ISSN: 2664-9640

Development and application of maritime security technology

Jiale Li

Shanghai Maritime University, Shanghai 201306, Shanghai, China

Abstract

the 21st century is an ocean century, and the future competition of countries all over the world will also compete on the ocean. The full development and comprehensive utilization of marine resources is an inevitable requirement for the further development of countries all over the world. The technical development in the field of maritine security technology has become a key link of national marine strategy. This paper introduces the current international and domestic situation of maritime security, analyzes the gap, and also introduces the international development trend and the current development of domestic maritime security in the technical field.

Keywords

Lectronization; e-Navigation; application.

1. Introduction

The survival and development of human society are inseparable from the ocean, especially navigation. The history of human civilization, to some extent, is a history of navigation. In fact, it is a changing history of a chart. Navigation is inseparable from security. The goal of navigation security is to find a location, avoid risks and improve efficiency.

2. Current situation of maritine security technology

Navigation security in a broad sense is the sum of people, ships, environment and management. In a narrow sense, maritine security technology mainly includes navigation, chart, communication and so on. Navigation refers to the positioning of the ship and its own and surrounding environment. The function of chart is to know the condition of seabed in detail. Communication refers to the contact with relevant parties[1].

International organizations in maritime security mainly include the International Association of navigational aids (IALA), the International Hydrographic Organization (IHO), the International Telecommunication Union (ITU) and the International Maritime Satellite Organization (INMARSAT).

At present, there are four major global positioning systems in the world: one is the American global positioning system (GPS). The second is the Russian GLONASS system. The third is the European Galileo system. Fourth, China's "Beidou" system. At present, the contact between domestic ships and shore is shown in Figure 1.

3. Gap between domestic guarantee technology and international level

There are six main differences between domestic maritine security technology and international level. First, the equipment is backward. The second is the weak analytical ability, mainly due to the gap in the professional quality of ship and sea support practitioners[2]. Third, the service capacity is weak. It is reflected in data distribution and coverage, meteorological navigation, etc. Fourth, there is no fine chart. The fifth is the dispersion of professional strength.

Sixth, institutional mechanisms lead to weak command and coordination ability and are not easy to form joint forces.

At present, the ship is gradually developing towards intelligence and greening, which is mainly reflected in 10 aspects, such as large-scale ship, specialization, high-speed, automation, electronic navigation and positioning, collision avoidance automation, electronic chart, digitization of navigation data, high-speed communication, digitization of wide area, automation of navigation records, etc., which also puts forward higher technical requirements for the maritine security technology department[3]..

4. E-Navigation

E-navigation (electronic navigation) is the development direction of international maritime security at present. It refers to the collection, synthesis, exchange, display and analysis of maritime information on board and on shore through electronic means, so as to enhance the whole process navigation ability of ships from berth to berth, enhance the corresponding maritime service, safety and security ability, and the ability of marine environmental protection. IMO's e-navigation will probably not be a system, but some standards, regulations, guidelines, training requirements and data formats. IMO members use these achievements to build an integrated marine navigation assistance information environment.

The implementation strategy of e-navigation is mainly to implement and formulate a number of product technical standards in terms of communication and navigation technology, such as 500KHz digital communication (NAVDAT) technology; VHF based data exchange system (vdes) communication technology; Satellite communication technology; Global Navigation Satellite Technology (including China BDS Technology); Ship integrated pnt (positioning, navigation and timing). The implementation and implementation of this technology provides basic support for the implementation of e-navigation strategic system and is the meridian and eye of the whole e-navigation strategy.

The research contents under e-navigation strategy mainly include three aspects: one is the development and upgrading of shipborne equipment, such as the upgrading of integrated navigation system (INS), the intellectualization of ECDIS, new communication equipment, etc. The second is shore based support system, such as Hydrometeorological Information, port information, VTS Information, chart correction, maritime search and rescue and other maritime service sets. Third, ship shore communication optimization technology, such as satellite communication system, NAVDAT, vdes, 3G / 4G / 5G channel optimization control technology.

In the e-navigation strategy, based on the technical architecture, the real muscle of its implementation is all kinds of marine service sets (MSPs) for different user needs. Each service is aimed at specific user needs or underlying data services, such as AIS data collection services, statistical analysis services for ships entering and leaving ports, water traffic management services, maritine security technology series services, etc. These services constitute the core of e-navigation and reflect the purpose of "on-demand service" of e-navigation[4]..

In the e-navigation strategy, data exchange and transmission are carried out among various marine services. Specific data should have a certain standard model in exchange, and a standard exchange protocol is also required. Therefore, the data model and data transmission standard based on S-100 standard are the blood of the landing of e-navigation strategy, enabling seamless data sharing and business information exchange between various offshore service sets, so as to realize the "interconnection" between various parts of e-navigation strategy.

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5. Achievements of China's maritime security

In recent years, China's maritime security personnel have made preliminary achievements in the technical field, such as publishing the Chinese version of the Arctic navigation guide for the first time and the Chinese version of the Antarctic chart (14); It is also the first time to use professional marine survey ships to carry out precision hydrographic survey (Anchorage) in polar waters; For the first time, polar scientific research integrated navigation system compatible with Beidou, GPS and AIS is applied (navigation and man station interaction); An anchorage suitable for anchoring near Nanyan island in the Ross Sea was also found.

The technologies implemented by the East China Sea maritine security technology center under the framework of e-navigation mainly include: ① positioning enhancement technology. Such as radio beacon differential Beidou satellite navigation system and maritime Beidou continuous operation reference station system (bd-cors). ② Water digital communication technology, water safety information digital broadcasting system (NAVDAT), broadband VHF data communication system, maritime regional WiFi, satellite coverage. ③ Navigation assistance information integration and service technology. For example, electronic chart service cloud platform - haie bank, construction of e-navigation demonstration area of Yangshan Port (navigation in fog), and global navigation safety information system.

The specific applications of radio beacon differential Beidou satellite navigation system (rbn-dbds) include: the East China Sea maritine security technology center has completed the first coastal differential satellite navigation system with completely independent intellectual property rights to provide navigation users with positioning and navigation services with positioning accuracy of 1-2m; Daweishan rbn-dgnss (DBDs + DGPS) station was officially put into operation on January 1, 2014; The revision of gb17424 technical requirements for differential global navigation satellite system (DGNSS) has also been incorporated into the standard revision plan of the Ministry of transport from 2015 to 2017.

The specific applications of Beidou CORS system include: the high-precision positioning with horizontal accuracy of 3cm and vertical accuracy of 5cm is realized in the 2213 square kilometer core area covered by the Yangtze Estuary Beidou CORS test system, the real-time positioning with horizontal accuracy of 15cm is realized in the 5812 square kilometer high-precision area covered by the system, and the sub meter real-time positioning is realized in the surrounding 12132 square kilometer area.

For the digital broadcasting system of water safety information (NAVDAT), the NAVDAT electronic chart release test was carried out. The size of the electronic chart update packet is 91KB, and the data transmission time is only 37 seconds.

At present, the construction of large-scale container navigation (navigation) port in Yangshan is under way, and the visibility of large-scale container navigation (navigation) port in Yangshan is poor[5].. It mainly starts from five aspects, using NAVDAT, VHF broadband, 4G network and other means to broadcast navigation assistance information; Realize high-precision berthing of large ships based on bd-cors system; Based on rbn-dgnss and broadcasting BDS / GPS differential signal, high-precision navigation is realized; Optimize the layout of existing navigation standards of Yangshan Port, improve performance and meet the needs of fog navigation; Gather AIS, BDS, VTS and other information to improve the monitoring ability.

In terms of the information system of the global navigation safety information system, the main goal of the East China Sea maritine security technology center is to open the public platform, cooperate with application development and provide navigation digital service business. The second is to establish a one-stop navigation information service platform to provide industry data special service business. For example, the required data can be obtained through the highly integrated data pool of the chart center, such as fishery information data, marine resources data

and marine ecological data, so that users inside and outside various types of industries can query and obtain most of the relevant information.

6. Conclusion

The ocean has become the second largest space for human survival and development, and countries all over the world will compete on the ocean in the future. As China's maritime security department, we must look forward to the future, make breakthroughs in four aspects: new fields, new technologies, new services and new methods (big data) under the framework of safety, environmental protection and efficiency, provide timely, accurate, comprehensive and convenient services for ships in the deep sea, open sea and new channels, keep pace with the global pace, actively participate in international organizations and strive to catch up with and surpass the world level, Contribute to China's maritime power strategy.

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