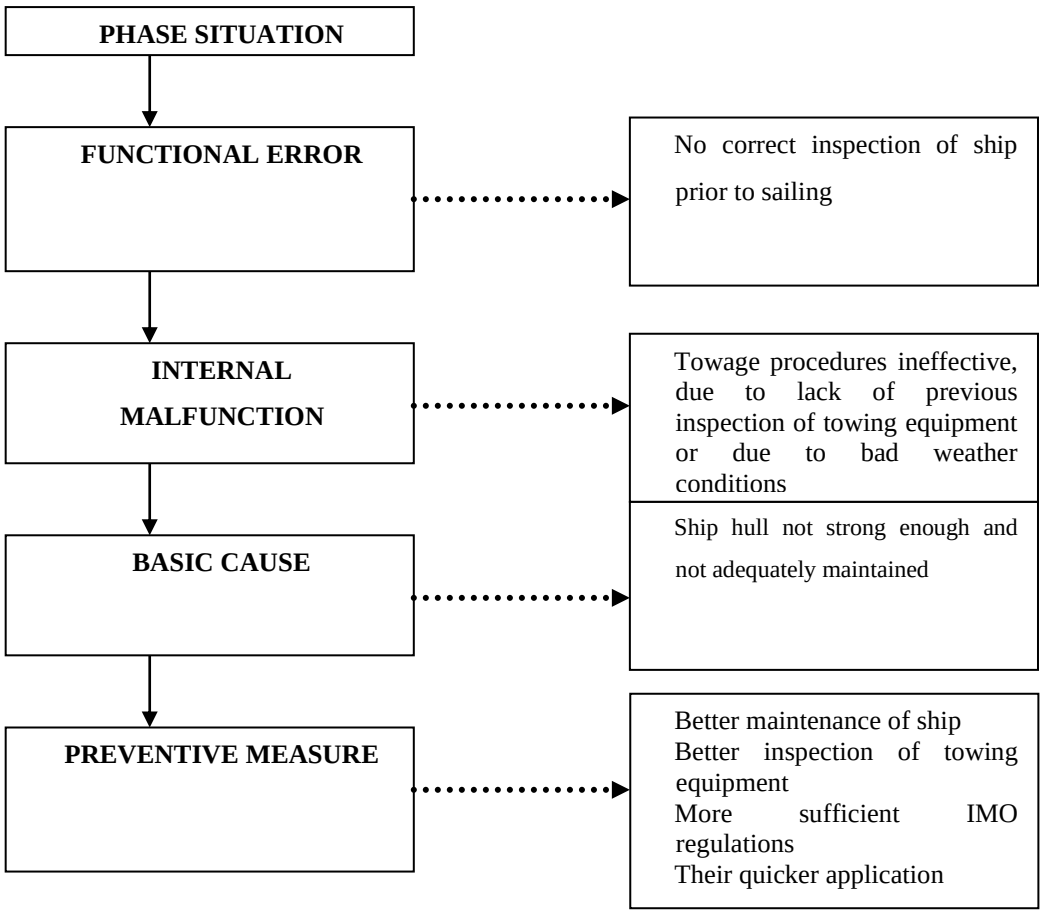


According to the above analysis, it is evident that the MV Derbyshire accident occurred because of the structural failure of the ship to withstand the bad weather conditions she went through. For the limited secondary data available for the accident, and the results of the investigation that was held, it is evident that the crew could what it could to save the ship and her cargo, but the structural condition of the ship did not allow for an effective saving process of the ship. At the same time, there seems not to have been any violations of IMO conventions and regulations, as this is also evident by the reactions after the accident, which concentrated on how to improve the strength of vessels in general. This shows that regulations up to that moment were not sufficient to anticipate all dangers that bulk carriers could be involved in. If they were more sufficient, if they were implemented applied more quickly, and if the vessel had been better maintained, the accident would have probably been prevented. (Kanishka, 2019)

- **MV Treasure**

Module	Description
Identification	MV Treasure Y/B 1982 Nagasaki Class: Bulk ore carrier Sinking, total loss of ship and cargo in heavy weather conditions Hole in hull identified, towing ropes broke South African coast
Vessel	DWT: 66,413 Panama Flag IMO number: 8011251 Universal Pearls SA (Good Faith Shipping Co SA), Panama
Environmental conditions	Bad weather conditions, rough seas
Manning	Master and crew
Consequences	Ship and cargo totally lost Oil spill causing environmental pollution Port authorities blamed for inadequate towage procedures (Kelway, 2020)


LATENT PHASE
INITIATION
ESCALATION
CRITICAL PHASE
Vessel proceeded to Brazil carrying iron ore
Ship entered rough sea area
Hole identified in hull, water entered the ship, she began to trim
Master asked for towage from authorities
Towage difficult due to bad weather conditions
Ship and cargo totally lost, oil spill creating environment al pollution
Surveyor inspected the ship. It was found that the cause of the accident was structural failure
Water entered through hull hole, towage ropes broke
Master and crew could do nothing to avoid accident
The ship sank after trimming in rough seas (Kelway, 2020)

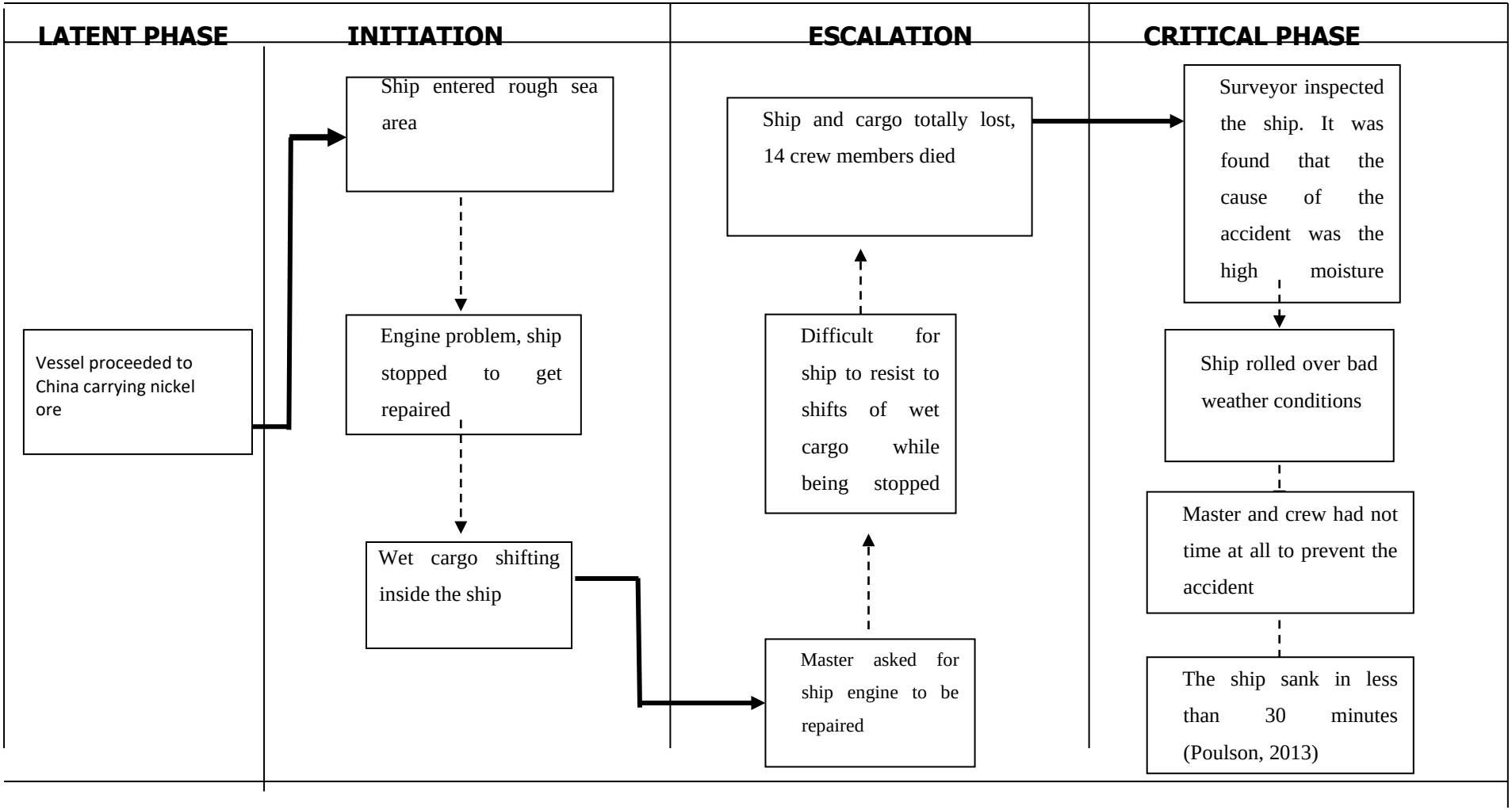


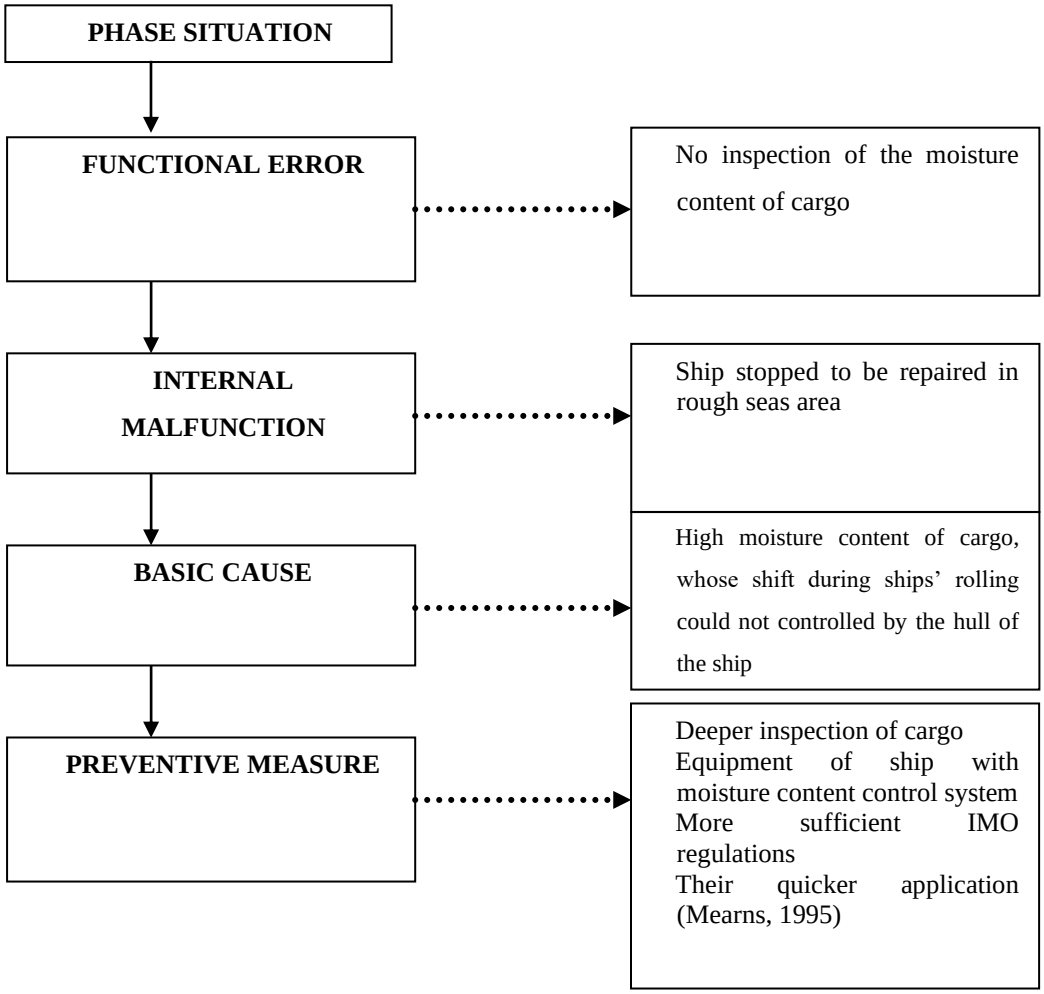
According to the analysis held for the accident of MV Treasure, the accident was caused because of the hole that was identified in the hull of the ship, as well as the unsuccessful towage procedures. Although no human lives were lost, the accident was very serious, because it led to the total loss of the ship and her cargo, while oil spill also occurred, thereby causing environmental pollution. Due to the limited data provided, it is not sure whether SOLAS was violated in terms of improvements in the structure of ship. It is clear though that when the accident of the ship occurred, it was difficult for any new amendments of SOLAS to have been applied. What is more, although the ship sailed in rough seas when towage operations took place, it is certain that the towing ropes were not adequately maintained. As such, port authorities could also be blamed for the accident, together with the ship owner, the latter for not having properly maintained her ship, in order to prevent the hole in the hull. However, even this last issue is difficult to be verified, given the limited secondary data available for this accident. What is sure, though, is that it seemed

that at the time the accident what happened, IMO had not done what it took to prevent bulk carrier accidents attributed to ships' structure (Kelway, 2020).

- **M/V Harita Bauxite**

Module	Description
Identification	Harita Bauxite Y/B 1983 Panama Class: Handymax Bulk ore carrier Total loss of ship and cargo, 14 crew members lost Engine problem, cargo too wet for the hull to withstand the vessel's heavy rolling in rough weather Cape Bolinao, North West Luzon, Philippines (Poulson, 2013)
Vessel	DWT: 48,891 Panama Flag IMO number: 8103664
Environmental conditions	Bad weather conditions, rough seas
Manning	Master and crew
Consequences	Ship and cargo totally lost 14 crew members died Increased international attention to handling cargoes properly High moisture content of cargoes named as a major cause of ship accidents (Mearns, 1995)


LATENT PHASE
INITIATION
ESCALATION
CRITICAL PHASE
Vessel proceeded to China carrying nickel ore
Ship entered rough sea area
Engine problem, ship stopped to get repaired
Wet cargo shifting inside the ship
Master asked for ship engine to be repaired
Difficult for ship to resist to shifts of wet cargo while being stopped
Ship and cargo totally lost, 14 crew members died
Surveyor inspected the ship. It was found that the cause of the accident was the high moisture
Ship rolled over bad weather conditions
Master and crew had not time at all to prevent the accident
The ship sank in less than 30 minutes (Poulson, 2013)



The accident of M/V Harita Bauxite is like those previously analyzed in that the hull of the ship was not strong enough to withstand shifts of cargo. However, there are more issues identified, with the most important being the main cause of the accident, in example the high moisture content of the cargo. Although IMO regulations up to the point the accident happened stressed and particularly the SOLAS Convention and its amendments stressed the need for better handling of cargoes, it seems that the shipping company, the Master and the crew of the ship were not adequately informed about the danger the ships would be put in, due to the high moisture content of cargo. Of course, given the international reactions regarding this accident, it seems that international regulations were also not sufficient enough to contribute to the prevention of such types of accidents. Next to the above, it is also uncertain whether the master and the crew of the ship were

trained enough, so as to identify whether the decision to stop and repair the ship in rough sea conditions was an optimal one, thereby questioning whether the crew of the ship was consistent with the provisions of the SCTW convention. What is evident from the analysis is that if IMO regulations regarding the required condition of bulk cargoes were more specific, if IMO Conventions were applied more quickly, if the shipping company and its officers were more aware of the required condition of the cargo, and if the ship was equipped with the appropriate systems to control the moisture content of the cargo, the tragedy would have probably been prevented. (Mearns, 1995)

6. Conclusion

"*Shipping is perhaps the most international of all the world's great industries and one of the most dangerous."* (IMO, 2002)

Although the shipping sector has a very strong safety record, marine mishaps have a significant potential for disaster. The social organization of the crew aboard, economic pressure, the structure of the industry, insurance, and the problems in international regulation are thought to contribute to the system's error-prone nature. As it was mentioned in the previous chapters, organizations have adopted a lot of conventions in order to secure safety and prevent accidents. Although automation and new technologies have been adopted by shipping industry over the past decades successfully, many reports state that human mistake is responsible for 75-96% of all maritime fatalities. People make mistakes.

Prevention of accidents is a critical aspect in the shipping industry. In this business, numerous human elements influence safety: weariness, automation, situation awareness, communication, decision making, teamwork, and health and stress. These difficulties were investigated within the context of a theory that suggested that while each of these variables individually might contribute to an accident's cause, the safety climate on board a ship will also have a role on whether or not a person chooses to act safely.

Many demanding characteristics of sailing include employees' inability to leave the jobsite, adverse weather conditions, extended times away from home, and workplace mobility. Some changes these are irreversible and reflect the nature of the transportation sector. However, it is feasible to adjust, supplement, and introduce new tactics or treatments to possibly lessen the impact of these elements on the individual seafarer's health and wellbeing.

When a situation exists that creates loss of life, injury and suffering; when its cure has been demonstrated to be practical; and when all are agreed that something can and should be done about it, it is time to stop talking, roll up the sleeves and go to work.

Although human error is the cause of many accidents yet even the accident-prone can have fewer accidents if the environment in which they work is reasonably safe. Can anyone imagine if all these accidents/incidents were happened nowadays what will be the global outcry? When transporting commodities that are hazardous to the environment, human life, or property, shipping firms should use extreme caution. Some proactive precautions that the shipping sector must take include on-board safety practices and crew training for both everyday operations on board and emergency situations, hire expertise personnel to support the activities back to the office. Even if all the above measures are costly, it must be taken into consideration if we want to support the phrase “Safety First”. And if you think safety is expensive, try an accident.

The “Risk Assessment” is the answer regarding safety because if you reduce the risk, safety is being improved by preventing future comparable accidents. The difficult point is to identify the risk and to evaluate. To conclude, this is the reason that even though the shipping industry has created a strong well-structured safety and security framework, accidents still occur.

Annex I – Key IMO Conventions,

Key IMO Conventions

- International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended
- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997 (MARPOL)
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) as amended, including the 1995 and 2010 Manila Amendments

Other conventions relating to maritime safety and security and ship/port interface

- Convention on Facilitation of International Maritime Traffic (FAL), 1965
- International Convention on Load Lines (LL), 1966
- International Convention on Maritime Search and Rescue (SAR), 1979
- Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation (SUA), 1988, and Protocol for the Suppression of Unlawful Acts Against the Safety of Fixed Platforms located on the Continental Shelf (and the 2005 Protocols)
- International Convention for Safe Containers (CSC), 1972
- Convention on the International Maritime Satellite Organization (IMSO C), 1976
- The Torremolinos International Convention for the Safety of Fishing Vessels (SFV), 1977, superseded by the 1993 Torremolinos Protocol; Cape Town Agreement of 2012 on the Implementation of the Provisions of the 1993 Protocol relating to the Torremolinos International Convention for the Safety of Fishing Vessels
- International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F), 1995

- Special Trade Passenger Ships Agreement (STP), 1971 and Protocol on Space Requirements for Special Trade Passenger Ships, 1973

Other conventions relating to prevention of marine pollution

- International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (INTERVENTION), 1969
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other

  Matter (LC), 1972 (and the 1996 London Protocol)
- International Convention on Oil Pollution Preparedness, Response and Cohttp://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-on-Oil-Pollution-Preparedness,-Response-and-Co-operation-(OPRC).aspxoperation (OPRC), 1990
- Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances, 2000 (OPRC-HNS Protocol)
- International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS), 2001
- International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004
- The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009

Conventions covering liability and compensation

- International Convention on Civil Liability for Oil Pollution Damage (CLC), 1969
- 1992 Protocol to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND 1992)
- Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material (NUCLEAR), 1971
- Athens Convention relating to the Carriage of Passengers and their Luggage by Sea (PAL), 1974

- Convention on Limitation of Liability for Maritime Claims (LLMC), 1976
- International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (HNS), 1996 (and its 2010 Protocol)
- International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001
- Nairobi International Convention on the Removal of Wrecks, 2007

Other subjects

- International Convention on Tonnage Measurement of Ships (TONNAGE), 1969

- International Convention on Salvage (SALVAGE), 1989

Convention establishing IMO

- Convention on the International Maritime Organization

Annex II – MLC Regulations

Minimum Requirements for seafarers to work on ships

4.1. Minimum age
4.2. Medical certificate
4.3. Training and certifications
4.4. Recruitment and placement

1. Conditions of Employment

1.1. Seafarer's Employment Agreement
1.2. Wages
1.3. Hours of rest and hours of work
1.4. Entitlement to leave
1.5. Repatriation
1.6. Seafarer compensation for ship's loss or foundering
1.7. Manning levels
1.8. Career and skill development and opportunities for seafarer's employment

2. Accommodation, Recreation, Food and Catering

2.1. Accommodation and recreational facilities
2.2. Food and catering

3. Health Protection, Medical Care, Welfare and Social Security Protection

3.1. Medical care on board and ashore
3.2. Ship owner's liability
3.3. Health and safety protection and accident prevention
3.4. Access to shore-based welfare facilities
3.5. Social Security

4. Compliance and Enforcement

4.1. Flag state responsibility
4.2. Authorization of recognized organizations
4.3. Maritime Labour certificate and declaration of maritime Labour compliance
4.4. Inspection and enforcement
4.5. On board compliance procedures
4.6. Port State Responsibilities
4.7. Marine Casualties
4.8. Labour Supplying responsibilities

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