船舶特高頻資料交換與航行風險評估之技術發展

Document Analysis of VHF Data Exchange System and AIS-based Risk Assessment for Navigation Safety

主管單位：交通部運輸研究所

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摘要

臺灣位於東北亞和東南亞交界處，往北連結日本、韓國，往南連接東南亞各國，且為東北亞與東南亞海上來往航運的樞紐，在海運與經濟貿易上更為重要據點。雖然，近 20 年以來船舶自動識別系統(AIS)提供了海域內各船隻的即時資訊，然而海上事故卻仍常造成人身安全及船舶財產嚴重損失。為降低海上事故發生的可能，本計畫主要蒐集往昔海上事故歷史資料，分析其類別與時空分布以進一步了解其發生的熱區與風險因子。

本研究首先蒐集國內外特高頻資料交換系統(VDES)之相關應用與技術文件，彙整 VDES 對航運安全及海上通訊之助益，以供國內學術與港灣管理單位做參考。透過事故的成因統計與熱區分析，了解臺灣沿岸海域常發生海難事故的位置及重要成因。選擇高雄港當為案例，分析與海氣象因子有關的往昔事件，並以實測資料與數值模式完成重點事故的情境重現並以探討其成因。最後，以歷史 AIS 資料初步建立高雄港的船行模擬模式，以航行安全範圍來評估高雄港海域之航行風險。結果顯示兩個高風險熱區與高雄港範圍碰撞事故熱區分析結果並無一致的現象，顯示高雄港目前透過 VTS 管理中心的管控下其海事碰撞事件在交通密集區域並無明顯較多的情況。本研究針對海上事故的記錄提出幾項建議，期望能加強國內海事案件的資料紀錄與資訊整合。船行模擬模式配合文檔式資料庫與船行安全範圍的大數據處理方式可應用在其他海域航道或港區，可提供港務管理與規劃相關單位在航控與調配上做參考。

關鍵詞：自動識別系統、特高頻資料交換系統、海上事故分析、航行風險模式

Abstract

Taiwan is located at the junction of Northeast Asia and Southeast Asia, connecting Japan and South Korea to the north and Southeast Asian countries to the south. It is not only a hub for maritime transportation between Northeast Asia and Southeast Asia but also an important base for shipping and economic trade. Although the Automatic Ship Identification System (AIS) has provided real-time information of all ships in the sea for the past 20 years, marine accidents still often cause personal safety and serious damage to the ship’s property. In order to reduce the possibility of marine accidents, this project mainly collects historical data of

past marine accidents and analyzes their types and temporal and spatial distribution to further understand their hot spots and risk factors.

This research first collects relevant application and technical documents of domestic and foreign UHF Data Exchange System (VDES), and summarizes the benefits of VDES on shipping safety and maritime communications for reference by domestic academic and harbor management units. Through accident cause statistics and hot zone analysis, we can understand the locations and important causes of frequent maritime accidents in the coastal waters of Taiwan. Select Kaohsiung Port as a case to analyze past events related to marine meteorological factors, and reconstruct the scenarios of key accidents with measured data and numerical models to explore their causes. Finally, based on historical AIS data, a preliminary ship simulation model of the Kaohsiung Port was established to evaluate the navigation risk in the waters of the Kaohsiung Port. The results show that the two high-risk hot spots are not consistent with the analysis results of the collision accident hot spot in the Kaohsiung Port. This shows that maritime collision incidents are not significantly more in densely trafficked areas under the control of the Kaohsiung Port VTS Management Center. This research provides suggestions for the marine accidents recording, hoping to strengthen the data record and information integration of domestic maritime cases. The ship simulation model, combined with the big data processing method of the NOSQL and the ship domain mothed, can be applied to other routes or port, the results can be used for reference by relevant units of port management and planning in navigation control and deployment.

Keywords：automatic identification system；VHF data exchange system；marine accidents analysis；navigation risk assessment model