Ocean Engineering: Jurnal Ilmu Teknik dan Teknologi Maritim
Volume 5, Nomor 2, Juni 2026
e-ISSN: 2963-5454; p-ISSN: 2963-5012, Hal 38-47
DOI: https://doi.org/10.58192/ocean.v5i2.4815
Tersedia: https://journal.unimar-amni.ac.id/index.php/ocean

Implementation of Man Overboard Emergency Handling Based on Safety Management System

(A Case Study of KM. Tidar)

Andi Aprilia[1*], Bruce Rumangkang [2], Nurul Hatifah[3]
[1-3] Nautical Department, Politeknik Ilmu Pelayaran Makassar, Indonesia
**Corresponding Author: apriliaandi037 @email.com*

Abstract. Man overboard (MOB) incidents remain one of the most critical emergencies in maritime operations due to the high risk of loss of life and the limited time available for rescue actions. The effectiveness of MOB handling is highly dependent on crew response, communication, coordination, and adherence to established safety procedures. This study aims to analyze the conformity of man overboard handling implementation on KM. Tidar with the Safety Management System (SMS) of PT PELNI. A descriptive qualitative approach was employed using observation, semi-structured interviews, documentation, and NVivo-assisted data analysis during sea practice onboard KM. Tidar. Data were analyzed through data reduction, data display, and conclusion drawing techniques. The findings indicate that MOB handling on KM. Tidar consists of six stages: initial detection, initial response actions, emergency communication, rescue maneuver, search operation, and follow-up actions. Most procedures were implemented in accordance with the company's SMS, particularly in emergency communication, rescue maneuver execution, and search operations. The Williamson Turn maneuver was applied effectively under limited visibility conditions during nighttime operations. However, procedural non-conformities were identified at the initial detection stage, including the absence of verbal "man overboard" warning, failure to activate the emergency alarm, and incomplete initial recording procedures. These issues were influenced by human factors, operational pressure, and emergency conditions. The study concludes that MOB handling was operationally effective but not fully compliant with SMS requirements, emphasizing the need to strengthen emergency preparedness and safety culture onboard vessels.

Keywords: Emergency Handling; Man Overboard; Maritime Safety; Passenger Vessel; Safety Management System.

1. INTRODUCTION

Indonesia, as the world's largest archipelagic country, relies heavily on maritime transportation to support passenger mobility, regional connectivity, and national logistics distribution. Maritime transportation plays a vital role in connecting remote islands and sustaining economic activities across the country(Aritonang et al., 2025; Hudaya & Idris, 2023). Therefore, maritime safety has become a fundamental requirement in ensuring operational reliability, protecting human life, and maintaining sustainable maritime transportation systems. Maritime safety encompasses vessel seaworthiness, crew competence, operational procedures, and environmental protection standards (Latt, 2024; Melnyk et al., 2021)

Despite technological developments and international maritime regulations, maritime accidents remain a significant concern worldwide. Human error continues to be identified as one of the dominant causes of maritime accidents. Weak safety culture, inadequate emergency preparedness, ineffective communication, and procedural non-compliance frequently contribute to operational failures onboard vessels(Chowdhury et al., 2024; Shi et al., 2023).

Naskah Masuk: 29 April 2026; Revisi: 25 Mei 2026; Diterima: 22 Juni 2026; Tersedia: 24 Juni 2026

Furthermore, empirical data indicate that human error accounts for approximately 72% of all recorded maritime incidents, necessitating a shift toward more robust safety management frameworks (Maharani & Mustofa, 2025). Addressing these systemic vulnerabilities requires integrating advanced telecommunication infrastructure and comprehensive crew resource management to effectively mitigate the influence of human factors (Haryono, 2025). Beyond crew performance, these frameworks must also address the critical influence of shipping company management systems, which are estimated to be responsible for the majority of human-related failures in Indonesian waters (Setiawan et al., 2022).

One of the most dangerous emergencies in maritime operations is a man overboard (MOB) incident. MOB refers to a situation in which a person falls from a vessel into the sea and requires immediate rescue action. Such incidents are highly critical because survival chances are strongly influenced by rapid detection, emergency communication, rescue maneuver execution, and environmental conditions such as currents, waves, and visibility limitations(Kannagi et al., 2025; Maghinay et al., 2025). International regulations, particularly SOLAS and the International Safety Management (ISM) Code, require vessels to establish emergency response procedures for MOB situations to maximize rescue effectiveness (IMO, 2021).

A man overboard incident occurred onboard KM. Tidar on 19 May 2025 while the vessel was conducting maneuvering operations before berthing in Makassar Port waters. According to the accident report, the incident occurred shortly after anchor-up operations. Initial information was obtained from passenger witnesses who reported the incident to ship security personnel before the information was relayed to the bridge. Emergency actions subsequently included lifebuoy deployment, position marking through ECDIS, emergency communication, execution of a Williamson Turn maneuver, and search operations(Bowman et al., 1977; Hoehner et al., 2024). Previous studies have primarily examined maritime accident causation, safety culture, and MOB prevention strategies. Asri et al. (2024) emphasized the influence of human factors on maritime accidents, while Bram et al. (2025) identified discrepancies between written procedures and practical implementation. De Kruif et al. (2025) analyzed the effectiveness of Williamson Turn maneuvers in MOB emergencies, and Alshibli and Memon (2025) highlighted the influence of environmental conditions on search and rescue operations. However, studies specifically focusing on the actual implementation of MOB handling procedures onboard passenger vessels under real operational conditions remain limited. This study addresses this research gap by evaluating the efficacy of onboard rescue maneuvers and emergency communication protocols during actual MOB events in Indonesian waters.

Therefore, this study aims to analyze the conformity of man overboard handling implementation onboard KM. Tidar with the Safety Management System (SMS) of PT PELNI and identify factors influencing procedural compliance during emergency situations.

2. LITERATUR REVIEW

Maritim Safety

Maritime safety refers to the fulfillment of safety requirements related to vessel operations, crew competence, navigation systems, emergency preparedness, and environmental protection. International maritime safety standards are regulated through the Safety of Life at Sea (SOLAS) Convention and the International Safety Management (ISM) Code, which emphasize systematic safety management and emergency preparednes(Agnesi & Wirza, 2025). These regulatory frameworks are further supported by the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, which ensures that crew members possess the necessary professional qualifications to uphold operational safety standards (Fan & Yang, 2022).

Maritime safety is not only associated with technical aspects of vessel operation but also with organizational and human elements that influence decision-making processes during emergencies. Effective maritime safety management requires the integration of competent personnel, reliable communication systems, standardized operating procedures, and continuous safety training. According to the International Maritime Organization (IMO), the implementation of a proactive safety culture significantly contributes to reducing accident rates and improving emergency response performance onboard ships. Therefore, maritime safety should be viewed as a comprehensive system involving human, organizational, and technical dimensions rather than merely compliance with regulations.

Safety Management System (SMS)

The Safety Management System (SMS) is a structured framework developed to ensure safe vessel operations through documented procedures, emergency preparedness plans, reporting mechanisms, and continuous improvement processes. The ISM Code requires shipping companies to establish and maintain effective SMS procedures to improve safety performance and reduce operational risks (Malau et al., 2025; O.D., 2025), thereby addressing the human errors that previously contributed to severe maritime accidents (Naevestad, 2017).

The Safety Management System also functions as a preventive mechanism designed to identify potential risks before accidents occur. Through systematic risk assessment, internal audits, corrective actions, and continuous monitoring, shipping companies can maintain

operational standards and improve safety performance. In emergency situations, SMS serves as a practical guideline that assists crew members in executing coordinated and timely actions. Consequently, the effectiveness of emergency response procedures largely depends on the level of crew understanding and commitment toward SMS implementation.

Man Overboard (MOB)

Man overboard refers to an emergency condition where a person falls into the sea and requires immediate rescue assistance. Effective MOB response depends on rapid detection, communication efficiency, rescue maneuver execution, and coordinated search operations. Standard MOB procedures generally consist of detection, initial response actions, communication, rescue maneuver execution, search operations, and follow-up actions(Aditya et al., 2025).

Rescue Maneuvers in MOB Situations

Several rescue maneuver methods are commonly used during MOB emergencies.

Table 1. Comparison of MOB Rescue Maneuvers.

Maneuver	Characteristics	Advantages	Limitations
Williamson Turn	Returns vessel to reciprocal course	Effective during low visibility conditions	Longer maneuvering time
Anderson Turn	Circular maneuver toward victim	Fastest response when victim remains visible	Requires continuous visual contact
Scharnow Turn	Used when vessel has traveled far from incident position	Efficient return distance	Requires precise timing

Source: Adapted from MOB handling procedures.

The Williamson Turn maneuver is widely recognized as one of the most effective methods for returning vessels to a victim's last known position when visibility conditions are limited (De Kruif et al., 2025).

3. RESEARCH METHOD

This study employed a descriptive qualitative approach to examine the implementation of man overboard handling procedures onboard KM. Tidar. A qualitative approach was selected because it enables in-depth analysis of emergency response processes under actual operational conditions.

Data were collected through direct observation, semi-structured interviews, and documentation review. Observations focused on incident information reception, initial response actions, emergency communication, rescue maneuver implementation, search operations, and follow-up actions.

Data analysis followed the Miles and Huberman model through data reduction, data display, and conclusion drawing. NVivo software was utilized to facilitate thematic coding and analysis of MOB handling stages.

4. RESULTS AND DISCUSSION

The implementation of man overboard (MOB) emergency handling onboard KM. Tidar was analyzed based on the procedures established in the company's Safety Management System (SMS). The findings were organized according to the sequence of emergency response activities observed during the incident, starting from the initial detection of the emergency until the completion of search operations and procedural evaluation.

Initial Detection Stage

Initial information regarding the incident was not directly received by bridge officers. Passenger witnesses first reported the incident to ship security personnel, who subsequently relayed the information through Handy Talky communication to the bridge. However, the verbal warning “man overboard” was not announced, and emergency alarms were not activated according to SMS procedures. The initial detection stage is considered one of the most critical phases in man overboard emergencies because the success of subsequent rescue operations depends heavily on the speed and accuracy of incident recognition. Delays in identifying the incident may increase the distance between the vessel and the victim, thereby reducing the probability of successful recovery. In the observed incident, information was received indirectly through passenger reports rather than direct observation by bridge personnel. This communication pathway potentially increased response time and contributed to deviations from standard SMS procedures, particularly regarding emergency alarm activation and verbal warnings.

Initial Response Actions

Following notification, crew members immediately deployed lifebuoys, marked the victim’s position through ECDIS systems, and adjusted engine operations to support rescue maneuvers and reduce risks to the victim. These actions were carried out to maintain visual and positional references of the victim while preparing the vessel for further rescue operations. The deployment of lifebuoys served as an immediate aid for the victim and as a visual marker, whereas position marking through ECDIS facilitated accurate navigation during the rescue maneuver. Such prompt responses reflected the crew's awareness of the critical importance of time during man overboard emergencies.

Emergency Communication

Emergency communication was conducted through VHF radio channels to Vessel Traffic Service (VTS), Coast Guard authorities, nearby vessels, and internal ship communication systems including Public Address (PA) and Handy Talky communication. Effective communication plays a central role in emergency management onboard ships. During MOB incidents, communication must be transmitted rapidly, accurately, and simultaneously to all relevant parties, including bridge officers, deck crews, engine personnel, nearby vessels, and maritime authorities. The findings indicate that communication procedures onboard KM. Tidar were generally implemented effectively through the utilization of VHF radio, Public Address systems, and Handy Talky communication. These communication channels facilitated coordination among response teams and supported the execution of rescue operations.

Rescue Maneuver

The vessel executed a Williamson Turn maneuver to return to the victim's last known position because the incident occurred at night under limited visibility conditions. This maneuver enabled the vessel to retrace its original track efficiently and support search operations. The selection of the Williamson Turn maneuver was considered appropriate because the incident occurred during nighttime conditions with limited visibility. Compared with the Anderson Turn, which requires continuous visual contact with the victim, the Williamson Turn allows the vessel to return to the original track and approach the estimated position of the victim more effectively. This finding is consistent with previous maritime studies that identify the Williamson Turn as one of the most suitable rescue maneuvers for situations involving poor visibility and uncertain victim location.

Search Operation

Search activities were conducted through visual observation and coordinated communication with nearby maritime authorities. Nevertheless, the victim was not successfully located despite extensive search efforts. During the operation, bridge personnel continuously monitored the surrounding waters while maintaining communication with relevant authorities and nearby vessels to obtain additional information that could support the search process. The search area was determined based on the victim's last known position, vessel movement, sea currents, and prevailing environmental conditions. Furthermore, the effectiveness of the search operation was influenced by several external factors, including limited visibility during nighttime conditions, sea state, and the elapsed time between the incident and the commencement of search activities. Although the victim was not found, the coordinated efforts undertaken by the vessel's crew and maritime authorities demonstrated adherence to

established search and rescue procedures. These actions reflected the crew's commitment to maximizing rescue opportunities under challenging operational conditions.

Conformity with the Safety Management System

Table 2. Conformity Between SMS Procedures and Actual Implementation.

Procedure	Implementation	Conformity
Verbal MOB warning	Not conducted	Non-conforming
Lifebuoy deployment	Conducted	Conforming
Position marking through ECDIS	Conducted	Conforming
Emergency communication	Conducted	Conforming
Williamson Turn maneuver	Conducted	Conforming
Search operation	Conducted	Conforming
Emergency alarm activation	Not conducted	Non-conforming
Initial recording procedure	Not conducted	Non-conforming

Source: Research findings.

The results indicate that most emergency handling procedures were implemented according to SMS requirements. However, procedural discrepancies occurred during the initial detection stage. Human factors, panic conditions, indirect communication flow, and operational responsibilities significantly influenced procedural non-compliance. These findings support previous studies demonstrating that human factors and safety culture strongly influence emergency response performance (Mok et al., 2023; Xi et al., 2025).

Furthermore, although emergency drills and safety meetings had been conducted onboard KM. Tidar, implementation gaps remained during actual emergency situations. This finding suggests that procedural compliance requires not only training activities but also practical readiness under operational pressure. The identified procedural non-conformities suggest that emergency situations often create operational pressures that influence crew behavior and decision-making processes. Although documented procedures clearly require verbal warnings, emergency alarm activation, and initial recording actions, personnel may prioritize immediate rescue measures due to perceived urgency. This phenomenon reflects the influence of human factors in maritime operations, where practical responses occasionally differ from formal procedures. Therefore, strengthening procedural discipline through scenario-based training and periodic evaluations is necessary to minimize implementation gaps during actual emergencies.

5. CONCLUSION AND RECOMMENDATIONS

This study aimed to analyze the conformity of man overboard (MOB) handling implementation onboard KM. Tidar with the Safety Management System (SMS) of PT PELNI. The findings reveal that the implementation of MOB handling generally complied with the established SMS procedures, particularly in the execution of initial response actions, emergency communication, Williamson Turn maneuver, and search operations. These actions

demonstrated effective coordination among ship personnel and reflected the operational readiness of the crew in responding to emergency situations. However, the implementation was not fully compliant with the prescribed procedures because several requirements at the initial detection stage were not carried out, including the absence of a verbal "man overboard" warning, failure to activate the emergency alarm, and the omission of initial recording procedures. These discrepancies were primarily influenced by human factors, emergency pressure, and operational conditions during the incident. Therefore, the study indicates that the effectiveness of emergency response is determined not only by the availability of documented procedures but also by the ability of personnel to consistently implement those procedures under real operational conditions.

The findings provide practical implications for shipping companies, particularly in strengthening emergency preparedness programs, improving procedural compliance, and enhancing safety culture onboard passenger vessels. Regular evaluation of Safety Management System implementation and scenario-based emergency drills are recommended to improve crew responsiveness during actual emergencies. Nevertheless, this study has several limitations. It was conducted as a single case study on one passenger vessel and relied primarily on qualitative data obtained from observations, interviews, and documentation. Consequently, the findings cannot be generalized to all vessel types or operational environments. Future studies are recommended to involve multiple vessels, different shipping sectors, and quantitative approaches to examine the relationship between safety culture, crew competence, emergency preparedness, and the effectiveness of man overboard response. Comparative studies between passenger vessels and cargo vessels may also provide broader insights into the implementation of Safety Management Systems in maritime operations.

REFERENCE

Aditya, G. V., Reddy, K. B., & Yamini, B. (2025). Optimized smart wearable device for man overboard detection and identification system in marine. *IEEE*. https://doi.org/10.1109/ICoACT63339.2025.11005289

Agnesi, S. G., & Wirza, E. (2025). Studi literatur tentang implementasi kebijakan pemerintah dalam peningkatan keselamatan transportasi laut. *Jurnal Cakrawala Bahari, 8*(1), 180–191. https://doi.org/10.70031/jkb.v8i1.152

Aritonang, F. N. T., Arkady, J. C., Torindatu, L. A. R., & Silalahi, V. A. J. M. (2025). Indonesia's position as a maritime axis in the global logistics chain. *JIPower Journal of Intellectual Power, 2*(1), 110–123. https://doi.org/10.63786/jipower.v2i1.38

Bowman, J., Douglas, R. J. W., Giuntini, R., Lunn, D., & Sager, E. (1977). An evaluation of performance and effectiveness of a man overboard detection and location system. *Defense Technical Information Center*. http://oai.dtic.mil

Bram, S., Costa, N., Fabricius, V., Sjöblom, T., & Nilsson, E. (2025). Reframing procedures and teamwork for man overboard (MOB) scenarios on small MASS passenger ferries. In *Proceedings of the 16th International Conference on Applied Human Factors and Ergonomics*. https://doi.org/10.54941/ahfe1006543

Chowdhury, M. N., Shafi, S., Arzaman, A. F. M., et al. (2024). Navigating human factors in maritime safety: A review of risks and improvements in engine rooms of ocean-going vessels. *International Journal of Safety and Security Engineering, 14*(1), 1–14. https://doi.org/10.18280/ijsse.140101

Fan, S., & Yang, Z. (2022). Safety and security co-analysis in transport systems: Current state and regulatory development. *Transportation Research Part A, 166*, 369–388. https://doi.org/10.1016/j.tra.2022.11.005

Haryono, M. (2025). Analisis kuantitatif faktor sumber daya dan teknologi terhadap keselamatan pelayaran maritim di Indonesia. *Logistics and Supply Chain Insights, 1*(2), 94–104. https://doi.org/10.65428/login.v1i2.74

Hoehner, F., Langenohl, V., Akyol, S., Moctar, O. E., & Schellin, T. E. (2024). Object detection and tracking in maritime environments in case of person-overboard scenarios: An overview. *Journal of Marine Science and Engineering, 12*(11), 2038. https://doi.org/10.3390/jmse12112038

Hudaya, K., & Idris, H. (2023). The potential of blue economy implementation for Indonesia's maritime transport. *Journal of Southeast Asian Studies, 28*(2), 19–37. https://doi.org/10.22452/jati.vol28no2.2

Kannagi, L., Prakash, P., Priyadharshini, P., et al. (2025). Rescue the overboard person from water. *IEEE*. https://doi.org/10.1109/ICCCT63501.2025.11020105

Latt, N. Z. (2024). Mitigating the risk of ship accidents with an integrated approach to maritime safety management. *Maritime Park Journal of Maritime Technology and Society*, 8–15. https://doi.org/10.62012/mp.v3i2.35385

Maghinay, E., Fuderanan, M. J. B., Alolo, J., et al. (2025). Crew safety aid (CRESAFA): A modified technological system for efficient man overboard recovery. *Psychology and Education: A Multidisciplinary Journal, 47*(10), 1208–1214. https://doi.org/10.70838/pemj.471005

Maharani, M. D. D., & Mustofa, A. (2025). Integrating human factors and safety management frameworks in maritime occupational accidents: Evidence from Indonesia (2003–2019). *Malacca Journal, 2*(2), 88–96. https://doi.org/10.69965/malacca.v2i2.159

Malau, H. E. K., Ginting, D., & Yusnidah, Y. (2025). Pengaruh pelaksanaan internal audit ISM Code terhadap operasional kapal MV. Martha Golden. *Jurnal Bisnis Kreatif dan Inovatif, 2*(3), 200–206. https://doi.org/10.61132/jubikin.v2i3.915

Melnyk, O., Onyshchenko, S., Lohinov, O., Okulov, V., & Pulyaev, I. (2021). Actual problems of maritime safety and modern ways of ensuring ship security. *Municipal Economy of Cities, 6*(166), 204–210. https://doi.org/10.33042/2522-1809-2021-6-166-204-210

Nævestad, T. (2017). Safety culture, working conditions and personal injuries in Norwegian maritime transport. *Marine Policy*, *84*, 251–262. https://doi.org/10.1016/j.marpol.2017.07.019

O.D., K. (2025). The International Safety Management (ISM) Code in merchant shipping: Structure, implementation, and functional analysis. *Zenodo*. https://doi.org/10.5281/zenodo.17546606

Setiawan, H., Susanti, E., & Poerwanto, P. (2022). Analysis of navigation equipment on motor sailing ship safety. *Media Trend*, *17*(1), 53–58. https://doi.org/10.21107/mediatrend.v17i1.13673

Shi, K., Weng, J., Fan, S., Yang, Z., & Ding, H. (2023). Exploring seafarers' emotional responses to emergencies. *Ocean & Coastal Management*, *243*, 106736. https://doi.org/10.1016/j.ocecoaman.2023.106736