

# Research on Influencing Factors and Countermeasures of Fog Navigation in Weihai Harbour

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**Abstract:** Based on the actual situation of Weihai Harbor and fog navigation measures of other ports along the coast of China, this paper summarizes the influencing factors of fog navigation in Weihai Harbor. In order to eliminate the influence factor on the fog, we must strengthen the vision of personnel on watch, and in peacetime to strengthen the safety education and training, improve the level of knowledge and skills, so as to prevent fog accident fundamentally.

## 1. Introduction

The rapid development of the shipping industry has led to an increase in the number of ships, and the resulting maritime traffic accidents have emerged in an endless stream. According to past statistics, we can know that most marine traffic accidents occur in the case of fog. Weihai Port is located in the foggy zone of the Yellow Sea. The foggy accident is especially common. For example, on May 12, 2009, the "Xinchenjie" and the "Liaojinyu 15052" collided at Weihai Port; On May 2nd, 2010, the "Haisheng" and the "Light of the Century" collided at Weihai Port, causing many casualties; on May 4, 2010, the "Haifeng Lianyang" and "Rongxiang 68" collided on the open sea of Weihai. The hull is seriously damaged.

Through in-depth study of the above cases, combined with the navigation environment and traffic flow characteristics of Weihai Port, we invited the relevant leaders of Weihai Maritime Safety Administration, relevant staff of Weihai Port and the captains who entered and exited Weihai Port all year round to conduct joint discussions. In conclusion, the relevant influencing factors of the port fog can be divided into two categories: objective factors and subjective factors.

### 1.1 Objective factors

The impact on the visual hope: the presence of fog has greatly restricted the sight of Weihai Port. Due to poor visibility, the navigation and avoidance of the ship have great difficulties, which made many ships unable to find the surrounding conditions in time. This situation has led many ships to be able to detect each other only at very close distances during navigation, thus colliding with each other due to uncoordinated actions.

The impact on the hearing: When listening to the fog of the ship in the Weihai harbor in the fog, there are often problems such as limited audible distance and deviation of the fog direction. The fog itself cannot weaken the sound, but due to the difference in the density of the atmosphere in the fog and the atmosphere outside the fog, the sound will refract and reflect at the interface of the fog, and abnormal propagation occurs.

Impact on speed: Generally speaking, ships must use safe speeds for maritime navigation, and visibility is the primary factor in determining safe speed. The worse the visibility, the lower the safe speed. When a safe speed is adopted in foggy days, the influence of wind flow on the ship is increased, and the calculation rate of the speed and range is greatly reduced. This greatly effects the navigation safety of the narrow waterway terrain which is similar to Weihai Port.

### 1.2 Subjective factors

The main performance is in two aspects. First, some crew members have loose style of work and lack of responsibility. They have not strictly implemented the Rules for Avoiding Collisions and related regulations. Second, the ship entering and leaving the port caused technical failures in the

ship's power plant, navigation equipment, and communication equipment due to poor maintenance.

The driver's psychological quality has declined. The tense and dangerous navigation in fog is a reality that every ship entering and leaving Weihai has to face. Sailing and being on duty for a long time under the condition of poor visibility make the captain and the driver stay in a state of high concentration and tension. In the long run, many crew members have lost physical strength, mental flexibility and judgment ability. These conditions often cause many crew members to be irritable, rash and leave things to chance, so that their declining strain capacity at critical moments and judging mistakes seriously threaten the navigation safety of Weihai Port.

Nautical knowledge and skills are lacking. Many crew members did not maintain a correct expectation during the fog flight because they did not understand the professional knowledge, especially in the use of some devices such as VHN and AIS. The wrong method of use has left many crew members without adequate estimation and judgment of the collision risk in Weihai Port, lack of alertness and lack of crew capacity. Each ship is a collective, and the safe operation of the ship must require the tacit cooperation of all the ship's personnel. Therefore, this requires each crew member to have certain organizational, coordination and communication skills.

Insufficient practical experience. In recent years, China's crew market has been tense, and positions have been promoted too fast. This has led many crew members to work in low-post positions for a short period of time, and their practical experience is seriously inadequate. When they first entered Weihai Port, some crew members lacked awareness of danger and could not use good boat skills at critical moments, greatly increasing the danger of a sea traffic accident at Weihai Port.

## **2. Study on Safety Countermeasures of Influencing Factors of Weihai Harbor**

### **2.1 Objective factors of safety countermeasures for Weihai Harbor**

Vessels entering the Weihai Port for fogging must prepare in advance: timely copy weather forecasts, weather faxes, fog warnings, etc., and submit the relevant materials to the captain for the first time; Based on the ship's sea fog conditions and its own navigation performance, they should develop safety measures for fogging that adapted to the situation at that time. All navigational instruments and equipment should be inspected before the ship enters the fog area to ensure normal use. Strengthen the look inside Weigang. Lookout is an important part of ensuring the safety of fog. Lookout includes visual lookout, hearing lookout and radar lookout. In the foggy airway at Weihai Port, it is necessary to strengthen the fog lookout of the duty personnel. When sailing in the Weihai Port, the captain should arrange the head and the lookout on the ship. The head personnel identify the low object, and the lookout personnel observe the movement of the chasing ship or avoiding the ship touching the surrounding objects. The lookout staff on the bow and the stern should keep in touch through the walkie-talkie and keep in touch with the bridge to keep the observed situation to the captain. In order to avoid disturbing the driver's hearing, the whole ship should keep quiet when sailing in the mist of Weigang Harbour. Proper use of various navigation aids in Weihai Port, includes radar, VHF and AIS.

Early detection and active avoidance. Ships sailing in Weihai Harbour in the fog must strengthen the expectations of the drivers on duty, strive to find the ship as soon as possible, obtain the avoidance information, and coordinate and take early avoidance measures to avoid the occurrence of an urgent situation. Generally speaking, the ship can find the existence of the ship at least 10-12nmile through the radar, and then carry out radar mapping to determine whether the collision danger exists. If there is a risk of collision, measures should be coordinated immediately, but special care should be taken when taking measures, and another urgency should be avoided. Be alert and avoid uncoordinated actions in Weihai Port. The uncoordinated action of the two ships is the main cause of a safe traffic accident in the fog. This is mostly due to the inconsistency in the understanding of the provisions of the Rules by the duty officer. In addition, the two ships have insufficient estimates of visibility, misused the rules of action in mutual views, and have insufficient estimates of the risk factor for the ship approaching the port. They did not take the initiative to take evasive measures and waited for other ships to act. As a result, the timing was delayed and the

situation was urgent. In the fog flight, it is necessary to make full use of the VHF to communicate effectively with the ship and to grasp the dynamics of the ships coming and going in order to take reasonable and coordinated avoidance measures.

## **2.2 Subjective factors of safety countermeasures for Weihai Harbor**

Strengthen crew safety education and training to improve their knowledge and skills. According to ISM, we should establish a safety education and training system suitable for itself, and develop safety education and familiar training for new crew members. We can introduce a strict reward and punishment system, strengthen management through rewards and punishments, and correct the crew's serious and responsible attitude, so that the crew's business level and safe operation skills can reach their highest level.

Strengthen onshore management and increase the shore support of Weihai Port. The management of the shore is an indispensable part of avoiding maritime safety traffic accidents in the ship's fog. As the main land-based management, the port must provide sufficient shore-based support. Weihai Port Security Supervision Department is not doing a good job in the field of shore-based support functions. At present, Weihai Port only pays attention to the navigation position or arrival time of the ship, and lacks control over other information on the navigation of the ship. Raising the shore support of Weihai Port is particularly important in reducing the occurrence of accidents in Weihai Port and strengthening the management of Weihai Port.

Utilize existing equipment to establish a notification mechanism for Weihai Haze Network. At this stage, the VTS or Closed Circuit Television (CCTV) monitoring system has been established in the key waters of Weihai Port. It provides navigation and navigation information services for navigation vessels within a certain range, but it cannot be realized outside the system coverage. In order to solve this problem, the relevant units of Weihai Port should establish a fog monitoring station as soon as possible, form a fog notification system and a fog warning mechanism, promptly issue a fog warning, improve the quality of the fog forecast. Only in this way can we provide timely and effective logistic support for the ships sailing through the fog area in Weihai Port. In the fog flight, in order to avoid the occurrence of collision accidents, the captain and the driver on duty must improve their safety responsibility and conscientiously implement the provisions of the International Regulations for Preventing Collisions at Sea and COSCO Ship Safety System. When the visibility is 5 nautical miles, all fogging preparations should be prepared and the state of alert should be entered; when the visibility is less than 3 nautical miles, the fogging state should be entered and the fogging operation should be carried out; the 19th article of the "Rules" must be strictly enforced.

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