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Research on the team building of maritime investigators in China

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Research on the Team Building of Maritime Investigators in China

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DECLARATION

I certify that all the materials in this research paper that are not my own work have been identified, and that no material is 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.

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ABSTRACT

Title of Dissertation: Research on the Team Building of Maritime Investigators in China

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IMO has always attached great importance to maritime investigation. In order to promote the development of maritime investigation in various countries, the "Casualty Investigation Code", guided by "identifying causes, drawing lessons, taking corresponding measures and preventing similar accidents", put forward higher requirements for maritime investigation in various countries. In order to establish a safer maritime environment and promote the continuous development of shipping industry, different countries gradually improve their marine accident investigation system according to their own national conditions and historical evolution of the system. By comparing the team building of maritime investigators in developed shipping countries such as Europe and the United States, and conducting a questionnaire survey on the mechanism building of maritime investigation teams in China, it is found that the current maritime investigation system in China is difficult to adapt to further improve the safety of water transportation, and the main factors affecting the team building of maritime investigators in China include the qualification standards, training guidelines and objectives, as well as the mechanism of maritime investigation teams. Based on the statistics of the maritime survey questionnaire and the related theories of talent mechanism building, this paper puts forward some suggestions for improving the team building of maritime investigators in China.

Key Words: Maritime investigation, Team building, Qualification standards, Training, Mechanism

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LIST OF ABBREVIATIONS

AIS	Automatic Identification System
AMSA	The Australian Maritime Safety Authority
ATSA	Australian Traffic Safety Authority
CNKI	China National Knowledge Internet
CPC	Communist Party of China
DMU	Dalian Maritime University
ECDIS	Electronic Chart Data Display and Information System
ECS	Electronic Chart System
GMDSS	Global Maritime Distress and safety System
GPS	Global Positioning System
IMO	International Maritime Organization
JTSB	Japan Transport Safety Board
MAIB	Marine Accident Investigation Branch
MAIB	British Maritime Investigation Bureau
MCA	Coastal Guard Agency
MoC	Ministry of Communications
MoT	Ministry of Transport
MoWT	Ministry of Water Transport
MSA	Maritime safety Administration
NSW	Territory Maritime Administration
NTSB	National Transportation Safety Board

P.R.C.	the People's Republic of China
SOLAS	International Convention for the Safety of Life at Sea
UK	the United Kingdom
UNCLOS	United Nations Convention on the Law of the Sea
USCG	United States Coast Guard
VDR	Validated Data Record
VTS	Vessel Traffic System
WMU	World Maritime University

CHAPTER 1: INTRODUCTION

1.1 Background of Research

For thousands of years, human beings have mainly learned lessons from accidents to improve the safety situation. Looking back on the history of maritime transport safety, every major change in maritime safety is generated from the lessons learned from previous accidents. The main purpose of maritime investigation is to find out the facts of the accident through investigation, find out the cause and contributing factors of the accident, and prevent the recurrence of similar accidents in the future (Fu & Wu, 1993).Only by truly understanding and mastering the exact causes of maritime accidents can we find out the optimal measures of maritime safety management and avoid the recurrence of similar accidents.

IMO has always attached great importance to maritime investigation. In order to promote the development of maritime investigation in various countries, IMO has promulgated a series of rules, resolutions and recommendations to guide the maritime investigation in various countries. In January 2010, Code of International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident(hereafter Casualty Investigation Code) (IMO, 2008)came into force and were incorporated into the SOLAS convention, which has changed the situation in many countries where administrative investigation is the leading role after maritime traffic accidents.

In terms of the qualification standards of maritime investigators, the competent maritime investigation authorities of different countries have made different provisions on the theoretical knowledge, working experience and accident investigation skills of investigators for different levels. In the building of maritime investigation mechanism, developed countries such as the United States and Europe have also combined with

relevant international maritime investigation rules, and based on the principle of separation of powers and responsibilities, established completely independent or relatively independent investigation and analysis institutions according to their own development of maritime investigation(Tong & Hao, 2004).

Since the Eighteenth National Congress of the Communist Party of China (CPC), the Ministry of Transport (MoT) of China has put forward new requirements for the construction of a "revolutionary, regularized and modernized" contingent of Maritime safety Administration (MSA) in order to build a strong maritime power and a new strategic starting point towards the sea. In order to fulfill international obligations and implement the directive spirit of the CPC Central Committee and the MoT, China MSA attaches great importance to maritime investigation, establishes a team of safety investigators under the unified management of the MSA, formulates the "Regulations on the Management of Maritime Investigators of P.R.C."（MoT, 2009） and the "Manual for Maritime Investigators"(MoWT，2014)and compiles Training Textbooks and Outlines for maritime investigators, which have played an important role for improving the qualification of maritime investigators and the ability of maritime investigation

Maritime investigators are a group of specialized "doctors" looking for the root of the disease for the current situation of maritime safety management. The team building of maritime investigators in China is fundamental to improve the level of accident investigation. As the ship's modernization, crew internationalization and the technicalization of laws and regulations, maritime investigation has become a highly professional and complicated work. Maritime investigation work relies more and more on various advanced technical means and expertise, which puts forward a very good quality for personnel engaged in maritime investigation. According to the relevant conventions, in order to enhance the team building of maritime investigators in China, it

is necessary not only to do a good job in the regulation and training of the standards for the appointment of maritime investigators, but also to establish a management mechanism for maritime investigators that conforms to the characteristics of our country.

1.2 Objective of the Research

The main objective of this study is to review relevant international laws and regulations, analyze and compare the development status of maritime investigation at home and abroad, as well as the qualification standards for maritime investigators, and form a guiding standard and training guide for maritime investigators. Combining with the working characteristics of maritime investigation in China, reference to domestic and international maritime investigation personnel training practice, the paper studied the mechanism building of China's maritime investigation team, and puts forward relevant mechanisms that conform to China's characteristics, so as to promote the “revolutionary, standardized and modernized” building of China’s maritime investigation team. The following are the main objectives of this paper:

1. To sort out the international and domestic conventions and regulations related to maritime investigation;

2. Conduct research and analysis on the qualification standards of maritime investigators and the current situation of their team building at home and abroad;

3. Makes an analysis and study on the team building of maritime investigators in China and propose some suggestions.

1.3 Methodology and Procedure

In order to ensure that the theory of this research paper is solid and the application is practical, this paper comprehensively uses literature review, social investigation, theoretical analysis, statistical analysis and other methods to carry out targeted research and analysis:

1. Literature review

By consulting domestic and foreign literatures and materials related to the subject, and combining with the implementation of relevant international conventions and regulations from archive of IMO, CNKI[1] and libraries, we can understand and grasp the status quo of the subject at home and abroad, the standards of maritime investigators of domestic and foreign, and the status quo of their team building mechanism.

2. Field investigation

According to the research direction of the paper, a questionnaire was designed to investigate the current situation of the maritime investigation team (including the number, working hours, stability, treatment, team building) and the existing problems, and in-depth interviews with the views and opinions of the professionals on expert-type maritime personnel were conducted.

3. Application of theory

According to the relevant theories of human resources management and the specific situation of the subject, the paper combines theory with practice, and puts forward specific methods suitable for the research of the subject.

4. Statistical analysis

Statistical analysis of the collected questionnaires and other data, combined with the previous literature review, theoretical application and other problems found and put forward countermeasures.

[1]CNKI: China National Knowledge Internet

5. Summary

All the data are summarized, summarized and sorted out, and the countermeasures and suggestions are put forward according to the main problems found in the paper.

1.4 Structure of the Research paper

In order to ensure that the structure of this research paper is reasonable and clear, this research paper is divided into six chapters: **Chapter one** introduces the research background, research objectives, research methods and steps, and makes a good research plan for this paper; **Chapter two** collects relevant international conventions and regulations on maritime investigation, and analyses and collates the qualification standards and training of foreign relevant maritime investigators and the mechanism building of maritime investigation team. The **Third Chapter** reviews the history of China's maritime investigation and the development of maritime investigators, designs questionnaires aiming at the relevant classification standards of maritime investigators and the status quo of their ranks, and obtains the relevant information and data of the research papers; The **Fourth Chapter** combines the theory of team building, makes statistics on the data of the topic, and analyses and summarizes the main problems of the current construction of maritime investigators in China; **Chapter five** summarizes the main reasons for the related problems, and puts forward relevant suggestions and countermeasures; **Chapter six** makes a final summary and conclusion of the research papers, outlines the focus and limitations of this study and the inspiration for further research.

CHAPTER 2: RELEVANT REGULATIONS ON INTERNATIONAL MARITIME INVESTIGATORS AND THEIR TEAM BUILDING

For a long time, IMO has been committed to strengthening the legislation of international cooperation and mutual recognition of maritime accidents (Schröder, 2019). In order to standardize and unify the maritime investigation of member states, and encourage international cooperation in maritime research, the international maritime organization has issued a series of resolutions and demonstration tutorials since 1968 to guide countries to improve the construction of maritime investigators (Xia, 2009).

2.1 IMO Regulations and Model Courses for Maritime Investigators

In order to further regulate and guide relevant international maritime investigations, the 1982 United Nations Convention on the Law of the Sea (UNCLOS)(IMO, 1994), as an umbrella law of all maritime rules, entered into force in 1994 and clearly states in its article 94, paragraph 7, that: "Each country involved in the country's flag vessel due to the perils of the sea or the high seas in accident cause death or serious injury to the other nation, or the boat to the other country A or facilities, or cause serious damage to the Marine environment of each event, should be the proper one or more qualified persons, person or in the presence of this person to investigate"(Hartmut, 2019).

2.1.1 IMO Regulations and Requirements for Maritime Investigators

Reviewing the provisions of the MARPOL and the Load Line Convention, the STCW Convention, although the above conventions have made different descriptions and requirements for the provisions of the maritime investigation, but in many international conventions, RESOLUTION MSC.255(84) adopted on 16 May 2008 were more instructive. The "Casualty Investigation Code" is required to comply with the international standards and recommendations of the international maritime incident safety investigation and the "Casualty Investigation Code" of the international maritime investigation rules, which were adopted in November 1997, Resolution (The Code for

the Investigation of Marine) and incidents, adopted by the organization by Resolution A.849(20), as amended by Resolution A.884(21), to promote the cooperation of the international maritime investigation and the general way of the international maritime investigation[2].

However, it is difficult to find relevant provisions on the qualification standards for maritime investigators and the mechanism building of their teams through sorting out the above-mentioned relevant conventions, regulations, resolutions and other documents related to maritime investigation. Although the "Casualty Investigation Code" in Part III - Recommended practices in chapter 15.1 of Part III - Recommended Practices require that "States should ensure that Marine safety investigating Authorities have suitably qualified personnel to enable them to facilitate the State's obligations to undertake Marine safety investigations into Marine casualties and Marine incidents under this Code", and the requirement in article 15.2 also stipulates that "Any investigator participating in maritime safety investigations should be appointed in accordance with the skills of maritime safety investigators listed in Resolution A.996 (25)". However, referring to the relevant provisions of the annex to Resolution A. 996(25) concerning the "Flag State Maritime Investigation"(IMO, 2008), article 38 only reiterates once again that a maritime investigation requires the flag state to be equipped with a suitably qualified maritime investigator. And article 39 also is general to conduct an independent investigation of maritime investigator insist they should have the "working knowledge and practical experience in those subject areas pertaining to their normal duties", and added the description: "to help the maritime investigator outside of their normal assigned tasks, the flag state shall ensure that may at any time according to need access to the following areas of expertise: navigation and collision avoidance rules; Flag state rules on certificates of competency; Causes of Marine pollution; Interview skills;

[2] Refer to the Code for the Investigation of Marine Casualties and Incidents, adopted by the Organization by resolution A.849(20), as amended by resolution A.884(21).

Collect evidence and assess the impact of human factors."

However, in contrast to the detailed qualification requirements of flag state surveyors in Resolution a. 996(25), there are 9 clauses from articles 28 to articles 36, which clearly stipulate the professional degree, qualifications standard and work experience of flag state surveyors.

To further assist, to the extent permitted by national law, investigators in implementing the "Casualty Investigation Code" and effectively guide maritime investigators in conducting maritime investigations, and to provide a common way to realize that it is necessary to establish standards, IMO revoked once again on November 4, 2013 (REVOKES Resolutions A. 849(20) and A. 884(21)) and passed IMO Resolutions A. 1075 (28), in which the further provisions have been laid out in the third paragraph of the resolution concerning "Qualifications and Training of Investigators". The competent maritime investigation authorities are required to develop appropriate training and help maritime investigators acquire professional maritime investigation skills (IMO, 2014).

Therefore, it is difficult to find clear international convention standards for maritime investigators. Faced with the above situation, many countries are difficult to refer to accurate international standards to carry out good domestic legislation, so the maritime authorities of various countries have to constantly sum up their experience in practice and learning by doing（Schröder, 2019.）

2.1.2 IMO Model Courses for Maritime Investigators

In order to improve the overall level of training of maritime investigators, maritime authorities of various countries are instructed to "develop a formal training programme to ensure that its investigators acquire the necessary knowledge" IMO has launched a

maritime investigators training model course, the main contents of which are listed in table 2.1:

Table 2.1 Main contents of IMO Model course

Item	Chapter	The main content
1	Course introduction	1.The introduction;2.Course objectives;3.Course structure;
2	International shipping - casualties and public opinion	1. Maritime traffic accidents in the eyes of the public and media; 2. Shipping safety issues; 3.Tip of the iceberg in accidents;
3	The investigation and study	1.Definition; 2.Courts and investigations; 3.Brief history of casualty investigation; 4.Concept of guilt;
4	International conventions and requirements	1. Introduction to IMO; 2.Law of the sea; 3. International Labour organization; 4. IMO conventions and resolutions; 5.IMO resolutions and notifications; 6.Code for Marine casualty and accident investigation;
5	Establish a survey	1.Jurisdiction; 2.Survey types and the role of researchers in formal surveys; 3.Appointment of investigators;6.Basic stakeholder groups;10 Practice; 11.Occupational health and safety, etc.
6	Interview	1. Ten commandments of interviews; 2.Planning and preparation; 3.Organize interviews; 4.Witnesses - people; 5.Memory - guidance from non-professionals; 6. Types of sightings, etc.

7	Elements of human casualties	1.Simple accident model; 2.Shipwreck accident of Herald Free Enterprise; 3.Unsafe behaviors -- active and potential factors (accident investigation and analysis model); 4.Human contribution to complex system failure etc.
8	Human factors	1.Competence, health, talents and abilities; 2.Organization of vessels; 3.Incentive - Yerkes-Dodson Law; 4.Factors affecting performance, etc.
9	Gathering evidence	1. Evidence; 2.Evidence standards; 3.Evidence type; 10. Collect direct/true evidence; Using external experts on September; 12.External information of the ship, etc.
10	Identify the sequence of incidents and analyze the evidence	1.Introduction; Accident analysis criteria; 3.Establish the hypothesis; 4.Causal factors and events and conditions charts; Analysis of physical evidence; 9.Interview analysis, etc.
11	The report	1.Natural justice - dissemination of the draft report; 2.IMO reporting requirements; 3.Report format

2.2 Current Situation of Maritime Investigators in Foreign Countries

By reviewing the relevant international regulations, resolutions and conventions concerning maritime investigators, we can more effectively analyze and understand the current situation of the construction of the contingent of maritime investigators in Europe and the United States, as well as the training content and the contingent building mechanism, so as to provide reference for the development of the relevant research

direction of the contingent construction of maritime investigators in China.

2.2.1The Qualification Standards for Foreign Maritime Investigators

Overseas research on the classification and qualification standards of maritime investigators has been quite mature, such as the Australia, the Canada, the United States, Netherlands, the United Kingdom, Japan and so on.

2.2.1.1 Grading and Qualifications standard of the UK

The Marine Accident Investigation Branch (MAIB), established in 1989, is responsible for ascertaining the causes and facts of accidents, improving the safety of life at sea and avoiding the recurrence of accidents. Maritime investigators in Britain are divided into three levels (Tong & Hao, 2004):

1. The Chief Investigation Officer, who presides over the investigation of major accidents, is a comprehensive investigation, usually conducted by an investigation team; after the investigation, the investigation report is written.

2. Maritime investigators, who are investigating major accidents, need to call witnesses and, if feasible, investigate ships. Write an investigation report after the investigation.

3. Administrative investigators - General accidents are investigated by mail and telephone. Maritime investigations without summoning witnesses are divided into three levels: general inquiry, preliminary investigation and comprehensive investigation. Britain requires qualified maritime investigators to have a university degree, maritime qualifications, adequate knowledge of ships, and required training. MAIB surveys are conducted by senior personnel in the field of navigation, marine engineering or ship construction, who generally have different experience and expertise.

2.2.1.2 Grading and Investigation Team of the US

The U.S. Maritime Investigation is conducted by the National Transportation Safety Board (NTSB) and the United States Coast Guard (USCG). However, NTSB is responsible for maritime investigation in accordance with the International Maritime Investigation Rules. Its maritime investigation is divided into four levels: the first level and the second level have their own characteristics, and the first level is “desk audit”. In practice, the number and proportion of the first two types of surveys are much larger than those of the formal surveys. Therefore, the classification of the United States is relatively fine, which is conducive to the rapid handling of minor accidents.

The U.S. NTSB Maritime Investigation Division consists of 13 investigators, divided into several groups. Maritime investigators in NTSB are basically recruited by people who have worked as captains or engineers for many years or have special expertise in a particular field (such as psychologists). NTSB attaches great importance to the investigation and analysis of human factors in accident investigation. There are many experts of human factors investigation, a doctor of psychology in its maritime investigation team, and there are always human factors investigation teams in actual investigation.

2.2.1.3 Qualifications Standard of Australian

The Australian Maritime Safety Authority (AMSA), Australian Traffic Safety Authority (ATSA), all States and Territory Maritime Administration (NSW) and Port Company are the units participating in the Maritime Investigation in Australia. The ATSA and other accident investigation agencies believe that investigators at different levels should have appropriate skills. They are also very strict in the management of the contingent of maritime investigators. Personnel engaged in maritime investigation usually have a university degree and the qualifications of captain or engineer. Among them, the most

important are professional knowledge, investigation project management and related laws and regulations. In addition, it includes: system thinking, safety management system, safety investigation methods, human factor analysis, inquiry technology, evidence analysis (record, sampling, certification), occupational health and safety, casualty disposal, effective information communication and reporting, knowledge application and quality control, etc.

In addition, maritime investigators are given more responsibilities. They not only have the qualification certificate of investigators, but also have professional certificates such as ship inspection and ship safety inspection. They can also conduct legal technical appraisal of accident losses and issue technical appraisal reports of ship losses.

2.2.1.4 Grading and Knowledge Matching of Holland

G. Th. Koning of the Netherlands proposed that according to the different levels of accident investigation, maritime investigators should be divided into five levels: junior investigators, intermediate investigators, senior investigators, project managers, and major accident investigation managers. The knowledge matching maps of maritime investigators are given, as shown in Figure 2.1.

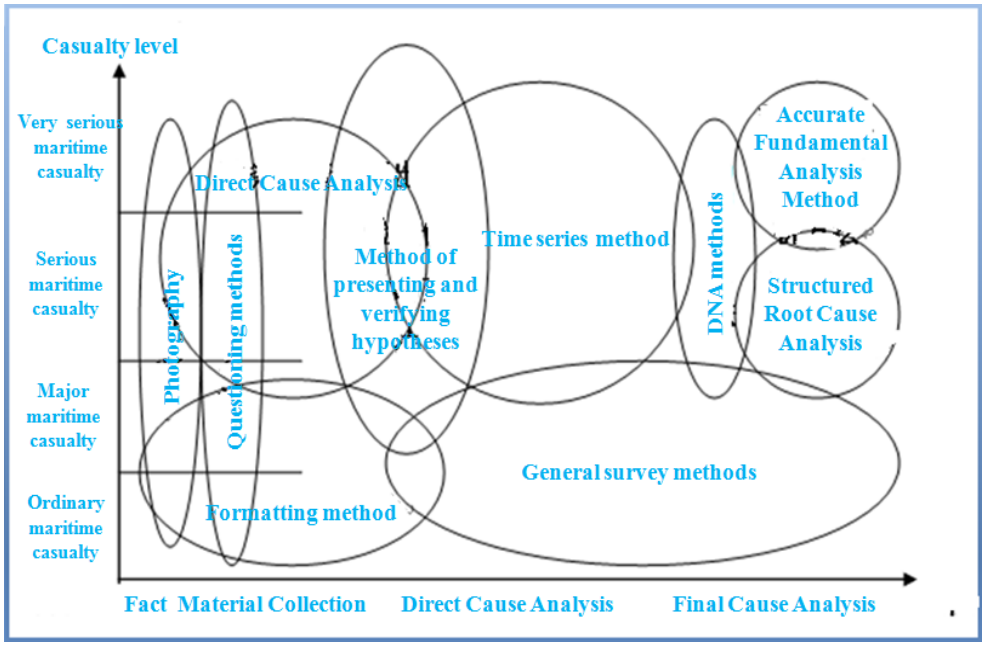

Figure 2.1 Surveyor Knowledge Structure Matching Diagram

These countries all have clear classification and professional standards for maritime investigators, and basically require relevant maritime background and expertise in different aspects of maritime investigation.

2.2.2 Training of Foreign Maritime Investigators

The shipping developed countries in Europe and America not only improve the standards of personnel, but also follow the relevant international rules in the training of maritime investigators. In addition to the basic maritime expertise of maritime investigators, they also emphasize the training of accident investigation expertise.

2.2.2.1Training of American Maritime Investigators

USCG Training Model: Maritime Investigators of the USCG must undergo professional training, which is conducted by the USCG to select training projects, arrange training courses and determine training time. USCG is generally responsible for training, but there are also cases where maritime colleges or training institutions are entrusted with

training according to relevant courses.

The training contents mainly include the following aspects: first, the laws and regulations related to maritime investigation and international conventions, system documents; second, the investigation of human factors. Mainly includes the command, operation and ship management requirements of ship officers, the management and operation mechanism of ship companies, etc. Thirdly, the technical requirements, operation methods, maintenance and inspection of ship structure, etc.; and fourthly, the technical standards, emergency procedures, fire-rescue maneuvers of fire-fighting and life-saving equipment, etc.; Fifth, the use and acquisition methods of various aids and recording equipment. It includes downloading relevant data from VDR, AIS, GPS, VTS system, radar and playback and analysis, etc. Sixth, maritime investigation techniques and techniques, specifically for the selection of inquiry sites, inquiry methods and records, on-site photography and production of inspection records, sample testing and component testing, simulation of the accident process, etc.

NTSB training model: NTSB marine traffic accident investigators are basically graduates of professional colleges and universities, and most of them have served as captains or engineers on ships with many years maritime experience, but before engaging in maritime investigation, they need two years of work experience and three months of specialized training. The following table 2.2 lists some of the training courses and lecturers.

Table 2.2 NTSB training course on maritime accident investigation

Date	Course Arrangement and Activity Content
Monday	Opening speech
	Introduction of Accident Investigation Technology
	The law involved in the investigation of accidents

	Coast Guard Accident Investigation
	Accidents caused by fatigue and distracted operation
Tuesday	Description of accidents caused by deck operation
	Survival factor
	Human factor
Wednesday	Fracture identification
	The influence of relevant parties on the investigation of the accident
	Electronic data and ship particular
Thursday	Accident investigation and evidence collection (interview)
	Fire accident investigation
	Influence of weather on maritime accident investigation
	Biochemical related matters
Friday	Marine Engine Factor
	Write accident investigation report

The Maritime Investigators of USCG should first undergo three months of training before they engage in accident investigation. After the training, they should conduct a two-year internship. After the completion of the internship, the expert committee will evaluate the results and performance of the internship, and then they can engage in accident investigation after they are qualified. Investigators generally start from junior investigators, and after a certain number of years, they are assessed and promoted according to their professional performance.

The NTSB Maritime Investigator is selected and appointed by the Transportation Safety

Committee according to the need of setting up maritime investigation posts. Once appointed as an accident investigator, it will belong to the national staff. These accident investigators have no mandatory training requirements and standards, nor assessment indicators. Whether they can maintain their competence depends on the specific working conditions. However, they are all authoritative persons and experts in the professions and disciplines involved in accident investigation.

2.2.2.2 Training at MAIB and CRANFIELD University, UK

1. Training at MAIB

The British Maritime Accident Investigation Bureau（MAIB） attaches great importance to the health and labour protection of maritime investigators. Before they participate in accident investigation, investigators are required to undergo relevant health and safety training. The Maritime Bureau of the UK equips each investigator with special labor protection equipment and carries out special training, which includes altitude training, personal protection equipment training, the use of toxic gas detectors, the use of radiation detectors and the effectiveness of the detection of protective masks. Every time an investigator enters the accident site, he needs to make a dynamic safety assessment of the accident site. If he thinks there is a safety risk, he can’t enter the accident site.

Every year, the MAIB also organizes various professional training for accident investigation, some of which are explained by internal staff, some by external experts, and the training is mainly aimed at some knowledge that needs to be used and understood in practical work. For example, in recent years, more and more accidents have been caused by the use of ECDIS or ECS. So the MAIB has devoted great efforts to this area, paying more attention to personnel training and accident investigation.

2. Training at CRANFIELD University

CRANFIELD University is a well-known graduate education institution, which mainly focuses on academic research. In recent years, the school has offered short-term training courses, in which the short-term training of accident investigation is very famous. It has 35 years of training experience and trained a large number of accident investigators from different countries in the world. The courses offered include:

1. Preparations for accident investigation and basic skills to be mastered

In terms of curriculum design, considering that the trainees come from different fields and have different working experience, some of them do not have the relevant experience of accident investigation, the curriculum lays particular emphasis on the basic knowledge of accident investigation to ensure that the trainees master the basic knowledge of accident investigation through training.

(1) Self-protection of maritime investigators

Accident investigators need to have basic knowledge of self-protection and equipped with appropriate self-protection equipment. The training includes the preliminary assessment of the accident scene, the personal protection equipment that investigators need to equip, and the use method of personal protection equipment.

(2) Evidence Collection Method at Accident Site

When an accident investigator enters the accident scene, he or she should collect evidence in all available ways, which will help you find out the cause of the accident.

(3) Method of preserving evidence on accident scene

Evidence collected at the scene of the accident needs to be well protected, otherwise it may lose its role, especially those easily lost evidence such as body sampling, DNA sampling, volatile evidence samples, fire scene and so on.

2. Accident investigation

Arrange a simulated accident investigation according to the course schedule at the appropriate time in the second week. The accident simulates an accident in which a railway maintenance worker was killed by a train. All the stories were not explained in advance. Each group studied how to evaluate the accident scene, collect evidence, ask witnesses, and preserve evidence according to the previous learning content.

3. Analysis of the causes of the accident

All the evidences obtained were analyzed by the method of teaching analysis. Each group chooses appropriate analytical methods to analyze the collected evidence. Training and learning focus on finding the cause of the accident, not responsibility investigation. In teaching, we instill the idea that "The human's error isn't the cause of the accident, it's only the potential of the system failure." Therefore, all investigations are based on the presumption of innocence.

4. Accident investigators testify in court

Many accidents in Britain require investigators to testify in court, not to point out that someone or company has made a mistake. They only need investigators to state some facts from professional investigations and give judges and juries a basis for judgment. Sometimes lawyers ask very guiding or tendentious questions about how to answer them, including the appearance and manner in court.

2.2.3 The mechanism of foreign maritime investigation team building

Maritime investigation has higher requirements for knowledge, ability and experience, among which more attention is paid to empirical factors, while the accumulation of

experience requires longer time and practice (Zhang, 2009). Different western maritime investigation team building mechanisms are conducive to ensuring the stability of investigators, and promoting the ability of investigators and accumulation of experience.

1. United Kingdom

The MAIB is responsible for ascertaining the causes and facts of accidents, improving the safety of life at sea and avoiding the recurrence of accidents. The Maritime and Coastal Guard Agency (MCA) is an administrative authority with the power to enforce the law. Accident investigation is only a part of its law enforcement work. Its nature is law enforcement investigation. It is specifically responsible for maritime safety and environmental protection, and carries out administrative investigation, punishment and litigation on ships and facilities causing accidents. MCA and MAIB may investigate the same case at the same time, but the content and direction of the investigation are different, and they do not interfere with each other in the investigation.

MAIB, the UK, has 35 people in its entirety. Investigators are divided into the Chief Survey Officer and Assistant Surveyor. The Chief Investigation Officer is responsible for international cooperation and project planning. The Assistant Investigation Unit is divided into four investigation groups, each consisting of a Chief Investigation Officer and three to four investigators. Each investigation group is on standby 24 hours a week.

2. The United States

Maritime investigation in the United States is a two-track system. The NTSB and the USCG exercise safety investigation and administrative investigation respectively (Huang, 2016). The USCG is responsible for investigating and administering penalties for all maritime incidents in US waters, and NTSB conducts selective safety investigations and submits investigation reports to Congress to conduct maritime

investigations in accordance with the International Maritime Investigation Rules. The findings issued by NTSB do not determine any liability, but only include negligence. USCG is responsible for the administrative investigation and handling of each incident and submits investigation reports to its built-in Maritime Investigation Headquarters.

3.The Australia

Maritime investigation departments in Australia conduct investigations according to their targets and scope of management. They all have their own characteristics and expertise, and the management of maritime investigators is very strict. They not only have strict hierarchy and promotion system, but also need to be determined according to the number of accidents investigated by investigators, the nature of accidents investigated and the level of professional culture. They are audited by the higher investigators every year, so that they can be promoted to meet the requirements.

4. The Japan

Japan Transport Safety Board (JTSB) is the Department responsible for preventing air, rail and sea transport accidents and reducing losses through accident investigation. The task of Japan Transport Safety Committee is to find out the causes of accidents and put forward suggestions to improve safety so as to prevent accidents, The Maritime Investigator at Headquarters is responsible for major maritime investigations, and the Maritime Investigator at each office is responsible for maritime investigations other than major maritime investigations. JTSB is the main agency to prevent maritime accidents and improve maritime safety. After receiving the accident notification, the Maritime Investigation Office designates the head of the investigation team and other investigators according to the level and nature of the accident, coordinates relevant departments and informs relevant stakeholders. The investigation team collects evidence, inquires witnesses and gets information from ships according to the law，and they also

may engage experts or specialized agencies to assist in the investigation.

2.3 Chapter Summary

Throughout the development and status quo of maritime investigation in various countries, the standards and investigation mechanisms of maritime personnel in various countries are becoming more and more mature, but each has its own characteristics. Although various countries have classified maritime investigators at different levels on the basis of different levels of maritime investigation and put forward different qualification requirements, and even formed the distinction between single-track system and double-track system in the investigation mechanism, such as the United Kingdom, Canada's single-track system and the dual-track system represented by the United States, with the aim of "identifying the circumstances and causes of accidents, in order to enhance life and property at sea" Maritime investigation for the purpose of "safety" has gradually been accepted by various countries, and an independent maritime investigation body has been formed according to relevant international and domestic legislation.

CHAPTER 3：REVIEW THE CURRENTTEAM BUILDING OF MARITIME INVESTIGATORS IN CHINA

After years of efforts, China’s maritime investigation legislation has been constantly improved. Maritime investigators have made considerable progress in terms of job standards, training and assessment mechanism construction, which has played an important role in the prevention of maritime accidents and the improvement of the level of water safety management in China (Huang, 2016). However, there is still a big gap between China's maritime investigation and the United States. Learning from other countries’ relevant maritime investigation mechanism and experience is of great significance to improve China’s maritime investigation mechanism and improve the level of maritime investigation.

3.1 The Development of Maritime Investigators in China

"Maritime Investigator" is a national official who is specifically responsible for the investigation of water traffic accidents in China. Its title is formally named according to the "Regulations on the Administration of Maritime Investigators" (MoC, 2009) issued by China MSA in 2006, which was previously called "Maritime Traffic Accident Investigator". For many years, it was generally believed that accident investigation could be done by anyone without the accumulation of technology and experience, which caused that the level of investigation has stagnated. There are many part-time investigators, and those who hold the certificates of Captain and chief engineer are not full-time accident investigators. Few of them are really engaged in accident investigation for more than 15 years and have some experience in accident investigation.

The competent departments of maritime investigators in China are the local maritime bureaus and their subordinate maritime offices, navigation offices, etc. However, due to the great regional differences among the local maritime administrative departments

themselves, the maritime investigators' academic level, knowledge structure, technical quality, professional ability and practical experience and skills are also quite different. The uneven quality of investigation and handling of cases has affected the credibility and authority of the Maritime Bureau.

According to the statistics of 349 intermediate and 58 senior investigators registered in the Ministry of Maritime Affairs in 2007, compared with the situation in 1999, the comprehensive quality of Chinese maritime investigators has been greatly improved on the one hand, mainly reflected in the higher educational level of investigators and the correlation between their majors and maritime affairs than in the past, but on the other hand, there are still some problems.

3.2 Current Grading and Qualification Standards of Maritime Investigators in China

On January 1, 2009, the "Regulations on the Administration of Maritime Investigators" was formally implemented, marking a new stage of development of China's maritime investigation work. According to the Regulations on the Administration of Maritime Investigators in China, maritime investigators are divided into three levels: senior maritime investigators, intermediate maritime investigators and assistant maritime investigators. Each level is divided into two categories: foreign-related and non-foreign-related. The conditions for admission of maritime investigators are as follows:

1. Qualifications of Assistant Maritime Investigators:

（1） Holding a certificate of maritime administrative law enforcement;

（2） College degree or above in maritime related specialty;

（3） Participating in maritime work for more than three years and engaging in the investigation and treatment of maritime traffic accidents for more than one

year;

（4） Qualified through training and examination of assistant maritime investigators;

（5） It is valid after annual examination and registration.

2. Qualifications of intermediate maritime investigators:

（1） Holding a certificate of maritime administrative law enforcement;

（2） College degree or above in maritime related specialty;

（3） Participating in maritime work for more than 8 years and having the qualification of assistant maritime investigator for more than 5 years; or engaging in the investigation and treatment of maritime traffic accidents and the cumulative qualifications of senior seafarers on board for more than 10 years; or engaging in the investigation of maritime traffic accidents for more than 10 years;

（4） Qualified by competent training and examination of intermediate maritime investigators;

（5） It is valid after annual examination and registration.

3. Qualifications of senior maritime investigators:

（1） Holding a certificate of maritime administrative law enforcement;

（2） College degree or above in maritime related specialty;

（3） Participating in maritime work for more than 10 years and having the qualification of intermediate maritime investigator for more than 5 years; or engaging in the investigation and treatment of maritime traffic accidents and

the cumulative qualifications of senior seafarers on board for more than 15 years; or engaging in the investigation and treatment of maritime traffic accidents for more than 15 years;

（4） Qualified by qualified training and examination of senior maritime investigators;

（5） It is valid after annual examination and registration.

4. A foreign-related maritime investigator shall have a CET-4 or above or a comparable level of English or a comparable level of other foreign languages.

3.3 Current Training Situation of Maritime Investigators in China

After the full implementation of the system of maritime investigators, the requirements for maritime investigators have been further improved. Only through regular training can the overall level of our country's maritime investigators be gradually improved, which meets the requirements of future maritime investigation. Therefore, in 2006, the MoT promulgated the "Maritime Investigator Training Examination Outline" (abbreviated as "Outline"), which is compatible with the "Maritime Investigator Management Regulations (Trial Implementation)". "Outline" aims to select training materials and develop training courses for maritime investigators to obtain the post, promotion and knowledge updating of maritime investigators. Through more systematic and practical training and teaching, the trainees can familiarize themselves with and master the knowledge of maritime laws and regulations, navigation technology, investigation technology, maritime traffic engineering and foreign languages related to accident investigation, and improve the basic quality and professional ability of the investigators of maritime traffic accidents, so as to be in line with international maritime investigation as soon as possible. The Outline has made general provisions on the specific content and class hours of the training of maritime investigators at all levels.

Since January 1, 2009, the formal implementation of the Regulations on the Management of Maritime Investigators has made the management of the investigative team more standardized, which also puts forward higher requirements for the maritime investigation team. Therefore, it is necessary for them to master comprehensive knowledge and skills of maritime investigation through training. According to the Regulations on the Management of Maritime Investigators, the training of maritime investigators in China can be divided into competent training and knowledge updating training. The competency training, examination and knowledge updating training of assistant maritime investigators shall be organized and implemented by the directly affiliated maritime bureaus and provincial local maritime bureaus on their own according to the training and examination outline; the competency training of intermediate and senior maritime investigators shall be organized and implemented by the units designated by the competent authorities, and the examination shall be organized and implemented by the competent authorities in a unified manner. The knowledge updating training for intermediate and senior maritime investigators (including English intensive training for foreign-related maritime investigators) is planned and organized by the Maritime Bureau of the Ministry of China in accordance with the training syllabus. Each investigator should have no less than 16 hours of knowledge updating training every two years.

Before the full implementation of the system of maritime investigators, the Maritime Bureau of the Ministry of China has selected excellent maritime law enforcement officers from all over the country for many times to study advanced maritime affairs knowledge and management experience of developed countries abroad in order to promote the improvement of the overall quality of maritime investigators; At the same time, in cooperation with IMO, several training and exchange projects have been held in Shanghai and Dalian.

3.4 Current Mechanism building of Maritime Investigators in China

The competent organs responsible for maritime investigation in China are the Maritime Bureau of the Ministry of Transport and its directly affiliated maritime bureaus and local maritime agencies. In the maritime system directly under the Ministry of Communications, the posts of maritime investigation are usually located in the safety management department. China's maritime agencies that perform maritime safety supervision shall be administered vertically, and the functions and powers of maritime investigation shall be exercised by the internal departments of the maritime agencies (Zhang, 2009). Local maritime agencies have different departments and posts for maritime investigation. The specific responsibilities of the Maritime System Safety Management Department directly under the jurisdiction of the Maritime System are as follows: to manage and guide the investigation, treatment, statistical analysis and settlement of maritime traffic accidents and pollution accidents; to organize or participate in the investigation, treatment and settlement of major and extraordinarily large maritime traffic accidents and pollution accidents; and to be responsible for the reporting and safety investigation of foreign-related maritime accidents or incidents.

At the end of 2005, the Ministry of Communications promulgated the Regulations on the Management of Maritime Investigators (for trial implementation), which means that the Maritime System has fully implemented the Maritime Investigator System since July 1, 2006. "Maritime Investigator" is a national official who undertakes the investigation and treatment of water traffic accidents. Its title is formally named after the "Regulations on the Administration of Maritime Investigators" (trial implementation) issued by China Maritime Administration, which was previously called "Maritime Traffic Accident Investigator".

The identification of the qualifications of maritime investigators began immediately,

and the certification system was applied to the civil servants of various maritime agencies engaged in maritime investigation. Maritime investigators are divided into senior maritime investigators, intermediate maritime investigators and assistant maritime investigators. Each level is divided into two categories: foreign-related maritime investigators and non-foreign-related maritime investigators. The senior maritime investigator may organize or preside over the investigation of all levels of maritime traffic accidents; the intermediate maritime investigator may organize or preside over the investigation of major accidents and below levels of maritime traffic accidents; and the assistant maritime investigator may organize or preside over the investigation of minor accidents. Personnel holding a maritime investigation certificate may participate in the investigation teams of accidents at all levels. Personnel holding maritime administrative law enforcement certificates may participate in the investigation of accidents at all levels. The investigation of foreign-related accidents shall be organized or presided over by senior maritime investigators or intermediate maritime investigators with foreign-related qualifications. Only through strict step-by-step training and assessment procedures can formal certificates of professional qualification of maritime investigators be obtained. Uncertified maritime investigators can’t conduct maritime investigation and processing.

For a long time, China's Law of the People's Republic of China on Maritime Traffic Safety stipulates that maritime investigation is "Identify the cause and determine the responsibility ". It emphasizes the common practice of investigating the liability for accidents and the current maritime investigation system. As a result, the investigation of accidents in China often stays at the superficial causes, and the causes of accidents are deeper. There is still a big gap between the level of understanding, understanding and mining and the maritime investigation in developed countries.

3.5 Current Team Building of Maritime Investigators in China

At present, only the directly affiliated maritime bureau has a full-time post of maritime investigator, which is located in the safety management department of the directly affiliated maritime bureau. No full-time maritime investigation posts are set up in all branches and local maritime systems. In the absence of a maritime investigation task, the personnel of each post shall perform their duties of daily maritime supervision; when it is necessary to carry out a maritime investigation task, the personnel holding the certificate of a maritime investigation officer shall be selected to form an investigation team according to the needs of the task. That is to say, except for a few full-time maritime investigation officers, the maritime investigation officers of our country are distributed in all positions of the maritime system, and their daily work is not based on maritime affairs. Survey is the main method.

In order to have a more in-depth and detailed understanding of the current situation of maritime investigators in China, this paper designs relevant questionnaires and conducts investigations through Fujian Maritime Bureau, Fuzhou Local Maritime Bureau, Guangdong Maritime Bureau, Shajiao Maritime Department of Guangdong Maritime Bureau, Chongqing Local Maritime Bureau, Yangtze River Maritime Bureau and Three Gorges Maritime Bureau, and collects the questionnaires and obtains the following relevant statistical data.

1. Age distribution

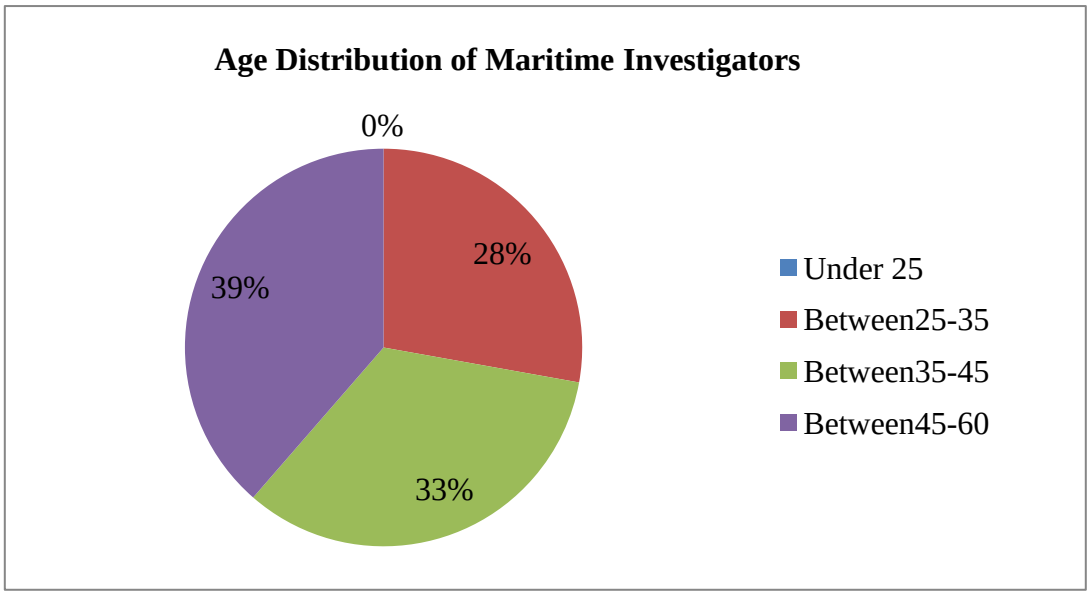

Figure 3.1 Age distribution of maritime investigators

Table 3.1 Questionnaire statistics of age distribution

Item	Age Distribution	Number
1	Under 25	0
2	Between25-35	116
3	Between35-45	140
4	Between45-60	161

2. Educational background

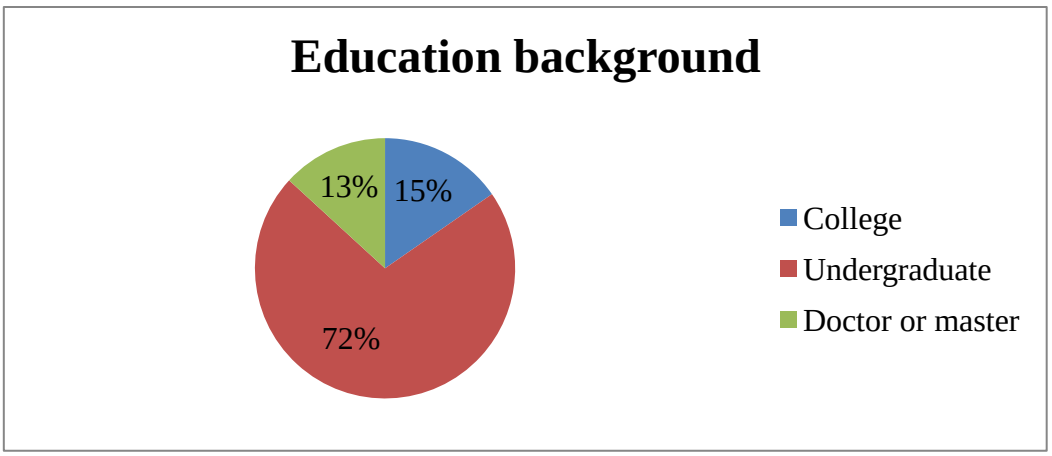

Figure 3.2 Education background distribution of maritime investigators

Table 3.2 Questionnaire statistics of education background

Item	Education background	Number
1	College	64
2	Undergraduate	298
3	Doctor or master	55

3. Professional background

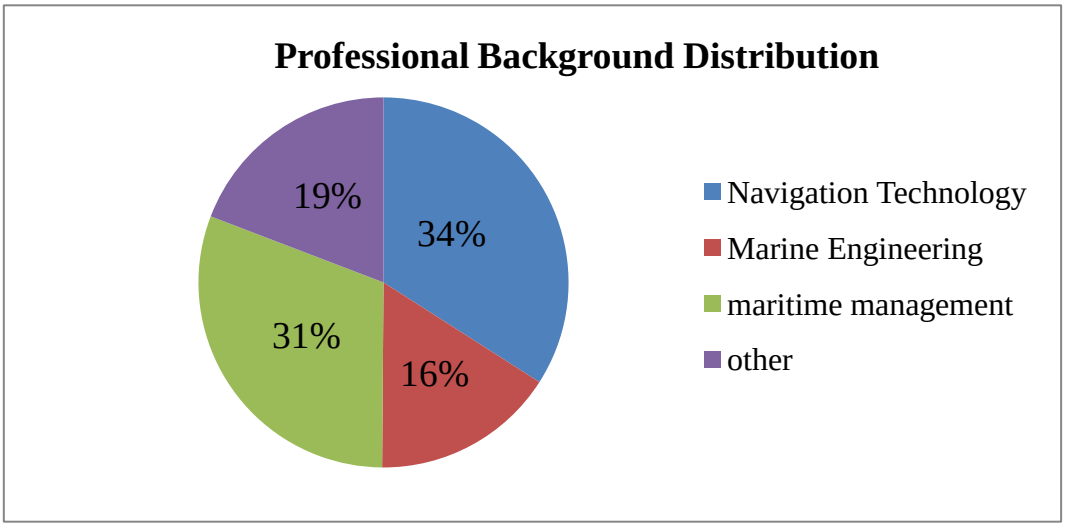

Figure 3.3 Professional background distribution of maritime investigators

Table 3.3 Questionnaire statistics of professional background

Item	Professional Background	Number
1	Navigation Technology	142
2	Marine Engineering	67
3	maritime management	128
4	other	80

4. Certificate level of maritime investigator

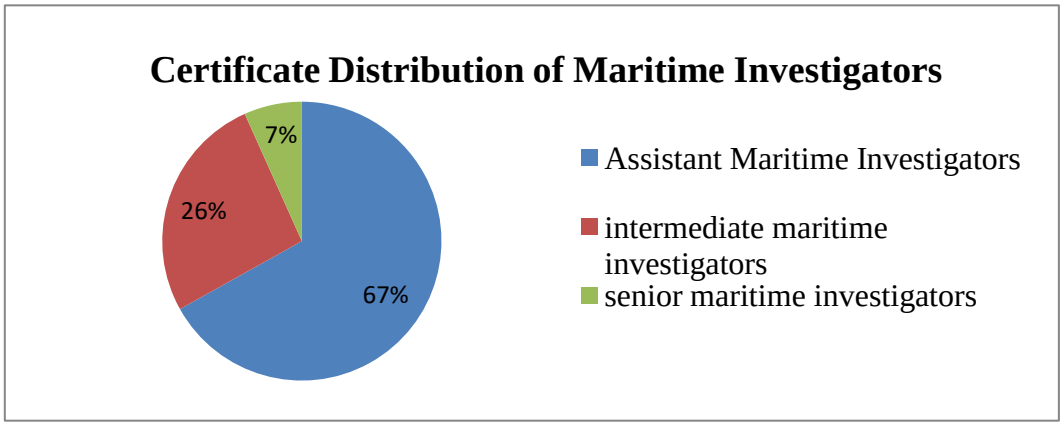

Figure 3.4 Certificate distribution of maritime investigators

Table 3.4 Questionnaire statistics of certificate levels

Item	Professional Background	Number
1	Assistant Maritime Investigators	279
2	intermediate maritime investigators	110
3	senior maritime investigators	28

5. Holding time of maritime investigator's certificate

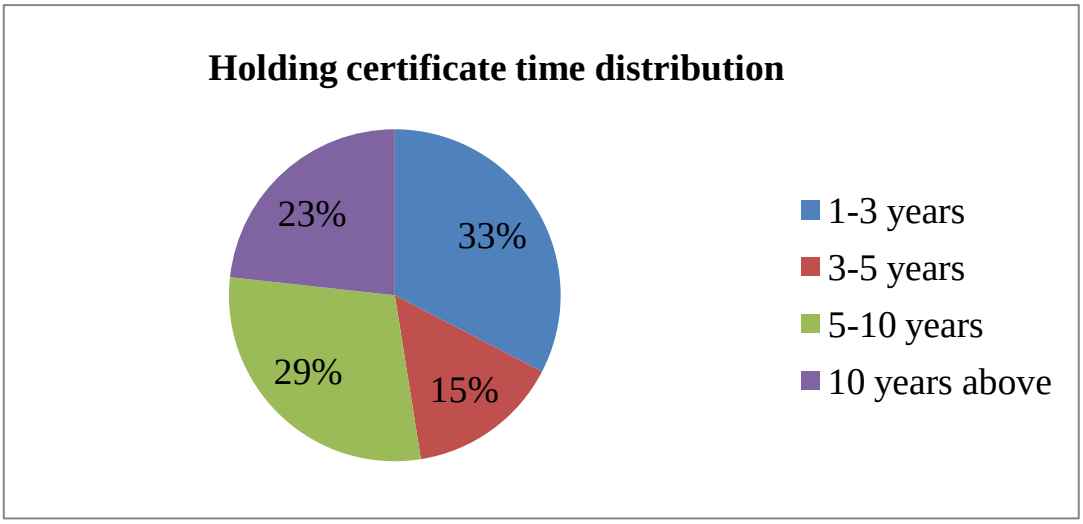

Figure 3.5 Holding certificate time distribution of maritime investigators

Table 3.5 Questionnaire statistics of holding certificate time

Item	Holding Certificates Time	Number
1	1-3 years	136
2	3-5 years	62
3	5-10 years	122
4	above 10 years	97

A total of 417 maritime investigators participated in the investigation, basically reflecting the basic situation of China's maritime investigators. From the above charts, we can see that the age distribution of maritime investigators in China is reasonable, and their educational background, professional background and training are in line with the relevant provisions of IMO. Moreover, as far as the personal conditions and qualities of maritime investigators are concerned, there is no gap between China's maritime investigators and foreign maritime investigators.

However, the number of maritime investigators participating in accident investigation and the working time of accident investigation in China still need to be further improved.

6. The number of participations in maritime investigations

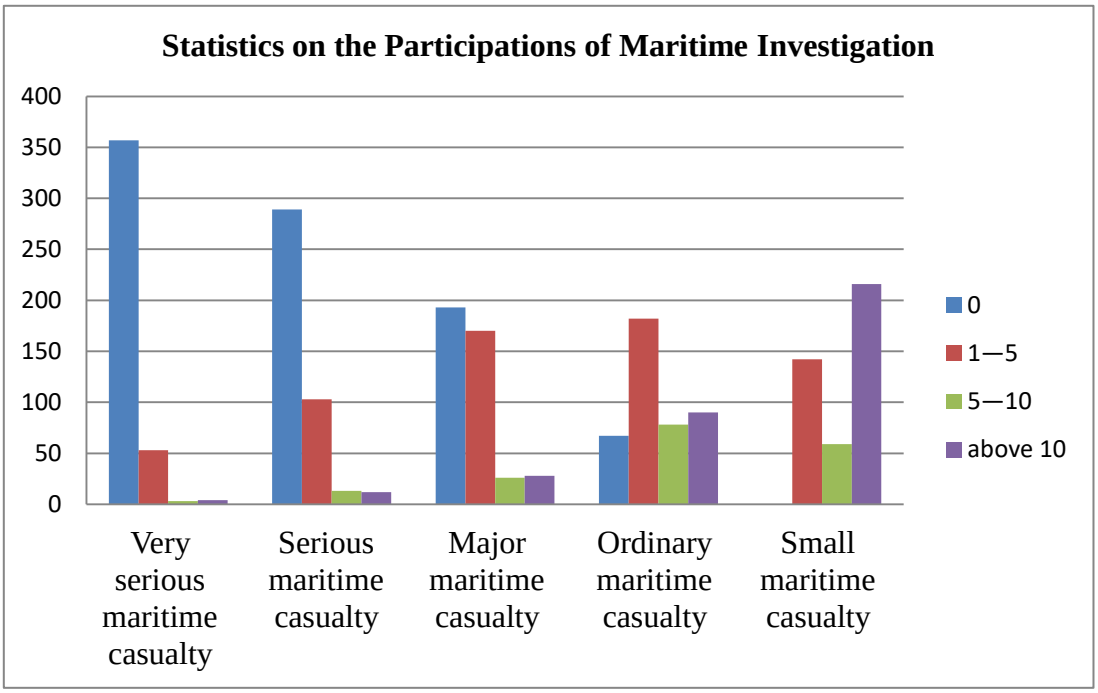

Figure3.6 Statistics on the Participation of Maritime Investigations

Table 3.6 Questionnaire statistics of Participation in Maritime Investigators

Item	Participation numbers	0	1-5	5-10	Above 10
1	Very serious maritime casualty	357	53	3	4
2	Serious maritime casualty	289	103	13	12
3	Major maritime casualty	193	170	26	28
4	Ordinary maritime casualty	67	182	78	90
5	Small maritime casualty	0	142	59	216

7. Statistics on the number of maritime investigations conducted

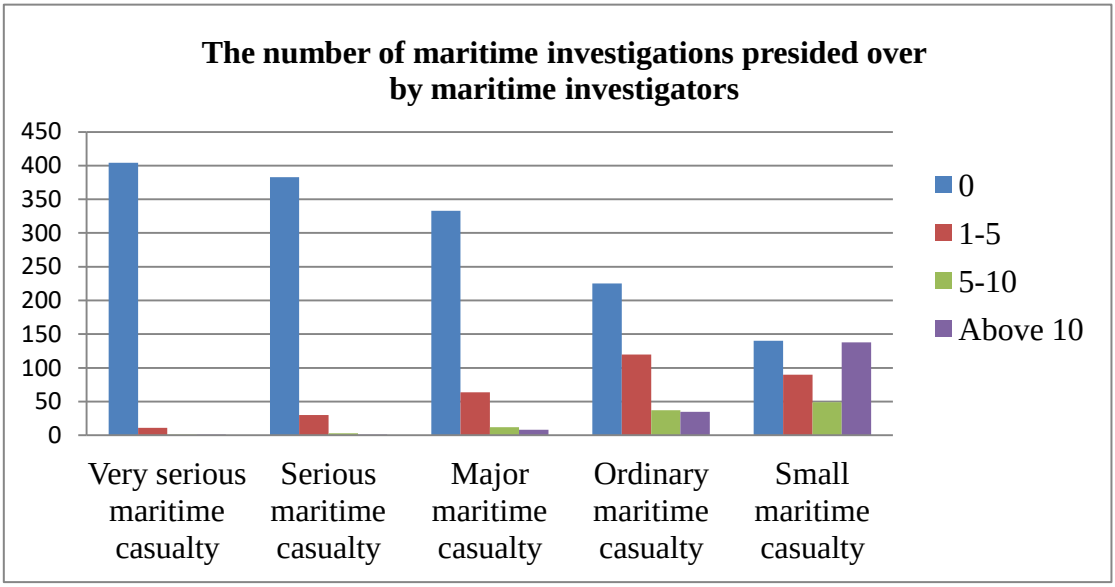

Figure3.7 The number of maritime investigations presided over by maritime investigators

Table3.7Questionnaire statistics of maritime Investigations presided over by maritime investigators

Item	The investigation number presided over by maritime investigators	0	1-5	5-10	Above 10
1	Very serious maritime casualty	404	11	1	1
2	Serious maritime casualty	383	30	3	1
3	Major maritime casualty	333	64	12	8
4	Ordinary maritime casualty	225	120	37	35
5	Small maritime casualty	140	90	49	138

At present, the number of experienced maritime investigators in China is relatively small. Investigators participate in or preside over less times of maritime investigation, especially in the investigation of serious and extraordinarily serious accidents. The time spent in maritime investigation is relatively short, which is not conducive to familiarizing with procedures, learning knowledge, mastering skills and accumulating experience. Maritime investigation is a very practical work. Some knowledge, skills and

practices needed by maritime investigation can only be learned and mastered in practice. Some experiences and skills must be practiced repeatedly enough and for a long time to form.

3.6 Chapter Summary

Implementing the system of maritime investigators is not only the historical requirement of China's maritime development, but also the objective requirement of international integration, and also the duty of fulfilling international conventions. In accordance with the requirements of conventions such as the UNCLOS, the maritime authorities of flag States and coastal States shall not only establish an appropriate, effective and internationally recognized system for the investigation of maritime traffic accidents, but also take effective measures to ensure that adequate and appropriate human and material resources are available to complete the investigation of accidents. After years of efforts, the promulgation of the Regulations on the Management of Maritime Investigators in China not only establishes the corresponding standards for the "admission", "grading standards" and training and assessment of maritime investigators in China, but also gradually forms the construction mechanism of the contingent of maritime investigators with Chinese characteristics, and gradually trains and builds up a professional contingent of maritime investigators.

CHAPTER 4：MAJOR PROBLEMS AND ANALYSIS OF TEAM BUILDINGFOR MARITIME INVESTIGATORS

Within the current framework of maritime investigation in China, the purpose of accident investigation is only to "find out the cause and determine the responsibility", and more attention is paid to the latter, which is quite different from the purpose of investigation in IMO Maritime Investigation Rules "to find out the cause, draw lessons, take corresponding measures and prevent similar accidents". According to the relevant IMO conventions and regulations, compared with the concepts and institutional arrangements of maritime investigation in developed countries, we can better find the existing qualification standards, training and team building mechanism of maritime investigators in China (Yang & Pan, 2009).

4.1 Problems and Analysis of Qualifications of Maritime Investigators in China

Maritime investigators are charged with the complex tasks of identifying the accident circumstances, collecting evidence, analyzing the causes, summarizing and reporting. The complexity of the task requires that the maritime investigators should have a high comprehensive quality.

4.1.1 Requirements of Maritime Investigators

1. Basic quality requirements (Business-based).

Maritime investigation is a highly professional work, "impartiality, objectivity, timeliness and comprehensiveness" is the basic requirement for the quality of maritime investigators, but also its obligations to be fulfilled. In carrying out the task of accident investigation, they should issue law enforcement certificates to the respondents, use legal means to investigate and deal with water traffic accidents in accordance with the authorization of the law and the procedures prescribed by the law, and then objectively and authentically compile a report on the investigation of water traffic accidents. When mediating civil disputes caused by maritime traffic accidents, the principle of

voluntariness and fairness should also be followed.

2. Knowledge structure requirements.

The investigation of maritime traffic accidents often covers the investigation of maritime accidents of various nature, such as territorial sea of flag state, inland navigation waters, ports, wharfs and so on. Therefore, as a maritime investigator, in order to meet the special needs of maritime investigation, he should not only master the professional knowledge related to navigation, ship collision avoidance, ship maneuvering and marine engine management, but also have the relevant knowledge of law, psychology, evidence, investigation and system engineering. He should also master the relevant technologies of maritime investigation, such as collision trace analysis. In order to participate in international maritime investigation better, we should keep abreast of the new trends and new technologies of international maritime investigation, such as maritime investigation evidence, electronic evidence extraction and inquiry techniques.

3. Practical requirements.

Maritime investigation is a complex work with high requirements of theory, technology and experience, which requires the maritime investigators not only to master the relevant theoretical knowledge, but also to accumulate rich practical experience. In addition, more modern laboratory tools such as accident detection and simulation analysis are needed to support maritime investigation (Huang, 2016).

4.1.2 Main Problems of qualification Requirements for Maritime Investigators

As mentioned above, neither the previous A 24-Res.973 overview of the qualifications of maritime investigators nor the later IMO Res. A. 1075 (28) supplement the integrity of the qualifications and training of maritime investigators, there is no detailed

requirement for the qualifications of maritime investigators. However, in accordance with the relevant international rules, China has made relatively clear provisions on the standards for the appointment of maritime investigators after perfecting its domestic legislation. Detailed provisions can be found in **chapter 3.2**.

Reference to IMO and foreign maritime investigators classification and qualification standard, combined with China's maritime investigators grading system and the actual situation of maritime investigation aspects, the standard of appointment of maritime investigators and the three-level classification system of maritime investigators in China conform to the current situation of maritime investigation in China and can promote the development of the maritime investigation team building. However, compared with maritime investigations in developed countries such as Britain and Australia, their maritime investigators generally have professional background and work experience in navigation, marine engineering or shipbuilding. For example, there are captains or engineers who have worked for many years in navigation and investigators who have worked in large shipyards in shipbuilding.

According to relevant statistics, as shown in **Table 4.1**, only 18% of maritime investigators actually have the qualifications of C/Oor2/E, whereas 58% of them have no maritime qualifications, and they will gradually grow from assistant investigators to senior maritime investigators in the future. However，there is no clear and strict regulation on the requirement of working experience on board for maritime investigators in China，and The maritime investigator can be used as an alternative by experience of serving. To a certain extent, it makes up for the general lack of working experience on board for maritime investigators in China, but it leaves hidden dangers for the future development and maritime investigation teams building.

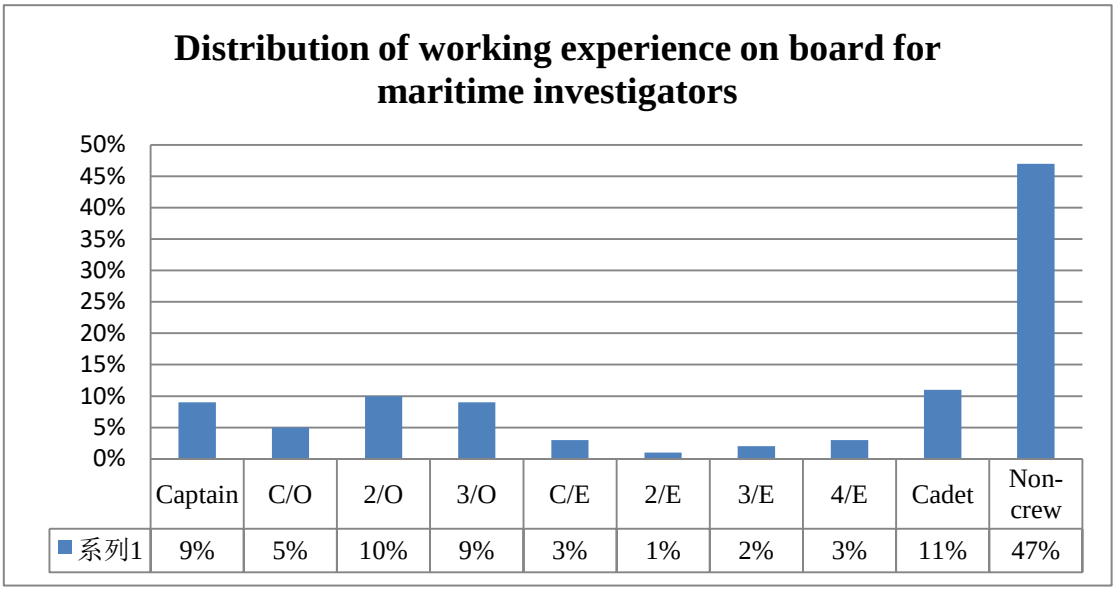

Figure4.1 Distribution of working experience on board for maritime investigators

4.2 Problems and Analysis of Maritime Investigator Training in China

Maritime investigation is a highly professional work. As a maritime investigator, in order to meet the special needs of maritime investigation, we should not only master the professional knowledge related to navigation, collision avoidance, and so on, but also have the relevant knowledge of law, psychology, evidence and so on. Maritime investigation training can effectively improve the professional skills of maritime investigators. By comparing the maritime investigation training in developed countries such as Europe and the United States, we can better find out the shortcomings of China's maritime investigation training.

4.2.1Comparison of Maritime Investigators Training between China and Foreign Countries

Because the foundation and the authorities in charge of the system of maritime investigation training institutions at home and abroad are different, there are also some differences between China and other countries in maritime investigation training model.

1. Different training methods.

The corresponding training carried out by maritime investigation training institutions in developed countries has strong pertinence and purpose, and it is also conditional to carry out specific practical training, such as accident scene simulation training and laboratory practice. "Simulated accident investigation" is very practical, not only can it be well applied and tested the theoretical knowledge learned in the classroom. It can also give the trainees a sense of immersion, and at the same time enable them to experience the on-site forensic procedures, inspection procedures and post-investigation summary and reporting required by the actual investigation.

2. Different teaching contents.

Because foreign maritime investigators are basically recruited from applicants with corresponding working experience, the relevant training abroad emphasizes on professional technology, and the teaching content focuses on the promotion of maritime investigation professional technology; while the training of maritime investigation in China needs to start from basic knowledge, the training content focuses on theoretical knowledge, and then gradually through the investigation of actual cases to improve the operational capacity of maritime investigators.

In addition, compared with the IMO Maritime Investigation Model Course and CRANFIELD University Accident Investigation Basic Training, there is no specific knowledge module of "human factors" in the Maritime Investigation Officer Management Regulations of China.

4.2.2 Analysis of the Main Problems in the Training of Maritime Investigators in China

1. The training methods and contents of maritime investigators need to be improved.

As shown in Figures 4-2 and 4-3, although the MoC promulgated the “Outline of Training Examination for Maritime Investigators” in 2006, not all Maritime Authorities have developed a systematic training system for maritime investigators. In addition, the current training of maritime investigators focuses on the renewal of theory and knowledge, and the training for maritime investigation practice is less, which makes it difficult to develop in depth, and the lack of funds makes the training unsustainable. The training of maritime investigators in local maritime and non-water network regional maritime systems is far from systematic and institutionalized. Therefore, most maritime investigators believe that the current training methods can not substantially improve the level of maritime investigation.

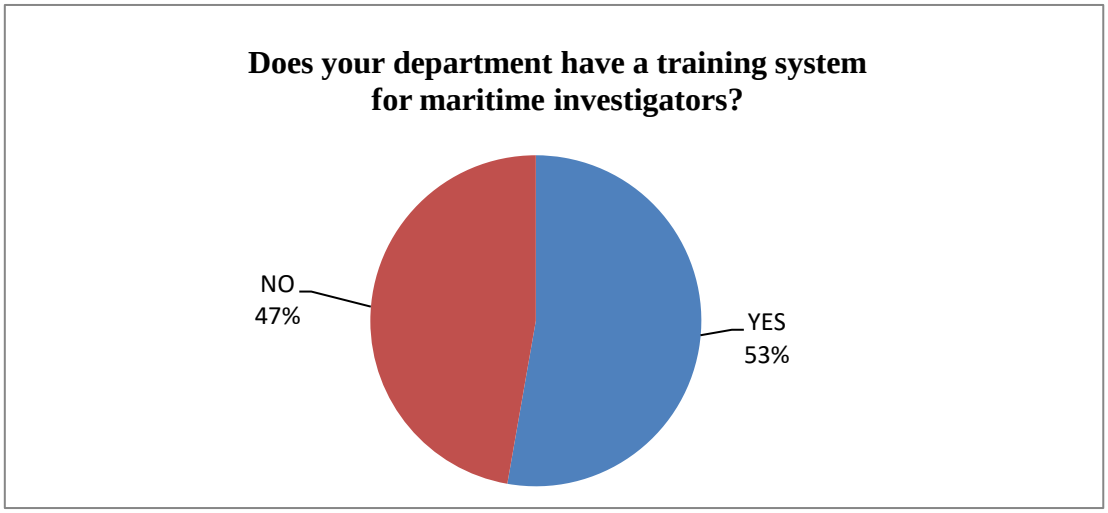

Figure4.2 Statistics of the training institutions for maritime investigation

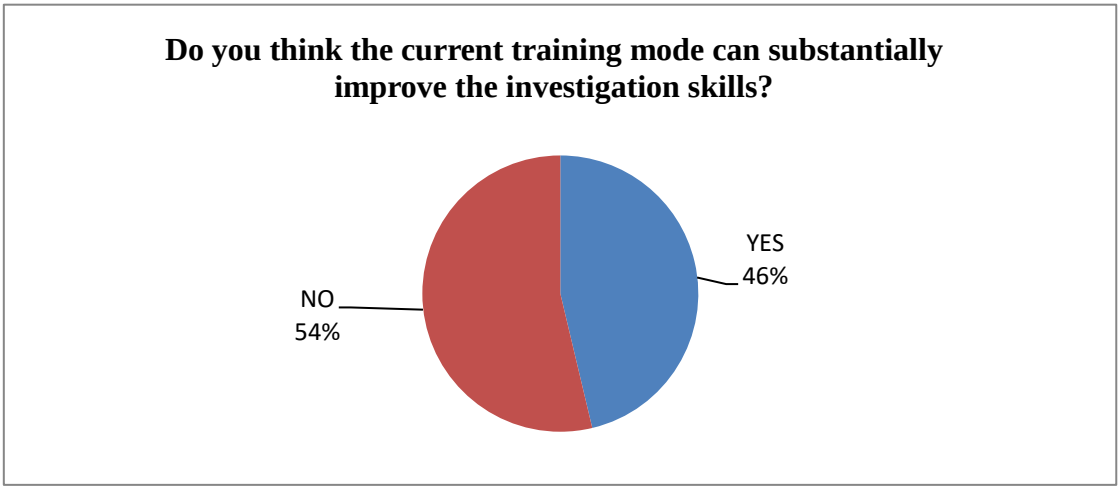

Figure4.3 Statistics of the training mode for maritime investigation

2.Some department still lack necessary professional equipments and maritime investigators.

According to the Statistics58% of the investigators reported that the maritime investigation team lacked the necessary professional facilities, and some maritime investigators still have the situation of "single combat". Compared with MAIB in Britain, they have a complete set of professional teams with clear tasks, such as investigation, forensics, technical analysis, experimental demonstration, expert support, report writing, and so on. They have a detailed division of work and tacit understanding, and can find out the cause of the accident to the greatest extent. However, China's maritime investigation is still in the era of "soldier-to-soldier combat" for maritime investigators. Almost all the work involved in maritime investigation should be completed by the investigator alone. The investigation of the causes of accidents usually stays on the surface and lacks the ability and conditions to continue to dig in depth.

4.3 Problems and Analysis of Mechanism for Maritime Investigation Team building

The mechanism of maritime investigation team building belongs to the category of talent working mechanism, which is the unification of talent working institution and related system of talent management. The mechanism of maritime investigation team

building should be based on the relevant theories and methods of human resources planning, personnel training and development theory, performance management and salary system theory and methods, and employee relationship theory.

4.3.1 Mechanisms for the Maritime Investigation Teams building

Strengthening the team building of maritime investigators is an important measure to cope with the new situation, challenges and tasks. Building a high-quality and high-level maritime investigation team requires not only scientific guidelines, but also various good mechanisms, which can improve the problems existing in the construction of maritime investigation team.

1. Appointment and selection mechanism.

Employment and selection are the entrance for the maritime investigation team building. It is necessary to improve the entry mechanism of the maritime investigation team and strictly control the entry on the selection and employment of the maritime investigation team.

2. Linkage mechanism of cultivation, use and flow.

Selecting excellent personnel is only the first step in the building of maritime investigation team. However, there is still a lot of follow-up work to be done to make a good employee become an excellent maritime investigator. The linkage mechanism of training, using and flowing of the maritime investigation team is an important link. This mechanism will promote the construction of maritime investigation team.

3. Restriction and assessment mechanism.

We will further improve the evaluation and restraint mechanism for the maritime investigation team, and earnestly strengthen the requirements for the work of the

maritime investigation team as well as the assessment work, so that rewards and punishments are clearly defined and merits are rewarded. This is also an effective measure to further strengthen the construction, management and use of maritime investigation team. In formulating assessment standards, we should implement the principle of objectivity and impartiality, and embody democratic principles in assessment methods and procedures.

4. Incentive and guarantee mechanisms.

The safeguard mechanism is a system formulated in accordance with the law to protect the rights of civil servants. It is a mechanism for the state to provide civil servants with guarantees to meet their material and spiritual needs. It is also the material basis for the normal operation of the entire civil service system. In order to strengthen the construction of maritime investigation team, we must establish and improve the incentive and guarantee mechanism of maritime investigation team.

5. Elimination mechanism.

Strengthen the dynamic management of the maritime investigation team, so as to have employment and dismissal, and constantly update. Resignation and retirement are the major exit mechanisms, which promote the rational flow of talents and effectively allocate human resources.

4.3.2 Analysis of the Major Problems in the Mechanism of Maritime Investigation team building in China

Through questionnaires and some on-the-spot investigations, this paper summarizes the problems existing in the current mechanism building of maritime investigation team in China and analyses the reasons. According to statistics of questionnaire Feedback on restricting factors in maritime investigation, see Figure4-4, 75% of the questionnaire

feedback believe that the ranks of maritime investigators are unstable and 73% of the maritime investigators believe that institutional issues of maritime investigation in the current maritime investigation system are the main problems which limits the further improvement of the level of maritime investigation. The mechanism problems of maritime investigation are as follows:

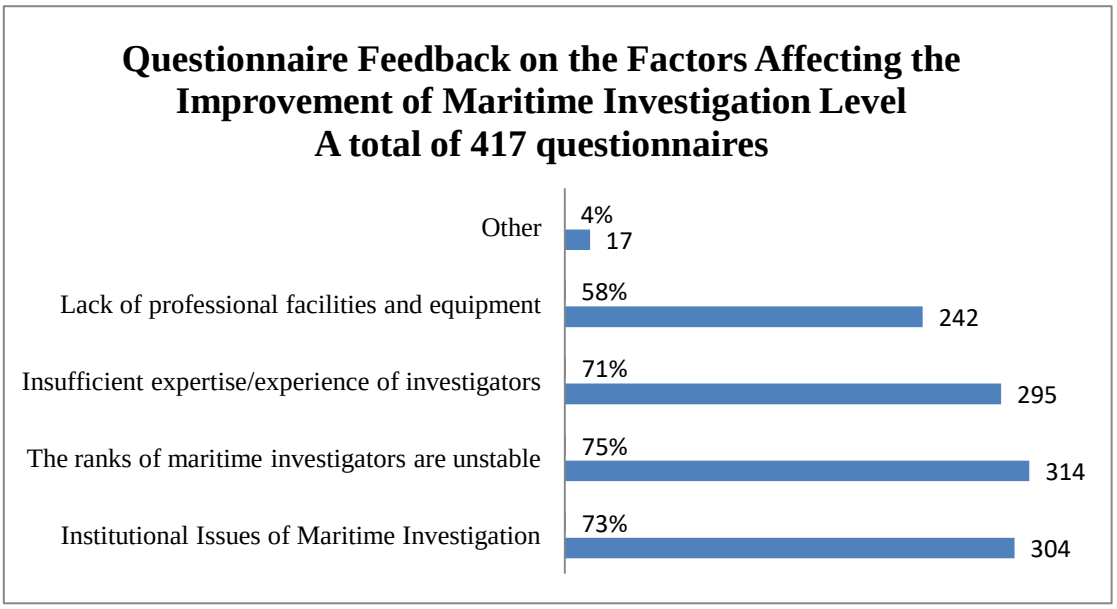

Figure4.4 Statistics of restricting factors in maritime investigation

1. The position setting of full-time maritime investigator is not scientific.

Maritime investigation work is different from other daily supervision or routine work of the maritime system. If there are accidents, there will be no investigation without accidents. Different personnel involved in the investigation of accidents will also be different, and there will be no fixed working hours and working objects. Maritime departments with fewer accidents in their jurisdictions may not have several maritime investigation work in perennial years; and maritime agencies with frequent accidents in their jurisdictions will have maritime investigation work. Investigation work is busy, often need to work overtime. Therefore, the maritime investigation posts of various maritime agencies in China should take into account the law of accidents in their

jurisdictions, and the existing posts have some imperfections.

2. No training, promotion, assessment and incentive mechanism.

Among the several maritime bureaus investigated by the research, there are no relevant documents for the construction of maritime investigation team. Only some of the personnel policies of the maritime bureau involve the evaluation and evaluation of maritime investigators. Questionnaire results show that most maritime bureaus do not have a clear system to select suitable materials according to the characteristics of maritime investigation work, such as considering educational background, qualifications, personality characteristics, and there are no relevant provisions for assessment, promotion, salary and so on, see figure-4-5.

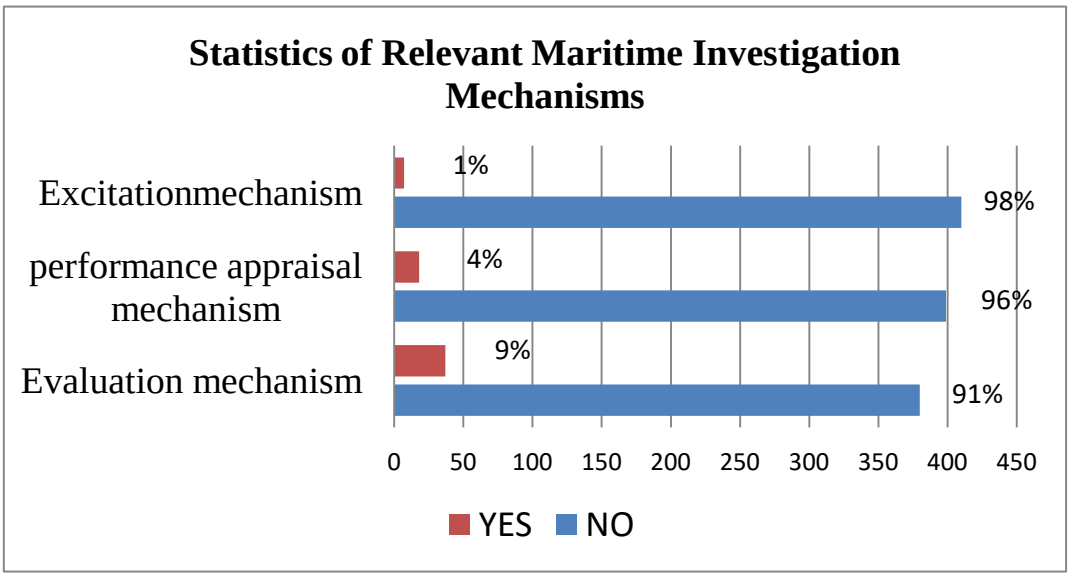

Figure4.5 Statistics of relevant maritime investigation mechanisms

3. The maritime investigation team is unstable and the personnel mobility is high.

The existing maritime investigation system leads to the instability of the maritime investigation team and the high mobility of personnel. As mentioned above, at present only a few direct bureaus have full-time maritime investigators, which are relatively stable; but most of them hold certificates, but their daily work is not based on maritime

investigation, but distributed in all positions of the Maritime Bureau. This often leads to situations where a maritime investigator has participated in several maritime investigations, has just become familiar with the work of maritime investigation, and has been transferred to other posts.

In addition, the work of maritime investigation has the characteristics of tight time, heavy tasks and great pressure. It often needs to work overtime and without holidays, and there is no corresponding incentive measures and compensation guarantee. Compared with other positions, maritime investigation posts are "hard work" and have no attraction, and lack of motivation for people to study business and improve their skills. It is understood in the investigation that some maritime bureaus, when they need to carry out tasks to recruit maritime investigators, have no one to take part in them voluntarily and only have to make compulsory apportionment; some who are unwilling to participate in maritime investigations intentionally do not obtain the certificate of the investigator, or intentionally do not participate in the training of the investigator, in order to avoid the task of maritime investigation, the units have no choice but to force new recruits to participate in the certificate of the investigator.

4.4 Chapter Summary

Through literature review, summary and theoretical analysis, this chapter makes an analysis and summary on the standards of service, training and assessment and team mechanism construction of maritime investigators in China, which provides sufficient theoretical proof and data support for the promotion of the construction of maritime investigators in China.

CHAPTER 5: SUGGESTIONS ON THE CONSTRUCTION OF MARITIME INVESTIGATORS IN CHINA

Through the analysis and research on the qualification standard, personnel training and team building mechanism of China's maritime investigation team, we can summarize the existing problems of China's maritime investigation team building in a more comprehensive way, carry out targeted research, and put forward suggestions to improve China's maritime investigation team building.

5.1 Revising the Qualification Standards in Time

Improving the professional quality of law enforcement personnel is the precondition of strengthening the maritime investigation and processing work and ensuring a maritime investigation. Whether it can be fair and efficient, and whether it can satisfy and convince all parties involved in the accident, the professional quality of maritime investigators is a key factor (Wang, 2009). Especially in the past ten years, the development of navigation technology has made great strides. The application of new technologies such as electronic chart, digital communication, cargo integrated control and processing system, high automation engine room, integrated navigation system and digital bridge has greatly changed the traditional mode and concept of navigation, and will also have a significant impact on the work of maritime investigation, which requirements for the quality of maritime investigators have also been raised accordingly.

In view of the fact that maritime investigators in China generally have no working experience on ships and are not clear about the actual operation of ships, the requirements for maritime investigators' experience at sea should be clearly strengthened. In particular, the requirements for the appointment of intermediate and senior maritime investigators should maintain certain working experience on board, such as three to six months within five years or equivalent study time at sea. For example, since the beginning of 2007, Tianjin Maritime Bureau has planned to send

inspectors on board to eat, live and work with the crew. They not only experience the hardship and working habits of the environment on board, but also learn and master the VDR, AIS, GPS, GMDSS satellite ship station and navigation aids which are seldom touched in marine work.

5.2 Formulating Guidelines and Principles for Personnel Training

Under the framework of relevant international conventions and domestic laws and regulations, taking the Regulations on the Management of Maritime Investigators as the main basis, the Guideline for Training and Examination of Maritime Investigators and the Model Course of IMO as the reference, Referring to the experience of training maritime investigators in developed countries, combining with the current situation of China's maritime investigation system and the contingent of maritime investigators, we adopt flexible, phased and targeted training methods, aiming at improving the professional competence and professional level of maritime investigators in an all-round way.

Based on the above guidelines, the following principles should be followed in formulating the training syllabus:

1. The principle of practicability of training content.

   The contents of courses, operations, practice and assessments included in the training syllabus can’t be separated from the actual situation of the maritime investigation system in China, nor can they copy or apply the IMO Model Course or the relevant training courses abroad. The purpose of the curriculum is to substantially improve the maritime investigation ability of the trainees.

2. The principle of diversification of training forms.

   Training should adopt many forms, such as theoretical teaching, case analysis, on-site

teaching, practical operation, simulator experiment, evaluation and so on, pay attention to the combination of theory and practice, and focus on improving the ability of training objects to solve practical problems.

3. The principle of modularization of training courses.

Modular training courses have the characteristics of strong pertinence, flexible training forms and easy training time arrangement. Training organizers can choose appropriate training courses according to the actual situation of training objects. For example, students of non-marine majors should learn appropriate courses of navigation majors, such as Introduction to Navigation and Marine Engine, while students of marine majors need not participate in such training.

4. Hierarchical principle of training object.

The training is divided into competent training and continuing education training. The training targets are assistant maritime investigators, intermediate maritime investigators and senior maritime investigators. There are also English training for foreign investigators at each level.

In addition, the training and management at different levels will be beneficial to the building of the professional team of maritime investigators and stimulate their enthusiasm. At present, the professionalization of the mechanism of maritime investigators in China is relatively low. Graded training and management of maritime investigators is conducive to maintaining the stability of the team and making the construction of maritime investigators in China gradually on the road of standardization.

5.3 Improving the Modularization of Training Syllabus

The modular course training is more suitable for the existing maritime investigation system and the present situation of the investigating officer team in China. According to the requirements for knowledge and ability of maritime investigators such as "Casualty Investigation Code" and "IMO Mandatory Document Implementation Rules", referring to "IMO Model Course" and according to the actual situation of China's maritime investigation system, the training syllabus module can be divided into the following parts:

Module 1: Maritime Code

This part is the basic knowledge of the training of maritime investigators. The personnel involved in maritime investigation should systematically grasp China's maritime investigation system, its operation procedures and relevant regulations, pay attention to the official information of relevant international organizations, and understand the latest developments in this field.

Module 2: Professional knowledge of navigation and shipbuilding.

This module is the professional knowledge part of maritime investigators. Although maritime investigators generally have professional backgrounds such as navigation, marine engine or shipbuilding, they need to supplement their knowledge beyond their own specialties.

Module 3: Survey knowledge and skills

This module is for maritime investigators to train investigation professional knowledge and skills. Learn the basic knowledge of investigation, IMO Maritime Investigator Model Course, master the basic skills of investigation and interrogation, familiar with crash trace analysis, accident escape analysis and other skills. For senior maritime

investigators, they should also have a good grasp of the relevant provisions on coordination with maritime investigators from other countries in foreign-related maritime investigations.

Module 4: Evidence Science and Evidence Collection

This module is related to the training of maritime investigators in evidence theory and evidence collection technology. This module is the theoretical part. It trains trainees on the evidentiary basis and related evidences in maritime investigation, as well as the common methods of collecting evidences in maritime investigation..

Module 5: Accident analysis

The analysis of accident causes plays a decisive role in the process of maritime investigation. It is helpful for maritime investigators to find out the main causes of the accident by using appropriate analysis methods. This module is the relevant theoretical knowledge and method of accident cause analysis for maritime investigator training.

Module 6: Human/Fatigue Factor Investigation

Human factors are the main causes of maritime accidents in recent years. The relevant IMO documents and China's regulations stipulate that maritime investigators must master the influence of human factors on maritime affairs and the investigation of human factors in maritime investigation. The investigation of human factors and fatigue factors is quite different from that of traditional accident investigation. Therefore, maritime investigators should systematically learn relevant theoretical knowledge and methods.

Module 7: Investigation equipment and its use

There are certain risks in the process of maritime investigation. Maritime investigators need their own protective equipment. In addition, professional equipment is needed to collect evidence, collect information and data, and trainees must be skilled in using these equipment in order to complete the task of maritime investigation.

Module 8: Maritime Investigation Report Writing

The results of maritime investigation are reflected in the report of maritime investigation. This module is for training maritime investigators to systematically learn and master the normative writing methods of maritime investigation reports. Foreign-related maritime investigators should also master the writing of English reports.

Module 9: Common English for Maritime Investigation

Qualified maritime investigators must be proficient in reading ship and equipment information in English. When conducting foreign-related maritime investigations, they should be able to communicate with parties, inquire and record in English; communicate and coordinate with foreign maritime investigation agencies or personnel; and write maritime investigation reports in English. It is necessary to train maritime investigators in English.

5.4 Establishing a Mechanism of Maritime Investigators with Chinese Characteristics

Under China's current maritime management system, the directly affiliated bureaus set up institutions and posts according to the unified deployment of ministries and bureaus, without the right to set up posts independently. The mechanism building of maritime investigation team needs top-level design and top-down implementation.

1. Establishing special incentive and safeguard mechanism and training, use and flow mechanism for maritime investigation work

In the course of investigation, the greatest opinion of the current maritime investigation team is that there is no corresponding incentive and guarantee mechanism for maritime investigation work, which leads to the low enthusiasm of maritime investigators to participate in maritime investigation work. Many units are forced to take the lead of mandatory apportionment or take turns to participate in the way of recruiting persons holding the certificate of maritime investigator to participate in maritime investigation. Even the phenomenon of deliberately failing to obtain the certificate of maritime investigator in order to evade maritime investigation is one of the fundamental reasons that restrict the development of maritime investigation team. Therefore, within the framework of the existing system, we should formulate incentive mechanisms for maritime investigation and adopt material incentives or as one of the necessary conditions for promotion.

In addition, it is necessary to establish a safeguard mechanism to ensure the stability and development of the contingent of maritime investigators, clarify the level and treatment of full-time maritime investigation posts in the system, so that full-time personnel can study maritime investigation business with confidence and dedication and improve maritime investigation skills. Competition can only be achieved with treatment, and the vitality of the team can be maintained with competition.

2. Taking full-time maritime investigators into the management of professional and technical personnel series.

China's Maritime Safety Law stipulates that the duty of maritime investigation is to "ascertain the cause and determine the responsibility". Currently, the main task of maritime investigation is to ascertain the cause of the accident. In terms of the nature of the work, full-time maritime investigation posts are closer to professional and technical posts. Full-time maritime investigation officers work on various types of maritime/water

traffic (pollution) accidents. Their work mainly includes investigation, evidence collection, analysis of causes and preparation of investigation reports. Similar to the surveyors of classification societies, this work needs more professional and technical competence than administrative competence. Other day-to-day supervisory posts directly face the administrative counterpart, the content and way of work are different in public affairs management and administration.

The management system of professional technology series has relatively perfect standards of admission, assessment, promotion, reward and withdrawal, and clear levels and treatment. Incorporating full-time maritime investigators into professional technical series can attract more social talents to join the ranks of maritime investigators, maintain the competitiveness and vitality of the ranks, and facilitate the assessment of the workload of maritime investigation.

3. Establishment of a Maritime Investigation Center by the Subordinate Bureau.

At present, it is difficult to change the organizational structure and increase the staffing of the Maritime Bureau. Without additional staffing, it is more convenient and feasible to set up a Maritime Investigation Center directly under the Maritime Bureau. In this way, we can not only ensure the relative stability of maritime investigators, but also mobilize everyone's enthusiasm through the establishment of posts. The specific scheme is as follows:

(1) The Maritime Bureau directly under the Ministry of Maritime Affairs shall establish an internal organization, a "Maritime Investigation Center", which shall clarify the composition of personnel and posts, positions or ranks (e.g. chief investigators, senior investigators, etc.) and draw on the relevant contents of the scheme.

(2) The "Maritime Investigation Center" is responsible for the investigation and treatment of maritime traffic accidents in the jurisdiction; for the analysis and research of the traffic safety situation in the jurisdiction; and for putting forward the safety management countermeasures of the jurisdiction according to the research.

(3) Clearly specify the conditions and assessment mechanism of each post, so that the personnel of each post of the "Maritime Investigation Center" are truly competent maritime investigators.

(4) Depending on the circumstances of maritime traffic accidents in the jurisdiction, the directly affiliated Bureau shall, when necessary, set up a "maritime investigation sub-center" under its Branch Bureau or grass-roots maritime organizations.

4. Establish an independent Maritime Investigation Technical organization.

If it is possible to increase the staffing, an independent maritime investigation technical institution (and its branches) under the direct leadership of the Maritime Bureau of the Ministry shall be established and managed according to the staffing of public institutions.

The establishment of an independent maritime investigation technical organization can fundamentally solve the main problems existing in China's maritime investigation and further improve the level of China's maritime investigation for the following reasons:

(1) Establishing independent technical institutions to conduct maritime investigation conforms to the development trend of IMO and maritime investigation.

(2) The establishment of an independent maritime investigation technical organization can free the maritime investigators from the shackles of determining responsibility and regulating disputes.

(3) Establish an independent maritime investigation technical institution, whose personnel are full-time maritime investigators, which can be organized and managed according to public institutions and incorporated into the professional and technical personnel system; or face the society to absorb talents, so as to break down the obstacles of the system and mechanism of the flow of talents and allow the free flow of talents in accordance with market rules. Maritime investigation team can achieve talent flow, and the level of maritime investigation will inevitably be improved.

5.5 Chapter Summary

Based on the analysis of the related problems in **Chapter 4** and the current situation of China's maritime investigation team, this chapter puts forward some suggestions on the modification of the qualifications and personnel training of China's maritime investigation personnel, and further clarifies the relevant suggestions on the construction mechanism of the maritime investigation team.

CHAPTER 6: CONCLUSION

Maritime investigation is one of the important responsibilities of China's maritime administration, and it is an important reflection of the maritime department's legal duty and economic duty of serving shipping. The quality of the team building of maritime investigators directly affects the level of maritime administration.

This paper reviews the relevant international conventions on the team building of maritime investigators, compares the current situation of the construction of maritime investigator team in China with the differences between developed countries, and combines with the actual situation of our country, analyses the relevant problems of the building of maritime investigator team in China in terms of its qualification standards, personnel training and team building mechanism.

According to the above comparative analysis, the following three main opinions and suggestions are put forward to enhance the team building of maritime investigators in China: **First**, in terms of the qualification standard of maritime investigators, according to the current situation of maritime investigators in China, it is suggested to revise the relevant regulations of maritime investigators in working experience on ships; **Second**, in terms of personnel training, it is suggested that the relevant regulations of maritime investigators be revised. Setting up the general guiding ideology and training outline for the training of maritime investigators in China, developing modular curriculum to improve the operational level of the construction of maritime investigators in China; **Third**, further reforming the system of the maritime investigation team and establishing a mechanism that can not only meet the requirements of the International Maritime Organization, but also meet the management characteristics of maritime personnel in China.

Limited by the research conditions and the level of researchers, this paper still has the following problems:

(1) The investigation is insufficient and fails to fully reflect the problems existing in the team building of maritime investigators;

(2) The feasibility demonstration of the proposed proposals and measures is insufficient.

I hope it can be perfected in the future study and work, and invite relevant experts to give criticism and correction.

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APPENDIX: A

Personal Questionnaire for Maritime Investigators

1. Basic information of maritime investigators

1) Age: 25-35□ 35-45□ 45-60□

2) Education: College□ Undergraduate□ Postgraduate (Doctor/Master)□

3) Major:_____

4) Department/administrative level: / _____(Section/Branch/Bureau)

5) Technical Title: Junior□Intermediate□Advanced□

6) Maritime Investigator Certificate Level: Assistant□Intermediate□Senior□

7) The time of obtaining the investigator certificate:

8) Number of times to participate in/preside over maritime investigations:_____ times to participate_____; times to preside over_____

9) Level of participation/presiding over maritime investigation: Participation in special Very serious maritime casualty_____; Serious maritime casualty_____; Major maritime casualty_____; Ordinary maritime casualty_____; Small maritime casualty_____

Presiding over Very serious maritime casualty_____; Serious maritime casualty; Major maritime casualty_____; Ordinary maritime casualty_____; Small maritime casualty_____;

10) Participated in the training of maritime investigators:_____; Training time:_____;_

Learning content:

2. Occupational status of maritime investigators

1) What do you think should be the selection criteria for maritime investigators?

(1) Educational background: college☐undergraduate☐ postgraduate☐

(2) Professional background: Navigation technology ☐ ; Marine engineering ☐ ; Maritime management☐; unlimited☐;Other:_____

(3) Maritime related work experience: no☐; 3 years☐; 5-10 years☐; more than 10 years☐;

(4) Work experience on board: no need for☐; 3 years☐; 5-10 years☐; more than 10 years☐;

(5) Personality: extroversion☐; introversion☐; sense of responsibility☐; easygoing☐; good at cooperation☐; stubbornness☐; bigotry☐; carefulness☐;

(6) Psychological quality: compressive ability☐; random response ability☐;

(7) Other:

2) What professional skills do you think maritime investigators need?Or rank the importance of the following professional skills

Professional knowledge; Maritime investigation (inquiry) skills☐; Accident Cause Theory ☐ ; Evidence/Data Analysis Ability ☐ ; Report Writing Ability ☐ ; Communication and Coordination Ability☐; English; (Fill in with number1-4, and the most important fill in 1)

Other:_____

3) What special abilities and qualities do you think a good maritime investigator must possess?

4) In your opinion, the main reasons that affect the improvement of the level of maritime investigation in our country are: (multiple choices or ranking)

Institutional problems of maritime investigation□; unstable contingent of maritime investigators□; insufficient professional knowledge/experience of investigators□; lack of professional facilities and equipment□; other:_____

5) Which professional skills of maritime investigation do you think need to be further improved?

Professional knowledge□; Maritime investigation (inquiry) skills□; Accident-causing theory□; Evidence/data analysis ability□; Report writing ability□; Communication and coordination ability□; English□; Others:_____

6) Do you have an evaluation mechanism for maritime investigation? For example, after completing a maritime investigation, the evaluation of this investigation is excellent/good/medium/poor.

There is: Yes□; No□.

7) Is there a performance appraisal system for maritime investigators?Are there any key performance indicators (KPIs)?

Yes, what are the key indicators?/ none._____

8) Does your organization have a training system for maritime investigators?

There is: Yes□; No□.

9) Do you think the current training system can substantially improve skills?

Can□; Can't □.

10) What kind of training would you like to receive? (optional or sortable)

Professional knowledge□; Maritime investigation (inquiry) skills□; Accident-causing

theory□; Evidence/data analysis ability□; Report writing ability□; Communication and coordination ability□; English□; Others:_____.

11) Does your department have a promotion mechanism for maritime investigators?

If so, the conditions or criteria for promotion are:

12）What aspects do you think should be examined for the promotion of maritime investigators?

Number of times/level of participation/presiding over the survey/submission of reports; Publication of papers/monographs;

Other_____。

13）Does your unit have benefits/benefits for maritime investigators? Or rewards for maritime investigation?

There is: Yes□; No□.

If yes, the reward is:_____;.

14）What benefits/benefits do you think a maritime investigator should enjoy?

Additional subsidies□, overtime pay□, workload bonus□, as the priority of promotion □, select advanced priority□, and others:_____。