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Article

The Effectiveness of *Emergency Drill* to Prepare Crew to Face *Abandoned Ships* on MT. Pagerungan

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A B S T R A C T

Safety of life at sea is a paramount operational priority that heavily relies on crew preparedness in managing maritime emergencies. This study evaluates the effectiveness of abandon ship drills in improving crew readiness on the commercial tanker MT. Pagerungan. Using a qualitative case-study design, data were collected over a 12-month period through direct participant observations, structured interviews with six key personnel, and documentary analysis. Effectiveness was measured using specific operational indicators: alarm response time, correct usage of life-saving appliances (LSAs), compliance with muster list duties, and communication efficiency. The results indicate a significant gap between administrative compliance and practical readiness. Drills were conducted only four times annually, violating the monthly requirement stipulated by the Safety of Life at Sea (SOLAS) Convention. Observations revealed critical deficiencies, including the inability of junior and catering crew members to correctly don lifejackets and a lack of role awareness among specific deck ratings. Furthermore, commercial pressures and a tendency to view drills as bureaucratic formalities hindered the development of a robust safety culture. The study concludes that while incremental improvements were observed across repeated drills, overall effectiveness remains structurally fragile. Recommendations include the rigorous implementation of monthly drills, integration of pre-drill toolbox meetings, station-specific compliance checklists, and documented competency assessments to bridge the gap between regulatory mandates and actual emergency preparedness.

1. Introduction

The preservation of human life at sea remains the absolute priority within the hierarchy of modern commercial shipping operations. The execution of maritime logistics must be balanced with rigorous accident prevention and emergency preparedness strategies. Fundamentally, international maritime safety is governed by the International Maritime Organization (IMO) through the Safety of Life at Sea (SOLAS) convention, specifically Chapter III Regulation 19, which mandates that every seafarer must participate in at least one abandon ship drill and one fire drill every month (SOLAS Consolidated 2020, 2009). In Indonesia, this is reinforced by the Law of the Republic of Indonesia No. 17 of 2008 concerning Shipping, emphasizing the obligation to fulfill seaworthiness and human resource readiness (Law of the Republic of Indonesia No. 17 of 2008)

Despite comprehensive regulatory frameworks, practical implementation often reveals fatal anomalies driven by human error. An empirical investigation by the Marine Accident Investigation Branch (MAIB) regarding the RRS Sir David Attenborough highlighted a serious accident where a lifeboat fell uncontrollably during a drill because the crew failed to understand the release gear mechanism and neglected locking devices (Sir & Attenborough, 2023). This incident demonstrates that the mere presence of life-saving appliances (LSAs) is insufficient without the rigorous, high-quality emergency training required to build operational competence (Putra, 2022).

The "Abandon Ship" command represents the highest escalation of a maritime emergency—a final evacuation order issued by the Master when vessel stability and safety can no longer be maintained (Alghivary, 2025). Because of its critical nature, crew reflexes and muscle memory must be continuously honed (Alfadil, 2024). However, operational realities aboard the MT. Pagerungan indicate significant inefficiencies. During an abandon ship drill on January 11, 2025, at Tuban Anchorage, several procedural omissions were observed: catering staff and engine ratings lacked the basic capability to don lifejackets correctly, and an Ordinary Seaman failed to identify specific duties assigned in the muster list (Wibisono, 2026).

Such foundational ignorance creates a domino effect that endangers the entire evacuation process (Widyaningsih, 2022). Previous studies have largely described drill procedures without critically evaluating their operational success. To address this gap, this study aims to systematically evaluate the effectiveness of abandon ship drills on MT. Pagerungan by measuring specific performance indicators—response time, role compliance, and LSA utilization—while identifying the root causes of non-conformities and evaluating the vessel's safety management system.

2. Literature Riview

2.1 Training Effectiveness and Drill Evaluation

In the context of maritime human resource training, effectiveness is the degree to which a program achieves specific, predefined safety targets (Nugroho, 2023). Effectiveness is not measured merely by the execution of the drill, but by the tangible improvement in competencies, the assimilation of emergency knowledge, and the transformation of safety behavior (Suwarna, 2025). Evaluating this requires specific indicators. In this study, "effectiveness" is operationalized through observable metrics: (1) muster response time, (2) the accuracy of lifejacket and immersion suit donning, (3) strict compliance with muster list responsibilities, and (4) communication flow during lifeboat preparation (Engriyani, 2022; Zulianto et al., 2025).

2.2 Regulatory Framework and The Role of the Master

Emergency drills are formulated by the Standards of Training, Certification and Watchkeeping (STCW) as fundamental exercises designed to internalize basic survival skills, self-rescue maneuvers, and teamwork synchronization (IMO, 2010). These drills sharpen seafarers' intuition and response timeliness (Kory, 2020). The ultimate authority in crisis management is the Master, who bears absolute responsibility for life safety, seaworthiness, and the enforcement of international regulations including SOLAS and the International Safety Management (ISM) Code (Law of the Republic of Indonesia No. 17 of 2008, 2008).

2.3 Life-Saving Appliances (LSA) Specifications

Evacuation relies heavily on the mechanical readiness of lifeboats (Putra, 2022). MT. Pagerungan utilizes a Totally Enclosed JY65 F lifeboat manufactured by Jiangyin Wolong FRP Boat Co., measuring 6.50 meters with a 28-person capacity, constructed from Fiber Reinforced Plastic (FRP) with polyurethane foam buoyancy (Wolong, 2012b). The launching mechanism is a JY-LE65 Gravity Luffing Arm Davit, which exploits gravitational force with a dynamic lift limit of 4.2 tons, utilizing integrated centrifugal and manual brakes for descent control (Wolong, 2012a).

3. Research Methodology

3.1 Research Design

This study adopts a qualitative case study design focusing on phenomenological observations to deeply explore the operational realities and safety culture aboard a specific commercial vessel (Hasan et al., 2023; Wicaksono, 2020). The investigation took place aboard the MT. Pagerungan, a tanker operated by PT. Pertamina International Shipping, over a 12-month sea practice period from July 2024 to July 2025 (Wibisono, 2026).

3.2 Participant Selection and Ethical Considerations

Purposive sampling was utilized to select participants directly responsible for emergency management and drill execution. The primary participants included the Master, Chief Officer, Second Officer, Third Officer, Boatswain, and Fitter. To maintain ethical standards, informed consent was obtained prior to interviews, and organizational permissions were secured for observational data collection. Personnel are referred to primarily by their professional titles to focus on systemic rather than individual critique.

3.3 Data Collection

Observation: Direct, unstructured participatory observation was conducted during emergency simulations to assess the mechanical and psychological reactions of the crew (Suryani et al., 2018). The observation protocol specifically tracked muster response times, correct usage of LSAs, and adherence to the muster list.

Interviews: Semi-structured interviews explored the experiences, structural perceptions, and perceived challenges of command officers and ratings regarding drill effectiveness (Mar'atusholihah et al., 2019; Merriam, 2009).

Documentation: A comprehensive review of ship records verified synchronization with regulations (Creswell, 2013; Robbani, 2022). Documents analyzed included Drill Reports, Crew Lists, Muster Lists, LSA manuals, and SOLAS guidelines.

3.4 Data Analysis and Triangulation

Data were analyzed using the interactive paradigm proposed by Miles, Huberman, and Saldana (Sugiyono, 2022). The process involved data condensation to filter essential observation transcripts and interview notes, followed by data display through narrative text and matrices (Wanto, 2018; Kusumawati et al., 2022). Triangulation was achieved by cross-referencing observational findings with interview testimonies and official drill logs to ensure robust and verifiable conclusions (Sugiyono, 2011).

4 Results and Discussion

4.1 Observational Findings on Drill Execution

MT. Pagerungan is sheltered under the banner of PT. Pertamina International Shipping, transports commercial liquid products (Pertalite, Pertamax, Solar) with a crew population of 25 personnel spread across various departments. Empirical facts obtained from the recording of activities during the 12 months of sailing reveal a deviation from safety regulations: *Abandon Ship drill* was only practiced 4 times in one year, far below the SOLAS monthly standard (SOLAS Consolidated 2020, 2009). This frequency gap is strongly suspected to lead to compression of docking time due to the very massive operational burden of loading and unloading port cargo.

MT. Pagerungan operates with a crew of 25 personnel across various departments. Empirical records over the 12-month period revealed a critical regulatory deviation: abandon ship drills were conducted only four times in one year, falling drastically short of the SOLAS monthly requirement (SOLAS Consolidated 2020, 2009).

During the simulation on January 11, 2025, at Tuban Anchorage, several specific competency deficiencies were documented:

LSA Utilization: Catering personnel and junior engine ratings demonstrated mass

confusion regarding the proper donning procedures for lifejackets.

Role Awareness: An Ordinary Seaman failed to identify and execute his structural role as defined by the Muster List decree.

Coordination: Activity at the Davit Launch area was notably passive. Crew members relied entirely on repetitive orders from the Chief Officer, showing a lack of independent managerial initiative.

Safety Culture: Observational cues indicated that some crew members treated the exercise as a mere bureaucratic formality rather than a critical survival scenario.

4.2 Engineering Cause-Effect Analysis of Residue Formation

The interpretation of the issue is deepened through a structured interview approach to the policymakers on board:

1. Skipper (Reymon Nicodemus): Validates that *drills* are a catalyst for understanding emergencies. He acknowledged that the impact of training has not been evenly distributed, but emphasized that the trend of the learning curve is improving in each post-training evaluation through the *monthly safety meeting forum*.
2. Mualim I (Gatot Supeni D.S.): As the person in charge of safety, he confirmed the positive effects of the *drill*, but highlighted the apathy and lack of seriousness of some of the crew as the biggest obstacle to effectiveness.
3. Mualim II (Danu Purwantoro) and Mualim III (Welly Aditia Atmaja): Highlighting the weaknesses of technical understanding in the field. Mistakes in assembling *life jackets* and inindependence in *launching* lifeboats are still found in junior crews with minimal screen experience.
4. Crew Representative (*Boatswain* Nurbiyantoro & *Fitter* Charles Mangungsong): Claims administratively that he has followed the schedule and made an effort to get to *the muster station*, but realizes that repeated habituation is still needed.

4.3 Evaluation and Conclusive Discussion

Visual and attendance documentation show an increase in discipline that gradually improves linearly in the February, March, and April 2025 periods (Wibisono, 2026). The crew began to be able to coordinate effectively preparing the lifeboat without being closely supervised.

However, this effectiveness is structurally fragile when correlated with SOLAS Chapter III Regulation 19 compliance parameters (SOLAS Consolidated 2020, 2009). The regulation requires a continuous nature (once a month) so that the crew's muscle memory is firmly attached. The frequency of executions that is only 4 times a year thwarts the formation of an automatic response (automatic reflex) in emergency psychology. This gap indicates the dominance of commercial interventions (loading-unloading schedules) over the need for life safety training. Thus, it can be evaluated that the basic framework of the Abandon Ship exercise in MT. Pagerungan has referred to the correct international regulatory guidelines, but in terms of consistency and effectiveness in the formation of operational readiness, the ship still fails to meet the absolute reliability threshold due to the low frequency of training repetitions.

Table 1. Summary of Interview Results

No	Resource Persons	Questions	Interview Results
1.	Reymon Nicodemus (Captain)	According to the Captain, how effective is the *emergency drill* on crew readiness in dealing with *the Abandon Ship* situation? What factors affect the crew's readiness level during *drills*?	The skipper said that *the emergency drill* has a very big influence on the crew's readiness because through *the drill*, the crew can understand the procedures, roles, and responsibilities of each in an emergency. Improvements and improvements can be seen in each emergency *drill (Abandon Ship).*

			The skipper always holds evaluations that are carried out periodically to support the implementation *of better drills* in the next activity. Through these evaluations and directions, *the crew* gained additional knowledge about what mistakes had been made during *the drill*,
2.	Gatot Supeni D.S (Mualim I)	How is the implementation *of emergency drill (Abandon Ship)* seen in terms of supervision and control? Is the *drill* carried out able to increase *the readiness of the crew*?	Mualim I stated that *the emergency drill (Abandon Ship)* had a positive influence on the readiness of the *crew*, especially for *the crew* who did not understand and understood their duties at the *time the drill* took place Mualim I assessed that the effectiveness of the *drill implementation* was still not optimal because there were still crews who only participated in the *drill* formally without understanding the meaning and purpose *of this drill* exercise.
3.	Danu Purwantoro (Mualim II)	How is your involvement in the implementation of *emergency drill (Abandon Ship)* on MT ships. A Slingshot? Are there any obstacles in the implementation of *the drill*?	Mualim II said that his involvement was more about supporting coordination and ensuring that *the drill* was carried out according to procedures. Based on his observations, the crew's readiness showed quite good development from time to time, although there are still some things that need to be improved.
4.	Welly Aditia Atmaja (Mualim III)	Is the implementation *of emergency drill (Abandon Ship)* technically effective? How is the *crew*'s ability to use safety equipment during the *drill*?	Mualim III explained that *the emergency drill (Abandon Ship)* will affect the increase of *crew* readiness if *the crew* wants to recognize the location and function of the safety equipment. *Crews* who have longer sailing experience show a better understanding of the use of *life jackets* and lifeboat preparation.
5.	Nurbiyantoro (*Boatswain*)	Do you follow the implementation of *the emergency drill (Abandon Ship)* according to the schedule set on the MT ship. A Slingshot? Do you understand the duties and responsibilities according to *the muster list?*	*The boatswain* stated that he participated in the *implementation of the emergency drill* according to the schedule that had been set. He also said that when the alarm was hidden, he immediately headed to the *muster station* and tried to carry out his duties in accordance with the

			muster list. In the implementation of *the drill*, the use of safety equipment such as *life jackets* has also been carried out.
6.	Charles Mangungsong (*Fitter*)	Do you follow the implementation of *the emergency drill (Abandon Ship)* according to the schedule set on the MT ship. A Slingshot? Do you understand the duties and responsibilities according to *the muster list?*	*Fitter* said that he participated in the *implementation of the emergency drill (Abandon Ship)* carried out on the ship. *Fitter* knows the position to go to when at the *muster station* and tries to carry out his duties according to the directions given. In the implementation of *the drill*, the use of *life jackets* has been carried out, and in general the equipment used is in a ready condition.

Figure . 1. Crew Gathers at Muster Station

4.2 Interview Findings: Perceptions and Challenges To understand the root causes of these observational findings, semi-structured interviews were synthesized to evaluate perceptions of drill effectiveness (Table 2).

Table 2. Summary of Interview Findings on Drill Effectiveness

Rank / Position	Perceived Effectiveness & Readiness	Identified Challenges & Root Causes
Master	Drills are essential for readiness. Noted gradual improvement after post-drill evaluations.	Effectiveness is unevenly distributed among the crew.
Chief Officer	Positive influence on knowledgeable crew.	Apathy, lack of seriousness, and treating the drill formally without understanding its life-saving purpose.
Second & Third Officers	Highlighted weak technical understanding among junior crew (lifejackets, lifeboat launching).	Crew members with less sea experience lack the initiative to independently prepare safety equipment.
Boatswain & Fitter	Claimed strict administrative compliance (arriving at muster station, wearing lifejackets).	Acknowledged that repeated physical habituation is required to build true competence.

5 Discussion

5.1 Regulatory Non-Compliance and Commercial Pressure

The most glaring systemic failure identified is the frequency of the drills. Conducting only four drills annually directly violates SOLAS Chapter III Regulation 19 (SOLAS Consolidated 2020, 2009). This low frequency severely thwarts the formation of automatic reflexes and muscle memory essential in emergency psychology. Interview and observational data strongly suggest that this

frequency gap is driven by commercial pressures—specifically, the compression of port stay times due to massive loading and unloading burdens. This indicates a dangerous dominance of commercial intervention over mandatory life-safety training.

5.2 Safety Culture vs. Administrative Formality

The Chief Officer's observation that crews participate in drills "formally without understanding the meaning" aligns with the observed passive coordination at the Davit Launch area. A robust safety culture requires proactive engagement, yet the findings show a compliance-based mindset where crew members aim merely to be marked present rather than competent. Without continuous repetition, the technical operation of the Totally Enclosed JY65 F lifeboat and the Gravity Luffing Arm Davit cannot be guaranteed under the psychological stress of a real crisis. Therefore, while the basic framework of the drills on MT. Pagerungan refers to correct international guidelines, the vessel fails to meet the absolute reliability threshold due to insufficient training repetition and a weak safety culture.

6 Conclussion and Recommendations

6.1 Conclusion

The implementation of abandon ship drills theoretically increases the understanding and technical readiness of the MT. Pagerungan crew, with some observable improvements in coordination noted between January and April 2025. However, the effectiveness of these drills is neither permanent nor evenly distributed. The study concludes that crew competence is critically undermined by the low frequency of exercises (four times a year)—a direct violation of SOLAS standards triggered by commercial operational pressures. Consequently, the current drill framework functions more as an administrative formality than a robust emergency preparedness system.

6.2 Recommendations

To rectify these safety management weaknesses, the following operational and tactical steps are recommended:

1. Mandatory Buffer Times: Fleet management at PT. Pertamina International Shipping must implement a scheduling "buffer time" that explicitly allows the Master to conduct disciplined, monthly abandon ship drills without commercial penalty for port delays.
2. Pre-Condition Briefings: Deck Officers must conduct mandatory technical briefings prior to sounding the general alarm. This will educate the crew on LSA operation and clarify muster list duties, shifting the mindset from bureaucratic formality to active survival preparation.
3. Muster Station Checklists: Develop and mount localized "carrying-effect" checklists at each lifeboat station. This visual aid will ensure personnel independently verify that all emergency navigation and logistics equipment is mobilized according to the Muster List mandate prior to the Officer's inspection.

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