

# ***The Theory and Practice of Maritime Comprehensive Risk Management and Control in the New Situation***

Lin Zheng<sup>1,a</sup>, Ran Zhou<sup>1,b,\*</sup>, Lequn Zhu<sup>1,c</sup>, Yi Zhang<sup>1,d</sup>, Xiaojun Li<sup>1,e</sup> and Yisheng Wang<sup>1,f</sup>

<sup>1</sup>Tianjin Research Institute for Water Transport Engineering, Ministry of Transport (TIWTE),  
Tianjin 300456, China

a. zhenglin9648@163.com, b. chinaphoebe@126.com, c. zhulequn@hotmail.com

d. zy403657583@foxmail.com, e. lixiaojun709@126.com, f. yishwang@126.com

\*Ran Zhou

**Keywords:** Comprehensive maritime risk, risk control, control process.

**Abstract:** In the new situation of the types of risks are gradually increasing and the relevance of risks are becoming more apparent, it is necessary to establish a comprehensive maritime risk management and control concept with all elements and processes. Based on the traditional maritime safety supervision risk, this paper put forward the concept of maritime comprehensive risk, designed the comprehensive risk control process from risk identification, risk prevention and risk evaluation. Meanwhile, this paper introduced the practice of Tianjin Maritime Administration in the aspect of comprehensive maritime risk control, in the hope of to provide useful reference for the risk control of maritime system.

## **1. Introduction**

In contemporary China, the work of risk prevention is extremely urgent and arduous. President Xi had stressed the need to prevent and defuse all kinds of risks effectively on many occasions. The "Outline for Building a Powerful Transportation Country" clearly proposes to improve the prevention and control system and strengthen the construction of risk prevention and control mechanisms. As an important part of the integrated transportation system, maritime affairs are more specific in risk prevention and control. With the profound changes in the environment and conditions at home and abroad, the sources of risks faced by the maritime system are becoming increasingly diversified, the types of risks are increasing, and the characteristics of liquidity, relevance, and complexity of risks are becoming more and more obvious, which will put forward new higher requirements for maritime risk management inevitably. Therefore, it is particularly necessary to strengthen the comprehensive maritime risk management and control under the new situation.

## **2. The Proposal of the Concept of Maritime Comprehensive Risk**

Since the Maritime Safety Administration is mainly responsible for the supervision and management of maritime traffic safety, maritime risks mainly refer to maritime safety supervision risks in the traditional sense, which are caused in the supervision process of ships, navigation order, and ship anti-pollution management etc. The risk management and control of maritime units often

pay more attention to the risks of maritime safety supervision, and the academic community also mainly conducts research on how to effectively prevent and evade the risks of maritime supervision responsibility. Guided by the requirements of the quality management system, Gu Y put forward thoughts and suggestions on maritime safety supervision [1]. From the perspective of safety dual prevention mechanism, Zhang J made relevant suggestions for different subjects such as maritime management agencies, crews, and crew companies [2]. According to the actual situation of the jurisdiction of the Maritime Safety Administration, Wang H established the risk management and control system for the whole jurisdiction [3].

In the daily maritime risk management practice, it is found that in addition to the previous maritime traffic safety risk factors, risk events caused by maritime personnel performance, internal safety, financial discipline, party style and clean governance are gradually increasing. In recent years, Typical risk events in the maritime system caused by staff negligence, network information leakage, fund management violations, and violations of integrity and discipline are not uncommon, which has brought a series of economic losses and adverse social impacts. Therefore, the previous practice of paying more attention to the risk of maritime traffic safety supervision can no longer meet the needs of multi-source risk management and control under the new situation. It is necessary to establish a comprehensive concept of all-factor maritime risk management and control, and integrate safety supervision, responsibility performance, internal safety, financial discipline, Overall consideration of risks arising from areas such as party style and clean governance. In academia, some scholars have slowly begun to pay attention to other types of risks besides water traffic safety supervision. For example, Fang G has carried out related research on maritime network security risk management system in response to maritime network security risks [4]. Based on the PDCA theory, Wang K formulated a maritime integrity prevention and control plan [5]. However, these studies are still in the state of decentralized and single-point research as a whole, and systematic research on the integrated risks of the maritime system has not been carried out yet.

In summary, this article gives the definition of maritime comprehensive risk, which refers to the all-factor risk caused by the maritime system in the process of maritime safety supervision, maritime staff performance, internal infrastructure and network operation, capital use, and the construction of party style and clean government construction. Through overall consideration of the risks involved, comprehensive maritime risks can be divided into the following five categories: safety supervision risks, duty performance risks, internal safety risks, financial discipline risks, and party conduct and clean governance risks. The safety supervision risk mainly refers to the risks arising from the supervision process of ship management, navigation order management, and ship anti-pollution management; the duty performance risk mainly refers to the risk caused by the improper performance of duties by maritime workers leading to personal accountability. ; Internal security risks mainly refer to the risks arising from the internal infrastructure construction and network operation of maritime units; financial disciplinary risks refer to the risks arising from the processes of the maritime department's capital budget and final accounts, bidding, and three public expenditures; party style and clean government risks are mainly refers to the risks caused by maritime units in the process of carrying out the construction of party style and clean government.

### **3. Process Design of Maritime Comprehensive Risk Management and Control**

Based on the comprehensive safety assessment method (FSA) and PDCA cycle management method, the whole life cycle process of maritime integrated risk management and control is designed. The maritime integrated risk management and control is carried out according to the four steps of "risk identification - risk assessment - risk prevention and control - Evaluation and supervision"

### 3.1. Identification of Maritime Comprehensive Risk

As the first step of comprehensive risk management and control, comprehensive risk identification refers to the process of finding, confirming and describing all kinds of maritime risks. The scope of identification should cover all areas such as water safety supervision, maritime employee performance, internal safety operation of the unit, the use of project funds, and the construction of party style and clean government. Carrying out comprehensive risk identification is conducive to maritime risk management and control agencies to discover various risk factors in time and reduce the occurrence of risk events.

The identification of risk is carried out through regular and special ways. Regular identification is a comprehensive identification of risk events, typical industry cases, special rectification activities, and foreseeable potential risks through statistics for a period of time. Special identification refers to the special identification carried out by the competent business department for a certain risk after the change of internal and external situation or the occurrence of major negative impact events.

### 3.2. Assessment of Maritime Comprehensive Risk

Comprehensive risk assessment refers to the assessment of the results of comprehensive risk identification according to the risk assessment standard, which provides the basis for determining the level of comprehensive risk. The magnitude of risk is reflected in the degree of risk. The degree of risk (D) is the product of the probability of occurrence of risk events (L) and the severity of consequences (C).

#### (1) Probability of risk occurrence (L)

The probability of occurrence of a risk refers to the probability of occurrence or frequency of occurrence of a risk event under the current level of risk management and control, which is divided into 4 levels.

Table 1: Determination of risk possibility (L).

Grade Score	4	3	2	1	0.5
Likelihood (frequency of occurrence)	Extremely easy, occurs more than once a month (inclusive)	Easy, it will happen more than once every six months (inclusive)	Possibly, it will happen more than once a year (inclusive)	It's unlikely that it will happen once a year	After taking preventive and control measures, the possibility can be reduced to the lowest value

#### (2) Severity of risk consequence (C)

The severity of risk consequences refers to the impact of the risk event on the unit and society, which is divided into four levels. The impact of risk events on the unit and society is reflected in one or several aspects, and the appropriate aspect can be selected as reference in the evaluation.

Table 2: Establishment of severity of risk consequences (C).

Grade Score	4	3	2	1
Severity of consequences	Especially serious	serious	Generally serious	Nothing serious

### (3) Judgment of risk (D)

According to the risk discrimination criterion, the risk degree (D) is determined, and the results of risk assessment can be divided into two grades.

Major risk ( $D \geq 4$ ), general risk ( $D < 4$ ).

Table 3: Risk degree judgment table.

Risk level (D)		Severity of consequences (C)			
		1	2	3	4
possibility (L)	0.5	0.5	1	1.5	2
	1	1	2	3	4
	2	2	4	6	8
	3	3	6	9	12
	4	4	8	12	16

### 3.3. Prevention and Control of Maritime Comprehensive Risk

According to the principle of hierarchical management and control, if a risk is determined as a major risk after the risk assessment, the unit shall take the lead in formulating a comprehensive management and control plan for major risks. The plan shall contain the main contents of risk identification and assessment, risk analysis and risk prevention and control measures, and each prevention and control measure shall be designated as the executing unit or department and the guiding department. For general risks, the Department with the risk shall formulate control measures for control. If necessary, the risk can be further classified in the units or departments with the risk. The formulation of comprehensive risk prevention and control measures should focus on reducing the possibility of risk events and the severity of the consequences. It should not only inherit traditional experience, but also explore innovative prevention and control methods, and gradually improve the formation of a long-term mechanism.

### 3.4. Assessment and Supervision of Maritime Comprehensive Risk

The unit organizes and carries out comprehensive risk management and control work assessments on a quarterly basis or irregularly depending on the changes in the risk situation, and analyzes and evaluates the risk management and control work in terms of the coverage of risk identification, the effectiveness of control measures, and the implementation of supervision. Problems and deficiencies are carried out in a timely manner updates and adjustments to ensure that the entire mechanism is dynamically updated and improved.

Each department shall establish a risk control work mechanism under the responsibility of the core leader, coordinate and take charge of various risks existing in their responsibility areas, and make good ledger records of various risk control work. At the same time, in order to ensure the effective implementation of the comprehensive risk control mechanism, the unit shall carry out regular or irregular supervision and inspection on the implementation of the major risk control plan and the implementation of the comprehensive risk control work of all departments.

## 4. Practice of Maritime Comprehensive Risk Control

Based on the accumulation and summary of risk management practice for many years, Tianjin Maritime Administration has taken the lead in the maritime comprehensive risk control practice in the maritime system since 2018, and it has built a comprehensive risk control mechanism including

organizational structure design, risk identification method, risk assessment standard, hierarchical prevention and control plan, evaluation and improvement model, etc. which has achieved good results and provided strong support for preventing and resolving various maritime risks.

#### **4.1. Organizational Setup of Comprehensive Risk Control**

The Tianjin Maritime Safety Administration's leading group for preventing and resolving major risks is formed by the leaders of the major bureaus, and is responsible for the overall supervision and overall coordination of the major risk management and control work of the bureau. The leading group shall set up a promotion office, which shall be responsible for organizing the overall implementation of major risk management and control work, and assist the leaders of the Bureau in supervising and inspecting the implementation of major risk management and control work of the Bureau. The leading group has five risk management and control working groups, namely safety supervision, duty performance responsibility, internal safety, financial discipline, and Party conduct and clean government, which are responsible for risk management and control in their respective fields. Each working group has a leading department, which is responsible for organizing, coordinating, supervising and evaluating the implementation of the control work of various risks within the scope of the group.

#### **4.2. Comprehensive Risk Sorting and Control Plan Formulation**

According to the comprehensive maritime risk management and control process, each department sorted out 390 risks, including 48 major risks, and formed a risk event database covering 263 items. After screening, integration, new additions, research and modification by the five risk working groups, the Tianjin Maritime Safety Administration's major risk list containing 34 major risks was finally formed, and a comprehensive risk management plan was formed for 34 major risks.

#### **4.3. Promulgate Work Management Measures of Comprehensive Risk Control**

After extensive solicitation of opinions and multiple rounds of revisions and improvements, Tianjin Maritime Safety Administration issued the "Management Measures for Comprehensive Risk Management and Control Work of Tianjin Maritime Safety Administration", which dealt with comprehensive risks in terms of classification and classification, identification and evaluation, risk prevention and control, rating and supervision and management. The management work has been specified in detail, and it has become a specific starting point for guiding the overall comprehensive risk management and control work. At the same time, 34 comprehensive management and control plans for major risks were issued for the overall communication and learning.

### **5. Conclusions**

The comprehensive risk management and control concept proposed in this paper is to take the overall risk of the maritime system into consideration, design the whole life cycle management and control process, realize the global management and control of maritime risk, and make up for the shortcomings and deficiencies of the original single risk management and control. In the next step, informatization methods can be explored to promote the efficient implementation of comprehensive maritime risk management and control mechanisms.

## Acknowledgments

This work was financially supported by “Joint research on international green port hub and key supporting system of multimodal transport” (National Key R&D Program of China (2016YFE0204800), “Research on Comprehensive Risk Management and Control of Tianjin Maritime Safety Administration(Strategic planning project of Tianjin MSA).

## References

- [1] Gu Y, Wang C, Jiao H, Ma L. *Thoughts on maritime safety supervision based on the perspective of quality management system [J]. Journal of the School of Management Cadres of the Ministry of Transport, 2020, 30(01): 31-32+40.*
- [2] Zhang J, He X. *On the relationship between ship safety supervision and hidden danger investigation and management [J]. World Shipping, 2019, 42(05): 33-35.*
- [3] Wang H, Bian C, Liu H, Wang Z, et al *Maritime Safety Administration Water Traffic Safety Risk Management and Control[J]. China Water Transport, 2019(11): 60-61.*
- [4] Fang G, Chu B. *Research on the Legal Governance of Maritime Network Security Risk Insurance [J]. Jiangxi Social Sciences, 2020, 40(05): 179-191.*
- [5] Wang K. *A Research on the Maritime Integrity Risk Prevention and Control Program [D]. Dalian University of Technology, 2018.*