

Research on Inland Water Area Search & Rescue Planning and Key Issues in Shaanxi Province

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ABSTRACT

Shaanxi Province is defined as a non-water-network area, such as rivers, lakes, reservoirs, park water areas, etc., which are not connected with the main river system, and less developed in terms of the search and rescue capability. Once a major waterborne accident occurs, the water search and rescue work would be difficult and hard. Based on the investigation of the current situation of water transportation and emergency search and rescue capabilities in Shaanxi Province, this paper analyzes the current situation of water search and rescue, and clarifies the main problems, the main needs and theoretical requirements of search and rescue. Consequently, the key issues are summarized, including the institutional mechanism, planning system, monitoring and early warning system, command and dispatch platform, construction of material equipment system, water search and rescue team system, science and technology support system, publicity, education, and training system. these factors should be planned and realized in the next step in Shaanxi province search and rescue program.

Keywords: Inland water, Search & rescue planning, Key Issues

1. INTRODUCTION

Actually, the whole province could be divided into three natural areas: northern Shaanxi, Guanzhong, and southern Shaanxi. The Shaanxi water system is bounded by the Qinling Mountains and is subordinate to the two major river systems of the Yellow River and the Yangtze River. Ferry traffic exists in some rivers, lakes, reservoirs, etc. in the province. At present, most of the research on search and rescue are mainly considering the issues at sea and the navigational river. The lack of studies about search and rescue in non-water-network area causes negative results, for example, defective planning, or deficient equipment, or unprofessional personnel, making it hard to fulfil a successful search and rescue action in these area. In addition, new types of water transportation such as water tourism, and drift exploration have emerged in large numbers in recent years[1]. The frequency of waterborne accidents increases with the transportation volume. To improve the search and rescue capability in non-water-network area of Shaanxi province, it is necessary to figure out the key issues and put forward the corresponding suggestions in the planning, which is the framework of search and rescue capability construction.

2. THE STATUS QUO OF WATER SEARCH AND RESCUE CAPABILITIES IN SHAANXI PROVINCE

2.1. Overall situation

During the “Thirteenth Five-Year Plan” period, the province’s waterway traffic passenger and freight volume remained stable. The province’s waterway conditions and port and wharf facilities have been effectively improved, the comprehensive transportation network has been further improved, and regional economic development has been promoted. In the meantime, various water safety inspections and hidden danger investigations have been carried out to consolidate the long-term safety supervision mechanism. The construction of maritime equipment has been increased, and 47 sea patrol boats and more than 25,000 life jackets have been equipped for municipal and county maritime departments, realizing the full coverage of safety supervision in key waters of the province. An attempt has been made to promote the construction of an emergency response system, organize the establishment of provincial, municipal, and county-level water emergency search and rescue agencies, and carry out various types of water emergency rescue drills

more than 40 times. In this regard, the ability to deal with water emergencies has been significantly improved.

However, there is still a gap between the overall implementation of the province's waterway transportation plan during the 13th Five-Year Plan and the expected goals. The construction of key ports and docks, the construction of small docks, the construction of maritime duty stations, and the construction of maritime equipment have completed 40%, 36%, 70%, and 37% of the planned targets respectively. Ship type standardization is still advancing, and ferry standardization construction has not yet been launched.

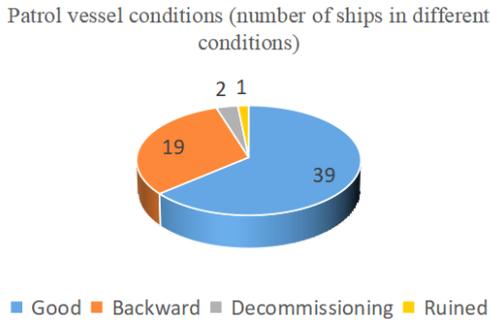


Figure 1. Patrol vessel length statistics

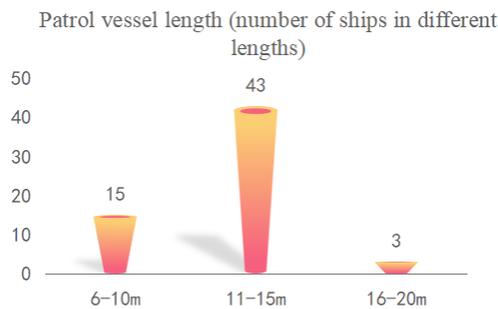


Figure 2. Patrol vessel conditions

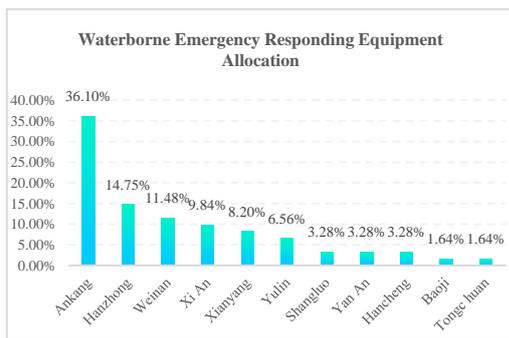


Figure3. Waterborne emergency responding equipment allocation

2.2. Emergency system and operation mechanism

(1) System construction

In terms of emergency system construction, Shaanxi Province mainly relies on the existing administrative

management system, responsibility division, and management pattern. The provincial transportation department, the city (state, prefecture) transportation department, and the county (city, district) transportation department are responsible for corresponding emergency management work, all of which thus constitute the existing Shaanxi water transportation emergency management system. Shaanxi Province has also established the Provincial Water Traffic Emergency Response Headquarters. At present, Shaanxi Province has basically formed a water search and rescue emergency management work pattern of "unified leadership, hierarchical responsibility, and integration of sections".

(2) Operation mechanism

With regard to operational mechanisms, in the framework of the existing emergency response system, Shaanxi Province has established an emergency on-duty guard, hidden danger investigation and monitoring, monitoring and early warning, information reporting, information dissemination, public opinion guidance, rapid response, and emergency linkage, aftercare, recovery, reconstruction, and other emergency management mechanisms at all levels of the province's transport authorities, around the prevention and disposal of water traffic emergencies. Meanwhile, the Shaanxi Province Water Search and Rescue Joint Conference System has been established, the water search and rescue coordination mechanism has been continuously constructed, emergency cooperation has been strengthened, and the cooperation mechanism of regional linkage and industry coordination has been improved.

2.3. Emergency plan system

In light of the construction of the emergency plan system, the transportation system of Shaanxi Province strengthened the function construction of the emergency plan system and rationalized the operation mechanism of the emergency plan through system construction. In accordance with the emergency work requirements of the provincial government and the Ministry of Transportation, the transportation system of the whole province has established a series of water transportation emergency management-related systems such as an emergency duty system, emergency information reporting system, emergency work liaison system, weather information warning release system, information notification system, etc. To this end, the emergency system construction has been continuously improved.

2.4. Construction of emergency command system and information

At present, Shaanxi Province has built a special network for the transportation industry connecting the provincial and municipal shipping management and local

maritime systems. Water transport data exchange, voice, video information transmission, and integrated processing have entered into the “information superhighway”.

2.5. Construction of emergency equipment support capacity

In the midst of dealing with risk materials, the establishment of emergency equipment and material reserve method with a combination of physical reserves and commercial reserves, production capacity reserves and technical reserves, government procurement, and government subsidies strengthens the emergency equipment and material reserve capability. The water emergency equipment and material reserve system consists of three-level water emergency equipment and material reserve centers (points) at the provincial, municipal, district, and county levels. In combination with the waterway conditions in various regions, the construction plan of the province’s water emergency material reserve center was formulated, and several provincial water emergency material reserve points were established.

By the end of 2020, key waters across the province were equipped with 61 sea patrol boats, including 22 for Ankang, 9 for Hanzhong, 7 for Weinan, 6 for Xi’an, 5 for Xianyang, 4 for Yulin, 2 for Yan’an, Shangluo, and Hancheng, as well as 1 for Baoji and Tongchuan, basically achieving full coverage of patrol law enforcement in key waters.

2.6. Construction of emergency team

The composition of water emergency rescue forces mainly includes rescue forces of maritime agencies, fire rescue forces, other civil ships that can be put into rescue operations, and social volunteer rescue forces. Some regions (cities) have also formed professional social assistance forces[2].

The supervision bases and boat forces set up along the inland river can actually undertake the responsibility of professional rescue on the water. This model called “cruise rescue integration” is in line with the actual needs of the current inland rescue.

3. ANALYSIS OF MAIN PROBLEMS AND NEEDS

3.1. Imperfect water search and rescue management system

At present, the formulation of “water traffic emergency response plans” at all levels in the province has basically formed a system, but the hardware and software conditions to ensure the implementation of the “plans” are not perfect, and the organization,

coordination, command, and security systems are not sound. The “government-led, command-unified, local-based, special and mass-combined, convenient, fast and efficient” water search and rescue work pattern has not yet been formed. In fact, the task of water search and rescue in various places is actually entrusted to the transportation departments at all levels, and the synergy between the government and relevant departments has not been fully exerted at all levels.

3.2. Insufficient level of water search and rescue command platform and information construction

Although some achievements have been made through the construction during the “Thirteenth Five-Year Plan” period, in general, the construction of informatization is still relatively lagging. The informatization of inland water transportation in the province is in the early stage of development, and the construction of an emergency information command platform is not comprehensively coordinated. The construction of emergency search and rescue centers, water emergency search, and rescue sub-centers in key districts and cities of the province, as well as emergency rescue sites in key waters does not meet the requirements of accelerating the development of inland water transportation, especially strengthening the management of waterway traffic safety. To this end, dynamic water management cannot be achieved for insufficient supervision and management.

3.3. Incompatibility between water search and rescue equipment and the emergency rescue needs

The existing search and rescue method is single, the search and rescue methods are traditional, and there is a lack of search and rescue equipment and professional teams for search and rescue. The existing search and rescue mission in Shaanxi Province mainly relies on the sea patrol boats in the waters where the incident occurs, the mobilization of ships from nearby shipping companies, and ferry ports to participate in the search and rescue; search and rescue means are still relatively traditional, with a low level of emergency rescue equipment, poor performance, and insufficient quantity, which cannot meet the needs of emergency rescue[3]. At present, the province is equipped with only one search and rescue ship, which is difficult to cover 120 kilometers of water along the Han River. The current situation of poor rescue timeliness and weak search and rescue capabilities is not compatible with the requirements of the State Council and the provincial government to strengthen water search and rescue work and Shaanxi Province’s economic development goal of “chasing, catching, overtaking, and surpassing.”

3.4. Relatively weak construction of water search and rescue teams

The county-level water emergency management and water law enforcement personnel of the transportation department are weak, mainly relying on the municipal water administrative law enforcement personnel. The structure is unreasonable, and the work is difficult to guarantee[4]. Professional search and rescue forces are relatively weak, and there is a serious shortage of inland river search and rescue professionals, especially high-level search and rescue commanding personnel, high-skilled search and rescue professionals, and high-quality search and rescue technical support personnel. With the safety situation and the need for emergency work, the technical level of emergency rescue equipment continues to improve, the number of emergency rescue equipment increases, and the demand for high-quality professionals and high-skilled talents is increasing.

3.5. Uncoordinated development of emerging water tourism and emergency rescue capabilities

With the in-depth advancement of the inland river “all-for-one tourism” strategy and the vigorous development of rural tourism in Shaanxi Province, the scope, activity volume, and types of water tourism activities have shown an average annual growth trend, and the prosperity of inland water scenic tourism has also appeared. There are many new tourism formats such as water self-driving ships and water rafting. The scope of water tourism activities has also been further expanded. At the same time, the number of recreational vessels under 5 meters in inland rivers, lakes, and canals in Shaanxi Province increased, but some recreational vessels did not meet the requirements for water transport licenses. At present, the existing laws and regulations of Shaanxi Province are not clear on the management of pleasure ships under 5 meters, and there is no emergency rescue equipment and facility. In general, the emergency rescue capability does not match the development increment of the emerging water tourism industry, and it is urgent to carry out simultaneous expansion and deepening.

4. CONSTRUCTION FOCUS OF WATER SEARCH AND RESCUE CAPACITY IN SHAANXI PROVINCE

4.1. Institutional mechanism

The perfect institutional setting is conducive to strengthening the organization and leadership of the province's water search and rescue emergency response, coordinating and integrating all forces, and also laying an important foundation for forming an emergency

management mechanism with unified government leadership, departments performing their own duties, responsive, coordinated, orderly, and efficient operation. Commitment is made to improve the water search and rescue contact meeting system, enhance the water search and rescue emergency organization, strengthen the related responsibilities of emergency management in function construction, clarify and implement them through documents and other forms, and strictly implement relevant work requirements on a daily basis. At the same time, an attempt should be made to improve the professionalism of emergency search and rescue, take the two aspects of talent team construction and equipment configuration as the starting point, complete emergency management personnel and necessary facilities and equipment, set up professional emergency rescue teams, form a joint force, innovate emergency management models, and improve the collaborative work mechanism of water search and rescue, thereby boosting the overall emergency work capability.

In daily management, it is necessary to continuously strengthen emergency prevention and preparation, for the sake of establishing and improving the emergency mechanism of the risk analysis of water traffic emergencies, hidden danger investigation and monitoring and early warning, information reporting and sharing, comprehensive coordination and emergency decision-making, information release and public opinion guidance, and expropriation compensation and incentives, and social mobilization, thus constantly pushing forward mechanism innovation and adjustment.

4.2. Pre-planning system

The construction of the emergency pre-planning system is conducive to determining the scope and system of emergency rescue so that emergency management is no longer groundless and ruleless; it is beneficial to making timely emergency responses and reducing the consequences of accidents. Emergency pre-planning is the basis for responding to various emergencies, and can also ensure the contact and coordination of emergency agencies when emergencies occur. In the meantime, emergency pre-planning can improve the awareness of risk prevention, facilitate all parties to understand the possible emergencies and emergency measures, and improve the awareness and ability of risk prevention. Therefore, it is of great significance to improve the construction of the emergency pre-planning system, deepen the implementation of the Emergency Response Law and related emergency regulations, improve the construction of “one case and three systems” for water search and rescue, formulate and improve various emergency management rules and regulations, organize and develop the revision work of emergency pre-planning systems, and improve the pertinence and practicality of the emergency pre-planning.

4.3. Monitoring and early warning system

The monitoring and early warning system can realize the daily monitoring and monitoring of key monitoring targets such as key waterways, reservoirs, lakes, and ferry ports, do a good job in early warning, prevention, monitoring, and warning, predict possible emergencies in advance, and provide favorable support for emergency work. Efforts should be done to promote the construction of monitoring and early warning systems, strengthen monitoring and early warning functions, and give full play to the positive role of informatization to provide a strong starting point for emergency prevention. On the basis of improving waterway traffic monitoring, coordination management, and information service means, relevant departments should gradually carry out the integration of data resources related to emergency search and rescue and system construction and basically build a provincial water search and rescue emergency management platform with information exchange, coordination, and high efficiency.

4.4. Command and dispatch platform

The command and dispatch platform is an important auxiliary means for emergency command and decision-making, the core of informatization construction, and the most direct manifestation of the results of informatization construction. To promote the construction of the “Water Search and Rescue Emergency Management and Command Platform” in Shaanxi Province, a unified and efficient water traffic emergency command and dispatch system is formed. Emergency work is inseparable from the specific work of each city and county and is also independent of relevant departments such as government, environmental protection, and meteorology. The emergency command platform should have multiple functions such as information collection, data sharing, and unified command to serve as a comprehensive management platform. In this way, a unified and efficient command and dispatch system will be formed that is connected from top to bottom, interconnected from left to right, a new mechanism for information exchange and the joint command will be established, and a new model of joint command, joint control, and joint search and rescue at the provincial, municipal, and county levels will be built.

4.5. Construction of material equipment system

According to the risk characteristics and distribution of water emergencies, rational layout and overall planning of the construction of water search and rescue emergency material reserves should be made to ensure the effectiveness of emergency material deployment and the rationality of the coverage area.

In terms of equipment warehouse, combined with different water transport risk characteristics and existing

equipment configuration in each region, a search and rescue emergency material reserve in key water areas should be built based on regional hidden danger investigation and risk assessment. In key water areas such as Ankang City and Hanzhong City, a water search and rescue emergency material reserve warehouse is established; in Yulin City, Xi'an City, Baoji City, Xianyang City, and Shangluo City, relying on existing water management enterprises, a water search and rescue emergency material reserve station is established; in Yulin City, Yan'an City, and Weinan City along the Yellow River, a Shaanxi-Shanxi inter-provincial joint water emergency rescue material warehouse is established.

With respect to emergency communication support, the construction of an emergency communication support system ought to be strengthened. An emergency communication center for the waterway transportation industry is built to improve the coverage of water networks and improve emergency communication support capabilities. Water rescue teams should be equipped with emergency communication systems, mobile 5G equipment, maritime satellite phones, etc.

4.6. Water search and rescue team system

At the level of the people's governments of cities, counties, and districts, it is imperative to set up water emergency search and rescue centers as needed, establish water rescue forces that are suitable for the actual situation of the jurisdiction, and carry out emergency search and rescue work[5]. Concerning emergency team management, in accordance with the principle of “one specialization with multiple abilities, one team with multiple functions, and the combination of specialization and part-time”, we will improve the dispatching, command, and management system of emergency teams to achieve regularized, standardized, and paramilitary management. Emergency drills should be organized to continuously improve combat capabilities. Meanwhile, to promote the province's river cruise law enforcement and water rescue integration construction, cruise search and rescue boats and supervision and rescue equipment should be reasonably allocated as prescribed combined with the actual waters, and cruise rescue integration pattern with “advanced equipment, effective supervision, and powerful rescue” is gradually formed, thus constantly improving the basic rescue capacity.

4.7. Science and technology support system

With regard to water traffic risk identification, it is committed to strengthening scientific and technological research such as risk and emergency capability assessment, prevention, and emergency rescue. In this regard, the prevention and preparation technology can be developed into comprehensive disaster prevention

technology and monitoring technology can be transformed into intelligence and digitalization. Scientific and technological platforms such as risk monitoring, emergency rescue engineering, and information service product development are specific applications of disaster risk and emergency technology development. In terms of key technologies for emergency prevention and disposal, combined with existing search and rescue models and team building, scientific and technological research and development can promote the application of artificial intelligence, new-generation information technology, and satellite communication technology in water search and rescue work.

4.8. Publicity, education, and training system

It is needed to set up a training base for water emergency search and rescue management. Relying on the existing rescue forces, according to the characteristics of the water emergency, it is required to establish a water emergency search and rescue management training base, carry out training for professional water emergency personnel, frogmen, and professional equipment operators, establish subject-based and planned exercise mechanism, and strengthen cross-sector, cross-system, cross-regional comprehensive emergency drills, and on-site command workflow exercises, with a focus on promoting functional and procedural drills to enhance the pertinence and practicability of emergency drills. The water emergency search and rescue management training base should also participate in the popularization of accident prevention and safety knowledge in society[6].

5. CONCLUSIONS

Shaanxi Province belongs to the non-water network area, and there are two major water systems in the province, the Yellow River and the Yangtze River. According to the work arrangements of the Provincial Party Committee, the Provincial Government, and the Ministry of Transport, the emergency management system and mechanism of transportation in Shaanxi Province have been basically established, the emergency response system and the planning system have been continuously improved, the emergency command system and information platform have taken shape, the emergency equipment support capacity has been gradually strengthened, the construction of the emergency response team has been continuously strengthened, the publicity, education and training work has achieved practical results, and the overall emergency search and rescue capacity construction has achieved remarkable results. At the same time, in the face of the rapid development and complex situation of the industry, water search and rescue work is also confronted with various opportunities and challenges.

In the future, the construction of water search and rescue capacity in Shaanxi Province are supposed to continue to promote the construction of the water search and rescue organization system, strengthen the construction of the pre-planning system, carry out the construction of the monitoring and early warning system, promote the construction of the command and dispatch platform, push forward the construction of the material and equipment system, improve the construction of the water search and rescue team system, and enhance the construction level of water search and rescue culture. Meanwhile, importance should be attached to safeguard measures, strengthening coordination and coordination with planning, increasing policy support, establishing a search and rescue funding guarantee mechanism, strengthening the research and application of scientific and technological achievements in water search and rescue, and reinforcing organizational leadership, supervision, and evaluation.

By 2035, relying on the existing "Shaanxi Provincial Highway and Waterway Safety and Unblocking and Emergency Response System", water safety and intelligent supervision and rescue will be realized. Besides that, the success rate of water search and rescue will be greatly improved. And the water supervision and rescue will comprehensively meet the construction requirements of the phased goals of a strong transportation province, that is, improving the search and rescue success rate, and expand the search and rescue region.

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