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WORLD MARITIME UNIVERSITY

Shanghai, China



**Comparison of Laws and Regulations Concerning
Human Factors in Maritime Accidents**

BY

XU YIFANG

China

A research paper submitted to the World Maritime University in partial fulfillments of
the requirements for the award the degree of

MASTER OF SCIENCE

ITL

2018

Declaration

I certify that all the material in this research paper that is not my own work has been identified, and that no materials are included for which a degree has previously been conferred on me.

The contents of this research paper reflect my own personal views, and are not necessarily endorsed by the University.

2018-04-05

Supervised by

Professor SHI XIN

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Acknowledgement

First and foremost I want to express my deepest appreciation to Prof. SHI Xin and Prof. GU WeiHong , who are in charge of this program on behalf of Shanghai Maritime University for their great and continuous contribution and support during my master study.

I feel grateful to my supervisor Prof. SHI Xin for giving me immediate response, precise guidance and constructive suggestions to help me alongside my research paper.

Finally, my sincere thanks to my friend Mr.XU Dong from The ShangHai Maritime University for providing me valuable suggestions to review literature.

Abstracts

Title of Research paper: **Comparison of Laws and Regulations Concerning Human Factors in Maritime Accidents**

Degree: **M.Sc.**

With the development of the world economy, science and technology, the rapid development of the shipping industry has been brought about. Then the growing number of ships and the increasing of the shipload will inevitably lead to the decline of maritime safety. For a long time, frequent maritime accidents have not only endangered the lives of crew members and the shipping companies, but also the world economy. In the past, the maritime community has always focus on technical issues when analysis maritime accidents, such as shipbuilding and equipment deployment. Therefore, They generally emphasized the safety of navigation on the equipment and machinery through its good performance. However, in recent years, So many maritime accident caused by human factors have caused the World's attention. So the control of human factors is the most important issue which is needed to be solved in order to improve the maritime safety. The first step to achieve that is to establish and improve relevant laws and regulations. Based on the analysis of relevant international conventions and the regulations of maritime safety in China, this paper attempts to analyze the similarities and differences between this two Legal System of the requirements for human factors in maritime accidents, the degree of stringency, and the compliance of Chinese domestic laws with international conventions. Finally, I hope that I can put forward valuable opinions on relevant legislation.

KEYWORDS: Human Factors, Maritime Accidents, Legal Systems, Comparison

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List of Abbreviations

SOLAS	International Convention for Safety of Life at Sea
ISM	The International Management Code for the Safe Operation of Ships and for Pollution Prevention
NSM	The National Management Code for the Safe Operation of Ships and for Pollution Prevention
FFS	International Fire Safety System Rules
ISPS	International Ship and Port Facility Security Code
STCW	International Convention on Standards of Training; Certification and Watchkeeping for Seafarers
MLC	Maritime Labour Convention
BWM	International Convention for the Control and Management of Ships Ballast Water and Sediments
IMO	International Maritime Organization
IACS	International Association of Classification Societies
WP/HE	Human Factors Working Group

Chapter 1 Introduction

1.1 Background

China is a major maritime country. The oceanic issue concerns the fundamental interests of the country. In recent years, frequent accidents at sea have severely constrained the development of China's marine industry. Research shows that 80% of marine accidents are caused by human errors, and human errors are caused by various factors. Since Heinrich first proposed the theory in the 1930s that the main cause of accidents was human factors, some shipping companies and scholars successively turned their attention to human factors and studied the human factors in maritime accidents. These studies are mainly devoted to the quantitative statistics and analysis of accidents at sea, extract valuable information about human factors. They are committed to studying the status of human factors in the maritime safety system and identifying factors that influence human error. The quantification analysis of human factors began in the early 1950s, and maritime agencies from various countries truly conducted research on the influence of human factors on maritime security from the middle of the 1980s. Marine traffic accidents not only seriously endanger the lives and property of people on board, but also pose a serious threat to the surrounding environment. The key to avoiding or reducing marine accidents is to reduce the occurrence of these factors. The first step to achieve this goal is to establish and improve relevant laws and regulations. In view of this, this article will focus on human errors in the field of maritime safety, and analyze the International Conventions related to human factors one by one, and describe how they deal with the human factors of marine accidents. Comparing with the relevant Chinese regulations of maritime transport to analyze their advantages and disadvantages, and make valuable suggestions to the Chinese legislative work.

1.2 Related Concepts

1.2.1 Human Factors and Human Errors

The special nature of the maritime environment determines its enormous risk. In the process of shipping, unsafe factors mainly include insecurity factors and human unsafe behavior. There is a certain degree of stability in the insecure state of things, which can be discovered through security inspections in time. People's unsafe behavior is changing with time and environment. They are affected by many factors such as technical level, safety knowledge, physical condition, mental state, family environment and social environment. In addition, human behavior is flexible that causes people to make mistakes when dealing with simple things. Therefore, human unsafe behavior is more difficult to predict, prevent and control than the insecurity of the material. Statistics and analysis of a large number of accidents show that: About 80% of accidents and damages with pollution are caused by human factors, and the proportion of human factors in maritime accidents which hit rocks, fires, and explosions is as high as 90%. Security is a vague concept. The fact that the ship transportation system does not cause accidents does not mean that the system is safe. The ship with no accidents does not mean that people's actions are safe. The purpose of human factors research is to discover hidden dangers.

1.2.2 Concept of Human Factors

Human factor refers to the adverse effect of human behavior on the correct or successful performance of the system when a person completes a specific task. Human factors involve a broad research area such as psychology, behavioral science, management, system security, and ergonomics. Individuals are far more than just a production factor. In any organization, there is a person-to-person relationship between people and things, but the relationship between people and things ultimately manifests itself as a person-to-person relationship. The distribution of any resources is also people-centered. Since people not only have physical needs but also spiritual needs, social and cultural backgrounds, historical traditions, social systems, human

values, human material interests, human mental states, human qualities, and human beliefs will all affect human activity. Due to the influence of various factors above, in the process of completing a specific task in a certain system, if a person has enough comprehensive ability to deal with all kinds of situations that appear in the system, it becomes a key factor to complete the task safely. The negative impact of human factors on security is ultimately reflected by human errors.

1.2.3 Concept of Human Error

Human error refers to the fact that the awareness, judgment, behavior, etc. of an operator in a particular system are incorrect in the process of completing the task, resulting in failure to make an operation that suits the circumstances at the time and does not achieve the purpose. As a result, human behavior does not have enough capacity to deal with the current situation and the malfunction of the system operation occurs. An accident may occur in a maritime security system. It can also be said that it is due to the operator's wrong decisions and actions, leading to system failure, reduced efficiency, or impaired performance. To understand the nature of human error, we must first understand why people make mistakes. From the point of view of behavior, the root cause of human error is that the person's consciousness or behavior fails to achieve the intended purpose for some reason. The occurrence of human error has certain rules. Understanding laws and taking appropriate preventive measures can greatly reduce the number of mistakes. Knowledge and mistakes come from the same area of consciousness. Only the final result can distinguish the two. To study human errors, we must first study human consciousness and behavior. In other words, mistakes fall within the category of behavior.

1.2.4 Behavior and Level of Consciousness

According to the law of ideology, the occurrence of human behavior is at different levels of consciousness. There are quite a few similar models of behavioral level of

consciousness rules. The research of human error has evolved from some of these models. Usually, it is divided into unconscious and conscious behaviors. On the one hand, the execution of some behaviors is a customary behavior, which does not include other ideological consciousness. On the other hand, some behaviors require existence of conscious. The theory holds that the task execution process is also a learning process. Because the same task is often performed, the behavior that is dominated by consciousness can be stably transformed into a mechanical behavior. The pattern of behavior and consciousness is transformed into fixed mechanical behavior through repeated operations. This transformation takes some time. Through the training and learning process, as the execution ability of the behavior and the familiarity with the execution increase, the behavior will be translated into a low-level behavior.

1.3 Method of Investigation of Human Factors

In order to eliminate and reduce the negative impact of human factors on maritime safety, IMO and related organizations have conducted extensive research and developed a series of rules and standards, such as *ISM Code*, *Fatigue Prevention Measures* and so on. However, human factors are the most elastic, adaptable and vulnerable parts of the ship transportation system. As the foundation of human factors research, the key information of human factors is often ignored in maritime investigation, due to the deviation of understanding and classification. In response to this problem, IMO passed *A.884(2.1) Guidelines for Investigation of Human Factors in Maritime Affairs* in 1999 to provide maritime investigators with methods and procedures for investigation of human factors in maritime affairs.

In maritime analysis and prevention, maritime investigation plays an important role in collecting and feeding back maritime information. Its purpose is not to determine the responsibility of the parties, but to investigate the actual circumstances of the accident, external conditions, subjective or objective cause, the main or secondary cause, the

direct or indirect cause, and the contributing factors of the accident, so as to propose safety recommendations in all directions to prevent the recurrence of similar accidents.

1.4 Survey of Human Factors

In 1997, IMO adopted Resolution *A.849(20) Maritime Investigation Rules.(Code for the Investigation of Marine Casualties and Incidents)*, which seeks to promote a unified approach and cooperation among States Parties in maritime investigations. However, the investigation and analysis of human factors by this rule are not enough. At the 21st Congress, the IMO revised *Resolution A.849(20)* and added the *Guidelines for the Investigation Of Human Factors in Marine Casualties and Incidents* as an appendix. The guide provides maritime investigators with maneuverable advice on the systematic investigation of human factors in order to avoid prejudice in investigating the accident simply focusing on technical factors.

The guide mainly proposes procedures and technical methods for systematic investigation of human factors, including information collection, event sequencing, identification of unsafe behavior (decision making) and insecure conditions, fault or violation identification, potential factor identification, potential safety issues and how to identify and propose safety actions, etc. In addition, the qualifications and training of reporting procedures and investigators are also required

The survey procedures and technical methods provided by the guide can help investigators to classify and identify human factors in maritime affairs, avoid omissions and confusion, and thus identify human factors and other contributing factors leading to the occurrence of maritime affairs.

1.5 Research in Basic Causes of Maritime Accident

In December 2000, the IMO Maritime Safety Committee and the Marine Environment Protection Committee adopted the *MSC/Cir.953* and *HEPC/Cir.352* Circulars at their 72nd and 44th and 45th General Assembly respectively, requiring member states to adopt a unified maritime report. In its Appendix 2, *Information Contained in Special Major Accidents and Major Accidents*. It is mentioned that human factors are a complex and multidimensional issue affecting maritime safety and marine environmental protection. It covers all aspects of the activities of the crew, the onshore management agency of the ship, the competent authority, the classification society, the shipyard, the legislators and other parties. After the occurrence of maritime affairs, in order to formulate effective preventive measures, it is necessary to make an extensive and in-depth understanding of the human factors involved in the causes of the accident. This understanding comes from an in-depth investigation of the accident and the contributing factors to the accident and a systematic analysis of the accident chain. In the circular letter, the causes of the accident were divided into: internal causes (related to the ship where the accident occurred), external causes (other than the ship), and unexplained causes. Internal causes include five types of irregular operations or mistakes by crew members/engineers, structural defects in ships, technical defects in mechanical equipment (including design mistakes), and cargo carried on ships. External reasons include other ships (mis-operation, etc.), environment, navigation infrastructure, crimes, and others. In terms of human factors, the circular divided the types of deviations and errors and classified the fundamental causes of the accident.

Chapter 2 Literature Review

Human factors are the main cause of maritime accidents and have been recognized by the shipping industry. In this regard, the British Shipowners' P & I Association, the Japan Coast Guard Agency, the Bremen Shipping Economy Institute of Germany, and the Australian Department of Transportation have all conducted special accident

statistics and thematic studies, even though the statistics and data sources of various departments and countries which may have different perspectives, but in terms of accidents caused by human factors, the conclusions are roughly the same. Human factors are the main factors causing maritime accidents. It is difficult to achieve the goal of reducing the occurrence of maritime accidents by relying only on the improvement of equipment and navigational conditions of ships. From the perspective of cost-effectiveness, too much investment cannot be accepted by ship owners. Therefore, Human factors can be further studied, seafarers' certification standards can be improved, and management can be strengthened. With appropriate assessments and models of relevant crew behaviors, human error risk prediction can be achieved, and potential hazards can be identified in advance and preventive measures can be taken to reduce the incidence of maritime accidents. In the past, the shipping industry has been focusing on the research of maritime traffic safety in terms of shipbuilding and equipment configuration and other technical issues, it is generally emphasized to ensure safety through the good performance of equipment and machinery. However, in recent years, major maritime disasters caused by human errors have attracted worldwide attention, so the world attaches great importance to human factors research. The emphasis of maritime safety research has also shifted from "focus on technology" to "emphasis on people."

2.1 The Status of Research on Human Factors in Maritime Safety

At the 20th meeting on January 27, 1997, IMO adopted the *Resolution A850 (20) The IMO's scope, principles, and objectives related to human factors*, and Appendix *The Role, Principles, and Objectives of Human Factors*. The International Association of Classification Societies (IACS) has established the Human Factors Working Group (WP/HE), which aims to study the principle of how to apply ergonomic principles to reduce potential human factors based on ship surveys. A series of rules and guidelines have been formulated to guide the various classification societies in formulating inspection rules and performing inspections in order to ensure the safety of ships and

human lives and to protect the marine ecological environment.

2.1.1 Research on Human Physiological and Psychological Characteristics

Through the comparison of the competent effects of mariners with different experiences, the size of the error may be due to the person's experience, the length of the marine work experience, and the different physiological conditions of the person. There are some different conclusions: RGCurtis of London Polytechnic Institute used a simulation experiment to perform statistical analysis on the reaction time. Under the constraints of different physiological conditions, the time required to change the state of the ship. The natural conditions, physical conditions, working pressures, the fatigue of seafarers, the behaviour of their working and living environment are all included as potential risk factors. Although there are no statistics on ship accidents caused by these factors in the report, they are clearly explained. Factors must be considered in shipbuilding and ship operation management

2.2 The Classification of Human Factors

International Association of Classification Societies (IACS) Human Factors Working Group (HE) divides human factors into Five aspects:

Table 1 -- Classifications of human factors

Technology	Including design, ergonomics, manufacturing/structure, installation, certification, maintenance, repairing, updating, etc.
Staffing	Including qualifications, crew size, crew composition, cultural background, working language, and competency status Etc.),
Training	Including basic safety training, expanded safety training, skills, familiarization, personal land training, etc.
Management	Including safety awareness, policies, motivation, communication links, responsibilities, competent rights, work plans, accident plans, emergency responses, manuals, procedures, work methods, checklists, education, training, etc.
Environment	Including toxic substances, personal protection, injuries, working hours, rest periods, fatigue, living conditions, human-machine interfaces, etc.

The above five aspects Distributed in the following six areas:

Table 2 -- Division of human factors in the shipping sector

Shipbuilding	Including design institutes, equipment manufacturers and suppliers, ships manufacturers
Marine industry management	Including classification societies, maritime bureaus;
Ship operations management	Including shipowners, agents, shippers
Ship protection	Including spare parts supply and repair
Personnel training	Including training institutes for shipping institutions, enterprises and institutions
Related departments	Including ports, customs, commodity inspection, sanitation, insurance

The contents related to ship inspection are mainly related to the technical and environmental aspects. Among these related items, the current ship inspection is only an inspection of whether the equipment or product meets the requirements of the

“standard” for this type of project. The human factors involved in this type of project have not been examined, such as whether the product or equipment was designed to meet the relevant requirements of ergonomics; whether the structure of the equipment is suitable for the personnel to perform maintenance and repair; Whether the key management equipment considers the “human” to be able to exert their initiative most efficiently.

Chapter 3 International Convention on Human Factors of Maritime Accidents

3.1 The Importance of the International Convention

International conventions are laws that all member states that join the United Nations should abide by. Their scope of application covers the entire world. Both international law and domestic law are laws that regulate the relationship between individuals. They both belong to the same legal system. International law is higher than domestic law. Domestic law serves the domestic policy of a country. International law serves the foreign policy of a country. Diplomacy is the continuation of internal affairs. For a country, international law and domestic law should be consistent. When a country formulates a domestic law, it must not ignore the rules and regulations that all countries generally comply with, and its international obligations should be fully reflected in domestic laws. When participating in the formulation of international law, the state must not ignore its own sovereignty and the provisions of the current domestic laws. It must also try to penetrate the principles, spirit and even the basic contents of the current domestic laws into international law. Therefore, in the process of formulating domestic laws and participating in the formulation of international laws, the state will coordinate the two organically and avoid conflicts or contradictions as much as possible. Some principles of international law require domestic laws to make specific provisions. If domestic laws do not have such

provisions, the provisions of these principles of international law will lose their meaning. Any country will not be subject to the provisions of domestic law as a reason for refusing to perform its obligations under international law.

As the IMO has done research on maritime safety issues for many years, the relevant legislation is also very comprehensive and complete. It can be said that the IMO Convention is a template for all member states in the domestic legislation and has guiding significance for the structure and specific requirements of domestic laws. China and other major regions of the world have followed the principle of strictly referring to the relevant provisions of international conventions in legislation. Therefore, international conventions are "legal laws." As the foundation of national legislation, it is very important to study international conventions.

3.2 Specific Provisions on Human Factors in International Conventions

Because human factors include a wide range of aspects, including ship design and port state supervision and so on, these aspects cannot be described in detail. The laws and regulations compared here only include those laws that directly restrict human error or reduce the possibility of human error. These aspects are also the main content of human factors research. Therefore, only the factors which are closely related to human errors are summed up. In other words, the and requirements for specific work content and processes is not considered in this essay. For example, the rules of watchkeeping are not within the scope of this article because it is only a specification of the work content. This paper divides human factors into five aspects:

- ① **Competency and Training**
- ② **Crew Size and Composition**
- ③ **Working Language**
- ④ **Safety Management**
- ⑤ **Working Hours and Rest Periods**

3.2.1 Competency and Training

The provision of International Conventions relating to the appointment of seafarers, are mainly from the IMO *STCW Convention* (The *STCW Convention* is mainly used to control the professional and technical qualities of seafarers) The implementation of the Convention will improve the quality of seafarers in all member states and protect the marine environment on a global scale. The topic of the qualifications of seafarers is a topic that covers a very wide range of issues. Because the Convention seeks to cover all the details of the seafarers' competency, the requirements for seafarers' qualifications are very comprehensive and specific. Different types of seafarers also do different things. In this article, I have summarized the framework of the requirements for various types of seafarers' qualifications, taking the rules *II/2 of Manila Amendment* as an example.

“Regulation II/2

Mandatory minimum requirements for certification of masters and chief mates on ships of 500 gross tonnage or more

Master and chief mate on ships of 3,000 gross tonnage or more

1 Every master and chief mate on a seagoing ship of 3,000 gross tonnage or more shall hold a certificate of competency.

2 Every candidate for certification shall:

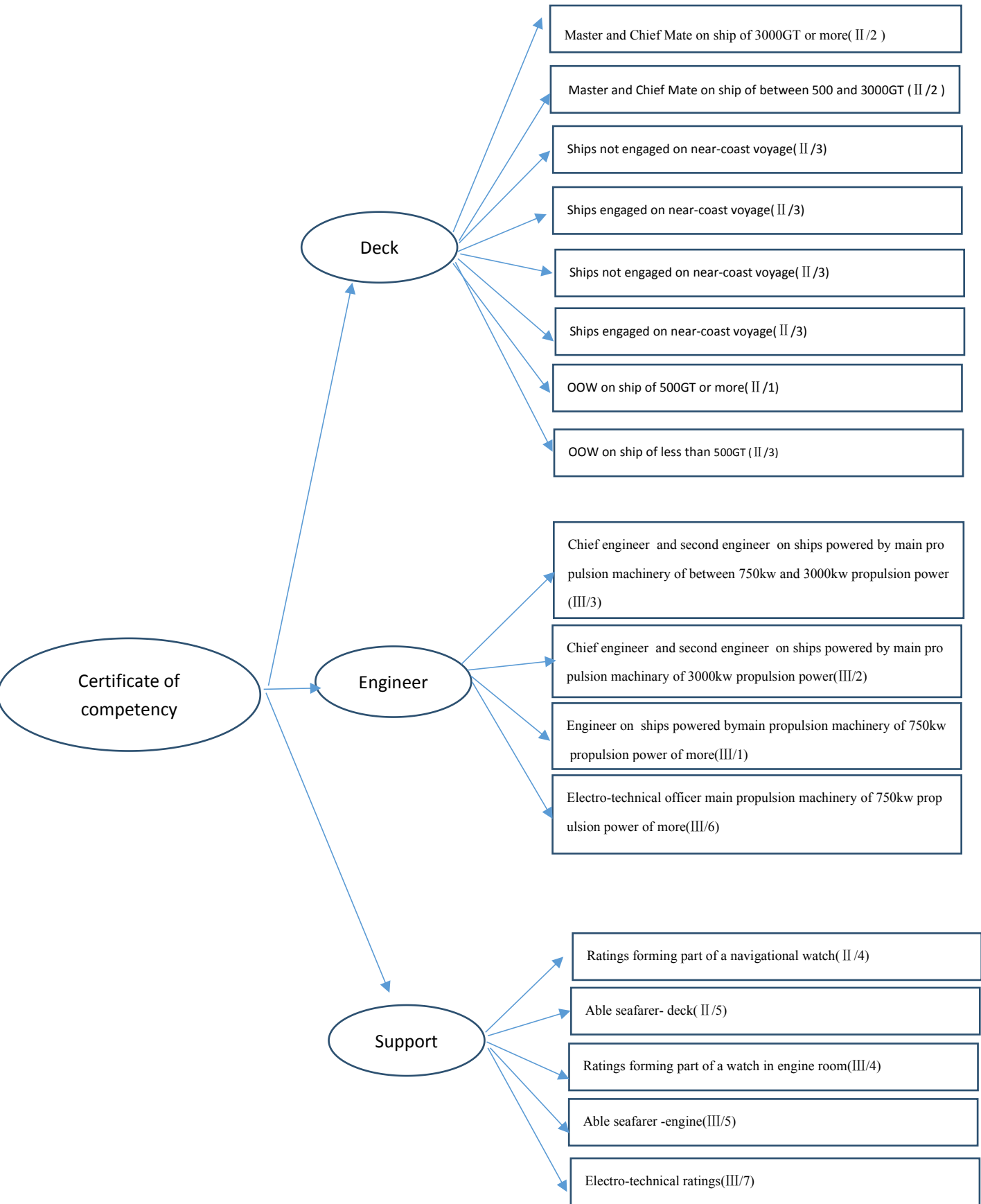
2.1 Meet the requirements for certification as an officer in charge of a navigational watch on ships of 500 gross tonnage or more and have approved seagoing service in that capacity:

2.1.1 For certification as chief mate, not less than 12 months

2.1.2 For certification as master, not less than 36 months; however, this period may be reduced to not less than 24 months ; and

2.2 have completed approved education and training and meet the standard of competence specified in section A-II/2 of the STCW Code for masters and chief mates on ships of 3,000 gross tonnage or more. ”

Table 3 -- STCW Convention Demands for different jobs by STCW Convention



3.2.2 Crew Size and Composition

There is no specific international standard for the requirements of crew size and composition. There are only some principled guidance:

SOLAS Convention Article V/14 states that the maritime administrative agency shall establish a minimum safe manning scale for each ship, and the maritime regulatory agency shall consider the “**Minimum Manning Requirements**” (**IMO .A 1047 (27) Resolution**) related recommendations and requirements. **The Maritime Labour Convention of 2006** also made mandatory requirements for the preparation of medical doctors (or persons appointed with medical care), cooks, and dietary service personnel. The effectiveness of the above-mentioned international conventions has significantly affected the size of seafarers' crews.

For example: **Maritime Labour Convention, 2006**

“Rule 2.7: As for the seafarer’s safety, efficiency and security. The ship takes into account the fatigue of the seafarers and the conditions of the navigation. A sufficient number of seafarers aim to ensure the safe and efficient operation of the ship and full awareness”

3.2.3 Working Language

We all know that there is a certain language is stipulated on the ship as a working language. The working language is a mandatory requirement in the International **SOLAS Convention**, which facilitates the use of seafarers in communication. Therefore, it is both unreasonable and inconsistent to specify two or more languages as working languages.

The working language must be a language understood by every crew member on board. They use the language to issue instructions and responses. If the crew on the ship understands both Chinese and English, they can choose to use Chinese as a

working language, or they can choose English as a working language, but they can only choose one.

The 1974 Conference to the International Convention for the Safety of Life at Sea Resolution 10 ---- the establishment of a working language on board is the first time clearly establishes a working language on passenger ships. This requirement is reflected in the new version of **SOALS V/13(c)**.

“For every passenger ship to which Chapter I applies, in order to ensure the effective operation of the crew on safety matters, a working language shall be established and recorded on the ship's log book. The company or master (suitable person) should determine the appropriate working language. Each crew member should be required to understand this language and use this language to issue instructions and responses. If the working language is not the official language of the flag State, all drawings and diagrams to be posted should have translations in that working language.”

At this point, we see that SOLAS only requires that a working language should be established on international passenger ships and should be recorded in the logbook.

The meaning of "applicable to Chapter I" is as follows:

SOLAS Chapter I General Provisions Article 1 Applicable Areas

(a) Unless expressly provided otherwise, these rules apply only to ships engaged in international voyages.

(b) The types of ships and the scope of application to which the various chapters of the Code apply are clearly defined in the chapters.

Subsequently, the IMO adopted the November 2000 ***Amendment in Resolution MSC.99(73)***, which took effect on July 1, 2002;

SOLAS Article V/14 Ships Assignment:

3 In all ships, in order to ensure that the crew members play an effective role in safety matters, a working language should be specified and recorded on the ship's log book.

The company or the master (suitable person) as defined in Article IX/1 shall determine the appropriate working language. Each crew member should be required to understand the language and use the language to issue instructions and responses. If the working language is not the official language of the flag State, all the drawings and diagrams to be posted should have translations in the working language.

In the amendment to this resolution, the working language requirements were first extended to all ships. In addition, let's take a look at the regulations on working languages in the ***International Ship Safety Management Rules (ISM)***:

6.6 The company should establish procedures to enable shipboard personnel to obtain information on the safety management system in a working language or in other languages that they understand.

6.7 The company shall ensure that the personnel on board can effectively communicate when performing their duties related to the safety management system.

It can be seen that system documents can be written in a working language. For example, they are all international sailing ships equipped with Chinese crew. Even if the working language on board is English, the system documents can also be written in Chinese.

3.2.4 Safety Management

As we all know, the ship safety management is the most effective measure for ships and crews to cope with maritime accidents or urgent situations. The quality of their arrangement is related to the safety evaluation of the entire ship. It is also an important aspect of human factors. The standards related to emergency plans are generally stipulated in the ***ISM Code***. The ***ISM Code*** is the abbreviation of the ***"International Ship Safety Operation and Prevention of Pollution Prevention Regulations"*** adopted by the International Maritime Organization. The core of the rules is to require the company and its ships to establish, implement, and maintain a safety management system that meets the requirements of the rules and approved by

the competent authority. The main features of the **ISM Code** are targeted, comprehensively relevant and systematic. The security management system includes two systems: a security operating system and a monitoring system. The provisions concerning the emergency plan for ships are stipulated in principle in Chapter VIII.

“8.1 The company shall establish procedures for identifying, describing and responding to emergencies that may occur on board.

8.2 The company should develop plans for emergency training and exercises.

8.3 The safety management system shall provide measures to ensure that the company's relevant agencies can respond to the dangers, accidents and emergencies faced by the ship at any time.”

As for specific requirements, IMO Document **A.852 Guidelines for the overall system composition of emergency plans for ships on board** will give different requirements for different situations, so we will not go into details here. Take the oil pollution contingency plan as an example.

*“According to **Article 26 of Annex I of MARPOL 73/78**, oil tankers of 150 gross tonnage or above and non-oil tanker vessels of over 400 gross tonnage (for fixed or floating drilling platforms or other offshore facilities) shall be available "Onboard Oil Contingency Plan." Vessels equipped with the Shipboard Oil Contingency Plan shall comply with the requirements of **Article 26 of Annex I of MARPOL 73/78** and the requirements of the **Guidelines for the Preparation of Shipboard Oil Contingency Plans** prepared by the International Maritime Organization.”*

3.2.5 Working Hours and Rest Periods

As we all know, fatigue is considered to be a serious cause of marine disasters and seafarers' physical problems, and excessively long working hours or lack of rest is one of the factors leading to fatigue. Fatigue is the most critical factor affecting the crew's working mental status and attention which have a direct impact on human error. The regulations related to working hours and rest periods is the protection of seafarers

from fatigue.

The International Labor Organization (ILO) and the International Maritime Organization (IMO) have always been concerned about crew work and rest time. Taking the “Working Hours and Rest Hours” of **Regulation 2.3 of the Maritime Labour Convention, 2006** as an example, the relevant contents include the following 14 aspects:

Table 4 --The requirement for Working hours and Rest Hours by MLC Convention

(1) Definition of work and rest time;
(2) Determination of the maximum working hours and
(3) Seafarers' normal working hours;
(4) The fatigue of the crew;
(5) Limits on work hours or rest time;
(6) Subsections on breaks;
(7) Application in the actual situation;
(8) Complementary rest;
(9) Supplementary provisions for the first two;
(10) Provisions for work schedules on board;
(11) Form of work schedule and its writing;
(12) Working hours and rest Time records;
(13) Exceptions to Member State laws;
(14) Exceptions in emergency

The ***ILO Convention No. 180 (Maritime Employee Hours and Ship Manning Conventions)*** aims to limit the maximum working hours for seafarers or to guarantee the minimum rest time for seafarers.

“Article VIII/1 (Compulsory) Suitable for watchkeeping:

1. To prevent fatigue, the competent authorities should:

1.1 establish and enforce a system of rest periods for persons on watchkeeping and

persons designated as responsible for security, pollution prevention and security, in accordance with Section A-VIII/1 of the STCW Code; and

1.2 require that the watchkeeping shift system be arranged so that the efficiency of all on-watchkeeping personnel will not be affected by fatigue, and that the organization of the shifts will enable the first shift of the voyage and all subsequent shifts to be fully rested, and in other respects Suitable for watchkeeping.”

“All officers in charge of watchkeeping on board or crew members who are on watchkeeping and who have designated safety, pollution prevention and security responsibilities should provide no less than: 10 hours for any 24-hour period; and 77 hours for any 7 days. Break time can be divided into no more than two time periods, one of which requires at least six hours. The interval between consecutive breaks should not exceed 14 hours. It is not necessary to maintain the above-mentioned requirements for rest time in emergency or in other extraordinary work situations. Emergency exercises, firefighting and lifesaving drills, as well as drills prescribed by national laws and regulations and international documents, should be conducted in a manner that minimizes disruption to rest time and does not lead to fatigue of the crew. ”

Chapter 4 Comparison with Relevant Chinese Laws

International law and domestic law are different legal systems. However, these two systems are interconnected and serve to infiltrate, complement and promote each other. When a country formulates a domestic law, it cannot ignore its due international obligations. When participating in the formulation of international law, it cannot ignore its own sovereignty. International law must not interfere with domestic law. Domestic law must not change international law. The relationship between the two should be coordinated.

By comparing the two, we can clearly see the similarities and differences between domestic law and international conventions on the same issues. The legislation of domestic law should be framed by international conventions and fully refer to the specific requirements of international conventions. If the relevant provisions are inconsistent with international conventions, or if the specific requirements are less stringent than international conventions, then the provisions of this article are problematic. They do not meet the requirements for fulfilling obligations under international conventions, and further amendments to the articles of law are required. If the international conventions only provide guidance or explanation in principle, domestic regulations can make specific provisions, but they must not conflict with the principles of the Convention. If there is no relevant provision in domestic legislation, or before new regulations are introduced, they should be implemented in accordance with the requirements of international conventions. For reservations made by member states when they accede to the Convention, they may not have to follow the provisions of the Convention.

4.1 Competency and Training

The content of requirement of the seafarers' competence and training are specifically stipulated in the *Rules of the People's Republic of China for the Examination and Certification of Seafarers' Competency*.

Rules of the People's Republic of China for the Examination and Certification of Seafarers' Competency.--- (The following is called the *Certificate Rules*) has been implemented since March 1, 2012. The rules govern the crew examination system and certificate, which fully embody Content of the *Manila Amendments to the STCW Convention* (The following is called the *Certificate Amendments*). It meets the requirement of maintaining a comprehensive and effective implementation of international conventions. With regard to the types of seafarers' certificates, under the premise of ensuring compliance, scientifically classify the competency certification

and reasonably adjust the types of seafarers' certificates in order to minimize the number of seafarers' certificates. The specific requirements for obtaining a certificate of competency are set out in the annex. The following table shows the contents of the chapters.

Table 5 -- The chapter of Certificate Rules

Chapter number	Name and Terms
Chapter 1	General Provisions 1-4(4)
Chapter 2	Competency Certificate 5-23 (Section 19, 3)
Chapter 3	Competency Examination 24-29(6)
Chapter 4	Certificate of Exemption 30-35(6)
Chapter 5	Recognition of Visa 36-39(4)
Chapter 6	Duties of Shipping Companies and Related Institutions 40-42(3)
Chapter 7	Supervision and Management 43-50(8)
Chapter 8	Legal Responsibility 51-57(7)
Chapter 9	Supplementary Provisions 58-64(7)
Attachment 1	Application for Training of Seafarers' Certificate of Competence, Qualifications for Sea Qualifications and Requirements for Competency Examination

As far as the implementation of the "STCW Convention" is concerned, full compliance is a request made by the organization in the context of human factors becoming increasingly important factors in maritime safety. Through the "crew" as an important carrier, we can ensure that its maritime safety, maritime pollution prevention and transport efficiency goals are achieved. Full compliance of International Convention is a requirement of the internationalization of the maritime industry itself. It is also the responsibility and obligation of our government as a state party. The important prerequisite for full compliance is that the domestic legislation of the State party is in conformity with the conventions. For the *STCW Convention*, it is clear that the *Certificate Rules* must at least meet the minimum requirements of the *Certificate Amendment*.

Navigation areas, ship classes, duties, applicable competency standards, and matching training certifications are the core elements of the crew competency and certification system. Chinese current certification system for seafarer certificates can fully meet the requirements of the *Certificate Amendments* to the Convention in terms of navigation areas, ship classes, duties, standards of competency, and matching training certificates.

Table 6 -- Comparisons between Certificate Amendment and Certificate Rules

The ranks and duties determined by <i>Certificate Amendment</i>	The ranks and duties determined by <i>Certificate Rules</i>	Note
Article II / 1 Senior officer responsible for navigational watchkeeping for ships of 500 GT or above	1) The second and third officers responsible for the navigational watchkeeping of ships from 500 to 3 000 GT 2) The second and third officers responsible for the navigational watchkeeping of ships of 3,000 GT or above	Refer to Section II/1, Section A-II/1
Article II/2 Master and Chief Officer for ships of 500GT or above Captain and Chief Officer of ships of -3 000 GT or above Captain and Chief Officer of 500	1) Chief officer and captain of a ship of 500 GT and above to 3 000 GT 2) Chief officer and captain of ships of 3 000GT or above	Refer to Section II/2, Section A-II/2

to 3 000GT ships		
Article II / 3 Officers and captains responsible for navigational watchkeeping on ships under 500 GT - Do not engage in near shore navigation	<p>1) The Chief, second and third officers of the navigational watchkeeping for the 500 to 3000 GT ship</p> <p>2) The Chief, second and third officers of the voyage watchkeeping of 3 000GT and above</p> <p>3) Captain of ships from 500 GT and above to 3 000 GT and above</p>	Refer to Section II/2, Section A-II/2
Article II / 4 Ordinary Seafarers (watchkeeping sailors)	watchkeeping sailors on ships of 500 GT and above	Refer to II / 4, A-II / 4
Article II / 5 Senior sailors on watchkeeping	Senior sailors on 500 GT and above	Refer to II / 5, A - II / 5
Article III / 1 Engineers assigned on-watchkeeping	<p>1) Third and fourth engineer on ships with main propulsion power units of 3 000 kW and above</p> <p>2) Third and fourth engineer on ships with main propulsion power units 750 to 3 000 kW</p>	Refer to Section III/1, Section A-III/1
Article III/2 Chief Engineers and Second engineers for Main Propulsion Units of 3 000 kW or above	Chief, second engineer on ships with main propulsion power plant 3 000 kW and above	Refer to Section III/2, Section A-III/2

Article III / 3 Chief Engineers and Second engineers on Ships from 750 kW to 3 000 kW	The chief engineers and Second engineers on ships with main propulsion power units 750 to 3 000 kW	Refer to Section III / 3, Sections A-III / 3
Article III/4 Ordinary Seafarers (On-watchkeeping)	Ordinary Seafarers of ships of main propulsion power 750kW and above	Refer to III / 4 , A - III / 4
Article III/5 Advanced Seafarers On-watchkeeping	Advanced Seafarers of ships of main propulsion power plant 750kW and above	Refer to III / 5, A - III /5

As we can see in the table, all of the specific rules of the *Certificate Rules* completely refer to the convention, so it basically meets the requirement of the *Certificate Amendment*. However, the regulations on some ship type have some conflicts with the convention, or lower than the convention requirement. For example, Certificate Amendment have no lower limit to the size of the ship, but the Certificate Rules only include ships that more than 500GT and of main propulsion power more than 750kW. The reason for this is that china has retained the rules for the suitability of crews of small vessels and inland river vessels because it does not generally have ocean-going capabilities and is within the jurisdiction of domestic laws.

The *Certificate rules* increase the types of crew positions. In accordance with the requirements of the *Certificate amendment*, the *Certificate Rules* added four crew positions for "high-level on-duty sailors," "advanced duty mechanics," "electronic electricians," and "electronic technicians." Reasonably adjust the applicable area for the certificate of competency. The *Certificate Rules* merged the original unlimited navigation zone and the Near Ocean Navigation Zone into an unlimited navigation zone, and the coastal navigation zone and the near-shore navigation zone merged into

the coastal navigation zone.

Comparing the *Certificate Amendments* and the *Certificate Rules*, it is clear that China's solid basic education, navigation professional education and training, and seafarers' professional entry standards are all higher than the requirements of the Convention, so there is no problem in this regard. However, the regulations on some ship type have some conflicts with the convention, or lower than the convention requirement. For example, *Article II/3 of the STCW Convention* is for senior officers and captains on all kinds of ships. The *Certificate Rules* of China does not impose any requirements on ships of which gross tonnage is below 500 GT or main propulsion power is lower than 750 KW. This shows that China has made reservations on small vessels. Although Chinese accession to the Convention has stated that it reserves the standard for the training and certification of small-scale ship crews, but as a major maritime country, China still needs to improve relevant legislation soon as possible. Strict standards also shall be established for small ships so that the maritime safety can be further protected.

4.2 Crew Size and Composition

China's relevant laws on crew size and composition is *Minimum safety rules for manning on ships in People's Republic of China (Manning Rules)*, due to the fact that there is no specific international standard for the requirements of crew size and composition. There is only some principled guidance, so the specific rules for crew size and composition in China basically meets the requirements of the Convention.

Table 7 -- Crew size and composition required by Manning Rules

Deck			
Ship type, navigation area, tonnage or power		General provisions	
General ship	3000GT and above	Captain, chief officer, second officer, and third officer 1 person each, Three sailors .	
	500GT and up to less than 3000GT	The captain, chief officer and second officer 1 person each. Three sailors .	
	100GT and up to less than 500GT	Captain,third officer 1 person each, 2 sailors.	
	Less than 100 GT	One officer , One sailor .	
Passenger ship	500GT and above	(1)Captain, chief officer, second officer, and third officer 1 person each, Three sailors . (2) Crew with the same number of lifeboats holding a lifeboat crew certificate (not including the captain and chief officer) .	
	100GT and up to less than 500GT	(1) Captain,third officer 1 person each, 2 sailors. (2)Same as above	
	Less than 100 GT	(1) One officer , One sailor . (2) Same as above.	
drag	on the sea	3000KW and above	Captain, chief officer, second officer, and third officer 1 person each, Three sailors .
		Below 3000KW	Captain,third officer 1 person each, 2 sailors.
	Inside port	750KW and above	Captain,third officer 1 person each, 2 sailors.
		Less than 750 KW	One officer , One sailor .

Engineer			
All ships	Navigation area and power		General provisions
	On the sea	3000KW and above	Chief engineer, , second engineer, third engineer and fourth engineer 1 person each, Three mechanics
		750KW and above to less than 3000KW	Chief engineer and second engineer 1 person each, Two mechanics.
		220KW or more to less than 750KW	Chief engineer and an engineer, Two mechanics.
		Less than 220 KW	Chief engineer and a mechanic.
Inside the port		Fourth engineer and a mechanic..	

In terms of the manning requirements for specific ships, the **Manning Rules** is in full compliance with the requirements of the Convention, but there is a difference between the application forms for members and minimum safety certificates and the international conventions.

1) From the point of view of the responsible party, the **Manning Rules** do not stipulate that the company has the primary responsibility for ensuring the safety of the ship. It only stipulates the crew number for ships to be equipped, and lacks a mechanism for the company to apply for safe manning of ships actively.

2) The **Manning Rules** lacks the “lowest-level safety crew size” procedure approved by the maritime management agency--- the “transparent procedure” required by the **S O L A S Convention Article V/14 2nd**.

3) The **Manning Rules** do not stipulate that ships that violate rules and regulations have to "removing their minimum safety personnel certificate."

4) Through the reference to the relevant papers, I found that the official text, the list of the members, the crew application form and the lowest safety personnel certificate that stipulated by Chinese **Manning Rules**, are different from the international conventions.

1) From the point of view of the responsible party, China's **Manning Rules** does not stipulate that the company has the primary responsibility for ensuring the safety of the ship. It only stipulates the number of ships to be equipped, and lacks a mechanism for the company to actively apply for safe manning of ships.

2) Chinese **Manning Rules** do not stipulate that ships that violate the requirements of the anti-corruption agents will be required to withdraw their **minimum safety certifications**.

3) The relevant provisions of the ship's Manning Rules in China are not flexible. Although regulations have different requirements for ships with different tonnage and main power, investigations show that there are still some special circumstance in it. For example, a ship with an engine room that is too small or without an engine room does not require too many engineers. But at this time, it must still be equipped as required. At the same time, China's **manning Rules** lacked the special types of personnel required by the Convention (including high-level watchkeeping sailors)

4.3 Working Language

The effectiveness of communication and the efficiency of information transfer between crews is one of the main factors of human factors in maritime accidents, and the regulations on working languages on ships have important influence on it.

However, according to my inspection, China currently does not have relevant laws and regulations that govern the working languages of ships. Therefore, Chinese ships engaged in international navigation should abide by the provisions of relevant.

Table 8 -- The requirement of working languages by each Convention

International Conventions	Provisions
<p><i>SOLAS</i></p>	<p style="text-align: center;">Chapter V:</p> <p>3 On all ships, to ensure effective crew performance in safety matters, a working language shall be established and recorded in the ship's log-book. The company, as defined in regulation IX/1, or the master, as appropriate, shall determine the appropriate working language. Each seafarer shall be required to understand and, where appropriate, give orders and instructions and to report back in that language.</p> <p>4 On ships to which chapter I applies, English shall be used on the bridge as the working language for bridge-to-bridge and bridge-to-shore safety communications as well as for communications on board between the pilot and officer , unless those directly involved in the communication speak a common language other than English</p>
<p><i>ISM</i></p>	<p style="text-align: center;">The Company should establish procedures by which the ship's personnel receive relevant information on the SMS in a working language or languages understood by them.</p>

<i>FFS</i>	All installation, operation and maintenance instructions/plans for the system shall be in the working language of the ship. If the working language of the ship is not English, French, nor Spanish, a translation into one of these languages shall be included.
<i>ISPS</i>	The security plans and records on board need to be in the working language or the language that all crew can understand.
<i>STCW</i>	Administrations shall require that watch schedules be posted where they are easily accessible. The schedules shall be established in a standardized format in the working language or languages of the ship and in English.
<i>MLC</i>	A copy of the applicable instruments in English or the working language of the ship should be carried on board and should be accessible to seafarers
<i>BWM</i>	Be written in the working language of the ship. If the language used is not English, French or Spanish, a translation into one of these languages shall be included.

Because of the poor communication of working languages on ships, it will have a serious impact on the ship’ s life-saving, fire fighting, navigation safety, anti-fouling, distress communications, and emergency search and rescue. It will even directly lead

to the occurrence of maritime traffic accidents or pollution accidents.

There is no relevant Chinese law on working languages on ships. Therefore, before relevant Chinese authorities enter into relevant laws, they should abide by relevant international conventions. China's maritime management Institutions should strictly enforce the legislation and inspection of working languages on ships to make up for the lack of relevant domestic legislation.

Although It is controversial about whether there is only one working language (Administrations shall require that watch schedules be posted where they are easily accessible. The schedules shall be established in a standardized format in the **working language or languages** of the ship and in English.--*STCW convention*), I still obey the mainstream view of the academic community: there is only one working language
Through the above understanding, we can make such a summary:

1. Only one working language should be specified on board as a common working language for all ships, not 2 or 3;
2. The working language should be the language understood by every crew member on board;
3. The working language of the entire ship should be recorded in the log book.
4. International sailing ships, the bridge should use English as a working language;
5. Persons directly involved in communications (including shore staff) in safety communications inside and outside the bridge are all speaking a common language other than English; they can be selected as the working language of the bridge;
6. The working language of the whole ship and the working language of the bridge may not be the same;
7. The ISM system documentation can be written in the common language of the crew outside the working language.

4.4 Safety Management

In order to strengthen the safety and anti-pollution management of domestic ships and to promote the continuous improvement of the overall quality and management level of China's shipping industry, the Chinese Ministry of Communications, on the basis of summarizing the implementation of the *ISM Code*, formulated and promulgated the *Safety of Ships of the People's Republic of China Operational and Anti-pollution Management Rules* (referred to as the "*NSM code*") in 2002. According to the requirements of the rules, the company responsible for domestic ship operations and the ships it operates should establish a scientific, systematic, and programmatic safety management system, and review the certification authority's audit through the safety management system. The establishment of a ship safety management system is a compulsory measure by the International Maritime Organization and the Chinese government. It is also a social need. Its purpose is to standardize safety management, ensure the safety of water transportation, prevent casualties, and protect the safety of the water environment and property.

The goal of the regulations on "*NSM code*" is to safeguard the safety of water traffic, protect the water environment, and embody the theme of safety operation and pollution prevention. The "*NSM code*" basically refer to the original version of the *ISM Code*, and only a small amount of adjustment has been made. The following table compares the sections and main contents of *NSM code* and *ISM code*

Table 9 -- Comparison of ISM and NSM code

The ISM code	The NSM code
International ship safety operation and prevention of pollution control rules. Part A implementation	Rules for the safe operation of ships and the prevention of pollution control in the People's Republic of China. Part one implementation
<p style="text-align: center;">1 The general Omitted</p>	<p style="text-align: center;">1 The general Omitted</p>
2. Safety and environmental protection policy.	2. Safety and environmental protection policy.

<p style="text-align: center;">Omitted</p> <p style="text-align: center;">3.Responsibility and power of the company.</p> <p style="text-align: center;">Omitted</p> <p style="text-align: center;">4 Designated personnel</p> <p>In order to ensure the safe operation of each vessel and to provide the contact channel between the company and the ship, the company shall designate one or several shore personnel who can directly contact the top management according to the situation. The responsibility and authority of the designated personnel shall include monitoring of the safe operation and prevention of pollution of the vessels and ensuring adequate resources and shore-based support as required.</p> <p style="text-align: center;">5.Captain's responsibility and authority.</p> <p>5.1 The company shall specify the following responsibilities of the captain in the form of a document.</p> <ol style="list-style-type: none"> 1. Implement the company's policy on safety and environmental protection. 2. Encourage the crew to comply. 3. Issue commands and instructions in a concise manner. 4. Review compliance with specific requirements. 5. Review the safety management system and report its deficiencies to the onshore management department. <p style="text-align: center;">6 Resources and personnel</p> <p>6.1 The company shall guarantee the captain.</p> <ol style="list-style-type: none"> 1. Appropriate command qualification. 2. Fully familiar with the company's 	<p style="text-align: center;">Omitted</p> <p style="text-align: center;">3.Responsibility and power of the company.</p> <p style="text-align: center;">Omitted</p> <p style="text-align: center;">4 Designated personnel</p> <p>4.1 The company shall appoint designated personnel to contact the top management directly and provide the contact channel between the company and the ship.</p> <p>4.2 The company shall specify the responsibilities and rights of the designated personnel in the form of documents, and the responsibilities and powers of the designated personnel shall include:</p> <ol style="list-style-type: none"> 1. Monitor the safety and anti-pollution work of the ship's shore. Ensure that the company provides adequate resources and shore-based support to the ship. <p style="text-align: center;">5.Captain's responsibility and authority.</p> <p>5.1 The company shall specify the following responsibilities of the captain in the form of a document.</p> <ol style="list-style-type: none"> 1. Implement the company's policy on safety and environmental protection. 2. Encourage the crew to comply with the policy. 3. Issue instructions in a concise manner. 4. Review compliance with specific requirements. 5. Review the safety management system and report its deficiencies to the onshore management department. <p style="text-align: center;">6 Resources and personnel</p> <p>6.1 The company shall guarantee the captain.</p> <ol style="list-style-type: none"> 1. Appropriate command qualification. 2. Fully familiar with the company's
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<p>safety management system.</p> <p>3. Obtain the necessary support for the reliable performance of its responsibilities.</p> <p>6.2 The company shall ensure that each ship is equipped with qualified and healthy crew according to national and international regulations.</p> <p>6.3 The company shall establish procedures to ensure safety and environmental protection work of the new hire and transferred personnel familiar with the appropriate responsibilities that need to happen before sailing the important instruction will be issued in the form of document and shall be marked</p> <p>6.4 The company shall ensure that all personnel involved in its safety management system fully understand the relevant laws, regulations, rules and guidelines.</p> <p>6.5 The company shall establish and maintain procedures to identify any training that may be required to support the safety management system and to ensure that such training is provided to all relevant personnel.</p> <p>6.6 The company shall establish procedures to enable the crew to obtain information about the safety management system in a working language or other languages they understand.</p> <p>6.7 The company shall ensure that the personnel of the ship are able to communicate effectively when performing their duties in respect of the responsibilities of the safety management system.</p> <p>7. The formulation of the operation plan of the ship.</p> <p>The company shall establish procedures for the formulation of relevant programs</p>	<p>safety management system.</p> <p>3. Obtain the necessary support for the reliable performance of its responsibilities.</p> <p>6.2 the company shall ensure that each vessel is equipped with qualified and healthy crew in accordance with the relevant provisions.</p> <p>6.3 The company shall establish procedures to ensure safety and environmental protection work of the new hire and transferred personnel familiar with the appropriate responsibilities that shall be issued before the shipment of the important instructions will be issued in writing and shall be marked</p> <p>6.4 The company shall ensure that all personnel within its safety management system fully understand the relevant provisions, standards and relevant guidelines.</p> <p>6.5 The company shall establish procedures to identify any training that may be required by the security management system and ensure that such training is provided to all relevant personnel.</p> <p>6.6 The company shall establish procedures to ensure that the crew can obtain timely information on the safety management system.</p> <p>6.7 The company shall ensure that vessels communicate effectively when performing their duties relating to the safety management system.</p> <p>7. The formulation of the operation plan of the ship.</p> <p>The company shall establish procedures for the formulation of relevant programs</p>
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and guidelines (including the checklist of inspections required) for the operation of the key vessels involved in the safety and prevention of pollution. The relevant work should be clearly defined by the appropriate personnel.

8 Emergency preparedness

8.1 The company shall establish identification, description and response to the possible emergencies on board.

The program

8.2 The company shall make plans for emergency training and exercises.

8.3 The safety management system shall provide measures to ensure that the relevant institutions of the company respond to any risks, accidents and emergencies to their ships.

9. Report and analysis of non-conforming situations, accidents and risks.

9.1 The safety management system shall include procedures to ensure that the report does not meet the prescribed conditions, accidents and risks and conduct investigation and analysis of the company in order to improve safety and prevent pollution.

9.2 The company shall establish procedures for the implementation of corrective measures.

10. Maintenance of ships and equipment.

10.1 The company shall establish procedures to ensure that vessels are maintained in accordance with the relevant regulations, rules and any additional requirements that may be formulated by the company.

10.2 To meet these requirements, the company shall guarantee.

and guidelines (including the checklist of inspections required) for the operation of the key vessels involved in the safety and prevention of pollution. The relevant work should be clearly defined by the appropriate personnel.

8 Emergency preparedness

8.1 What are the possible emergencies on board and how to respond to these emergencies?

8.2 The company shall formulate emergency training and exercise plans.

8.3 The safety management system shall provide measures to ensure that the company can respond to the dangerous emergencies and accidents of its vessels at any time.

9. Report and analysis of non-conforming situations, accidents and risks.

9.1 The company shall establish procedures to ensure that the company does not comply with the prescribed conditions, accidents and dangerous situations, and undertakes investigation and analysis to improve safety and anti-pollution work.

9.2 The company shall establish procedures for the implementation of corrective measures.

10. Maintenance of ships and equipment.

10.1 The company shall establish procedures to ensure that vessels and equipment are maintained in accordance with relevant regulations and standards and any additional requirements that may be formulated by the company.

10.2 To meet these requirements, the company shall guarantee.

<p>1. Conduct inspection according to appropriate intervals.</p> <p>2. Any failure to comply with the prescribed conditions shall be reported and attached to the possible reasons. Take appropriate corrective actions.</p> <p>4. Keep records of these activities.</p> <p>10.3 The company shall establish relevant procedures in the safety management system in order to identify the equipment and technical systems that may cause sudden failure. The safety management system should provide periodic testing of technical systems designed to improve these devices or non-continuous use.</p> <p>10.4 The inspections mentioned and the measures mentioned in 10.2 and 10.3 shall be incorporated into the daily operational maintenance of the ship.</p>	<p>1. Conduct inspection according to appropriate intervals.</p> <p>2. Any failure to comply with the regulations shall be reported. Take appropriate corrective actions.</p> <p>4. Keep records of these activities.</p> <p>10.3 The company shall formulate relevant procedures, in order to identify those who will risk caused by the sudden malfunction of equipment and technology system, and provides specific measures, in order to improve the possibility of these devices and systems. These measures shall include regular testing of spare installations and equipment or non-continuous use of equipment or technical systems for non-continuous use.</p> <p>10.4 The inspection mentioned in article 10.2 And the measures referred to in article 10.3 Shall be incorporated into the daily operational maintenance of the ship.</p>
<p style="text-align: center;">11 Files Omitted</p>	<p style="text-align: center;">11 Files Omitted</p>
<p style="text-align: center;">12 Company audit, effectiveness evaluation and management complexity. Omitted</p>	<p style="text-align: center;">12 Company audit, effectiveness evaluation and management complexity. Omitted</p>
<p style="text-align: center;">Part B audit certification.</p>	<p style="text-align: center;">The second part examines the certification.</p>
<p style="text-align: center;">13 Issuance and periodic review. Omitted</p>	<p style="text-align: center;">13 Issuance and periodic review. Omitted</p>
<p style="text-align: center;">14 Issue a provisional certificate. Omitted</p>	<p style="text-align: center;">14 Issue a provisional certificate. Omitted</p>
<p style="text-align: center;">15 Audit Omitted</p>	<p style="text-align: center;">15 Audit management Omitted</p>
<p style="text-align: center;">16 Certificate format 16.1 Omitted</p>	<p style="text-align: center;">16 Certificate format Omitted</p>

Through the comparison of the chapters and the main contents of the two regulations, we can see that NSM code completely duplicates the contents of ISM in terms of specific content, and also supplements the situation in China.

The goal of the Chinese regulations on safety management is to safeguard the safety of water traffic, protect the water environment, and embody the theme of safety operation and pollution prevention. The rules are formulated as the principle of applying the rules of the international ship safety operation and prevention of pollution management (*ISM rules*), and the related international conventions . To Chinese shipping and waterway transport development, the *NSM rules* basically quoted the original version of the *ISM rules* and made only a small amount of adjustment.

In the past years, the international maritime organization, in order to strengthen the management of ships and crew, reduce the occurrence of accidents , set up a large number of international conventions, mainly from the technical aspect of the safety navigation and crew management of ships

There is not much difference between the *NSM code* and the *ISM code*. The main difference is the use of rules 1, 2 and 3. For example, for the control of the health of the crew, the crew of an internationally-sailed ship should have a health certificate, and Chinese domestic ships do not need to.

These two are also slightly different in the basis for auditing certification. ISM code certification is based on the *SOLAS Convention Chapter IX*, while the NSM code is based on the *People's Republic of China Shipping Company Safety and Pollution Control Regulations*. The latter is under the State Council's regulations and its legislative hierarchy is relatively low.

4.5 Working Hours and Rest Periods

The principled guidance concerning the work and rest time of seafarers in China can be found in the *Labor Law* and *Crew Regulations*. The *Regulations on the watchkeeping of Seafarers Working on Ships of the People's Republic of China* which took effect on February 1, 2013, has further clarified the rules and governing crew working hours or rest periods on the basis of the integration of relevant IMO and ILO conventions and Chinese laws. The content is basically the same as the **Maritime Labour Convention of 2006** and **STCW convention**. The two conventions concerning the maximum working hours and minimum rest time standards of seafarers are equally legally binding on ships. The two conventions are the standard for the longest working hours and minimum rest time of seafarers, the applicable targets of standards, exceptions to applicable standards, and the implementation and supervision of standards. There are similarities and differences in such issues. So the next step is to compare the two conventions and the Chinese domestic law.

Table 10 -- Comparison of MLC Convention, STCW Convention and Chinese Labor Law

Conventions or domestic law	<i>MLC 2006</i>	<i>STCW 95</i>	<i>Regulations on the watchkeeping of Seafarers Working on Ships of the People's Republic of China</i>
Purpose	To ensure that seafarers' physical condition is not damaged due to long-term fatigue work	In order to ensure that the efficiency of workmanship on watchkeeping is not impaired by fatigue.	To ensure that the crew can effectively rest
Applicable object	All crews It refers to any person	Crews for watchkeeping, The	Crews for watchkeeping and

	<p>who is defined by the national laws or regulations or labor agreements, or who is working on a ocean going vessel.</p>	<p>“Crews for watchkeeping,” here mainly refer to the senior crew responsible for the navigational watch, the senior officers responsible for the engine room watch, and the radio operators responsible for the radio work, as well as the ordinary crew members who form part of the watch staff.</p>	<p>appointed to assume safety, pollution prevention and security duties</p>
<p>Standards and Limits on Working Hours and Rest Hours</p>	<p>The maximum working time of the crew should not exceed 14 hours in 24 hours and 72 hours in 7 days; the minimum rest time should not be less than 10 hours in 24 hours, within 7 days Not less than 7 7 hours; breaks can be divided into no more than 2 segments, one of which shall be</p>	<p>All senior officers or members of the crews for watchkeeping should have at least 10 hours of rest time within 24 hours; rest periods can be divided into no more than 2 time periods, and at least one of them should have 6 hours. The minimum rest period of 10 hours may be reduced to not less</p>	<p>(1) No less than 10 hours in any 24 hours; (2) no less than 77 hours in any 7 days; (3) the rest time in any 24 hours can be divided into no more than 2 periods, one of which is at least 6 hours, and the interval between consecutive intervals should not exceed 14 hours. There may be</p>

	no less than 6 hours, and continuous breaks should not exceed 14 hours.	than 6 consecutive hours, provided that the decrease cannot exceed 2 days, and the rest period provided within 7 days is not less than 70 hours.	exceptions when the captain arranges the rest time in accordance with item (2) and (3), but the rest time in any 7 days shall not be less than 70 hours.
Exceptions	Emergency, drill, or other abnormal working conditions do not necessarily maintain standards concerning working hours and rest periods. The “emergency” and “other abnormal working conditions” should be interpreted as due to safety or preventing the cause of the pollution from being delayed or that it is not reasonable to expect the important work on board the ship at the beginning	The captain may temporarily terminate the schedule of working hours and rest time, and ask the crew to resume any necessary work from time to time until the normal situation. The term "required work" as used herein refers to any work required for the direct safety of ships and cargo, and for any assistance to other ships or persons in distress.	Exceptions to the weekly rest time specified in Item (2) shall not exceed two consecutive weeks. The interval of two consecutive exceptions on a ship should not be less than two times the duration of the exception. The exceptions to item (3) can be divided into no more than 3 periods, one of which is at least 6 hours, and the other two should not be less than 1 hours. The interval of continuous rest time

	of the voyage.		<p>must not exceed 14 hours. Exceptions shall not exceed two two hours in any 7 days.</p> <p>2. The emergency assembly exercises, fire fighting and lifesaving exercises, and other exercises stipulated in domestic laws, regulations and international conventions shall be carried out in the form of minimal interference for rest time and no fatigue of the crew.</p> <p>When crew members are on standby, they should be compensated for interrupting their normal rest time because they are sent to work.</p>
Time schedule	Posted on the easy-to-see place on	Obviously posted on the boat	Obviously posted on the boat

	<p>the ship, the work schedule should include at least the work plans on the sea and in the port, and the longest working hours and the shortest rest time required by laws and regulations.</p>		
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Fatigue is an abstract concept that varies from person to person and is difficult to quantify. The *SCTW Convention* stipulates standards relating to work and rest time. The purpose of the *SCTW Convention* is to ensure that the work efficiency of the staff on duty is not weakened due to fatigue, thus ensuring that the crew on board is qualified and fit to perform its duties. The standard of work and rest time in the *MLC Convention* is to protect the interests of seafarers and ensure that seafarers' physical condition is not damaged due to long-term fatigue work. Although the objectives of the three parties are not the same, they are consistent in respect of the issue of human factors, which is an important factor in safeguarding life and property safety on the sea. Obviously, the *MLC 2006* applies the broadest object, but in terms of "Crews for watchkeeping," they are the subjects that are adjusted by the three at the same time.

The *MLC Convention* does not impose mandatory rules on whether the maximum working hours should be enforced or whether the minimum rest time should be enforced. That is, the flag State may be based on the maximum working hours or minimum rest time when formulating its own domestic regulations. Choose between two limits. For shipping companies, they may be more willing to choose to implement the system with the least rest time, because this system seems to be more pragmatic for them to perform. Chinese law skillfully combines the provisions of the two

conventions and makes specific provisions for exceptions and compensatory rest.

Proposals for deficiencies of Chinese legislative work: Regarding the protection of the crew's right to rest, Chinese current *"Labor Law," "Labor Contract Law," and "Maritime Law"* have not made specific provisions. The provisions on the protection of the rights of crew members are mainly embodied in the *"Regulations on the watchkeeping of Seafarers Working on Ships of the People's Republic of China "*, but these are the provisions of the State Council or transportation departmental regulations that have low effect in law. Although the promulgation of these administrative laws and regulations has filled the gaps in the legislation in a certain sense, its effectiveness is limited, and it is far less effective than the law. In view of this, China should raise the relevant provisions of the "Crew Regulations," "On-duty Rules," and "Work and Life Management Measures" to the law so as to fully protect the rights of the crew and reduce the possibility of maritime accident which is caused by fatigue.

Through the above comparison, we can find that: Chinese law skillfully combines the provisions of the two conventions and fulfills these two conventions well, but there are still some problems:

(1) The legislative level is too low, and most of them are administrative regulations

(2) The relevant sanctions are too light and the illegal costs are too low.

Chapter 5 Conclusion

Due to the rapid growth of the number of ships and tonnage in the world, ship traffic accidents and water pollution accidents frequently occur. As one of the main causes of maritime accidents, human factors have become the focus of research in the international community in the past century and have made remarkable achievements. The establishment and improvement of laws and regulations related to human factors have become the first step in putting research theories into practice. It is also an important step to improve the safety of navigation.

A series of conventions related to human factors formulated by the International Maritime Organization have been quite complete. The main problem is that they are not performed well. This requires the State party to establish and improve relevant rules and regulations in a timely manner, and to put these laws and regulations into practice. As a major maritime country, China has the obligation to improve its maritime safety laws and regulations so that the rules for human factors in maritime accidents can meet the standards of international conventions. Chinese legislative work on human factors in maritime accidents has done very well and it strives to meet every article of the international convention. In the event of a change in the convention, the accompanying domestic regulations will be revised in a very short time. During the transition period when the new legislative work is not completed, a series of supporting government documents or department rules will be issued to achieve a smooth transition. China has been strictly known for its enforcement and supervision of laws.

However, there are still many problems that need to be improved in the relevant Chinese domestic laws and regulations. For example, some specific clauses are conflict with international conventions , and their requirements are lower than the international conventions. This is unreasonable. There are also laws and regulations that China has made reservations such as inland river ships, small ships and fishing boats. With the development of globalization, the degree of openness in China will

become higher and higher. These laws and regulations for making reservations should also be based on the standards of international conventions. Chinese relevant legislative bodies should carry out relevant legislative research work as soon as possible and strive to achieve international standards as soon as possible in respect of legislation on human factors in maritime accidents.

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