



Regular Research Article

Implementation of SOLAS Compliant Life Saving Appliances to Support Safety on Board the KM. Armada Segara

Abiyyu Ikbar Sriwandana*, Kuncowati and Elva Febriana Anggraeny

Universitas Hang Tuah Surabaya, Indonesia

*abiikbar65@gmail.com

Abstract: Given that IMO data shows that approximately 80% of ship accidents are caused by human error, maritime safety is of paramount importance to the maritime industry. The objective of this study is to analyze the implementation of Life Saving Appliances (LSA) on the KM. Armada Segara, identify the challenges encountered, and evaluate their effectiveness in ensuring the safety of life in accordance with Chapter III of the SOLAS Convention. This study employed a descriptive qualitative method. Data were collected through document analysis, observation, and in depth interviews with four informants (Second Officer, Third Officer, Boatswain, and Able Bodied Seaman). The Miles and Huberman model was used to analyze the data. The study found that the Life Saving Appliances (LSA) available on the KM. Armada Segara meet SOLAS requirements, including life jackets, lifeboats, liferafts, and lifebuoys, as well as certification documentation and a well-maintained Planned Maintenance System (PMS). However, technical issues included problems with the lighting systems on four life jacket units, a failure in the lifeboat davit retrieval system, and human factors such as crew hesitation during the engine room fire incident. The study found that although the implementation of Life Saving Appliances (LSA) is technically and administratively sound, their effectiveness in emergency situations depends heavily on the crew's skills and preparedness, making it necessary to provide better training and consistently improve the safety culture.

Keywords: Life Saving Appliances (LSA); SOLAS Convention; Maritime Safety.

1. Introduction

Maritime safety is of utmost importance in the marine industry, because it directly relates to the preservation of human life at sea. Security and travel safety are crucial elements of Indonesia's maritime transportation system, according to Law No. 17 of 2008 on Shipping [2]. In addition to technical elements like the state of the ship and safety gear, non technical elements like management, workplace culture, and crew discipline in adhering to safety protocols all have an impact on maritime safety. 80% of ship accidents are caused by human mistake and negligence, according to accident statistics analyzed by the International Maritime

Organization (IMO). Of these human error cases, it is also known that about 80% are due to shipping corporations' bad management.

In order to improve maritime safety, safety devices like Life Saving Appliances (LSA) that adhere to current laws must be implemented in tandem with technology improvements in the shipping sector. This is in line with studies by [3], which indicates that most people think that the ship, its crew, and its equipment are the only factors that affect maritime safety. For all passengers and crew to be safe while the ship is in operation, safety equipment is essential. Safety equipment must always be in top shape and prepared for use in case of an unforeseen incident [4].

Received: 2026-07-01; Accepted: 2026-09-18

doi.org/10.62012/mp.vi.52446 | e-ISSN: 2828-6669 p-ISSN: 2828-7010

This work is licensed under a Creative Commons Attribution 4.0 International License.

Maritime safety is crucial because it is directly related to the safety of lives, ships, and cargo [5]. The Directorate General of Maritime Transportation has released a policy to lower ship accidents in order to enhance maritime safety. To guarantee the safe operation of ships and lower pollution, the International Maritime Organization (IMO) has adopted a number of standards. The International Safety Management Code (ISM), the SOLAS Convention, the International Industry Code of Practices and Guidelines, and MARPOL are some of these rules.

The SOLAS Convention was established in 1914 to improve safety in the shipping industry and enhance the protection of human life at sea [6]. For merchant ships of a specific size, the SOLAS maritime safety standard must be followed [7]. The provision, upkeep, and use of life-saving equipment, including life jackets, lifebuoys, lifeboats, liferafts, immersion suits, pyrotechnic signals, and emergency communication devices, are expressly governed by the SOLAS Convention [8]. These laws state that the crew's safety can only be guaranteed if life saving appliances (LSA) are readily available, in good operating order, and used correctly through frequent drills.

Having enough safety equipment suitable for the ship's size, type, and crew size is one of the safety requirements that every ship must fulfill in order to guarantee the crew's safety in the case of an emergency at sea [9]. Comprehensive safety equipment, continuous maintenance, and crew preparedness to deploy Life Saving Appliances (LSA) appropriately and efficiently in compliance with relevant protocols are all necessary for a maritime safety system to operate successfully. Through regular training, recurring inspections, and supervision of the application of international safety standards on board ships, one of the main duties of ship operators and maritime authorities is to guarantee that all safety equipment is in excellent working order. Thus, it is anticipated that this study will contribute to a better understanding of the significance of safety standards in shipping and act as a guide for the marine sector to continue adhering to SOLAS Convention requirements.

The application of the SOLAS Convention and the usage of Life Saving Appliances (LSA) require special attention to lower the risk of maritime accidents and enhance the safety of ship crews and passengers, according to a number of earlier studies. For instance, according to a study by [10], the SOLAS Convention standards govern the kind, quantity, and state of life-saving equipment that must be on board a ship in order to guarantee that all Life Saving Appliances (LSA) are in good operating order and prepared for use in an emergency, thereby improving the chances of survival for the entire crew and all passengers in the event of an incident at sea. According to the research findings, maintaining and operating Life Saving Appliances (LSA) in compliance with the SOLAS Convention's criteria is not just an administrative necessity but also an essential part of guaranteeing safe and efficient transportation.

Additionally, research by [11] demonstrates that safety equipment on board a ship is essential to ensuring marine safety, particularly in emergency scenarios like fires, people falling overboard, or shipwrecks. Regular maintenance and inspections are necessary to guarantee that safety equipment operates as intended. This complies with the standards set forth by the International Maritime Organization (IMO) in the SOLAS Convention, which mandates that every ship have sufficient safety equipment that is kept up to date and prepared for use when needed. The SOLAS Convention's goals are to guarantee that a ship's safety systems adhere to the necessary regulations and to save the lives of both passengers and crew.

Previous research on the readiness and implementation of life saving equipment on board ships, such as that conducted by [12] on the MT Marlin88, has generally focused on analyzing the availability, placement, and physical condition of Life Saving Appliances (LSA) and Fire Fighting Appliances (FFA) simultaneously. This study emphasizes compliance with administrative standards and identified several non conformities regarding LSA and the implementation of the Planned Maintenance System (PMS). However, such

research has not yet examined how LSA function in real operational situations, particularly regarding how the technical readiness of the equipment is integrated with the crew's capabilities and how they respond in emergency situations. In an effort to meet the requirements of Chapter III of the SOLAS Convention regarding the safety of life at sea, this study analyzes the use of LSA on the KM. Armada Segara. This study emphasizes the relationship between equipment readiness and crew preparedness under actual operational conditions, thereby providing a better understanding of how effective LSA is in contributing to maritime safety.

On September 21, 2025, while participating in field training on board the KM. Armada Segara, the author personally encountered an emergency involving a minor fuel system leak that resulted in a fire and dense smoke in the engine room, posing a threat to the ship's and its crew's safety. However, because the crew was ready, safety protocols were properly followed, and life-saving appliances (LSA) such as fire extinguishers, warning systems, and fire suppression pipework operated in compliance with relevant regulations, the emergency was managed swiftly and efficiently. The ability to manage emergencies on board a ship is largely dependent on the availability, quality, and preparedness of life-saving equipment, which is crucial for preserving the stability of ship operations and lowering the risk of property damage and fatalities. This is demonstrated by the fire's successful containment.

Against this backdrop, these reasons motivated the researcher to write a thesis titled "Implementation of SOLAS Compliant Life Saving Appliances to Support Safety on Board the KM. Armada Segara". The purpose of this study is to increase awareness of the significance of installing and maintaining safety equipment on board ships in compliance with the SOLAS Convention's requirements. In order to ensure that all safety equipment on board can be utilized safely, this study is also anticipated to give ship workers instructions on how to

operate Life Saving Appliances (LSA) appropriately and on a regular basis. The danger of marine accidents can be reduced and onboard safety can be increased with proper implementation.

2. Methods

This study employs a qualitative research design. This type of research is defined as the investigation, discovery, description, and explanation of qualities or levels of social impact that cannot be quantified, explained, or defined using quantitative techniques [13]. In this study, a descriptive qualitative approach was used, the researcher acted as the key instrument, and the data were used for description and analyzed inductively. This method was chosen because the implementation of Life Saving Appliances (LSA) is a complex phenomenon involving technical equipment, human behavior, and regulatory compliance elements that are better understood through a naturalistic approach rather than numerical measurements alone.

The KM. Armada Segara was selected as the study site because its operational characteristics are representative of the national commercial shipping sector, featuring high cargo handling volumes, frequent voyages, and complex crew interactions. Thus, the KM. Armada Segara can be viewed as representative of the overall implementation of the LSA on Indonesian domestic container ships. Informants were selected through purposive sampling based on the relevance of their positions to LSA management duties on board the vessel. In this study, the term "Mualim" is used to refer to deck officers on Indonesian commercial vessels, where the designations I, II, and III indicate the order of responsibility and are equivalent to the titles Chief Officer, Second Officer, and Third Officer in international maritime terminology. Meanwhile, the term "Bosun" is a term commonly used worldwide to refer to the head of the deck crew who handles technical tasks on the ship's deck.

Table 1. List of Research Informants

No	Informant	Role on the Ship	Relevance to the Research
1	Second Officer	Is responsible for navigation and monitoring the technical condition of safety equipment, including periodic LSA inspections.	Information on the compliance of LSA technical specifications and human resource readiness challenges for LSA implementation.
2	Third Officer	Is directly responsible for inspecting, documenting, and coordinating the maintenance of LSA in accordance with the Planned Maintenance System (PMS) schedule.	The primary source of technical data regarding LSA compliance with SOLAS regulations includes the condition of davits, winches, and lifeboat launching systems.
3	Boatswain	Oversee the technical operations on deck, including physical maintenance of LSA equipment, drill operations, and reporting on the condition of equipment such as fire extinguishers.	Provide field operational data on drilling operations, the current condition of equipment, and recommendations for improvements.
4	Able Bodied Seaman (AB)	Operational personnel who use the LSA directly during drills and in actual emergencies.	Provides end users with insights into the comprehensiveness, ease of use, and practical challenges encountered in the field with LSA.

The data used in this study consist of two sources, primary data and secondary data. Primary data were obtained through direct interviews with the four informants listed in Table 1. above, as well as field observations conducted by the researcher during sea training. Secondary data sources included literature reviews such as the 1974 SOLAS Convention, IMO regulations, the International Life Saving Appliance (LSA) Code, maritime safety textbooks, and relevant scientific journals.

Data collection was conducted through interviews, observations, and document analysis. This study employed semi structured interviews. The interview process was carried out in the following stages: (1) the researcher developed interview guidelines based on the LSA implementation indicators as outlined in Chapter III of SOLAS; (2) the researcher scheduled meetings with each informant based on their availability during work hours; (3) interviews were conducted in person on board the ship, lasting an average of 20 to 30 minutes per informant; and (4) with the informants' consent, their responses were transcribed and recorded using a voice recorder.

A participatory observation method was used. Observations were conducted periodically throughout the study and supported by photographic documentation as visual evidence of field findings. Observations were conducted using a checklist instrument that included 30

observation indicators based on the provisions of SOLAS Chapter III, covering the availability, physical condition, placement, functionality, and readiness of LSA.

The documentation process involves collecting and reviewing all official ship documents related to the implementation of the LSA. These documents include the LSA inventory list, fire and safety plans, LSA certificates of compliance, the ship's logbook, the Planned Maintenance System (PMS), safety procedure manuals, sample lists, and records of safety drill implementation. After obtaining official permission from the authorized officer, the documents are photographed or copied for analysis, and the results of observations and interviews are compared to corroborate the findings.

The Miles and Huberman data analysis model was used to examine the gathered data [14] through the following stages: 1) Data reduction, which was carried out through the processes of selection, focusing, simplification, and abstraction of raw data obtained from field observations, interview transcripts, and a review of documents at KM. Armada Segara; 2) Data presentation, which was conducted to compile and organize the reduced data so that it would be easier to draw conclusions about the implementation of Life Saving Appliances (LSA) on the KM. Armada Segara; 3) Drawing conclusions, which is done to interpret the

research findings and formulate final results regarding the implementation of Life Saving Appliances (LSA) on the KM. Armada Segara based on the reduced and presented data.

Finding the analysis's emphasis based on the research question was the first step in the data analysis procedure once all the research data had been gathered. The gathered data was then analyzed using the Miles and Huberman model, which covered the phases of data reduction, data presentation, and conclusion making. The study topic was systematically and

methodically answered by the research findings.

3. Results

According to the findings of the observations made during the at-sea training on the KM. Armada Segara, the researchers used an observation checklist that covered thirty aspects pertaining to the availability, condition, placement, maintenance, and readiness of Life Saving Appliances (LSA) in compliance with the SOLAS Convention.

Table 2. Summary of Observation Findings on the Implementation of LSA

Aspects Observed	Number of Items	Observation Results	Notes
Availability and Completeness of the LSA	5	Compliant	Life jackets, lifeboats, liferafts, and lifebuoys are available in quantities corresponding to the number of crew members
LSA Placement	3	Compliant	Easily accessible and along the evacuation route
Physical Condition and Functionality of LSA	5	Partially not optimal	Several life jackets were found with non-functioning lights, and the lifeboat davit systems could not be used for retrieval
Maintenance and Documentation	5	Compliant	Routine inspections are conducted and recorded in the logbook and the PMS
Compliance with SOLAS Standards	6	Compliant	The number, type, placement, and certification comply with SOLAS requirements
Ship Crew Readiness and Competence	6	Not fully optimal	Some crew members still lack a clear understanding of their roles during emergencies
Total	30	The majority met the requirements, subject to certain technical conditions and crew readiness	

The life jackets on board the KM. Armada Segara comply with Chapter III of the SOLAS Convention, which states that there must be at least as many life jackets as there are passengers plus five percent of that total.



Figure 1. Life jackets on the KM. Armada Segara in 2025

A routine examination revealed that some

of the life jackets in Figure 1 were discolored and had malfunctioning emergency lights. Numerous significant conclusions that must be taken into account are revealed by the field observations. First, every ship is required by SOLAS standards to have as many life jackets as crew members. This criterion has been satisfied with 29 life jackets on the KM. Armada Segara. Nevertheless, it was discovered that four of them had issues with their emergency lighting systems. These circumstances may lead to malfunctions in the safety equipment, particularly during nighttime emergencies or low-visibility scenarios where lighting is essential for identifying victims on the water's surface.

Chapter III of the SOLAS Convention, which states that all equipment used to lower lifeboats must operate correctly in compliance with the ship's SOP, is not yet met by the lifeboat davits

aboard the KM. Armada Segara.



Figure 2. Lifeboat Davits on the KM. Armada Segara in 2025

The Davits system's state is depicted in Figure 2, which calls for additional repairs, including mechanical parts that seem to be having problems. Every ship is required by SOLAS standards to have two lifeboats. This condition has been satisfied on the KM. Armada Segara. Nevertheless, the lifeboat davits system was found to have a technical problem that made it unusable, making it unable to raise the lifeboats back on board after launch. This problem is still a major worry even though it does not affect the principal purpose of davits in emergency evacuations, which is to safely lower lifeboats to the water's surface. To stay completely functional, this one-way davit system needs constant, comprehensive maintenance, especially in relation to its capacity to raise lifeboats back on board.

Chapter III of the SOLAS Convention, which mandates that ships between 60 and 120 meters in length must carry at least 12 lifebuoys, is met by the life jackets on board the KM. Armada Segara.

Lifebuoys are arranged thoughtfully throughout the ship's areas in Figure 3. There are thirteen lifebuoys in good shape, each with a marking system that uses reflective stickers, demonstrating that these requirements have been met and even exceeded. These stickers help with visual identification at night or in low-visibility emergency circumstances. Lifebuoys must be rapidly and easily accessible, which is a crucial consideration in their placement. High-risk locations, like loading and unloading areas

and working decks, should be prioritized.



Figure 3. Lifebuoy on the KM. Armada Segara in 2025

Chapter 3 of the SOLAS Convention, which stipulates that posters explaining the manual use of Life-Saving Appliances shall be posted on every deck of the ship, is cited in a poster on the KM. Armada Segara that describes the procedures for Life Saving Appliances (LSA).



Figure 4. Poster on Life Saving Appliances (LSA) Procedures on the KM. Armada Segara in 2025

Each deck of the ship has safety posters and placards with visual instructions on how to use Life Saving Appliances (LSA), as shown in Figure 4. This instructional material is presented in a format that is easy for the entire crew to understand, combining clear text instructions with captivating graphic illustrations. All materials are written in both English and Indonesian so that crew members from different countries can understand them.

The KM. Armada Segara's Life Saving Appliances (LSA) inventory list shows a

thorough, methodical, and orderly recording system. All of the ship's life-saving gear, including life rings, lifeboats, life jackets, emergency flares, and other rescue tools, is included in this inventory. Every item is meticulously recorded, including technical details, quantity, storage location, manufacturing date, expiration date, maintenance history, and certifications. In addition to complying with national and international marine standards (SOLAS), this

documentation method significantly facilitates equipment lifetime management, tracking, and monitoring.

Table 3. Below summarizes a comparison between the SOLAS Chapter III requirements and the actual conditions of each type of LSA on the KM. Armada Segara, including their compliance status and a list of deficiencies identified during the study. It provides a concise and systematic overview.

Table 3. Comparison of LSA Items with SOLAS Chapter III Requirements

LSA Item	SOLAS Chapter III Requirements	Actual Conditions on Board	Compliance Status	Deficiency/Maintenance Notes
Life Jacket	Total $\geq$ the number of people on board + 5% reserve	29 units are available, based on the number of staff	quantitatively consistent, not fully functionally consistent	Four units have malfunctioning warning lights, which may impair visual identification at night or in the dark
Lifeboat	Each vessel must have at least two units that meet the crew capacity requirements	Two units are available, depending on capacity	As specified (quantity)	-
Lifeboat davits	Descent aids must be operated in accordance with the vessel's Standard Operating Procedures (SOP) (SOLAS Reg. 20)	The drop function works as usual, but the pick-up function isn't working	Not entirely accurate	The davit system operates in only one direction; testing of the davit, winch, and release gear in accordance with SOLAS Regulation 20 has not yet been completed
Liferaft	In terms of ship capacity, it is available and ready for use	Available, in good physical condition	Appropriate	-
Lifebuoy	At least twelve units are required for ships 60–120 m in length	13 units are available, located in strategic locations	Compliant (meets the minimum requirements)	-
LSA Certification	Must have a valid certificate of compliance	Each certificate is stored on the platform and can be accessed and used	Appropriate	-
Fire extinguisher	Must be available and ready to use	Available, but some units are running out	Not entirely accurate	Some fire extinguishers had exceeded their service life and had not yet been replaced at the time of the inspection

4. Discussion

4.1 Implementation of Life Saving Appliances (LSA) on the KM. Armada Segara

The usage of Life Saving Appliances (LSA) on the Armada Segara has substantially complied with the regulations outlined in the 1974 SOLAS Convention, particularly Chapter III regarding

life saving equipment and arrangements. Nevertheless, it should be emphasized that this compliance is partial, the KM. Armada Segara generally meets the requirements of Chapter III of SOLAS in terms of the quantity and completeness of documentation, but Table 3. shows that some equipment requires improvement in terms of operational readiness.

In other words, because some components such as the davit system and the life jacket lighting system are not yet functioning properly, the administrative and physical availability of LSA does not necessarily indicate full operational readiness.

According to observations, every Life-Saving Appliances (LSA) unit has a current certificate of fitness and has completed recurring inspections by the reputable Indonesian Classification Bureau (BKI). The document also demonstrates that, depending on the crew complement and operational features of a container ship with a gross tonnage of 5,320 GT, the availability of Life Saving Appliances (LSA) encompasses all types of necessary equipment, including life jackets, lifeboats, liferafts, and lifebuoys.

Interviews with Mualim II and Mualim III verified that all safety equipment has current certificates that are appropriately kept on the ship's bridge and that the technical specifications of the Life Saving Appliances (LSA) adhere to international standards. These requirements show that the ship's management is dedicated to abiding by the worldwide maritime safety standards set out by the worldwide Maritime Organization (IMO).

According to the bosun, safety drill records were kept, demonstrating that drills were regularly carried out. These records included information on the type of drill, who took part, and how the outcomes were assessed. However, an examination of the engine room fire event on the Padang-Jakarta route on September 21, 2025, found that several crew members were reluctant to do their assigned tasks. The researchers also observed firsthand the emergency response process, such as the crew's initial response, the use of fire extinguishers, and evacuation planning. Field observations and post-incident interviews corroborated the data on the incident. According to the Second Mate's statement, several crew members still lacked a thorough understanding of how to utilize Life Saving Appliances (LSA) as safely as possible.

Human factors engineering techniques were applied to determine the Life-Saving Appliances (LSA) on the KM. Armada Segara's

accessibility and alignment with the evacuation routes outlined in the emergency protocols. Observations made during the ship's operations revealed that every kind of Life-Saving Appliance (LSA) was placed in a key area that was accessible and unhindered by cargo or equipment.

For Life Saving Appliances (LSA), KM. Armada Segara has put in place a planned and recorded maintenance strategy. Life Saving Appliance (LSA) maintenance and inspections are carried out on a regular basis, according to logbook records, which provide detailed documentation of testing, maintenance, and inspection operations that create an exhaustive audit trail.

The KM. Armada Segara's Life Saving Appliances (LSA) certification paperwork is comprehensive and satisfies the standards set forth by the international maritime regulatory framework. The ship's safety certificate, the Life Saving Appliances (LSA) certificate, and other supporting paperwork were all correctly stored on the bridge and were still valid, according to the documentation check. The Second Mate said in an interview that the ship had complied with international requirements based on the safety certificates.

4.2 Challenges Faced in the Implementation and Maintenance of Life Saving Appliances (LSA) on the KM. Armada Segara

• Technical Issues with Safety Equipment

Technical difficulties are the primary barrier to installing Life Saving Appliances (LSA) on the KM. Armada Segara, according to the findings of observations and interviews. The lifeboat davit system's malfunction during retrieval operations is one particularly serious problem. According to the Third Mate, testing of the release equipment, including the davits, winches, and release gear, in compliance with SOLAS Regulation 20 has not been finished because of technical constraints in the mechanical components.

This situation has a significant impact on the ship's overall operational readiness. A complete rescue operation cycle involves the davits' retrieval function, particularly in cases where lifeboats must be lowered and hoisted

repeatedly, such as during routine drills or when a false alarm requires the evacuation to be canceled. Since a lifeboat that has been lowered cannot be returned to its original storage location without assistance from a harbor crane, operational downtime and additional costs may result from the davits' inability to operate in both directions. In terms of regulatory compliance, this situation indicates that the KM. Armada Segara does not yet meet SOLAS Regulation 20, which requires comprehensive testing of all components of the launching system, including the ability to operate in both directions.

A limitation in the electronic components of the life jacket was the next problem found. Some life jackets were found to have issues with the automatic lighting system, which is meant to turn on when it comes into contact with water. Because the light acts as a beacon to help with identification in low-visibility situations, this function is essential.

- **Management and System Challenges**

Problems with inventory control and equipment expiration date monitoring make it difficult to maintain Life-Saving Appliances (LSA) consistently. According to Bosun interviews, certain fire extinguishers (APAR) are getting close to the end of their useful lives, which suggests that there isn't a proactive monitoring mechanism in place. The alert system for equipment that is about to expire is not working effectively, despite the existence of a Planned Maintenance System (PMS).

- **Human Related Challenges**

The crew's awareness and skills are a major human factor impeding the usage of Life-Saving Appliances (LSA) on the KM. Armada Segara. According to the Second Mate in an interview, some crew members are still unaware of the best ways to employ Life-Saving Appliances (LSA) since they don't care about safety.

According to observations made during the fire incident in the engine room on the Padang–Jakarta route on July 7, 2025, certain crew members displayed reluctance and were confused how to carry out their assigned duties in an emergency that demanded swift coordination. Given this gap between theoretical knowledge and practical skills, there

is a need to enhance training programs that not only focus on the implementation of procedures but also build confidence and the ability to make decisions in realistic and challenging crisis situations involving high levels of stress.

The number and quality of emergency drills conducted over the years have led to uncertainty among the crew in handling emergency situations. Although the Bosun claims that drills are conducted regularly and documented, the discrepancy between the drill procedures and the actual response to the fire incident suggests that the simulations may not have fully captured the psychological pressure and complications of a real emergency. Given that high crew turnover on commercial vessels can lead to variations in competency levels among individuals during a single operational period, the aspect of familiarizing new crew members with the layout and procedures for using LSA must also be addressed. Furthermore, the safety culture on board influences how crew members view the importance of LSA readiness in their daily lives not merely as an administrative requirement during inspections. Compliance with the minimum drill schedule as required by SOLAS and the crew's ability to make quick and accurate decisions under unexpected conditions, such as a fire, are ideal measures of emergency preparedness.

4.2 The Effectiveness of Life Saving Appliances (LSA) Implementation in Supporting Safety on the KM. Armada Segara

The success of implementing Life-Saving Appliances (LSA) on the KM. Armada Segara can be evaluated by looking at the equipment's availability and readiness to support lifesaving operations in emergency situations. The findings demonstrate that there are adequate supplies of every kind of Life-Saving Appliance (LSA) needed by Chapter III of SOLAS in proportion to the crew capacity of the ship. Lifeboats, liferafts, lifebuoys, and life jackets are strategically positioned and easily accessible. The inventory indicates that no equipment has expired, and all certificates are still in effect. These circumstances show that the ship has fulfilled the prerequisites for operational readiness. To attain ideal performance, however, a number of

technical flaws in certain components still need to be fixed.

The KM. Armada Segara's regular use of the Planned Maintenance System (PMS) demonstrates the efficacy of the Life-Saving Appliances (LSA) maintenance system. Every routine inspection, test, and maintenance procedure is meticulously and methodically documented in the logbook. The maintenance methods are in line with the manufacturer's instructions and best nautical practices, according to an interview with the Third Mate. With the exception of a few almost empty fire extinguishers, no equipment has beyond its expiration date, which shows that the monitoring system is operating as intended.

The July 7, 2025, engine room fire on the Padang-Jakarta route offered a chance to assess how well Life-Saving Appliances (LSA) perform in an actual emergency. Observations show that, despite the fact that the situation was managed effectively and no fatalities or significant injuries occurred, this achievement was primarily attributable to the quick action of a few crew members with prior expertise rather than a methodical crisis response by the entire team. Although Life-Saving Appliances (LSA) are available and accessible, their utilization is mostly dependent on human competence, as seen by certain crew members' reluctance to perform their designated tasks.

5. Conclusions

This study identified three main issues related to the implementation of Life Saving Appliances (LSA) on the KM. Armada Segara. First, in terms of compliance, the LSA on this vessel largely meet the requirements of Chapter III of SOLAS regarding quantity, strategic placement, and documentation, as evidenced by consistent inspection results from the Planned Maintenance System (PMS) and the Indonesian Classification Bureau (BKI). However, this compliance has not yet been fully operationalized effectively. This is evidenced by four life jackets with non functional lighting systems and lifeboat davits that are unable to perform recovery operations in accordance with SOLAS Regulation 20.

The obstacles identified have two dimensions. Technically, the main issues lie in the lifeboat davit system and the electronic components of the life jackets, a poor maintenance monitoring system has exacerbated these problems. From a human factors perspective, the crew's low safety awareness and drills that lacked realism resulted in emergency responses that were not entirely swift or confident. This was evident during the fire on September 21, 2025, where the success of the response depended more on individual experience than on systematic team preparedness.

This study recommends three improvements to enhance the LSA function in protecting the crew's lives: (1) immediate technical repairs to the davit system and malfunctioning life jacket components; (2) improving the quality of drills by using more realistic scenarios to build solid team readiness, rather than merely procedural compliance; and (3) fostering a sustainable safety culture among the entire crew. To ensure that the LSA readiness on the KM. Armada Segara is truly optimal both in terms of regulations and operations these three steps must be implemented simultaneously.

References

- [1] *Undang-undang (UU) Nomor 17 Tahun 2008 tentang Pelayaran*. 2008. [Online]. Available: <https://peraturan.bpk.go.id/Details/39060/uu-no-17->
- [2] N. Aripkiah and M. Taufik, "Tinjauan Yuridis Keselamatan Dan Keamanan Berlayar Berdasarkan Undang-Undang No . 17 Tahun 2008 Tentang Pelayaran," vol. 3, no. 2, pp. 71–83, 2023.
- [3] D. F. T. S. Prabu, "Evaluasi Penerapan Solas Chapter Iii Life Saving Appliances Untuk Menunjang Keselamatan Awak Kapal Mv . Tanto," 2023.
- [4] A. A. Mashartanto, F. Roselia, and A. D. Kristian, "Analisis Sistem Perawatan Safety Equipment Terhadap Keselamatan Crew Kapal Mt. Gas Natuna," *Al Qalam J. Ilm. Keagamaan dan Kemasyarakatan*, vol. 17,

- no. 1, p. 78, 2023, doi: 10.35931/aq.v17i1.1785.
- [5] Kuncowati, E. Febriana, N. A. Listriyawati, and A. Maulino, "Penggunaan Bridge Simulator dan Komunikasi Untuk Keselamatan Pelayaran di Era New Normal," *J. Saintek Marit.*, vol. 23, pp. 151–158, 2023.
- [6] IMO, "International Convention for the Safety of Life at Sea (SOLAS), 1974." Accessed: Jan. 13, 2026. [Online]. Available: [https://www.imo.org/en/about/conventions/pages/international-convention-for-the-safety-of-life-at-sea-\(solas\),-1974.aspx](https://www.imo.org/en/about/conventions/pages/international-convention-for-the-safety-of-life-at-sea-(solas),-1974.aspx)
- [7] P. Cakrawardaya, "Penerapan Penanganan Muatan Cargo Reefer In Hold Sesuai dengan SOLAS Chapter VI pada MV. JU LONG 1," *Jurnal*, pp. 5–24, 2021, [Online]. Available: http://eprints.pipmakassar.ac.id/403/1/PRAMUDYA_CAKRAWARDDAYA_17.41.102_SKRIPSI.pdf
- [8] W. P. Rio, "Perawatan Alat-Alat Keselamatan untuk Meminimalisir Terjadinya Kecelakaan Di Atas Kapal," *Rachman, Garside, Kholik*, 2017, 2022, [Online]. Available: http://repository.pip-semarang.ac.id/3830/%0Ahttp://repository.pip-semarang.ac.id/3830/2/541711106352N_SKRIPSI_OPEN_ACCESS.pdf
- [9] P. D. Y. Muhammad, "Optimalisasi Penggunaan Alat-Alat Penolong yang Digunakan Abk dan Penumpang dalam Menghadapi Keadaan Darurat," 2023.
- [10] Y. Hulu and E. Fransiska, "Pemeliharaan Alat Keselamatan Kapal Rakit Penolong pada Kapal TB . Sea Win I oleh PT . Putra Samudera Inti Batam," 2025.
- [11] Andi, "Analisis Pemanfaatan Alat – Alat Keselamatan Jiwa di Mv. Kharis Pegasus," no. February, pp. 4–6, 2024.
- [12] A. R. Ramadan, R. Susanto, and M. Rahim, "Analisis Kesiapan Alat Keselamatan Jiwa pada MT. Marlin88," *E-Mabis J. Ekon. Manaj. dan Bisnis*, vol. 27, no. 01, pp. 1–6, 2026, doi: <https://doi.org/10.29103/e-mabis.v27i1.1606>.
- [13] A. Y. Nohara, "Analisis Peran Syahbandar Dalam Pengawasan Kelaiklautan Kapal-Kapal Tradisional Di Wilayah Kerja Ksop Kelas Iii Labuan Bajo," 2025.
- [14] M. B. Miles, A. M. Huberman, and J. Saldaña, *Qualitative Data Analysis*. 2014.