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Solas at the Algorithmic Frontier

Maritime Safety, Human Authority, and Governance in the age of Artificial Intelligence

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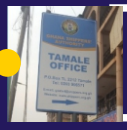

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Solas At The Algorithmic Frontier

Maritime Safety, Human Authority, And Governance In The Age Of Artificial Intelligence

01 Introduction: SOLAS and the New Safety Question Posed by Intelligent Systems

For more than a century, the International Convention for the Safety of Life at Sea has served as the moral and legal backbone of maritime safety. Born from tragedy and refined through experience, SOLAS was designed around a simple but uncompromising assumption: that the preservation of life at sea depends on clear human responsibility, disciplined command, and enforceable standards grounded in physical reality.

That assumption is now under pressure.

Shipping is entering an era in which artificial intelligence systems increasingly mediate navigation, collision avoidance, engine performance, cargo management, port traffic control, and emergency response. From AI-assisted voyage planning and predictive maintenance to automated berthing systems and algorithmic decision support on the bridge, the locus of safety judgment is shifting. Decisions that were once made solely by masters, officers, and port control personnel are now filtered, influenced, and in some cases pre-empted by machine-driven recommendations.

This transition raises a fundamental question that SOLAS was never explicitly designed to answer: **when safety decisions are co-produced by humans and intelligent systems, where does ultimate authority reside?**

The issue is not hypothetical. According to the European Maritime Safety Agency, human error remains a contributing factor in approximately **67 to 75 percent of marine casualties** investigated in recent years. This statistic has become a central justification for the rapid adoption of AI-enabled decision support systems, particularly in navigation,

situational awareness, and fatigue mitigation. Yet the same data that motivates automation also exposes a paradox. If human error dominates accident causation, but humans are progressively displaced from direct decision-making, the architecture of responsibility that underpins SOLAS becomes blurred.

SOLAS is not merely a technical code. It is a governance framework that assigns duties, liabilities, and authority. Masters are responsible for the safe navigation of the vessel. Flag states are responsible for enforcement. Port states are responsible for inspection. Classification societies certify compliance. These roles presume that safety-critical decisions are traceable to accountable human actors.

Artificial intelligence complicates this presumption. When an AI-based collision avoidance system recommends a maneuver that conflicts with a watch officer's judgment, who bears responsibility if an accident occurs? When an automated port traffic system sequences vessel movements in a way that contributes to a near miss, does liability rest with the port authority, the system vendor, or the vessel master who complied? When predictive algorithms normalize operational risk in pursuit of efficiency, how does SOLAS's precautionary logic respond?

These questions are no longer theoretical curiosities for academic debate. They are emerging daily in bridge operations, vessel traffic services, and port control rooms. Yet regulatory responses remain uneven. While the International Maritime Organization has begun exploratory work on Maritime Autonomous Surface Ships, the core safety conventions, including SOLAS, remain anchored in a human-centric model of command and control.

This creates a governance tension. On one hand, the industry is under commercial and operational pressure to adopt AI tools that promise efficiency, safety enhancement, and cost reduction. On the other hand, the legal architecture that governs safety at sea still assumes that humans retain final, informed, and unmediated authority over critical decisions.

For emerging maritime states, this tension is magnified. Limited regulatory capacity, dependence on third-party technology providers, and constrained access to maritime data create asymmetries of power. Ports and flag administrations may find themselves enforcing safety standards on systems they did not design, cannot audit fully, and struggle to regulate in real time.

This paper argues that the challenge posed by artificial intelligence to SOLAS is not primarily technological. It is institutional and philosophical. It concerns how safety authority is defined, how responsibility is allocated, and how governance adapts when decision-making becomes distributed between humans and machines. By examining accident data, regulatory practice, and comparative international responses, this article seeks to re-position SOLAS as a living framework that must be interpreted and reinforced, not diluted, in the age of intelligent maritime systems.

02 The Global Safety Landscape in Shipping: What Accident Data and Human-Factor Studies Now Reveal

To understand why artificial intelligence has become such a powerful force in maritime safety debates, one must begin with the empirical reality of accidents at sea. For decades, international casualty investigations have pointed to the same underlying pattern: technology rarely fails alone, and humans rarely err in isolation. Maritime accidents emerge from complex interactions between people, procedures, environments, and systems. It is precisely this complexity that has made shipping both resilient and vulnerable, and it is this same complexity that AI now promises to manage more effectively.

Global accident statistics provide the foundation for this promise. Analyses by international maritime safety bodies consistently show that human and organizational factors play a dominant role in marine casualties. Investigations conducted across multiple flag states and regions indicate that human error or human-system interaction failures are present in well over half of serious maritime incidents, often cited in the range of two-thirds or more of investigated cases. These errors rarely take the form of incompetence. They are more often linked to fatigue, information overload, misinterpretation of sensor data, breakdowns in bridge resource management, or procedural non-compliance under operational pressure.

From a safety engineering perspective, this evidence has driven a clear conclusion. If humans are the weakest link in safety-critical systems, then decision support, automation, and intelligent monitoring should reduce risk. Artificial intelligence, particularly in the form of machine learning, pattern recognition, and predictive analytics, appears ideally suited to address precisely the kinds of failures that dominate accident statistics. Algorithms do not tire. They do not become distracted. They can process far more data streams than any human bridge team. They can detect anomalies, predict component failures, and flag collision risks earlier than traditional rule-based systems.

This logic has fueled rapid adoption. AI-enabled navigation aids are now embedded in electronic chart display and information systems, radar overlays, and automatic identification system analytics. Predictive maintenance platforms use historical performance data to forecast engine and equipment failures

before they occur. In ports, vessel traffic services increasingly rely on algorithmic traffic optimization, conflict detection, and real-time risk scoring to manage dense traffic flows. Each of these applications is justified, at least in part, by reference to accident data and the persistent influence of human factors.

Yet the same datasets that support AI adoption also expose a deeper challenge for SOLAS. Accident investigations do not merely identify human error. They emphasize decision context. Officers act with incomplete information. Masters make judgment calls under time pressure. Safety margins are eroded gradually through normalization of deviance rather than sudden negligence. When AI systems enter this environment, they do not eliminate context. They reshape it.

Human-factor studies increasingly show that automation can both reduce and redistribute risk. While AI systems may lower the probability of certain errors, they introduce new failure modes. Automation bias, where operators over-trust system recommendations, has been documented across safety-critical industries. Situational awareness can degrade when humans are pushed into supervisory roles rather than active control. Skill fade becomes a concern when manual navigation and decision-making are exercised less frequently. These dynamics are not hypothetical. They are well documented in aviation, nuclear power, and increasingly, maritime operations.

This creates a paradox for SOLAS. The Convention's safety philosophy is deeply rooted in the idea of informed human judgment. The master's overriding authority and responsibility for safety is a central principle. SOLAS assumes that officers are actively engaged, continuously assessing risk, and capable of intervening decisively when circumstances demand. However, as AI systems become more capable, the human role shifts from primary decision-maker to system supervisor. The master may retain legal responsibility, but operational authority becomes shared, mediated, or subtly transferred.

Accident data also reveals another important dimension. Many maritime incidents occur not on the open ocean, but in constrained environments such as ports, coastal waters, and traffic separation schemes. These are precisely the areas where AI-driven vessel traffic systems, automated pilotage support, and port decision platforms are expanding most rapidly. The concentration of risk in these zones means that AI is increasingly influencing safety outcomes where consequences are immediate and liability exposure is high.

For ports and coastal states, this trend raises governance questions that accident statistics alone cannot answer. If a collision or grounding occurs in a port approach where both the vessel and the shore-based traffic system were relying on AI-assisted recommendations, the causal chain becomes complex. Traditional investigation frameworks struggle to assign responsibility when decisions emerge from human-machine collaboration rather than discrete human action.

Importantly, accident data also reflects disparities between maritime states. Advanced maritime administrations often have greater access to safety data, simulation tools, and system audits. Emerging maritime states, by contrast, may rely on vendor-supplied systems with limited capacity for independent verification. This asymmetry affects how accident lessons are learned and how safety improvements are implemented. It also shapes how SOLAS obligations are interpreted and enforced across different jurisdictions.

What emerges from the global safety landscape is not a simple argument for or against artificial intelligence. The data does not support a narrative of machines replacing humans, nor does it justify clinging to purely manual systems. Instead, it points to a transitional moment in which safety performance depends on how well governance frameworks adapt to hybrid decision environments.

SOLAS was forged in an era when safety failures could be traced to physical deficiencies or human actions. In the age of AI, safety failures may arise from misaligned incentives, opaque algorithms, insufficient training, or unclear authority structures. Accident statistics tell us that risk is real and persistent. They also tell us that technological capability alone does not guarantee safety.

The implication for SOLAS is profound. If the Convention is to remain the cornerstone of maritime safety, it must be interpreted in a way that recognizes the evolving relationship between humans and intelligent systems. Accident data should not be used merely to justify automation. It should be used to interrogate how authority, responsibility, and accountability are preserved when safety decisions are no longer made by humans alone.

TESTIMONIALS

Mr. Goerge Dumenu
CEO of Geogidus Shipping Consult Limited

My first engagement with the Ghana Shippers' Authority (GSA) was in 2021 during one of its routine stakeholder visits, where I represented the Korea Importers Association of Ghana as Secretary.

The experience contributed significantly to the growth of my business, from a small shop at the corner of the Ogbojo Industrial Park to a multi-functional operation where I now work as a freight forwarder and shipping consultant. Beyond the financial impact, the exposure and guidance strengthened my confidence and ability to contribute meaningfully to discussions within the trade and logistics industry.

03 SOLAS as a Human-Centric Safety Regime: Why the Convention Was Never Designed for Autonomous Judgment

To understand the tension between artificial intelligence and contemporary maritime safety, it is necessary to return to the philosophical and legal foundations of the SOLAS Convention itself. SOLAS did not emerge as a neutral technical manual. It emerged as a response to catastrophe, shaped by a moral conviction that safety at sea must be anchored in clear human responsibility and enforceable standards. From its earliest formulations following the Titanic disaster to its modern consolidated text, SOLAS has consistently treated humans, not machines, as the ultimate bearers of authority, judgment, and accountability.

This human-centric design is not incidental. It is embedded throughout the Convention's structure. SOLAS assigns duties to masters, officers, shipowners, flag administrations, and port state authorities. It presumes that safety decisions are made by trained professionals exercising judgment in real time. Even where technology is mandated, such as navigation equipment, fire detection systems, or distress communication tools, these are conceived as aids to human decision-making rather than autonomous actors. The machine informs. The human decides.

At the heart of SOLAS is the concept of command. The master's overriding authority to make decisions necessary for the safety of life, ship, and cargo is not merely symbolic. It is the legal mechanism through which accountability is preserved. In a safety regime where consequences can be fatal and irreversible, SOLAS insists that authority cannot be diffused or ambiguous. Someone must be in charge, and that someone must be human.

Artificial intelligence challenges this architecture not by openly rejecting it, but by quietly eroding its assumptions. AI systems are increasingly capable of generating recommendations, predictions, and optimized actions that appear superior to human judgment in narrow operational domains. Collision avoidance algorithms can process radar, AIS, and environmental data faster than a bridge team. Predictive maintenance systems can identify engine anomalies before any human operator senses a problem. Port traffic optimization platforms can sequence vessel movements with a level of computational sophistication that exceeds manual planning.

Yet SOLAS was never designed to govern decision-making by non-human agents. The Convention does not contemplate scenarios in which safety judgments are generated by systems that cannot be cross-examined, disciplined, or morally accountable. It does not define what it means for a master to exercise

authority when rejecting an algorithm's recommendation requires understanding how that recommendation was produced. Nor does it address the legal implications of compliance when officers follow machine guidance that later proves unsafe.

This gap matters because safety regimes are not only about outcomes. They are about process. SOLAS compliance has historically depended on the ability of regulators and investigators to reconstruct decision pathways. Why was a maneuver executed? What information was available? Who exercised judgment, and on what basis? These questions presuppose transparency and interpretability. Many AI systems, particularly those based on complex machine learning models, do not readily provide such clarity. Their outputs may be accurate, but their reasoning opaque.

From a governance perspective, this opacity undermines one of SOLAS's core strengths: traceability. Maritime safety investigations rely on the ability to trace causal chains back to accountable actors. When decisions emerge from human-machine collaboration, tracing becomes more complex. Did the officer defer to the system because it was demonstrably safer, or because organizational culture discouraged deviation from automated recommendations? Did the master override the system, or was override functionally impractical under operational pressure? These are not purely technical questions. They are questions of authority and responsibility.

The human-centric design of SOLAS also reflects an ethical stance. Safety at sea has long been understood as inseparable from seamanship, judgment, and professional competence. Training standards, certification regimes, and watchkeeping requirements are built on the assumption that humans must be capable of understanding, anticipating, and responding to unforeseen circumstances. Artificial intelligence, however advanced, operates within the boundaries of its training data and design parameters. When conditions fall outside those boundaries, human judgment remains indispensable.

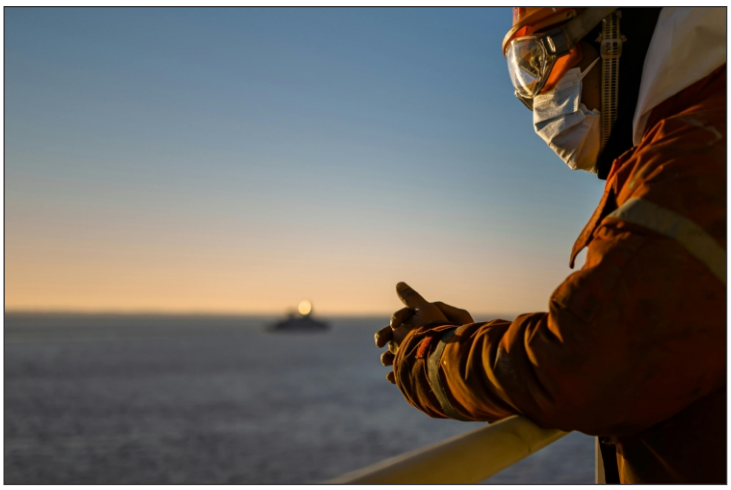
The danger, therefore, is not that AI will replace humans outright. The greater risk is that responsibility will become diluted. If officers are expected to monitor systems they do not fully understand, authority becomes nominal rather than real. If masters are legally responsible for outcomes but operationally constrained by automated systems embedded in vessel and port infrastructure, SOLAS's accountability framework begins to fray.

This tension is particularly acute in ports and coastal waters, where multiple actors interact under time pressure. Port authorities, vessel traffic services, pilots, and ship crews increasingly rely on shared digital systems. When these systems incorporate AI-driven recommendations, authority becomes distributed across organizational boundaries. SOLAS, however, was constructed on the premise that such authority can be clearly assigned and enforced.

Recognizing this mismatch does not imply that SOLAS is obsolete. On the contrary, it underscores the Convention's enduring relevance. SOLAS's insistence on human responsibility provides a critical anchor in an era of intelligent systems. The challenge is not to abandon this principle, but to reinterpret and reinforce it in contexts where machines play a growing role in safety decision-making.

This requires a shift in how SOLAS is understood and applied. Instead of viewing AI as an external innovation to be accommodated, maritime governance must treat AI as a factor that tests the limits of existing safety philosophy. The Convention's human-centric foundations offer guidance precisely because they resist the temptation to outsource judgment. They remind us that safety is not only about optimization, but about accountability.

In the age of artificial intelligence, SOLAS stands as a reminder that technological capability does not absolve human responsibility. The Convention was never designed for autonomous judgment because it was designed to protect life in conditions of uncertainty. That purpose remains unchanged. What must evolve is the governance framework that ensures humans retain meaningful authority even as machines become more intelligent.



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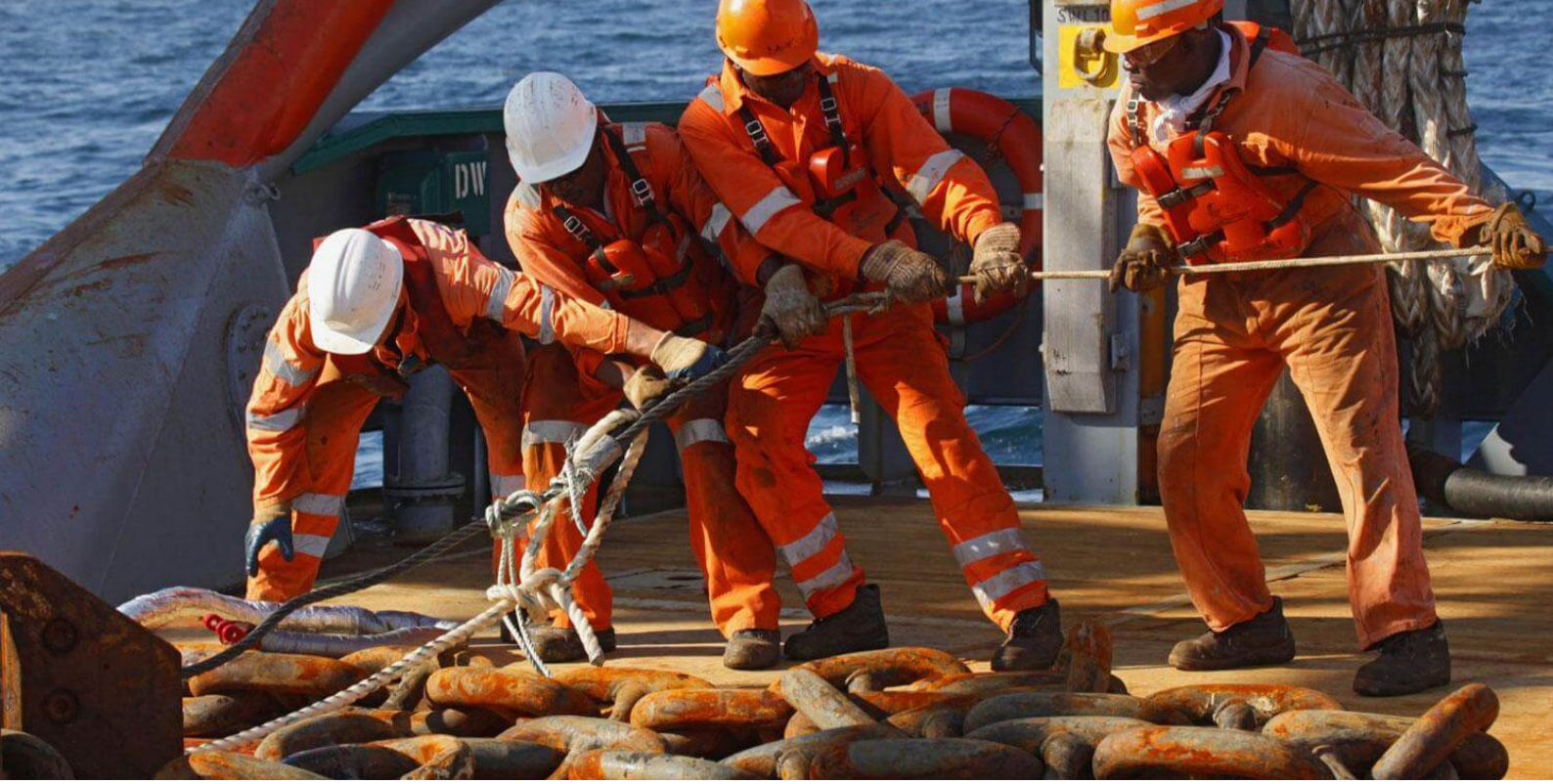


04 Artificial Intelligence on the Bridge and in the Port: Decision Support, Automation, and the Erosion of Command Clarity

The practical encounter between artificial intelligence and the SOLAS safety regime occurs not in policy documents, but in the everyday operational spaces of shipping. It occurs on the bridge at night when traffic density is high and visibility is limited. It occurs in port control rooms where vessel traffic services coordinate arrivals and departures under commercial pressure. It occurs in engine control rooms where predictive systems advise on maintenance decisions that carry safety implications. In these spaces, artificial intelligence is not an abstract concept. It is a presence that shapes how decisions are made.

On the bridge, AI increasingly appears in the form of decision-support systems rather than fully autonomous control. Modern electronic chart display and information systems integrate multiple data streams, including radar, AIS, weather forecasts, and bathymetric information, and use algorithmic logic to highlight collision risks and recommend maneuvers. Some systems go further, simulating future vessel trajectories and presenting ranked options based on probabilistic assessments of safety and efficiency. These tools are marketed as enhancements to situational awareness, and in many cases they are precisely that.

Yet decision support is not neutral. When an algorithm consistently produces recommendations that appear accurate, timely, and aligned with best practice, human operators may gradually defer to it, especially under fatigue or time pressure. This phenomenon, widely documented in other safety-critical sectors, is known as automation bias. It does not require blind trust in machines. It arises simply from the rational human tendency to rely on tools that have proven reliable in the past.

Within the SOLAS framework, this reliance creates ambiguity. The master retains legal responsibility for navigation, but the cognitive authority of the system may outweigh that of individual officers. If a collision avoidance algorithm recommends a course alteration that aligns with COLREGs interpretations embedded in its design, rejecting that recommendation requires both confidence and justification. Over time, the human role can shift from active navigator to validator of machine output. Authority remains on paper, but in practice it becomes shared in ways SOLAS never anticipated.

Ports introduce an additional layer of complexity. Vessel traffic services increasingly deploy AI-driven analytics to manage dense traffic patterns, predict congestion, and optimize sequencing. These systems ingest data from multiple vessels and shore-based sensors, generating recommendations that influence pilot instructions, berth allocations, and

speed adjustments. The intention is to improve safety and efficiency simultaneously, particularly in constrained waterways.

However, when shore-based intelligence begins to shape vessel behavior, command clarity can erode. A master navigating under the guidance of a pilot and in communication with a vessel traffic service may already operate within a complex authority structure. Introducing AI-mediated recommendations into this environment raises questions about whose judgment prevails when conflicts arise. If a vessel follows port traffic guidance influenced by algorithmic optimization and an incident occurs, responsibility becomes contested.

This contestation is not merely legal. It affects behavior. Masters may feel pressure to comply with shore-side recommendations even when their own judgment suggests caution, particularly if non-compliance could lead to delays, commercial penalties, or scrutiny. In such cases, AI does not remove human judgment. It reshapes the incentives that govern how judgment is exercised.

Automation also affects skill retention. SOLAS assumes that officers are capable of manual navigation, situational assessment, and emergency response. Training and certification regimes are built around these competencies. As AI systems handle more routine decision-making, opportunities for officers to practice and refine these skills diminish. The risk is not immediate incompetence, but gradual deskilling, which becomes apparent only when systems fail or conditions fall outside algorithmic assumptions.

The engine room presents a parallel dynamic. Predictive maintenance systems use AI to forecast failures based on sensor data and historical patterns. These systems can enhance safety by preventing catastrophic breakdowns, but they also influence operational decisions. When an algorithm predicts that equipment can safely operate beyond traditional maintenance intervals, human engineers may defer to this assessment. If the prediction proves incorrect, the question arises whether the engineer exercised judgment or merely followed system guidance.

From a governance perspective, these dynamics point to a subtle but significant shift. SOLAS compliance has historically been assessed by examining whether equipment standards were met, procedures followed, and human actions aligned with regulations. In AI-mediated environments, compliance becomes harder to observe and verify. Did the officer understand the system's recommendation? Was the system operating within validated parameters? Were there organizational pressures that discouraged deviation from automated advice?

These questions matter because safety regimes rely on enforceable norms. If command clarity erodes, enforcement becomes difficult. Port state control inspections, for example, may confirm that required equipment is installed and operational, but they are not designed to audit decision-making interactions between humans and algorithms. Classification societies may certify systems, but certification does not guarantee appropriate use under real-world conditions.

The erosion of command clarity does not imply that artificial intelligence should be rejected. It implies that governance frameworks must evolve to preserve meaningful human authority. SOLAS's insistence on the master's overriding responsibility remains a vital principle, but it must be operationalized in a context where authority is no longer exercised in isolation.

This may require new interpretive guidance on what constitutes informed decision-making in AI-supported environments. It may require training standards that emphasize critical engagement with automated systems rather than passive monitoring. It may require clearer protocols for resolving conflicts between human judgment and machine recommendations, particularly in high-risk situations.

Artificial intelligence on the bridge and in the port is not inherently incompatible with SOLAS. The danger lies in allowing command to become diffuse while responsibility remains concentrated. If the industry does not address this imbalance deliberately, it risks undermining the very safety culture that SOLAS was designed to protect.

05 Governance Tension under SOLAS: Responsibility, Liability, and the Limits of Delegation to Machines

The most consequential challenge artificial intelligence poses to the SOLAS Convention does not arise from technology itself, but from the governance vacuum that emerges when responsibility and authority begin to drift apart. SOLAS is fundamentally a liability-oriented instrument. It assigns responsibility clearly and deliberately because maritime safety, unlike many other regulatory domains, deals with irreversible harm. Loss of life at sea cannot be mitigated after the fact. The Convention therefore insists on traceable accountability, grounded in human command.

Artificial intelligence unsettles this logic by introducing systems that participate in safety decisions without bearing responsibility in any legal or moral sense. Algorithms do not owe duties. They cannot be licensed, disciplined, or sanctioned. Yet as AI systems become embedded in navigation, traffic management, and operational planning, they exert real influence over outcomes that SOLAS treats as human responsibilities.

This creates a governance tension that is increasingly visible in casualty investigations and regulatory debates. When an incident occurs in an AI-mediated environment, investigators seek to reconstruct a chain of causation. Under traditional SOLAS logic, this chain runs through human decisions, procedural compliance, and equipment condition. In AI-supported systems, the chain often runs through algorithmic recommendations, data inputs, system configurations, and organizational policies that shape how humans interact with technology.

The law struggles with this complexity because SOLAS was not designed for shared agency. The Convention assumes that while humans may rely on instruments, they ultimately exercise independent judgment. When AI systems are presented as authoritative, optimized, or mandatory within operational procedures, independence becomes questionable. The master may remain legally responsible, but operational discretion can be constrained by institutional expectations to follow system outputs.

Liability thus becomes asymmetrical. Humans retain exposure to legal and professional consequences, while system designers, vendors, and data providers often operate at a distance from direct accountability. This asymmetry creates incentives that are misaligned with SOLAS's safety philosophy. When responsibility is concentrated on individuals but decision power is distributed across technical and organizational systems, risk management becomes distorted.

This distortion is particularly problematic in ports and coastal waters, where multiple governance layers intersect. Vessel traffic services, port authorities, pilots, and ship operators each play a role in safety outcomes. When AI systems mediate these interactions, determining who exercised effective control becomes difficult. Did the port authority merely provide information, or did it effectively direct traffic through algorithmic sequencing? Did the vessel comply voluntarily, or was compliance functionally compelled by operational constraints?

SOLAS does not provide explicit answers to these questions because it presumes that authority structures are clear and hierarchical. Artificial intelligence introduces lateral influence, where recommendations flow across institutional boundaries without formal command. Governance systems must therefore grapple with the reality that influence, not authority, increasingly shapes safety behavior.

The limits of delegation to machines become apparent in this context. Delegation implies that authority can be transferred while responsibility remains. SOLAS permits delegation of tasks, but not delegation of accountability. A master may delegate watchkeeping duties, but remains responsible for outcomes. Artificial intelligence challenges this model because delegation is implicit rather than explicit. Systems are integrated into operations through procurement decisions, regulatory encouragement, or efficiency imperatives, not through formal acts of delegation governed by clear rules.

This implicit delegation undermines one of SOLAS's most important safeguards: the requirement that responsibility be consciously assumed. When humans rely on AI systems because they are embedded, normalized, or institutionally endorsed, responsibility becomes diffuse. In the event of failure, individuals may be held accountable for decisions they did not meaningfully control.

Governance responses to this tension remain uneven. Some jurisdictions emphasize the master's overriding authority regardless of technological context, effectively reinforcing SOLAS's traditional stance. Others explore shared responsibility models that distribute liability across operators, manufacturers, and service providers. Yet without clear international consensus, fragmentation persists. This fragmentation creates compliance uncertainty, particularly for emerging maritime states that may lack the legal capacity to interpret or enforce nuanced liability regimes.

From a safety perspective, uncertainty is itself a risk. When operators are unclear about who bears responsibility, decision-making can become defensive rather than precautionary. Masters may hesitate to override systems for fear of being blamed for inefficiency or non-compliance. Conversely, blind adherence to automated recommendations may be perceived as safer from a liability standpoint, even when human judgment suggests caution.

The governance tension under SOLAS is therefore not a technical flaw to be patched. It is a structural challenge that demands deliberate policy attention. Preserving the Convention's core principle of human accountability requires more than reaffirming legal responsibility. It requires ensuring that humans retain genuine authority to question, override, and contextualize machine-generated guidance without penalty.

This implies a need for clearer standards on the role of AI in safety-critical decisions, including requirements for transparency, explainability, and human override capability. It also suggests that liability frameworks must evolve to reflect the realities of human-machine collaboration, rather than assuming that technology remains a passive tool.

SOLAS has endured because it balances technical prescription with ethical clarity. Its insistence on human responsibility is not outdated. It is a reminder that safety cannot be automated away. In the age of artificial intelligence, the Convention's challenge is to assert that reminder in governance structures that recognize complexity without surrendering accountability.

06 Comparative Regulatory Responses: How Advanced and Emerging Maritime States Are Interpreting SOLAS in the Algorithmic Age

The growing integration of artificial intelligence into maritime operations has not produced a uniform regulatory response. Instead, it has exposed divergent interpretations of SOLAS across jurisdictions, shaped by institutional capacity, legal tradition, technological maturity, and geopolitical position within global shipping networks. Examining these comparative responses is instructive, not because they offer ready-made solutions, but because they reveal how governance choices either preserve or erode the Convention's core principles under technological pressure.

In advanced maritime administrations, the dominant approach has been cautious accommodation rather than wholesale revision. The International Maritime Organization's ongoing work on Maritime Autonomous Surface Ships illustrates this posture. Rather than amending SOLAS outright, the IMO has pursued a regulatory scoping exercise to identify how existing instruments apply to varying degrees of autonomy. This strategy reflects a deliberate effort to avoid premature legal fragmentation while acknowledging that intelligent systems are already influencing safety outcomes.

European maritime authorities have followed a similar logic. The European Maritime Safety Agency has invested heavily in digital surveillance, traffic monitoring, and decision-support platforms, particularly in vessel traffic services and port state control analytics. These systems use artificial intelligence to identify high-risk vessels, predict non-compliance, and allocate inspection resources more efficiently. Yet EMSA has consistently emphasized that such tools are intended to support, not replace, human judgment. Investigative authority and enforcement discretion remain firmly human-centered, in line with SOLAS assumptions.

At the national level, countries such as Norway and Japan have taken steps to test autonomous and semi-autonomous vessel operations within tightly controlled environments. These pilot projects are often framed as research and development initiatives rather than commercial rollouts, and they operate under special regulatory exemptions. Importantly, flag state authorities in these jurisdictions have retained close oversight, ensuring that responsibility remains clearly assigned even as operational autonomy increases. The emphasis has been on

learning how SOLAS principles apply under new conditions, rather than redefining those principles altogether.

By contrast, emerging maritime states face a different regulatory reality. Many are adopting AI-enabled systems through procurement rather than policy design. Port authorities install automated traffic management platforms supplied by global vendors. Shipping companies operating under flags of convenience deploy AI-assisted navigation and maintenance tools developed elsewhere. In these contexts, the state's role shifts from regulator to recipient of technology-driven change.

This asymmetry has significant implications for SOLAS interpretation. Where regulatory capacity is limited, authorities may lack the technical expertise to audit algorithms, validate decision logic, or assess system failure modes. Compliance becomes procedural rather than substantive. Equipment is certified, but its interaction with human operators is not systematically evaluated. In such settings, SOLAS risks becoming a checklist rather than a living safety regime.

Comparative evidence suggests that this gap is not merely technical, but institutional. Advanced maritime administrations often possess dedicated research units, simulation facilities, and data-sharing arrangements that allow them to engage critically with AI deployment. Emerging administrations may rely on external consultants or vendor assurances, reducing their ability to assert independent safety authority. This imbalance affects how responsibility is understood and enforced.

Another important contrast lies in liability frameworks. In jurisdictions with mature maritime legal systems, courts and insurers are beginning to grapple with questions of shared responsibility in AI-mediated incidents. Discussions around product liability, professional negligence, and organizational responsibility are increasingly informed by experience in other safety-critical sectors such as aviation and healthcare. While SOLAS remains the reference point for safety obligations, its application is mediated through broader legal doctrines that recognize complex causation.

In many developing maritime states, however, liability regimes remain closely tied to traditional fault-based models. The master is responsible. The shipowner is liable. The port authority enforces compliance. Introducing AI into this framework without corresponding legal evolution risks placing disproportionate burden on individuals who may have limited control over system design or operational constraints. This mismatch can discourage transparency and undermine safety reporting, as actors seek to minimize exposure rather than learn from incidents.

Comparative port governance also reveals differences in how AI is integrated into shore-side safety functions. Leading ports such as Rotterdam and Singapore have invested in digital twins, predictive traffic management, and AI-assisted safety monitoring as part of broader port authority mandates that explicitly include innovation and sustainability. These ports operate within governance models that grant authorities significant autonomy, stable funding, and strategic oversight capabilities.

In contrast, ports in many emerging maritime states operate under fragmented governance arrangements, where authority is divided among ministries, agencies, and concessionaires. Introducing AI into such environments can exacerbate coordination problems rather than resolve them. Without clear lines of authority, algorithmic recommendations may be followed inconsistently, and responsibility for outcomes may be contested.

What emerges from this comparative analysis is not a simple divide between advanced and emerging states, but a spectrum of governance readiness. SOLAS provides a common normative foundation, but its effective application in the algorithmic age depends on institutional capacity to interpret, enforce, and adapt its principles.

The lesson is not that emerging maritime states must wait for perfect capacity before engaging with AI. It is that engagement without governance adaptation carries risks. SOLAS's human-centric philosophy remains a valuable anchor, but it must be actively upheld through regulatory design, training, and legal clarity.

As artificial intelligence continues to diffuse across maritime systems, divergence in regulatory interpretation may increase. This raises the prospect of uneven safety standards and forum shopping, where operators gravitate toward jurisdictions with weaker oversight. Preventing such outcomes requires renewed international dialogue on how SOLAS principles apply when decision-making is shared between humans and machines.

OUR SERVICES

REGULATORY ENFORCEMENT

Shipping, Port & International Cargo Shipment Compliance Training.

Negotiation and approval of freight rates, local port charges, border crossing procedures, shipping agency charges, and service standards.

Ensure the publication of approved freight rates, charges, & service standards of service providers for the benefit of the shipper.

TRADE FACILITATION

Resolution of shipping complaints at seaports, airports, and land border posts and crossings

Promotion of transparency, simplification, harmonisation and standardisation of shipment procedures.

INFORMATION DISSEMINATION

Shipping Review

Maritrade

Digest of Maritime Statistics

Shippers' App

The Admiral

SERVICE STANDARDS

Registration and issuance of certificates to new Shippers under Section 2 of the Ghana Shippers' Authority Regulations, 2012 (LI 2190).

Annual renewal of registration under Section 2 of the Ghana Shippers' Authority Regulations, 2012 (LI 2190).

Resolution of shipping complaints and enquiries.

SUPPORT SERVICES

Investment in infrastructure and logistics that creates value for importers and exporters across land, air, and seaports.

Facilitate the development of inland logistics platforms, freight parks, warehouses etc. that enhance the experience of Shippers

Provide business opportunities for shippers including transit shippers across Ghana's ports, borders and corridors

Conduct Industry Research to inform tailored advocacy

Advisory Services (Legal, Commercial, Industry)

07 Ports, VTS, and AI-Mediated Safety: When Shore-Side Intelligence Influences Navigational Outcomes

Ports and their associated vessel traffic services occupy a unique position within the SOLAS safety architecture. They are neither fully external observers nor direct operators of ships, yet their influence on navigational outcomes is substantial. In the age of artificial intelligence, this influence has expanded in ways that challenge traditional understandings of command, responsibility, and safety governance.

Historically, vessel traffic services were conceived as advisory systems. Their function was to enhance situational awareness by providing information on traffic density, weather conditions, and potential hazards. Under SOLAS, the master retained ultimate authority, and compliance with shore-side advice was discretionary unless mandated by national regulations in specific areas. This arrangement preserved a clear hierarchy. Information flowed from shore to ship, but decision-making authority remained on board.

Artificial intelligence has altered this balance. Modern VTS platforms increasingly rely on algorithmic analytics to predict vessel trajectories, identify conflict points, and optimize traffic flows. These systems do more than present information. They generate recommendations, risk scores, and sequencing decisions that shape how vessels move through constrained waterways. In high-density ports, such recommendations can carry the practical force of instructions, even when formally described as advisory.

This evolution creates a subtle but important shift in safety governance. When shore-side intelligence influences navigational outcomes in real time, the locus of safety judgment becomes distributed. The master's authority remains intact in law, but operational reality becomes more complex. Decisions are no longer made solely on the basis of onboard observation and seamanship. They are mediated by shore-based systems that integrate data from multiple vessels and environmental sensors, often beyond the ship's own perceptual horizon.

From a safety perspective, this integration offers clear benefits. AI-enabled VTS can detect developing risks earlier than human operators working with limited information. They can coordinate movements across an entire port area, reducing congestion and minimizing close-quarters situations. In emergency scenarios, predictive analytics can support faster and more coordinated responses. These capabilities align with SOLAS's overarching objective of protecting life at sea.

However, benefits do not negate governance challenges. When AI systems shape traffic patterns, questions arise about responsibility for outcomes. If a vessel follows an AI-informed VTS recommendation that contributes to an incident, responsibility becomes contested. Was the decision effectively made by the master, who retained formal authority, or by the shore-side system that structured the available options? SOLAS does not explicitly address this scenario because it presumes that shore-side influence remains informational rather than directive.

The issue is further complicated by the commercial context in which ports operate. Port authorities face pressure to maximize throughput, reduce turnaround times, and maintain competitive advantage. AI-driven traffic optimization serves these goals by smoothing flows and minimizing idle time. Yet efficiency and safety are not always perfectly aligned. When optimization algorithms prioritize throughput, they may normalize narrower safety margins, particularly under peak demand conditions.

This creates an ethical dimension to AI-mediated port safety. SOLAS embodies a precautionary philosophy, emphasizing safety over efficiency where the two conflict. If AI systems are configured primarily around performance metrics rather than safety thresholds, they may subtly reframe risk acceptance. The governance question is not whether AI should be used, but how its objectives are defined, audited, and constrained by safety principles.

Ports also introduce institutional complexity. In many jurisdictions, port authorities operate as landlord entities, with safety functions shared among harbor masters, VTS operators, pilots, and private terminal operators. AI systems may be procured and managed by one entity while influencing decisions across others. Without clear governance arrangements, accountability becomes fragmented. SOLAS relies on coherent authority structures to enforce safety standards. Fragmentation undermines this coherence.

For emerging maritime states, these challenges are magnified by capacity constraints. Advanced ports may possess the technical expertise to audit AI systems, validate their performance, and integrate them into safety management frameworks. Less resourced ports may rely heavily on vendor assurances, with limited ability to interrogate algorithmic logic or failure modes. In such cases, shore-side intelligence risks becoming an opaque layer of influence rather than a transparent safety aid.

Training is another critical dimension. SOLAS places strong emphasis on competence and certification. As VTS and port operations become more AI-mediated, training requirements must evolve accordingly. Operators need not only technical proficiency but also an understanding of system limitations, biases, and appropriate override protocols. Without such training, human operators may become passive conduits for algorithmic decisions, weakening the human-centric safety culture that SOLAS seeks to uphold.

The interaction between ships and ports under AI mediation thus exposes a fundamental tension. Ports are becoming active participants in safety decision-making, yet SOLAS's legal framework still treats them primarily as facilitators rather than co-decision makers. Resolving this tension requires clarity. Either shore-side systems must be explicitly incorporated into safety governance structures, or their role must be constrained to preserve clear lines of authority.

This does not imply a need to diminish the role of ports in safety. On the contrary, ports are uniquely positioned to enhance maritime safety through coordinated oversight and advanced analytics. The challenge is to ensure that this enhanced role is matched by governance frameworks that allocate responsibility, authority, and accountability in ways consistent with SOLAS's principles.

As artificial intelligence deepens the integration between ship and shore, ports and VTS become critical test sites for the future of maritime safety governance. How these sites reconcile efficiency, innovation, and accountability will shape not only local outcomes, but the global interpretation of SOLAS in an intelligent era.

08 Implications for Emerging Maritime States: Capacity, Compliance Risk, and Asymmetric Exposure

The governance challenges posed by artificial intelligence under the SOLAS Convention are felt most acutely in emerging maritime states. These states operate within the same international legal framework as advanced maritime administrations, yet they confront markedly different institutional realities. Capacity constraints, fiscal limitations, dependence on external technology providers, and fragmented regulatory architectures combine to create an asymmetric exposure to compliance risk in the algorithmic age.

For emerging maritime states, SOLAS compliance has historically been a matter of institutional alignment rather than technological leadership. Flag administrations, port authorities, and maritime regulators have focused on meeting prescribed standards through inspection, certification, and enforcement. Artificial intelligence disrupts this model by introducing systems whose safety implications extend beyond observable equipment and procedural compliance. When safety decisions are influenced by algorithms, compliance becomes less visible and harder to verify.

This invisibility carries risk. Port state control regimes rely on the ability to assess compliance through documentation, physical inspection, and interviews. AI-mediated decision-making does not always leave clear audit trails that inspectors can easily interpret. An emerging maritime administration may confirm that required systems are installed and operational, yet remain unable to assess whether those systems are shaping decisions in ways consistent with SOLAS's human-centric safety philosophy.

The result is a widening gap between formal compliance and substantive safety governance. Emerging states may technically meet SOLAS obligations while lacking the capacity to interrogate how intelligent systems influence operational behavior. This gap exposes them to reputational and legal risk. In the event of a major casualty involving AI-mediated decision-making, questions may be raised not only about operator conduct, but about the adequacy of flag and port state oversight.

Capacity constraints also affect regulatory confidence. Advanced maritime administrations often engage with AI through dedicated research units, simulation centers, and partnerships with academic institutions. Emerging states frequently lack such resources. They may rely on vendor-provided training and documentation, which prioritizes system functionality over governance implications. This dependence limits the state's ability to assert independent safety authority and weakens its negotiating position in regulatory discussions.

Another dimension of asymmetry lies in legal infrastructure. Many emerging maritime states operate under legal frameworks that assign liability primarily to masters and shipowners, with limited provision for shared or distributed responsibility. Introducing AI into this context risks concentrating liability on individuals who operate within constraints shaped by technology and organizational policy. This concentration may discourage transparency and learning, as actors seek to minimize personal exposure rather than report near misses or system limitations.

Ports in emerging states face similar pressures. Many operate as commercial entities under public ownership, with mandates to generate revenue and facilitate trade. AI-driven port management systems promise efficiency gains and international competitiveness, making them attractive investments. Yet without parallel investment in governance capacity, these systems can introduce new safety dependencies. When ports rely on AI to manage traffic flows or optimize berth allocation, they assume a quasi-regulatory role that SOLAS does not clearly define.

This ambiguity is particularly problematic in contexts where institutional authority is fragmented. Responsibility for maritime safety may be divided among transport ministries, port authorities, maritime administrations, and security agencies. AI systems introduced at one node of this network can influence decisions across others, without clear mechanisms for coordination or accountability. In such environments, safety governance becomes reactive rather than strategic.

The international dimension further complicates matters. Emerging maritime states often serve as nodes in global shipping networks dominated by actors headquartered elsewhere. AI systems deployed on vessels or in ports may be designed, maintained, and updated by multinational firms. Data generated by these systems may be stored or processed outside national jurisdiction. This raises questions about sovereignty, data access, and regulatory reach. SOLAS presumes that states can enforce safety obligations within their jurisdiction. Artificial intelligence challenges this presumption by diffusing control across borders.

Despite these challenges, emerging maritime states are not passive victims of technological change. They possess agency in how AI is integrated into their maritime systems. The key lies in recognizing that AI adoption is a governance choice, not merely a technical upgrade. States can require transparency, mandate human override capabilities, and invest in regulatory capacity even within constrained budgets. They can prioritize regional cooperation to share expertise and develop common approaches to AI governance under SOLAS.

There is also an opportunity embedded in this transition. Emerging maritime states can avoid legacy pitfalls by designing governance frameworks that integrate AI from the outset. Rather than retrofitting oversight mechanisms to accommodate opaque systems, they can insist on safety-by-design principles that align with SOLAS's human-centric ethos. Doing so requires political will and strategic foresight, but it offers a pathway to safer and more resilient maritime systems.

Ultimately, the implications of artificial intelligence for emerging maritime states extend beyond compliance. They touch on legitimacy. A state that cannot explain how safety decisions are made within its ports and waters risks losing credibility in international fora. Conversely, a state that engages proactively with AI governance can strengthen its standing as a responsible maritime actor.

As the maritime sector becomes increasingly intelligent, SOLAS remains a common reference point. The challenge for emerging states is to ensure that this reference point retains substance rather than becoming a formality. In the next section, the analysis will move from diagnosis to prescription, exploring how SOLAS might be reframed to preserve human authority and accountability in the algorithmic age.

09 Reframing SOLAS for the Algorithmic Age: Governance Principles for Safety Without Surrendering Authority

If SOLAS is to remain the cornerstone of maritime safety in an era increasingly shaped by artificial intelligence, it must be reframed not by rewriting its foundational commitments, but by reasserting and operationalizing them under new conditions. The Convention's enduring strength lies in its clarity about responsibility, authority, and the primacy of human life. These principles are not rendered obsolete by intelligent systems. They are tested by them.

Reframing SOLAS for the algorithmic age therefore begins with a recognition that safety governance must now address hybrid decision environments. Artificial intelligence does not replace human actors; it reconfigures how decisions are made, justified, and executed. Governance frameworks must respond accordingly by ensuring that human authority remains meaningful rather than symbolic.

A first principle is the preservation of informed human control. SOLAS has always assumed that masters and officers understand the basis of the decisions they make. In AI-mediated environments, this assumption can no longer be taken for granted. Reframing SOLAS requires that intelligent systems used in safety-critical contexts be interpretable to the extent necessary for human oversight. This does not imply full transparency of proprietary algorithms, but it does imply that operators must be able to understand system logic, limitations, and confidence thresholds well enough to exercise judgment. A master who cannot interrogate or contextualize a system's recommendation does not exercise authority in any substantive sense.

Closely linked to this is the principle of meaningful override. SOLAS assigns responsibility on the premise that humans can intervene decisively when safety is threatened. In algorithmic systems, override must be more than a theoretical option buried in technical manuals. It must be operationally feasible under real-world conditions. Governance frameworks should require that AI systems incorporate clear, accessible mechanisms for human intervention, and that organizational cultures support, rather than penalize, the exercise of override when justified by safety considerations.

A second principle concerns accountability alignment. One of the most destabilizing effects of AI adoption is the decoupling of responsibility from influence. SOLAS presumes that those who exercise authority can be held accountable. Reframing the Convention for the algorithmic age requires mechanisms to ensure that entities influencing safety outcomes share appropriate responsibility. This may involve clarifying the obligations of shipowners, port authorities, and technology providers in relation to system design, configuration, and maintenance. Without such alignment, liability regimes risk placing disproportionate burden on individual operators while leaving systemic contributors unexamined.

A third principle is procedural traceability. Maritime safety governance relies on the ability to reconstruct events, learn from failures, and prevent recurrence. AI systems must therefore be designed and regulated to support robust audit trails. Decision logs, data inputs, and system outputs should be recorded in ways that enable investigators to understand how recommendations were generated and how humans interacted with them. This requirement is not merely technical. It is central to SOLAS's preventive logic, which depends on learning as much as on enforcement.

Training and competence form a fourth principle. SOLAS already places strong emphasis on certification and training standards, but these standards must evolve to reflect the realities of AI-mediated operations. Reframing SOLAS requires that training regimes move beyond system operation toward critical engagement. Officers, VTS operators, and port personnel must be equipped to question system outputs, recognize anomalies, and understand when reliance on automation may increase rather than reduce risk. Competence in the algorithmic age includes not only technical skill, but epistemic awareness of system limitations.

A fifth principle relates to institutional clarity. As artificial intelligence blurs the boundaries between ship and shore, governance frameworks must clarify roles rather than allow ambiguity to persist. Ports and vessel traffic services that deploy AI-driven safety systems should have clearly defined responsibilities within the SOLAS framework. If shore-side intelligence materially influences navigational decisions, this influence must be acknowledged and governed, not treated as incidental. Clear institutional mandates reduce the risk of responsibility gaps and enhance cooperation between actors.

Importantly, reframing SOLAS does not require abandoning its human-centric philosophy. On the contrary, it requires reaffirming that philosophy in more demanding circumstances. Artificial intelligence can enhance safety, but only if it operates within a governance framework that prioritizes human life over optimization and accountability over efficiency.

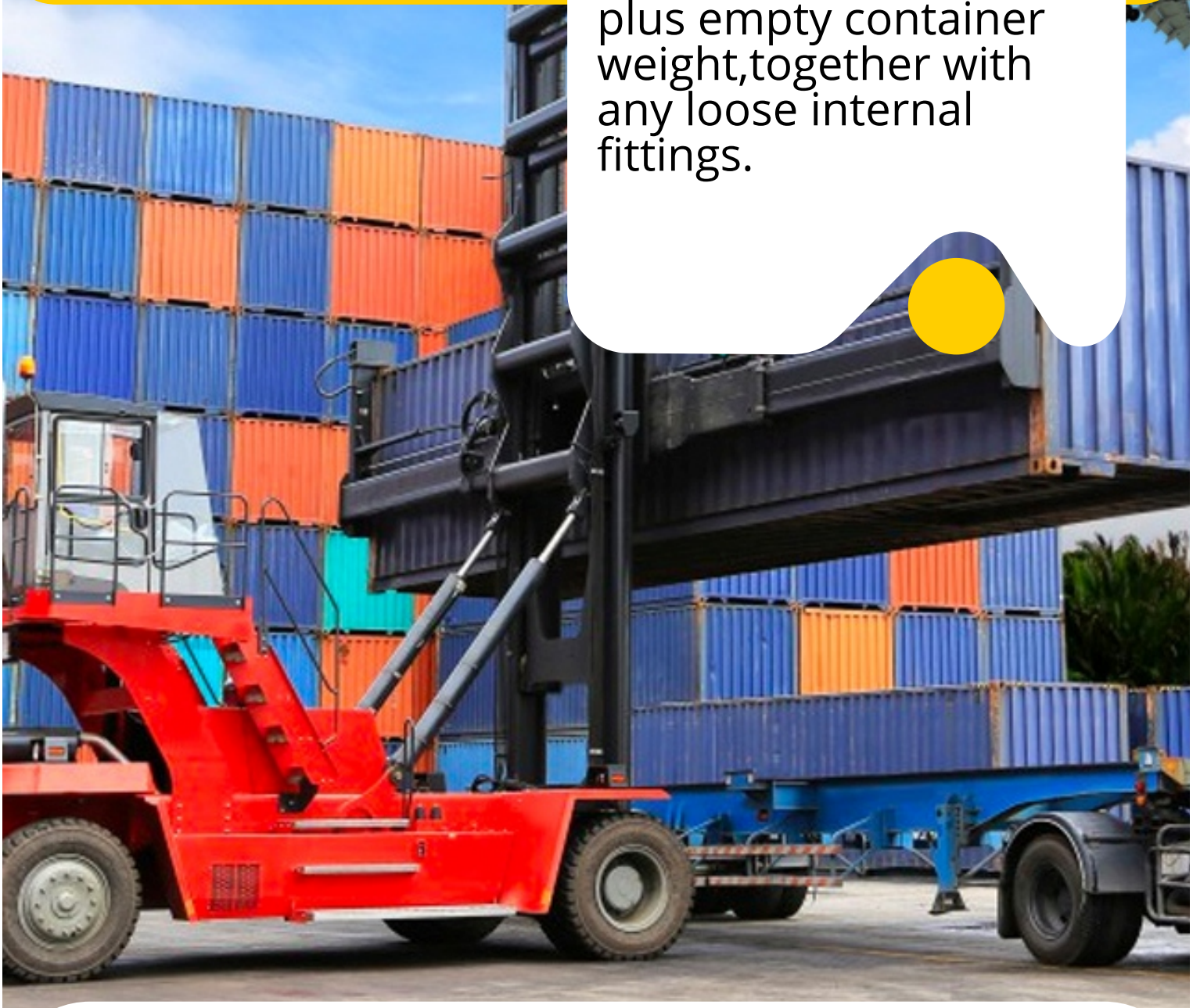
This reframing also has implications for international cooperation. Divergent national interpretations of SOLAS in relation to AI risk creating uneven safety standards and regulatory arbitrage. A shared set of governance principles, articulated through IMO guidance or interpretive instruments, could help harmonize approaches without reopening the Convention itself. Such guidance would provide clarity to flag states, port authorities, and industry actors navigating the transition.

Ultimately, reframing SOLAS for the algorithmic age is not about resisting technological change. It is about ensuring that change does not hollow out the ethical and legal commitments that have underpinned maritime safety for generations. The Convention's authority derives not from its technical prescriptions, but from its insistence that safety is a human responsibility.

TERMINOLOGIES

ACTUAL CONTAINER GROSS WEIGHT

Total weight of a container, i.e. the weight of the payload plus empty container weight,together with any loose internal fittings.



10 Conclusion: SOLAS, Human Authority, and the Future of Maritime Safety in an Intelligent World

The encounter between the SOLAS Convention and artificial intelligence is not a peripheral regulatory issue. It is a defining moment in the evolution of maritime governance. For over a century, SOLAS has endured because it articulated a simple but profound truth: safety at sea depends on clear human responsibility, exercised through authority that is both legitimate and accountable. That truth has not been invalidated by intelligent systems. It has been rendered more difficult to sustain.

This article has argued that artificial intelligence does not threaten SOLAS because machines are becoming capable. It threatens SOLAS because governance has not yet caught up with how capability reshapes decision-making. The gradual integration of AI into navigation, port operations, vessel traffic services, and maintenance has shifted the practical locus of judgment without a corresponding shift in how authority and responsibility are defined. When influence is distributed but accountability remains concentrated, safety regimes become fragile.

The danger is subtle. SOLAS is not being openly rejected. Ships remain certified, ports remain compliant, and regulations remain formally intact. Yet beneath this surface continuity, the meaning of command is changing. Masters increasingly operate in environments where algorithmic recommendations frame their choices. Port authorities and vessel traffic services shape navigational outcomes through AI-mediated systems that were once purely informational. Emerging maritime states adopt technologies they cannot fully audit, while remaining legally responsible for outcomes they only partially control.

If left unaddressed, this drift risks hollowing out the Convention's moral core. SOLAS was never meant to be a procedural checklist. It was designed as a living framework that assigns responsibility precisely because life at sea is exposed to uncertainty, complexity, and irreversible consequences. Artificial intelligence, for all its promise, does not remove uncertainty. It reconfigures it. Governance that fails to recognize this risks mistaking optimization for safety.

Yet the conclusion of this analysis is not pessimistic. On the contrary, it suggests that SOLAS remains

uniquely well positioned to guide maritime safety in the algorithmic age. Its human-centric philosophy offers a counterweight to technological determinism. Its insistence on traceable accountability provides a foundation for governing hybrid human-machine systems. Its emphasis on training, competence, and authority remains relevant precisely because intelligent systems amplify the consequences of error rather than eliminating them.

The task ahead is therefore one of reinterpretation rather than replacement. Reframing SOLAS does not require rewriting its text, but reasserting its principles through contemporary governance instruments. This includes clearer guidance on human override, stronger expectations around system transparency, and liability frameworks that align influence with responsibility. It also requires renewed investment in institutional capacity, particularly in emerging maritime states, to ensure that safety governance keeps pace with technological adoption.

Ports will play a critical role in this future. As interfaces between ship and shore, they are becoming sites where artificial intelligence most visibly reshapes safety dynamics. Whether ports act as responsible safety governors or as efficiency-driven facilitators will shape how SOLAS is experienced in practice. Vessel traffic services, pilotage regimes, and port authority mandates must evolve in ways that reinforce, rather than dilute, human authority.

For the global maritime community, the age of artificial intelligence presents a choice. One path treats SOLAS as an obstacle to innovation, something to be circumvented or minimally complied with as systems become more autonomous. The other path treats SOLAS as a stabilizing force, a framework that disciplines innovation by insisting that safety remains anchored in human judgment and accountability. The evidence suggests that only the latter path preserves the legitimacy of maritime governance.

Ultimately, maritime safety has never been purely technical. It has always been ethical, institutional, and political. Artificial intelligence does not change this reality. It makes it more visible. As shipping enters a period of profound technological transformation, SOLAS stands not as a relic of the past, but as a reminder of what must not be surrendered: the principle that when lives are at stake, responsibility must remain human.

In reaffirming this principle, the maritime sector can ensure that intelligence enhances safety without eroding authority, and that progress at sea remains guided by accountability rather than abstraction. That, in the end, is the enduring promise of SOLAS in any age.

GSA News Desk Report

First Quarter 2026 Airfreight Review: Emerging Risks, Shifting Demand, and Strategic Implications for Shippers

The first quarter of 2026 has unfolded as a period of cautious optimism tempered by emerging structural concerns within the global airfreight industry. While early indicators particularly in January pointed to a modest recovery in air cargo volumes, a deeper assessment reveals that much of this growth was influenced by seasonal distortions rather than a sustained rebound in underlying demand. Global volumes rose by 7% year-on-year in January, slightly outpacing capacity growth, yet this increase coincided with shifts in the Lunar New Year calendar, making it difficult to draw firm conclusions about the true state of the market.

As the quarter progressed, it became increasingly evident that one of the most significant drivers of air cargo demand in recent years; cross-border e-commerce was beginning to lose momentum. Data from late 2025 already showed a decline in Chinese e-commerce exports, including a notable drop in shipments to the United States following regulatory changes such as the removal of the de minimis exemption. This downward trend continued into 2026, raising concerns about the sustainability of demand in a segment that accounts for as much as a quarter of global airfreight volumes. The slowdown is not only a reflection of regulatory tightening but also signals a broader recalibration of global trade flows, as exporters seek alternative markets and adjust to rising compliance costs.

At the same time, geopolitical developments particularly the ongoing conflict in the Middle East have introduced a new layer of disruption to global air cargo operations. The region's strategic importance as a transit hub between Asia, Europe, and Africa means that any instability has far-reaching consequences. Flight suspensions, airspace restrictions, and rerouting have collectively reduced available capacity on key corridors, especially those linking Asia to Europe. Airlines have been forced to adapt by increasing direct services on alternative routes, but these adjustments have not fully offset the loss of capacity, resulting in inefficiencies and longer transit times.

These supply-side constraints have coincided with a sharp escalation in operating costs, most notably driven by fuel price volatility. Jet fuel prices have surged significantly compared to the previous year,

prompting airlines to introduce or increase fuel and war risk surcharges across their networks. Consequently, airfreight rates have risen markedly, with some routes experiencing increases of up to 80% within a matter of weeks. This rapid escalation has sparked concern among freight forwarders, particularly regarding the transparency and proportionality of surcharge adjustments, with some industry stakeholders questioning whether these increases accurately reflect underlying cost structures.

The interaction between weakening demand in key segments such as e-commerce and tightening supply due to geopolitical disruptions has created a complex pricing environment. In some corridors, rates have risen despite softening demand, underscoring the dominant influence of capacity constraints and cost pressures. This divergence highlights a fundamental shift in market dynamics: pricing is no longer driven solely by demand-supply equilibrium but increasingly shaped by external shocks and operational risks.

Amid these developments, structural changes within cargo composition are also becoming more pronounced. While food and perishables continue to account for a significant share of global airfreight volumes, their relatively low value contrasts sharply with the growing importance of high-value, specialized cargo such as pharmaceuticals. The latter, though smaller in volume, commands higher yields and reflects a broader industry shift toward precision logistics and value-driven transportation. For emerging economies such as Ghana, this presents both a challenge and an opportunity requiring investment in infrastructure and standards but also offering pathways to participate more competitively in global value chains.

Operational uncertainties have been further compounded by institutional and policy-related risks, as seen in disruptions to aviation systems in key markets such as the United States. Staffing shortages and administrative shutdowns have raised concerns about the resilience of critical logistics infrastructure, reinforcing the reality that global supply chains remain vulnerable not only to market forces but also to governance and policy stability.

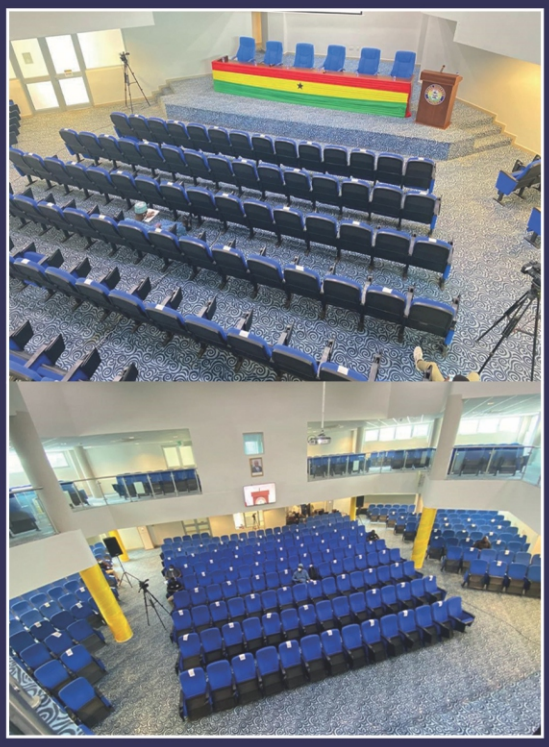
For Ghanaian shippers, these interconnected developments carry important implications. The current environment demands a more deliberate and informed approach to logistics planning. Rising freight rates and surcharges necessitate closer scrutiny of cost structures and contractual terms, particularly in ensuring transparency and fairness in pricing. At the same time, the unpredictability of transit routes, especially those involving the Middle East calls for greater flexibility in routing decisions and a willingness to explore alternative corridors where feasible.

Equally, the volatility observed in airfreight markets reinforces the importance of aligning transport choices with cargo characteristics. Airfreight, increasingly expensive and capacity-constrained, must be reserved for time-sensitive and high-value shipments, while other modes such as ocean freight or multimodal solutions should be considered for less urgent cargo. This strategic allocation of shipments can help mitigate cost pressures without compromising supply chain efficiency.

Furthermore, the evolving structure of global trade suggests that Ghanaian exporters should pay closer attention to emerging opportunities in specialized cargo segments. Investments in cold chain logistics, quality assurance, and regulatory compliance can enhance the competitiveness of Ghana's perishable exports, while gradual entry into pharmaceutical and high-value cargo markets may offer longer-term growth prospects.

Ultimately, the first quarter of 2026 underscores a broader transition within the airfreight industry; away from the relatively stable, demand-driven growth of previous years toward a more volatile, risk-sensitive environment shaped by geopolitics, regulatory change, and cost pressures. In this context, the ability of Shippers to adapt to anticipate disruptions, manage costs, and position themselves strategically will be critical in navigating the uncertainties ahead and sustaining their participation in global trade.

CONFERENCE FACILITIES



ACCRA

(Ghana Shippers House No. 12 Cruickshanks Street, Ambassadorial Enclave, West Ridge)

FEATURES

- 540 Seating Capacity Conference room
- 200 Seating Capacity Conference room
- 300 Capacity Restaurant
- Underground and Surface parking for 320 vehicles
- 2-600 KVA Generator
- High speed internet infrastructure
- Projector, Public Address system

0302 - 666915-7/ 668769
Osei Amankwah - 0203891069

TAKORADI

(2nd Floor Takoradi Shippers Centre)

FEATURES

- 300 seating capacity conference room
- 100 seating capacity conference room
- Projector, Public Address system
- High speed internet infrastructure

031 202 1739

GHANA'S MARITIME TRADE REVIEW 2025

OVERVIEW

Global maritime trade in 2025 was characterised by subdued growth and heightened fragility. The United Nations Conference on Trade and Development projected a modest 0.5% expansion, a sharp deceleration from 2.2% in 2024 and significantly below long-term historical averages. This slowdown occurred despite global GDP growth of approximately 3%, underscoring a disconnect between macroeconomic expansion and merchandise trade performance, as also observed by the World Trade Organization.

The weak trade outturn was driven by policy uncertainty, softening global demand, and constrained industrial activity. Concurrently, structural disruptions, most notably the rerouting of vessels away from the Suez Canal due to the Israel–Hamas War, introduced significant distortions in shipping metrics. While underlying trade volumes remained weak, ton-mile demand increased artificially as vessels undertook longer alternative routes, masking the true state of global trade activity.

Freight rates remained elevated, insurance premium surged, and emissions increased, reflecting an industry increasingly shaped by geopolitical disruption rather than demand. Key developments for 2025 including sustained insecurity in the Red Sea, rising tensions around the Strait of Hormuz, evolving U.S.–China maritime trade measures, container alliance restructuring, and decarbonisation pressures under the International Maritime Organization, collectively reinforced a transition toward a more volatile, risk-sensitive global shipping environment.

In contrast, Ghana's maritime sector in 2025 recorded a notable recovery underpinned by macroeconomic stabilization and infrastructure expansion. According to the Ghana Statistical Service, the Ghanaian cedi appreciated by approximately 40.7% against the U.S. dollar, supported by rising gold reserves, successful debt restructuring under the G20 Common Framework, and policy interventions by the Bank of Ghana. Inflation declined sharply from 23.8% in 2024 to 5.4% by year end, significantly easing cost pressures across port and logistics operations.

These macroeconomic gains translated into improved trade conditions and enhanced port competitiveness, with lower import costs. The

commissioning of the Tema Port expansion, valued at $1.5 billion and increasing capacity to 3.7 million TEUs, marked a transformative milestone, positioning Ghana as a regional logistics hub aligned with the African Continental Free Trade Area framework.

This was complemented by operational reforms, notably the implementation of 24-hour port services, which drove customs revenue beyond 2024 levels ahead of year-end. As a result, Ghana's maritime outlook shifted from constraint to cautious resilience, with cargo throughput reaching approximately 31 million metric tons at the end of December 2025.

1.0 PORT SHARE OF CARGO THROUGHPUT FOR 2025

Cargo throughput for the Tema and Takoradi seaports of Ghana for 2025 was over 31 million metric tons (mt). Cargo throughput for the Port of Tema was 19.9 million mt representing 64% of total volume whilst the Port of Takoradi recorded 11.1 million mt, representing 36% of total seaborne trade.

Transit/Transshipment imports amounted to 1.2 million mt whilst transit/transshipment exports recorded 50,052 mt. Table 1 below shows the summary performance for the review period.

Table 1. SUMMARY OF GHANA'S SEABORNE TRADE PER PORT (in mt) (JAN- DEC 2025)

PORT	IMPORT (mt)	TRANSIT/ TRANSHP. IMPORT (mt)	*EXPORT (mt)	TRANSIT/ TRANSHP. EXPORT (mt)	TOTAL (mt)	Share
TEMA	14,910,727.71	1,209,378.36	3,743,776.77	50,052.18	19,913,935.02	64%
TAKORADI	3,420,130.24	993.58	7,744,561.83	0	11,165,685.65	36%
TOTAL	18,330,857.95	1,210,371.94	11,488,338.6	50,052.18	31,079,620.67	100%

2.0 SUMMARY OF CARGO THROUGHPUT - 2025

Table 2 shows the summary of seaborne trade for 2025. Cargo throughput for the review period was over 31 million. Total import trade volume was 18.3 million while total export trade volume was 11.4 million. Total transit/transshipment trade volume for 2025 was 1.2 million.

Table 2. SUMMARY OF GHANA'S CARGO THROUGHPUT

JAN-DEC 2025	
TRADE TYPE	2025(mt)
TOTAL IMPORT	18,330,857.95
TOTAL EXPORT	11,488,338.60
TOTAL IMPORT & EXPORT	29,819,196.6
TOTAL TRANSIT/TRANSH.	1,260,424.12
CARGO THROUGHPUT	31,079,620.7

3.0 GHANA'S SEABORNE TRADE 2025 PER CARGO TYPE

Total import and Export for 2025 amounted to 29.8 million metric tonnes.

Table 3 GHANA'S SEABORNE TRADE PER CARGO TYPE

TRADE TYPE	2025 (mt)
IMPORT:	
Liner	6,409,195.03
Break Bulk	1,378,905.19

Dry Bulk	6,102,219.96
Liquid Bulk	1,190,283.53
TOTAL EXPORT	**11,488,339.84**
TOTAL IMPORT & EXPORT	**29,819,197.79**

Total imports for the review period was 18.3 million mt. This comprised 6.4 million mt of Liner cargo, 1.3 million mt of Breakbulk, 4.4 million mt of Dry bulk cargo and 6.1 million mt of Liquid bulk imports.

Total export trade volume for 2025 was 11.4 million mt. This was made up of 3.0 million mt of Liner items, 1.1 million mt of Break Bulk, 6.1 million mt of Dry Bulk and 1.1 million mt of Liquid Bulk.

4.0 PERFORMANCE IN LADEN CONTAINERS

Table 4 below shows the details of the performance in Laden containers for the review period (Jan. – Dec. 2025). Total Laden Containers for imports and exports for 2025 was 306,552 TEUs.

Total Import in Laden Containers for 2025 was 122,847 TEUs. Total Export in Laden Containers for 2025 was 183,705 TEUs.

Table 4 GHANA'S SEABORNE TRADE IN LADEN CONTAINERS (in TEUs) PER PORT

TRADE TYPE	PORT	2025 (in TEUs)
IMPORT	TEMA	120,785
	TAKORADI	2,062
	TOTAL IMPORT	**122,847**
EXPORT	TEMA	165,319
	TAKORADI	18,386
	TOTAL EXPORT	**183,705**
TOTAL	**IMPORT/EXPORT**	**306,552**

5.0 DIRECTION OF GHANA'S SEABORNE TRADE

5.1 Import Trade

Figure 1 and Table 5 below show that most of Ghana's seaborne imports for 2025 came from the Far East range, representing 39% of Ghana's total import trade. Africa was next with 26% share, followed by North Continent with 12% share of Ghana's import trade. The major commodities imported from the Far East range were general cargo, clinker, petroleum products, iron/steel/plates.

Table 5. DIRECTION OF GHANA'S SEABORNE IMPORT TRADE (in mt) 2025

Trade Type	UK	N. Cont.	Med.Eur	N.Amer.	F. East	Africa	Others	TOTAL
LINER	110,636.62	679,050.08	572,208.70	611,250.48	3,375,646.13	734,716.21	325,686.81	**6,409,195.03**
BREAK BULK	810.67	82,127.87	39,042.90	45,757.59	1,029,965.31	61,886.73	119,314.12	**1,378,905.19**
DRY BULK	8.78	149,047.89	588,468.03	14,489.47	2,101,037.67	1,357,119.02	228,993.33	**4,439,164.19**
LIQUID BULK	174,588.64	1,331,165.87	273,577.36	450,058.86	633,509.92	2,679,124.98	561,567.91	**6,103,593.54**
TOTAL	**286,044.71**	**2,241,391.71**	**1,473,296.99**	**1,121,556.40**	**7,140,159.03**	**4,832,846.94**	**1,235,562.17**	**18,330,857.95**
SHARE	2%	12%	8%	6%	39%	26%	7%	100%

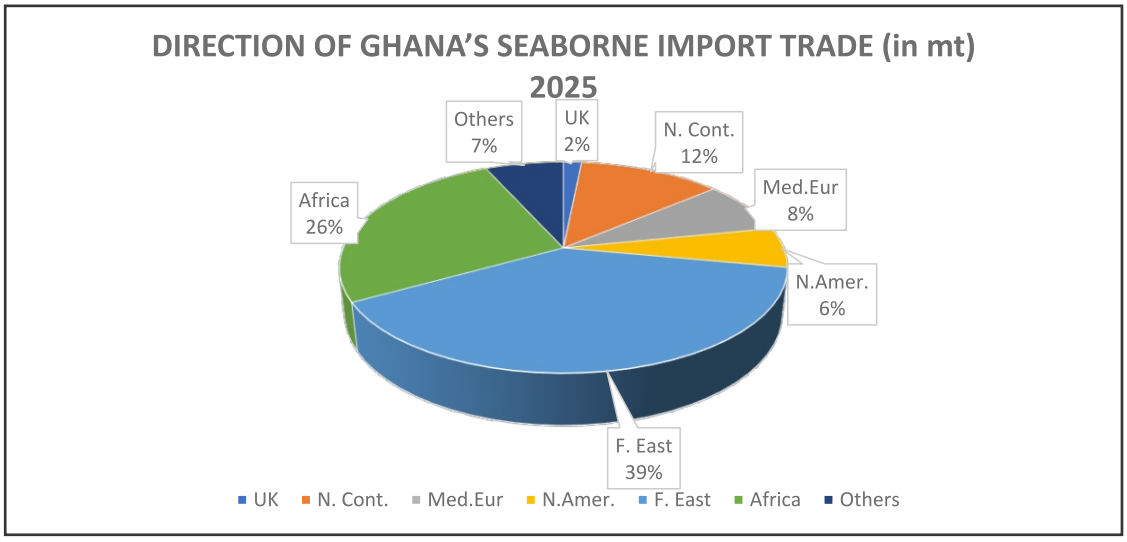


Fig. 1 Direction of Ghana's Seaborne Import Trade 2025

Fig. 1 Direction of Ghana's Seaborne Import Trade 2025

6.2 Export Trade

Over 11.4 million mt of seaborne exports for 2025 went to various destinations in the world. Majority of these exports were to the Far East accounting for a total of 6.4 million mt representing 56% of the total seaborne exports. The major commodities exported were Manganese (4.5million mt) which represents 39.7% of the total export, followed by Bauxite and Cashew nuts.

Table 6 and Fig 2 below give more details about the direction of Ghana's seaborne export trade for 2025.

Table 6. DIRECTION OF GHANA'S SEABORNE EXPORT TRADE (in mt) 2025

Trade Type	UK	N. Cont.	Med. Europe	N. America	F. East	Africa	Others	TOTAL
LINER	86,859	1,530,543	224,563	154,179	1,066,717	831,921	75,783	3,970,565.00
BREAK BULK	40.80	1,506.93	285.50	204	1,816.80	50.80	-	3,904.83
DRY BULK	-	27,737.92	140,257.36	82.93	5,373,904.03	-	781,603.91	6,323,586.15
LIQUID BULK	-	10,391.53	9,800.00	-	4,000.02	1,200	1,164,892	1,190,283.55
TOTAL	86,899.8	1,570,179.38	374,905.86	154,465.93	6,446,437.85	833,171.8	2,022,278.91	11,488,339.53
SHARE	1%	14%	3%	1%	56%	7%	18%	100%

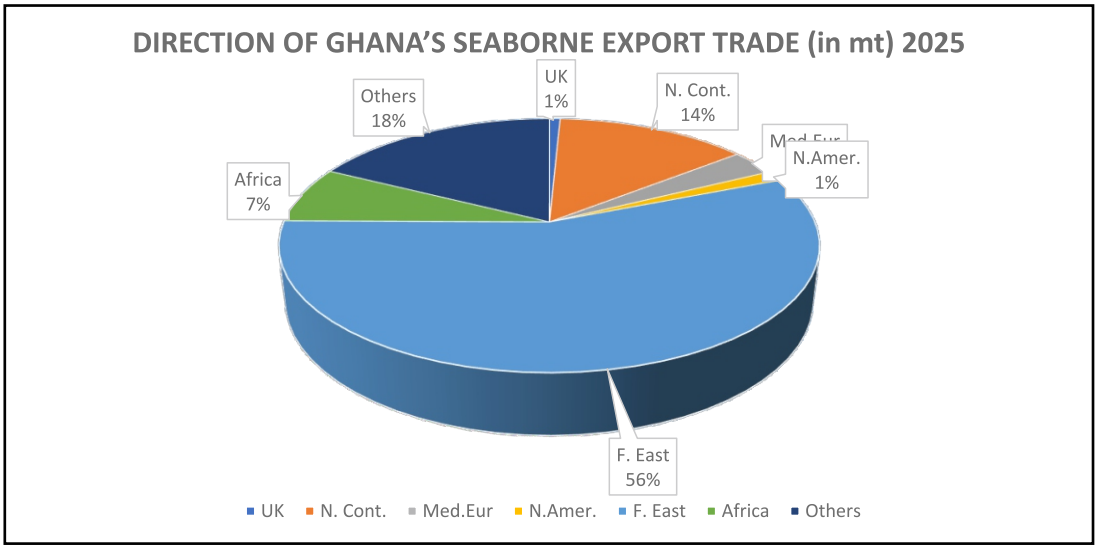


Fig. 2 Direction of Ghana's Seaborne Export Trade 2025

7.0 TRANSIT TRADE AND TRANSSHIPMENT THROUGH THE SEAPORTS OF GHANA

The total volume of transit/transshipment for 2025 was 1.2 million metric tons (mt).

Transit/Transshipment Imports for 2025 amounted to 1.2 million mt. Transshipment/Transit Exports for 2025 recorded 0.05 million mt. Table 7 below shows the details of the transit/transshipment trade volumes for the review period.

Table 7. TRANSIT TRADE AND TRANSHIPMENT THROUGH THE SEAPORTS OF GHANA 2025

TRADE TYPE	2025 (mt)
TRANSIT/TRANSH. IMPORT	1,210,371.94
TRANSIT/TRANSH. EXPORT	50,052.18
TOTAL	1,260,424.12

8.0 PERFORMANCE OF SHIPPING AGENTS PER VOLUME OF SHIPMENT

8.1 Performance of Shipping Agents per Volume of Shipment and Trade Type

Sixty-six (65) Shipping Agents handled over 29.8 million mt of seaborne trade (import & export) through the Ports of Tema and Takoradi in 2025. Table 8 below shows the performance in the various trades namely Liner, Break Bulk, Dry Bulk and Liquid Bulk trade for the review period.

High performers in the Liner Trade were MSC Ghana Ltd. with 21.9% of the volume and Maersk Ghana Ltd. with 17%. The leading Shipping Agents in the Break Bulk Trade were Ballore Gh Ltd with 50% and West Atlantic Ports Services Ghana Limited with 16.9%. In the Dry Bulk Trade, the high performers were Supermaritime Ghana Ltd. with 38.8% of the share and Hull Blyth Gh Ltd. with 15.6%. In Liquid Bulk Trade, Inchcape Shipping Services handled 28.7% of the volume whilst Bulk & trade Ltd handled 22.3%.

GHANA SHIPPERS' AUTHORITY

Table 8. PERFORMANCE OF SHIPPING AGENTS IN GHANA'S SEABORNE TRADE - JANUARY TO DECEMBER 2025

IMPORT & EXPORT - PORTS OF TEMA & TAKORADI

	IMPORT	EXPORT	TOTAL	% SHARE / TRADE TYPE	%SHARE
LINER					
A & J SHIPPING SERVICE	35,020.93	0	35,020.93	0.35	0.12
AFRICA GLOBAL LOGISTICS GH. LTD.	17,045.80	1,026.00	18,071.80	0.18	0.06
AR-RAHMANI SHIPPING LTD.	1,307.94	0	1,307.94	0.01	0.00
ANTRAK GH. LTD.	1,853.59	5,766.99	7,619.58	0.08	0.03
ARKAS GH. LTD.	41,651.43	44,897.34	86,548.77	0.87	0.29
BAJ FREIGHT TEMA	80,857.91	4,207.86	85,065.77	0.86	0.28
BOLLORE GH. LTD.	5,913.22	9,725.49	15,638.71	0.16	0.05
CLIO SHIPPING & LOGISTICS GH. LTD.	221,055.78	7,276.21	228,331.99	2.31	0.76
CMA CGM GH. LTD.	649,153.07	545,219.26	1,194,372.33	12.07	3.97
COMEXAS GH. LTD.	474.52	398.28	872.80	0.01	0.00
CONSOLIDATED SHIPPING AGENCIES	496.00	5,880.87	6,376.87	0.06	0.02
COSCO SHIPPING LINE GH. LTD.	281,245.19	142,473.74	423,718.93	4.28	1.41
DOLPHIN SHIPPING SERVICES LTD.	9,787.51	0	9,787.51	0.10	0.03
DW CABLE NET SHIPPING GH LIMITED	10,349.27	0	10,349.27	0.10	0.03
EOLIS GH. LTD.	53,988.70	148,384.33	202,373.03	2.05	0.67
GIANT ROCK LTD. CO.	3,690.00	0	3,690.00	0.04	0.01
GETMA GH. LTD.	19,181.07	0	19,181.07	0.19	0.06
GO MOVERS LOGISTICS GH. LTD.	91,000.00	0	91,000.00	0.92	0.30
GMT SHIPPING LTD.	65,050.95	7,745.13	72,796.08	0.74	0.24

GRIMALDI GH. LTD.	179,114.71	154,862.15	333,976.86	3.38	1.11
HAPAG-LLOYD GH. LTD.	661,313.37	317,757.26	979,070.63	9.89	3.26
HULL BLYTH GH. LTD.	24,910.86	4,598.24	29,509.10	0.30	0.10
JNI SHIPPING EXPERTS LTD.	27,964.75	0	27,964.75	0.28	0.09
INTERMODAL SHIPP. AGENCY GH. LTD.	122,273.70	145,838.95	268,112.65	2.71	0.89
JERIEMACOS CO. LTD.	4,418.53	106,563.12	110,981.65	1.12	0.37
KOYANKS CO. LTD.	48,830.00	76,254.74	125,084.74	1.26	0.42
MAERSK GH. LTD.	1,395,037.89	330,895.61	1,725,933.50	17.44	5.74
MARINE & ENERGY	228.95	238.79	467.74	0.00	0.00
MIDLAND INTERNATIONAL GH. LTD.	2,370.03	0	2,370.03	0.02	0.01
MULTI - PLAN LTD.	54,891.46	114,421.80	169,313.26	1.71	0.56
MSC GH. LTD.	1,684,228.66	485,908.53	2,170,137.19	21.93	7.22
OCEAN NETWORK EXPRESS GH. LTD.	196,493.99	89,943.46	286,437.45	2.89	0.95
OIL AND MARINE AGENCY	121.33	0	121.33	0.00	0.00
ONSHORE OFFSHORE GH. LTD.	124,448.89	0	124,448.89	1.26	0.41
ORIENT OVERSEAS CONTAINER LINES GH. LTD	0.00	36,080.50	36,080.50	0.36	0.12
OBT SHIPPING GH. LTD.	99.10	0	99.10	0.00	0.00
PIL GH. LTD.	354,441.01	131,198.96	485,639.97	4.91	1.62
PORTS MARINE LTD.	3,074.02	0	3,074.02	0.03	0.01
SPEEDE CARGO AND ADVISORY CONSULT LTD.	1,200.00	0	1,200.00	0.01	0.00
SEALAND SHIPPING & INLAND SERVICES LTD.	702.47	0	702.47	0.01	0.00
SEVENLOG LTD.	101,317.36	0	101,317.36	1.02	0.34
SHARAF SHIPPING AGENCY LTD.	5,447.28	0	5,447.28	0.06	0.02
STARDEX MARINE CONSULT LTD.	2,146.25	0	2,146.25	0.02	0.01
SUPERMARITIME GH. LTD.	83,972.52	0	83,972.52	0.85	0.28
THREEPORT LOGISTICS	87,992.99	0	87,992.99	0.89	0.29
SEA APOSTPEX GH. LTD.	7,417.50	0	7,417.50	0.07	0.02
OVAL SHIPPING	249.85	0	249.85	0.00	0.00
MACRO SHIPPING GH. LTD.	80,240.54	133,118.73	213,359.27	2.16	0.71
SUB-TOTAL	**6,844,070.89**	**3,050,681.33**	**9,894,752.22**	**100.00**	**32.91**
BREAK BULK					
AMS LOGISTICS LTD.	145,643.39	0	145,643.39	6.52	0.48
BOLLORE GH. LTD.	0	1,117,159.10	1,117,159.1	50.05	3.72
BULK SHIP & TRADE LTD.	941.54	0	941.54	0.04	0.00
COMEXAS GH. LTD.	0	5,050.00	5,050	0.23	0.02
COSCO SHIPPING LINE GH.	14,111.15	4,699.00	18,810.15	0.84	0.06
GLOBAL CARGO AND COMMODITEIS	0	1,234.09	1,234.09	0.06	0.00
GRIMALDI GH.	0	775.11	775.11	0.03	0.00
HASS LOGISTICS GH. LTD.	138,870.58	0	138,870.58	6.22	0.46
HULL BLYTH GH. LTD.	49,737.31	1.00	49,738.31	2.23	0.17
MAERSK GH. LTD.	0	11,656.80	11,656.80	0.52	0.04
MSC GH. LTD.	0	3,960.60	3,960.60	0.18	0.01
MULTI - PLAN LTD.	8,053.00	0	8,053.00	0.36	0.03
NAVITRANS MARINE ENERGY SERVICES GH. LTD.	2,500.00	0	2,500.00	0.11	0.01
OVAL SHIPPING AND LOGISTICS LTD.	4,435.00	0	4,435.00	0.20	0.01
OBT SHIPPING GH. LTD.	15,538.98	0	15,538.98	0.70	0.05
PORTSIDE LOGISTICS LTD.	12,804.69	0	12,804.69	0.57	0.04
SEVENLOG LTD.	30,000.00	0	30,000.00	1.34	0.10
SUPERMARITIME GH. LTD.	184,318.16	0	184,318.16	8.26	0.61
THREE PORT LOGISTICS LTD.	88,965.92	0	88,965.92	3.99	0.30

WEST ATLANTIC PORTS SERVICES GH. LTD.	377,399.99	0	377,399.99	16.91	1.26
WATERFRONT ALL SERVICES LTD.	13,691.56	619.32	14,310.88	0.64	0.05
SUB-TOTAL	**1,087,011.27**	**1,145,155.02**	**2,232,166.29**	**100.00**	**7.42**
DRY BULK					
ADVANCED MARITIME TRANSPORTS GH. LTD.	4,400.00	0	4,400.00	0.04	0.01
BLUESEAS SHIPPING SERVICE GH.	0	9,500.00	9,500.00	0.09	0.03
BULK SHIP & TRADE LTD.	9,398.96	0	9,398.96	0.09	0.03
COMEXAS GH. LTD.	0	5,000.00	5,000.00	0.05	0.02
GLOBAL CARGO AND COMMODITIES	263,716.14	14,249.63	277,965.77	2.70	0.92
GO MOVERS LOGISTICS GH. LTD.	109,486.01	0	109,486.01	1.06	0.36
HASS LOGISTICS GH. LTD.	49,483.80	0	49,483.80	0.48	0.16
HULL BLYTH GH.	1,491,796.87	43,029.00	1,534,825.87	14.89	5.10
INCHCAPE SHIPPING SERVICES	44,915.92	132,357.00	177,272.92	1.72	0.59
LUX CARGO SERVICES LTD.	0	1,316,635.61	1,316,635.61	12.77	4.38
MACRO SHIPPING GH. LTD.	340,702.00	51,430.10	392,132.10	3.80	1.30
MSC GH. LTD.	0	779.20	779.20	0.01	0.00
OBT SHIPPING GH. LTD.	4,895.69	136,840.42	141,736.11	1.37	0.47
OVAL SHIPPING	0	981,296.76	981,296.76	9.52	3.26
MAP SHIPPING COMPANY LTD.	18,686.28	0	18,686.28	0.18	0.06
SEVENLOG LTD.	792,726.72	0	792,726.72	7.69	2.64
SUPERMARITIME GH. LTD.	643,543.28	3,164,831.01	3,808,374.29	36.94	12.67
THREEPORT LOGISTICS	184,457.88	246,271.23	430,729.11	4.18	1.43
STARDEX MARINE CONSULT LTD.	250,133.16	0	250,133.16	2.43	0.83
SUB-TOTAL	**4,208,342.71**	**6,102,219.96**	**10,310,562.67**	**100.00**	**34.29**
LIQUID BULK					
BLUESEAS SHIPPING SERVICE GH.	48,170.29	0	48,170.29	0.63	0.16
BULKSHIP & TRADE LTD.	1,702,487.57	0	1,702,487.57	22.31	5.66
CMA CGM GH. LTD.	153,994.32	0	153,994.32	2.02	0.51
HULL BLYTH GH. LTD.	319,074.49	0	319,074.49	4.18	1.06
INCHCAPE SHIPPING SERVICES	2,185,111.57	10,391.53	2,195,503.10	28.77	7.30
IDF MARIA LTD.	23,553.68	0	23,553.68	0.31	0.08
MIDLAND INTERNATIONAL GH. LTD.	16,166.25	0	16,166.25	0.21	0.05
MARINEMOR CONSULT LTD.	55,266.79	0	55,266.79	0.72	0.18
MAP SHIPPING COMPANY LTD.	11,000.00	0	11,000.00	0.14	0.04
MARINE & ENERGY	27.66	0	27.66	0.00	0.00
OIL AND MARINE AGENCY	346,502.84	0	346,502.84	4.54	1.15
OVAL SHIPPING LOGISTICS LTD.	60,789.80	0	60,789.80	0.80	0.20
PETROMAR OIL LOSS CONSULTANCY LTD.	14,764.92	0	14,764.92	0.19	0.05
PORTS MARINE LTD.	3,684.34	0	3,684.34	0.05	0.01
QUANTUM TERMINALS LTD.	65,196.94	0	65,196.94	0.85	0.22
SEVENLOG LTD.	496,377.83	0	496,377.83	6.50	1.65
SUPERMARITIME GH. LTD.	17,195.45	1,164,892.00	1,182,087.45	15.49	3.93
THREEPORT LOGISTICS	9.40	0	9.40	0.00	0.00
WEST ATLANTIC PORTS SERVICES GH. LTD.	755,778.42	15,000.00	770,778.42	10.10	2.56
OTHER	166,852.03	0	166,852.03	2.19	0.55
SUB-TOTAL	**6,442,004.59**	**1,190,284.53**	**7,632,288.12**	**100.00**	**25.38**
GRAND TOTAL	**18,581,429.46**	**11,488,339.84**	**30,069,769.30**		**100.00**

The Strait of Homuz and its strategic relevance to Global Trade

The Strait of Hormuz is one of the most critical shipping corridors in the global maritime system. Situated between Iran to the north and Oman to the south, it serves as a vital gateway connecting the Persian Gulf to the Gulf of Oman and onward to the Arabian Sea, making it indispensable to global trade particularly in energy transport.

Despite its importance, the strait is geographically constrained, measuring about 33 kilometres at its narrowest point, with shipping lanes of roughly three kilometres in each direction. Within this limited space, an estimated 20 percent of the world's petroleum supply transits daily, carried by tankers from major exporters such as Saudi Arabia, United Arab Emirates, Kuwait, Qatar, Iraq, and Iran. This results in consistently high traffic, with crude oil tankers, LNG carriers, and other commercial vessels navigating the corridor daily.

Given its role as a major maritime chokepoint, any disruption in the Strait of Hormuz whether due to geopolitical tensions, security incidents, or navigational challenges can have immediate global consequences. These include fluctuations in oil prices, increased shipping costs, and adjustments in vessel routing. For the shipping and logistics industry, the stability of this corridor remains a key barometer for risks affecting energy supply chains and international trade flows.

TERMINOLOGIES

Terminal Handling Charge (THC)

Terminal Handling Charge (THC) is the cost for handling goods or containers at a port. The THC for FCL (Full Container Load) shipments is charged for moving the container itself, while for LCL (Less than Container Load) shipments covers the packing or unpacking of goods and is billed in W/M (Weight or Measurement).

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