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**INTERNATIONAL JOURNAL OF ADVANCED LEGAL RESEARCH**

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**LEGAL AND REGULATORY CHALLENGES OF ARRESTING  
UNMANNED AND AUTONOMOUS SHIPS UNDER INDIAN ADMIRALTY  
LAW**- Nisiya Liz Cherian<sup>1</sup>**Abstract**

This research paper examines the emerging legal and regulatory challenges that are posed by Maritime Autonomous Surface Ships (MASS) within the framework of the Indian Admiralty Law specially focusing on the Admiralty (Jurisdiction and Settlement of Maritime Claims) act, 2017. The advent of unmanned and autonomous vessels challenges the traditional maritime legal concept which are rooted in human presence and direct onboard control which can lead to ambiguities in definitions, liability attribution and procedural enforcement specially when it comes to ship arrest and detention. This paper analyses key statutory provisions and judicial interpretations in Indian Admiralty courts and compares them with the ever evolving international conventions and the guidelines which are developed by the International Maritime Organisation. It identifies India's current regulatory regime concerned with autonomous vessel governance including the gaps in arrest jurisdiction, cyber risk management and liability framework. This paper advocates for the need of legislative reforms and gives a foundation for policymakers and scholars to guide India's proactive adaptation to maritime revolution thereby reinforcing maritime security and legal governance in an era of technological transformation.

**Key words**

Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017

Maritime Autonomous Surface Ships(MASS)

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Ship Arrest

Maritime Claims

Autonomous Ships

Cybersecurity Risk

Ship detention and enforcement

International Maritime Organisation (IMO)

Maritime Dispute Resolution

Admiralty Jurisdiction

MARPOL( International Convention for the Prevention of Pollution from Ships)

CLC(Civil Liability Convention) protocols

Maritime Law in India is a legislative framework that consists of statutes like the Admiralty Act, 2017 and the Merchant Shipping Act, 1958 which regulates maritime activities - like regulating shipping, ports and maritime claims. It governs any shipping activity in India and handles any sort of maritime dispute to arise in the country. The definition of a 'ship', determining the liability and various Admiralty enforcement mechanisms under Indian law is based on the assumption that there is presence of human command and workforce on board . The emergence of Unmanned and Autonomous Ships showcases a transformative future for global maritime operations by promising efficiency ,enhanced safety and reduced costs .

However the merging of these maritime vessels into the Indian waters has shown the significant gaps in the already existing legal framework specially in Admiralty Law . The recent legislation , Admiralty Act ,2017 had developed protocols for the arrest of Ships and to hold them liable when faced with fundamental challenges even for ships that are Unmanned - for ships with no crew or remote operators. Although it is not specifically mentioned , the Indian Admiralty Act while defining the vessel includes the term as 'whether propelled or not' while broadly explaining that the vessel could be Unmanned or Autonomous.<sup>1</sup>

The MASS(Autonomous Maritime Surface Ships) falls under the grey areas as there is some ambiguity that is present with defining the term 'master' of the ship and also in holding accountability when there are some incidents or breaches of regulations These challenges are

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further combined by the complexity of arresting the vessels that may be controlled remotely or from abroad making detention and judicial orders difficult to implement .

India's maritime regime started off legally with the implementation of the Indian Admiralty Act 2017 which was a change from the colonial era Admiralty acts which are inapplicable in today's world where maritime law is globally advanced.

Automated vessels are slowly replacing conventional ships for various marine activities like servicing pipelines or installation of any offshore equipment . With the technological advancements these Autonomous vessels will add to the benefit of both law enforcement entities . These technologies will in the future render ocean navigation to be a safer enterprise by ensuring human error . The Indian Admiralty law does not address does not express the explicit mention of the liability of autonomous or Unmanned Ships in India

### Statement of Problem

The main problem that is to be addressed through this research paper is the lack of significant legal and regulatory provisions to govern the arrest of Unmanned and Autonomous Ships while applying the Indian regulatory state Indian Admiralty Act,2017. While the Indian Admiralty (Jurisdiction and Settlement of Maritime Claims ) act, 2017 does provide a definition for the legal framework for ship arrest, it is fundamentally designed for the traditional , crewed vessels which have human centered operations . Section 5 of the Admiralty Act establishes the prerequisites for Ship arrest in India. The significance of Section 5 extends beyond mere procedural reform. It embodies India's commitment to aligning domestic maritime law with International conventions like the Brussels Convention on the Arrest of ships, 1952 and the Geneva Convention on the Arrest of Ships,1999 although India is not a signatory to these conventions.<sup>2</sup>

The emergence of Unmanned and Autonomous Ships have introduced various challenges like

- In the absence of a manned crew and human operators, the definition of a “ship” or a “master” changes from the legal definition as it complicates legal responsibility and accountability under Indian Law . During the time of a legal issue or a proceeding, where the Autonomous vessel is said to be at fault. In such an instance, it would be extremely

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difficult to prove fault and to hold accountability as there is no human responsibility in such an issue.

- The legal ambiguities when accidents or any sort of regulatory breaches occur, given the fact that these autonomous ships highly rely on artificial intelligence and remote control systems is highly difficult as it is challenging the traditional fault based liability system.<sup>3</sup>
- There is also a huge lack in proper protocols and regulations for any sort of cybersecurity risks that were to arise due to the involvement of artificial intelligence , insurance coverage and enforcement mechanism which is to address the Autonomous vessel operation under the Indian jurisdiction.

The whole problem centres on the incapacity of the already legal framework with the technological advancements of autonomous shipping which has led to gaps in jurisdiction , liability attribution and regulatory compliance under Indian Admiralty Law.

### Research Questions

- How is the current Indian Admiralty ( Jurisdiction and Settlement of Maritime Claims) Act , 2017 defining the terms ‘ship’ and ‘master’ and how are these terms applicable when addressing Autonomous and Unmanned Ships ?
- What are the regulatory provisions that are involved in arresting Unmanned and autonomous ships under Indian jurisdiction if specified under the Indian Admiralty law?
- How can liability be appointed on to cases where the accidents have involved Unmanned and Autonomous vessels specially regarding service of legal notices and physical detention
- How can Indian Admiralty Law include cyber risk and technological reliability and international regulations to govern Autonomous shipping?
- How have Indian courts addressed the challenges that are posed by Autonomous Ships in the recent technological advanced world specially with the advancement of Artificial Intelligence in the recent world ?

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- What are the legislative and regulatory reforms that are necessary to harmonise Indian Admiralty Law with the global maritime conventions and emerging international frameworks on Autonomous Maritime vessels?
- What is the framework that can be developed to ensure that there is cybersecurity compliance and environmental safety for Maritime Autonomous Surface Ships (MASS) specially those which are operating under Indian Jurisdiction.

### Significance of Research

The significance of the research is in its analysis of the technological innovation in maritime transportation which intersects with the established legal framework. With the advent of the Maritime Autonomous Surface Ships (MASS) onto Indian and International waters, this research talks about the urgent need to adapt Indian Admiralty Law which talks about the traditionally governed manned vessels - to effectively regulate, adjudicate and enforce any sort of maritime claims which are to involve the Unmanned and Autonomous ships. The main significance of this research paper is to fill the existing legal gaps that are formed due to the lack of the existence of a regulatory framework for Unmanned and Autonomous Ships. There is a huge deficiency in the Indian Admiralty Act regarding definitions, procedural arrest mechanisms, liability holding and other enforcement protocols in relation to Autonomous vessels. This would help prevent any sort of legal uncertainty that is to arise.

By exploring liability and regulatory challenges, the study also contributes to the enhanced safety standards, the cybersecurity framework and the risk mitigation strategy that is tailored for Autonomous ship operations in Indian maritime jurisdiction. This research could bring in insight into the procedural challenges that is to enable the courts to manage jurisdictional claims and arrest proceedings which ensures that the Indian Admiralty Courts remain effective and relevant in the evolving maritime domain. The research would also encourage the harmonisation of Indian Maritime Law with that of the International conventions issued by international bodies such as International Maritime Organization thereby supporting India's compliance with that of the global shipping industry.

By pointing out the gaps and by offering solutions, this research would provide a foundation for the lawmakers and regulators and policymakers to modernize maritime statutes and rules which

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enables India to lead responsibly in the adoption and regulation of autonomous shipping technology. As an emerging field, this research would also enrich scholarly discourse on maritime law and Autonomous technology while trying to combine the two and offer legal officers and maritime professionals insights into one of the most significant technological shifts in the shipping industry.

### Scope and Limitation of Research

The scope of this research is to focus on examining the legal and regulatory challenges that are faced related to the arrest of Unmanned and Autonomous Ships (Maritime Autonomous Surface Ships -MASS) under the Indian Admiralty law framework specially under the Indian Admiralty (Jurisdiction and Settlement of Maritime Claims ) act, 2017. It mostly investigates on how traditional Admiralty concepts such as the definitions of 'ship' and 'master' , liability attribution, procedures for arrest of vessels and other enforcement mechanisms are impacted by the unique characteristics of autonomous shipping technology. The research also highly delves upon aligning the gaps in Indian maritime law and applying emerging international guidelines in relation to Autonomous vessels from bodies like the International Maritime Organization. This research would want to identify the legislative amendments and the judicial approaches and policy innovation that will be necessary for any sort of legal clarity that is to be brought in for the effective governance of unmanned ships in the Indian waters. The research paper will also look into the cybersecurity and insurance and safety concerns that are to arise as maritime legal challenges.

There are various limitations of this research however as this research is limited to the framework provided by the Indian Admiralty law and does not extensively cover other maritime laws like the Merchant Shipping Act . It also does not deeply delve into the technical and operational aspects of Autonomous shipping. The regulatory challenges outside of ship arrest such as the certification of the crew or cargo liability specifics are only briefly talked about.

Empirical studies and data and case laws related to Autonomous ship arrests specially in India is limited due to the nascent stage of such vessels in the Indian maritime commerce . The research also only talks about surface vessels - Maritime Autonomous Surface Ships -MASS and does not cover underwater Autonomous vessels.

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## Objective of Research

- In order to assess the suitability of the current Indian Admiralty legal framework for controlling the arrest and liability of unmanned and autonomous ships (Maritime Autonomous Surface Ships, or MASS), particularly the Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017.
- To recognize and investigate particular legal, regulatory, and procedural issues pertaining to ship arrest, liability distribution, enforcement procedures, and jurisdiction under Indian maritime law that are brought about by autonomous shipping technologies.
- To explore pertinent international agreements, rules (particularly those issued by the International Maritime Organization), and comparative legal systems in order to evaluate their suitability and potential for incorporation into Indian law for self-governing vessels.
- To make suggestions for the legislative, judicial, and policy changes necessary to bring Indian Admiralty law up to date, including revised definitions, conceptions of liability, cybersecurity safeguards, and procedural standards to take into account the special features of MASS
- To determine whether Indian courts and maritime institutions are prepared to handle new autonomous shipping practices and to provide procedures for efficient enforcement and conflict settlement in this changing environment<sup>4</sup>
- To provide academic understanding of the relationship between fast developing marine technologies and maritime law in order to assist stakeholders in integrating autonomous shipping in Indian seas in a way that is both sustainable and compliant with the law.

## Research Methodology

This research paper follows a doctrinal legal research methodology which basically entails a detailed analysis of the existing legal framework, case laws and International legal instruments. There is a Statutory analysis -there is a break down of the Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017 which talks about the judicial decisions from the Indian Court on ship arrest and maritime claims and focuses on the applicability and the

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limitations regarding Maritime Autonomous Surface Ships (MASS). There is comparative legal study between the guidelines from International organizations like International Marine Organisation (IMO) and regulatory frameworks from other maritime jurisdictions to understand the global trends and the best practices which concern the unmanned and autonomous ships. There is a critical interpretation of legal definitions and procedural requirements within Indian Admiralty law to identify the doctrinal gaps that are present with the advent of autonomous vessel technologies. There is also a gathering of academic articles and papers and analysing the regulatory and legal challenges that are posed by the autonomous ships to frame the broader context and challenges that are faced in India . There is a qualitative and analytical approach to making of this research paper trying to bring an intersection between autonomous maritime technology and Indian Maritime law leading to reasoned recommendations for legal and Regulatory reforms that are to balance the technological advancement within maritime legal principles.

### Literature Review

There has been consistent academic analysis based on the concept of maritime law . The statute that governs the Indian maritime law - Admiralty (Jurisdiction and Settlement of Maritime Claims) Act,2017 and the Merchant Shipping Act,1958 talks about the historically existing conventional shipping activities which are manned . Various scholars point out the inadequacy of the already existing legislation to deal with Unmanned or automated shipping vessels which may come with nuanced challenges especially when it comes to topics of ship arrest or holding legal responsibility when there is an absence of crew on board.

The introduction of the Maritime Autonomous Surface Ships(MASS) has established a transformative mark in the maritime industry as this has shown intense development in technological advancement in the field of maritime law as with the introduction of cutting edge technologies like Artificial Intelligence , Internet of Things (IoT) and automation . The incorporation of varying degrees of automation has helped to support and replace any sort of human intervention when it comes to the operation of the vessel .

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*International Conventions related to the seas and ships have not provided a unified or specific definition of autonomous ships*<sup>5</sup>. The research Article - Legal Issues And Liability Of Autonomous Ships: An Analytical Study On The Application of International Maritime Law

The research article - *Autonomous Ships and Indian Maritime Law: Challenges and Opportunities* in the Niti Tantra <sup>6</sup>. talks about the challenges that are faced by Autonomous vessels with the absence of a human creator . One of the key challenges that is addressed in this paper is on defining Responsibility and Liability: where trying to determine the “master” of an Autonomous ship would be hard as when in comparison to traditional maritime laws where specific duties are assigned to different roles , this is inapplicable in the case of an Autonomous or remotely operate vessels and the liability of accidents in this case would be difficult to determine.

India's maritime law has been modernised with the new Admiralty Law , 2017 which does not properly address the fully Autonomous and remote - operated ships . Although the statute provides prerequisites for arresting ships like holding the owners of the vessels liable this would completely be different in the case of autonomous vessels . There are various studies that address the challenges in attributing liability in the case of incidents which involve autonomous weapons and therefore a need to redefine traditional maritime concepts such as “seaworthiness” when it comes to digital navigation and artificial intelligence based systems .

The literature talks about the fundamental problem of allocating liability in incidents which involve autonomous ships. With the operational control which is being decentralised or managed by the AI systems, concepts of fault and seaworthiness require evaluation. The integration of cybersecurity risk management into maritime liability framework also emerges as a pressing issue, calling for international alignment with conventions like MARPOL( International Convention for the Prevention of Pollution from Ships) and CLC(Civil Liability Convention) protocols. This research is favoring strict liability for the technological nature of MASS to ensure accountability and enhance the safety standards. The comparative analyses reveal a substantial body of International efforts that has been taken to address autonomous shipping which is headed by the International Maritime Organisation (IMO) which had begun making guidelines to

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regulate such vessels.

The technological intricacies of MASS is focused upon specially on how the legal framework must acknowledge and incorporate AI reliability , remote operation capabilities and cyber physical systems. The literature talks about the regulatory lag that may expose the maritime stakeholders to huge risks without coherent insurance policies and liability structures which are adapted to autonomous vessel operations. This research paper would demonstrate a consensus on the urgent need for legal evolution within the Indian Admiralty law . It calls for legislative amendments, policy innovations that I'll intergt-rate the evolving maritime technologies and International conventions while trying to protect the maritime safety , liability clarity and the procedural fairness. This research can help bridge the regulatory gaps and enhance the enforceability of arrest and liability claims that would include involving Unmanned and Autonomous ships in India's waters.

### Introduction

Maritime Law in India is the field of law which deals with a huge array of maritime activities that is related to shipping, ports , maritime claims and various marine dispute resolution. The main cornerstone to the legal matrix of maritime law in India is the Admiralty(Jurisdiction and Settlement of Maritime Claims) Act,2017 which had replaced the previously existing colonial era Admiralty laws which were highly outdated and had come into force on 1st April 2018. This Act gives a comprehensive yet a modern statutory framework delineating Admiralty jurisdiction in Indian judicial courts , adjudicating maritime claims and also having procedural norms for arrest,detention and the sale of these vessels . The 2017 Act basically talks about the significant advancement by expanding the maritime jurisdiction beyond the traditional trio of Bombay, Calcutta and Madras High Courts to include other High Courts with maritime relevance and by modernizing the landscape for the adjudication of maritime disputes. It adds in procedural concepts in part with international instruments like the Brussels Convention on the Arrest of Ships, 1952 <sup>7</sup> and the Geneva Convention on the Arrest of Ships,1999<sup>8</sup> although India is not formally a party to either of these conventions . Section 5 of the Indian Admiralty Act talks about the statutory prerequisites for Ship arrest and granting courts with the discretionary power which

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is balanced by Safeguards to prevent any sort of wrongful detention and the abuse of arrest mechanism.<sup>9</sup>

However with the rapid technological advancement in this globalised world , maritime transport has marked a rise of the Maritime Autonomous Surface Ships (MASS)- these are the vessels that are capable of operating without the presence of a human crew on board and uses artificial intelligence, remote command and sensor based navigation which has exposed various significant gaps in the current Indian Admiralty legal framework regarding the same. As India progressively embraces technological revolution and automation driven maritime commerce , the blending of MASS into Indian waters has challenged the traditional maritime legal concepts which assume the presence of human command and workforce aboard the vessels.

While the Admiralty Act, 2017 broadly defines ‘vessel’ as ‘whether propelled or not’ implicitly encompassing Unmanned ships, it does not explicitly talk about the presence of such technologies. Key areas of ambiguity may include the definition of ‘master’ , the responsibility and liability of autonomous operations , procedural adaptations which are needed for arresting remotely controlled vessels and the various protocols that are to address the cybersecurity risk that are associated with the AI based navigation systems. The main problem revolves around the incapacity of the existing legal framework which is largely drafted with crewed vessels in mind and not autonomous ones. Without a clear statutory guidance or any sort of judicial precedent adapting to these new realities, unresolved jurisdictional , accountability procedural issues that can undermine the effective maritime law enforcement and dispute resolution within India’s jurisdiction.

As autonomous maritime technologies are evolving and proliferating globally, the international bodies such as the International Maritime Organisation (IMO) have begun to provide regulatory guidelines and conventions to fill these gaps. Alignment with such an international framework is extremely crucial for India to integrate MASS effectively within its legal framework and commercial maritime environment so as to ensure that the maritime interests are safeguarded and that these technological advancements are welcomed by Indian maritime. India is still in the nascent stages of harmonizing its domestic statute with these international regulatory trends, necessitating proactive legislative and policy reforms.<sup>10</sup>. India’s maritime judicial system includes Admiralty Courts in Key Ports such as Mumbai, Kochi and Chennai and has

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demonstrated proactive engagement with contemporary challenges and issuing orders related to global maritime disputes. However cases specifically addressing Autonomous vessels remains sparse due to the technology's nascent penetration in Indian Shipping ecosystems .

### Emergence of Autonomous Maritime Vessels

Autonomous Maritime Surface Ships (MASS) represents a significant technological advancement in the maritime sector which is characterised by vessels which are capable of operating without human crew onboard, navigating through advanced artificial intelligence (AI), sensor networks and remote control systems. The adoption of MASS around the world has increased efficiency , reduced human error , higher safety standards and lower operating costs. These innovations, however , present legal and regulatory challenges that the existing maritime laws, including the Indian statutes, are only beginning to address.

India has made considerable progress in technologies that will enable autonomous Maritime operations. The government initiative such as the Sagarmala Programme<sup>11</sup> is aimed at modernizing ports and to enhance the coastal economic zones which are increasingly accommodating innovations which are related to autonomous shipping by upgrading infrastructure, logistics and port services. There are various institutions in India like the **Indian Maritime University** (IMU) and the **National Institute of Ocean Technology** (NIOT) which have initiated various initiatives and projects on remote controlled and Autonomous underwater vehicles , which are indirectly contributing to Surface vessel autonomy.

The crucial technological capabilities like satellite - based navigation and communication systems specially India's GPS Aided Geo Augmented Navigation(GAGAN) which is developed by ISRO and AAI are foundational for precise navigation and control which is needed by autonomous vessels in the Indian waters. Additionally India's collaboration with Quad members including the United States and Japan on maritime security and technological advancement supports the country's evolving expertise in autonomous Maritime systems.

Although India has not established a dedicated regulatory framework governing autonomous vessels yet, there is clear movement towards integration of international guidelines. India has started to align with the International Maritime Organization (IMO) standards such as IMO's

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Guidelines on Maritime Cyber Risk Management , which recognize the increased cyber risks which are attached with MASS . The Minister of Ports, Shipping and Waterways has signaled their intentions to develop regulations to define operational standards, safety protocols, liability and certification mechanisms for autonomous vessels while trying to harmonize with international conventions like MARPOL and the Civil Liability Convention (CLC).

The policymakers acknowledged that autonomous vessels required an expansion of already existing maritime concepts such as “seaworthiness” to incorporate the AI system reliability, cybersecurity and safe operation protocols that differ substantially from crewed ships.

The emergence of autonomous vessels causes various challenges in insurance and liability coverage. The operational risks that arise from cyber attacks , software failures, data breaches and AI decision errors will ensure the need for insurance products customized for autonomous shipping. India;s regulatory framework is contemplating the comprehensive liability in endurance schemes which encompasses third party claims for any collisions , environmental damage and cybersecurity incidents.

The future road map for autonomous shipping in India has multiple phased development efforts:

- Infrastructure and pilot testing phase which is to establish autonomous Maritime corridors and testbed in controlled ports and the coastal areas.
- Regulatory development phase - which will include drafting and enforcing the national standards which is consistent with IMO guidelines that will cover vessel certification operation, cybersecurity and liability
- Commercial deployment and scaling phase , by integrating autonomous vessels in high traffic commercial routes and expanding technological factors like green shipping initiatives
- Global leadership phase which aims India to become a pioneer in autonomous Maritime technology , specifically in the Indo Pacific region , promoting sustainability and digital innovation <sup>12</sup>

The profiler action of autonomous vessels have disrupted the already established legal principles under Indian Admiralty Law , specially around - the definition of “master” and legal

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accountability in the absence of a human crew onboard, The service of legal notices and vessel arrest procedures that depend on physical control and presence, cybersecurity related liability and enforcement mechanism

The Indian Admiralty Law currently lacks explicit provisions addressing these challenges , though the broad wording of the 2017 Act defining “vessel” as “whether propelled or not” may suggest Implicit coverage .

#### International Bodies and Conventions on MASS

The rapid technological advancement and operational deployment of MASS has necessitated a coordinated global response which is primarily led by the International Maritime Organisation (IMO). As the United Nations specialized agency responsible for regulating shipping, the IMO is at the complete forefront of developing a comprehensive legal and safety framework for addressing the challenges that are posed by these Autonomous vessels while ensuring the secure, safe and environmentally responsible operation of MASS within international waters and ports.<sup>13</sup>

The IMO has initiated a regulatory scoping exercise which is to evaluate the applicability and the adequacy of the existing international maritime conventions and instruments such as SOLAS(Safety of Life at Sea), COLREG(Collision Regulations), MARPOL(Pollution Prevention), STCW (Standards of Training , Certification and Watch keeping for Seafarers) and the FAL Convention(Facilitation of International Maritime Traffic) in the context of MASS operations.<sup>14</sup>

A critical output of the IMO’s work has been the identification of four degrees of autonomy which is applicable to MASS

- Degree One: Ship with automated process and decision support , Seafarers onboard to operate and control the shipboard systems
- Degree Two : Remotely controlled ship with Seafarers onboard
- Degree Three: Remotely controlled ship without any Seafarers onboard
- Degree Four: Fully Autonomous ship capable of making decisions and determining actions independently without any human intervention .<sup>15</sup>

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This helps in clarifying the functional and operational parameters for MASS UNDER different scenarios and informs the regulatory treatment of various autonomy levels.

The IMO has established the Joint MSC-LEG-FAL Working Group on MASS(MASS-JWG). This cross disciplinary group is tasked with identifying the regulatory gaps, harmonizing approaches across safety , legal and facilitation domains and formulating a strategic road map for MASS regulation. The MASS JWG is actively working on critical legal and operational issues like - defining and the responsibility and accountability of the “master” and crew in the MASS context, competency requirements for remote operators and the possibility of one operator managing multiple vessels simultaneously, regulatory gaps concerning cyber risk management, Facilitation measures to streamline customs, immigration and security procedures for autonomous ship procedures under the FAL Convention.

Furthermore, in order to connect business interests with regulatory compliance, insurance bodies, classification societies, and marine technology companies work together internationally to set standards for the safety, security, and insurance of MASS.<sup>16</sup>

### Indian law

For India, an active member of the IMO, these global regulatory advancements offer crucial standards and direction. In order to facilitate coastguard and port security operations, guarantee the legal acceptability of autonomous vessels in Indian territorial waters and ports, and allow Indian maritime commerce to compete in the global autonomous shipping ecosystem, it is imperative that Indian admiralty and maritime regulations be brought into compliance with IMO standards.

By gradually implementing these MASS conventions and codes, India will close regulatory gaps brought to light by the emergence of autonomous shipping. These regulations will address important legal issues such as liability assignment, arrest procedures, jurisdictional concerns, and enforcement mechanisms in the Indian admiralty context. While the Admiralty( Jurisdiction and Settlement of Maritime Claims), Act 2017 provides a modern legislative framework for ship arrest , its direct applicability to MASS remains legally ambiguous. The definitions of “ship” and “master” have not been explicitly explained to address the Unmanned or autonomous ships and statutory liability provisions remain completely human centric.

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Although Indian courts have demonstrated their willingness to use admiralty jurisdiction in matters involving pollution and damage to ships, they have not yet effectively addressed issues unique to autonomous vessels. There is a regulatory gap caused by the lack of specific regulations addressing cybersecurity, remote operational command, and AI control systems.<sup>17</sup> The Indian government's Sagarmala initiative and related maritime policies are gradually incorporating technology - driven reforms but have not yet fully codified autonomous shipping governance.

Since the Indian Admiralty Act does not exclusively talk about autonomous shipping, there aren't many case laws and precedents that are to talk about the latter. However one landmark example is the *State of Kerala v MV MSC Akiteta II & Ors.* wherein in accordance with Section 5(2)'s "sister ship" provisions, the court had authorized for the detention of a sibling vessel. This arrest was requested in relation to the claims made for marine pollution and environmental harm brought on by the MSC Akiteta II's sinking. The ruling had demonstrated the Indian judiciary's participation to extend admiralty jurisdiction in order to successfully protect the significant marine claims and to uphold the environmental responsibility.<sup>18</sup> Strict adherence to the "reason to believe" standard—a balance which is brought in between the interests of maritime creditors seeking security and the defense of shipowners against arbitrary arrests—has also been another crucial component of Section 5's implementation. The claimant must provide prima facie facts that support an arrest in accordance with a fair legal process; simple accusations which are made are insufficient, according to rulings written by Indian High Courts in Bombay, Chennai, and Calcutta.

Though they have shown basic flaws in the Indian admiralty law, specially in regard to the arrest and culpability of unmanned or remotely piloted vessels, marine autonomous surface ships show a paradigm shift in the maritime industry. Due to its human-centered operational assumptions, the current legal framework finds it difficult to adapt to the technical realities of remote command, autonomous navigation, and AI-driven decision-making.

## Findings

The Key Findings of the research paper can be noted as the following

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- Inadequacy of the Current Indian Admiralty law for Autonomous Ships: Despite updating India's maritime laws, the Indian Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017 is mostly based on conventional ships with human crews. The definitions, liability regulations, and procedural measures like ship arrest assume that there are actual humans on board and exercise direct human supervision. When there is regulation of autonomous and unmanned Maritime Autonomous Surface Ships (MASS), this creates serious legal issues.
- Ambiguity in definitions and Liability: The Important words like "ship," "master," and "person in control" aren't specifically defined for use with AI-powered or remotely operated ships. For autonomous vessels, the absence of a clearly defined legal personality makes it difficult to pursue any sort of maritime claims, assign blame, and determine liability in mishaps or violations of maritime laws.
- Procedural challenges in Ship Arrest and Enforcement : Current legal areas have practical restrictions on arresting an unmanned ship, including jurisdictional enforcement, physical detention, and serving of process, when the vessel is operated abroad or is managed remotely. This procedural flaw has the jurisdictional effectiveness of the Admiralty courts and limits the effective redress available to maritime plaintiffs.
- Cybersecurity and Technological Risks Lag in regulation : The already existing marine regulations do not handle the emerging cyberthreats which are posed by autonomous vessels. Indian law for MASS also lacks a particular statutory mandate on digital navigation standards or cyber risk management, which can increase the vulnerability and legal ambiguity surrounding liability, safety, and insurance.
- International Regulatory Developments : It is highly advised that India is to actively participate in and integrate the International Maritime Organization's (IMO) policies. This ensures the establishment of operational autonomy levels, certifying autonomous technologies, establishing liability guidelines, and implementing safety procedures that comply with international standards.
- Need for policy reform in India : According to the report, Indian maritime laws urgently have the need to be amended to include the following in order to close the regulatory gaps - revised concepts that take into account MASS's technology reality; a shift for

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autonomous vessels from fault-based to strict liability regimes; changes to procedures that will allow for remote and digital enforcement methods; criteria for cybersecurity methods to be incorporated into operating guidelines and vessel certification; the specific insurance plans that would address cyber and AI concerns; Conformity to international agreements and IMO regulations to guarantee legal stability and global collaboration from the side of India

- Judicial readiness : Despite the upholding of admiralty claims by Indian courts under the 2017 Act, unmanned vessel challenges have not yet received explicit attention in Indian courts . To handle all the unique legal challenges which are to be presented by autonomous algorithms and remote vessel operations, Indian courts will need to create new doctrines and policies and procedural instruments based on developing foreign jurisprudence.
- Strategic Opportunity for India - By modernizing the Admiralty legal framework to include autonomous shipping technologies, India can leverage its strategic maritime location in the global world and growing technological capabilities to become a leader in autonomous Maritime regulation and operations in the Indian ocean region and beyond.

## Suggestions and Conclusion

There are various suggestion that can be given through this research paper

- Legislative amendments to the Admiralty Act : Although the Admiralty Act,2017 is a modernised Admiralty law , we cannot fail to notice the lack of explicit definition related to Maritime Autonomous Surface Ships (MASS). This should reflect the operational realities of Unmanned or remotely operated vessels clarifying terms such as “ship” and “master”
- There must be an establishment of clear liability regimes: Transition from traditional fault based liability to strict liability framework for incidents involving autonomous ships to ensure clarity and enforceability. Liability architectures that account for remote operator negligence, cybersecurity breaches, and system failure are necessary due to the nature of artificial intelligence and automated control.

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- Provide procedural frameworks that provide digital notifications, remote service of legal notices, and ways to detain or arrest assets linked to autonomous vessels, like software control centers or related shore-based infrastructure. Make sure courts have clear jurisdiction over foreign-operated and unmanned vessels in Indian waters.
- Make cybersecurity risk management requirements essential and include them into vessel certification processes. To avoid any sort of navigational errors or attacks, and to make sure autonomous systems have redundancy, fail-safe procedures, and real-time monitoring.
- To adopt new maritime autonomy codes and actively engage in IMO discussions to and to bring Indian law into compliance with international regulations. Make use of global regulatory frameworks as standards for domestic laws and court rulings.
- To coordinate the creation of policies, rules, and standards especially for MASS, form a specialized multi-stakeholder council with representatives from the maritime industry, government ministries, research organizations like Indian Maritime University and ISRO, and cybersecurity specialists.
- Promote the creation of insurance plans specifically designed to cover autonomous maritime risks, such as cyber liability and equipment failure, to give operators, cargo owners, and other parties complete protection.
- In order to enhance case management concerning unmanned ship arrests, liability, and dispute resolution, judicial authorities and maritime experts should get training on the technological and legal peculiarities of autonomous vessels.

This research paper identifies important inadequacies in the current legislative and regulatory framework while highlighting the revolutionary implications of Maritime Autonomous Surface Ships (MASS) on Indian Admiralty law. Although it takes a modern approach to maritime claims and ship arrest, the Indian Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017 was mostly created for crewed vessels and is therefore inadequate in addressing the particular difficulties presented by autonomous, unmanned ships.

The results highlight the urgent need for legal reform in order to define and regulate MASS precisely, set suitable liability standards, and provide novel procedural instruments that are compatible with AI and remote control operations. A major issue that needs integrated risk

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management procedures in maritime legislation and vessel certification is in the field of cybersecurity. India should take the initiative to comply with these international norms in order to protect its interests in environmental protection, maritime trade, and security.

India can responsibly lead in the integration of autonomous ships within its maritime authority by implementing comprehensive reforms and norms and by encouraging technological and legal innovation, and developing institutional capability. In the age of autonomous marine technologies, this will guarantee that Indian admiralty law continues to be strong, pertinent, and efficient in upholding maritime safety, justice, and order. Through comprehensive statutory analysis, comparative review, and synthesis of emerging judicial approaches, the paper charts a path toward developing an integrated Indian Admiralty law framework that can effectively regulate the arrest, liability, and safety of autonomous ships, thereby safeguarding India's maritime interests and supporting the sustainable evolution of the shipping industry

## BIBLIOGRAPHY

- Government of India (2017) *The Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017*. Act No. 22 of 2017. New Delhi: Ministry of Law and Justice. Available at: <https://www.indiacode.nic.in/bitstream/123456789/2256/5/A2017-22.pdf> (Accessed: 16 September 2025).
- Bhatt & Joshi Associates (2025) Section 5 of the Admiralty Act, 2017: Legal Framework for Ship Arrest in India. Available at: <https://bhattandjoshiassociates.com/section-5-of-the-admiralty-act-2017-legal-framework-for-ship-arrest-in-india/> (Accessed: 16 September 2025)
- Trivedi, D.S. (2023) 'The Legal Implications of Autonomous Vessels and the Use of Artificial Intelligence in the Maritime Industry', *Indian Journal of Law and Legal Research*, Volume V, Issue II. Available at: <https://www.ijlr.com/post/the-legal-implications-of-autonomous-vessels-and-the-use-of-artificial-intelligence-in-the-maritime> (Accessed: 16 September 2025)
- Indian Journal of defence & maritime Laws - Centre for Aerospace and Defence Laws NALSAR University of Law, Hyderabad, July 2021- December 2021

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<https://www.ijalr.in/>

- Author(s) (Year) Legal Issues and Liability of Autonomous Ships: An Analytical Study on the Application of International Maritime Law. Available at: <https://theamikusqraie.com/legal-issues-and-liability-of-autonomous-ships-an-analytical-study-on-the-application-of-international-maritime-law/> (Accessed: 16 September 2025).
- <https://nititantra.com/autonomous-ships-and-indian-maritime-law-challenges-and-opportunities>
- <https://www.shippingandfreightresource.com/indian-admiralty-act-2017-interpretation-and-e>
- International Convention for the Unification of Certain Rules relating to the Arrest of Sea-going Ships, signed at Brussels, 10 May 1952, in force 24 February 1956
- International Maritime Organization (IMO) (1999) International Convention on Arrest of Ships (Arrest Convention). Geneva: International Maritime Organization
- Government of India (2017) The Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017. Act No. 22 of 2017. New Delhi: Ministry of Law and Justice
- International Maritime Organization (IMO) (no date) Autonomous shipping. Available at: <https://www.imo.org/en/mediacentre/hottopics/pages/autonomous-shipping.aspx> (Accessed: 17 September 2025)
- Ministry of Ports, Shipping and Waterways, Government of India (2025) SagarMala. Available at: <https://sagarmala.gov.in/> (Accessed: 17 September 2025)
- Niti Tantra Autonomous Ships And Indian Maritime Law: Challenges And Opportunities. Available at: <https://nititantra.com/autonomous-ships-and-indian-maritime-law-challenges-and-opportunities/> (Accessed: 17 September 2025).
- Chief Editor (2022) IMO: Mandatory MASS Code from 1 January 2028. MASSworld.news, 14 September. Available at: <https://massworld.news/imo-mandatory-mass-code-from-1-january-2028/> (Accessed: 17 September 2025)

For general queries or to submit your research for publication, kindly email us at [ijalr.editorial@gmail.com](mailto:ijalr.editorial@gmail.com)

<https://www.ijalr.in/>

- International Maritime Organization (IMO) (no date) What's New – IMO press release. Available at: <https://www.imo.org/en/mediacentre/pages/whatsnew-1872.aspx> (Accessed: 17 September 2025)
- McKie, R. (2023) 'Maritime Autonomous Surface Ships (MASS) and SAR', International Maritime Rescue Federation. Available at: <https://www.international-maritime-rescue.org/news/maritime-autonomous-surface-ships-mass-and-sar> (Accessed: 17 September 2025)
- Comité Maritime International (2017) International Working Group Position Paper on Unmanned Ships and the International Regulatory Framework. Available at: <https://comitemaritime.org/wp-content/uploads/2018/05/CMI-Position-Paper-on-Unmanned-Ships.pdf> (Accessed: 18 September 2025)
- Kumar, S. (2025) Marine Disputes in India: Laws, Cases, and Legal Remedies Explained. IAS Express. Available at: <https://www.iasexpress.net/marine-disputes-in-india/> (Accessed: 21 September 2025)
- Bhatt & Joshi Associates (2025) Section 5 of the Admiralty Act, 2017: Legal Framework for Ship Arrest in India. Available at: <https://bhattandjoshiassociates.com/section-5-of-the-admiralty-act-2017-legal-framework-for-ship-arrest-in-india/> (Accessed: 18 September 2025)

<sup>1</sup> Government of India (2017) *The Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017*. Act No. 22 of 2017. New Delhi: Ministry of Law and Justice. Available at: <https://www.indiacode.nic.in/bitstream/123456789/2256/5/A2017-22.pdf> (Accessed: 16 September 2025).

<sup>2</sup> Bhatt & Joshi Associates (2025) *Section 5 of the Admiralty Act, 2017: Legal Framework for Ship Arrest in India*. Available at: <https://bhattandjoshiassociates.com/section-5-of-the-admiralty-act-2017-legal-framework-for-ship-arrest-in-india/> (Accessed: 16 September 2025).

<sup>3</sup> Trivedi, D.S. (2023) 'The Legal Implications of Autonomous Vessels and the Use of Artificial Intelligence in the Maritime Industry', *Indian Journal of Law and Legal Research*, Volume V, Issue II. Available at: <https://www.ijlr.com/post/the-legal-implications-of-autonomous-vessels-and-the-use-of-artificial-intelligence-in-the-maritime> (Accessed: 16 September 2025).

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<https://www.ijalr.in/>

<sup>4</sup> Indian Journal of defence & maritime Laws - Centre for Aerospace and Defence Laws NALSAR University of Law, Hyderabad, July 2021- December 2021

<sup>5</sup> Author(s) (Year) *Legal Issues and Liability of Autonomous Ships: An Analytical Study on the Application of International Maritime Law*. Available at:

<https://theamikusrqiae.com/legal-issues-and-liability-of-autonomous-ships-an-analytical-study-on-the-application-of-international-maritime-law/> (Accessed: 16 September 2025).

<sup>6</sup> <https://nititantra.com/autonomous-ships-and-indian-maritime-law-challenges-and-opportunities/>

<sup>7</sup> International Convention for the Unification of Certain Rules relating to the Arrest of Sea-going Ships, signed at Brussels, 10 May 1952, in force 24 February 1956

<sup>8</sup> International Maritime Organization (IMO) (1999) *International Convention on Arrest of Ships (Arrest Convention)*. Geneva: International Maritime Organization

<sup>9</sup> Government of India (2017) *The Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017*. Act No. 22 of 2017. New Delhi: Ministry of Law and Justice.

<sup>10</sup> International Maritime Organization (IMO) (no date) *Autonomous shipping*. Available at: <https://www.imo.org/en/mediacentre/hottopics/pages/autonomous-shipping.aspx> (Accessed: 17 September 2025).

<sup>11</sup> Ministry of Ports, Shipping and Waterways, Government of India (2025) *SagarMala*. Available at: <https://sagarmala.gov.in/> (Accessed: 17 September 2025).

<sup>12</sup> Niti Tantra *Autonomous Ships And Indian Maritime Law: Challenges And Opportunities*. Available at: <https://nititantra.com/autonomous-ships-and-indian-maritime-law-challenges-and-opportunities/> (Accessed: 17 September 2025).

<sup>13</sup> Chief Editor (2022) *IMO: Mandatory MASS Code from 1 January 2028*. MASSworld.news, 14 September. Available at: <https://massworld.news/imo-mandatory-mass-code-from-1-january-2028/> (Accessed: 17 September 2025).

<sup>14</sup> International Maritime Organization (IMO) (no date) *What's New – IMO press release*. Available at: <https://www.imo.org/en/mediacentre/pages/whatsnew-1872.aspx> (Accessed: 17 September 2025)

<sup>15</sup> McKie, R. (2023) 'Maritime Autonomous Surface Ships (MASS) and SAR', *International Maritime Rescue Federation*. Available at: <https://www.international-maritime-rescue.org/news/maritime-autonomous-surface-ships-mass-and-sar> (Accessed: 17 September 2025)

<sup>16</sup> Comité Maritime International (2017) *International Working Group Position Paper on Unmanned Ships and the International Regulatory Framework*. Available at: <https://comitemaritime.org/wp-content/uploads/2018/05/CMI-Position-Paper-on-Unmanned-Ships.pdf> (Accessed: 18 September 2025)

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<https://www.ijalr.in/>

<sup>17</sup> Kumar, S. (2025) *Marine Disputes in India: Laws, Cases, and Legal Remedies Explained*. IAS Express. Available at: <https://www.iasexpress.net/marine-disputes-in-india/> (Accessed: 21 September 2025)

<sup>18</sup> Bhatt & Joshi Associates (2025) *Section 5 of the Admiralty Act, 2017: Legal Framework for Ship Arrest in India*. Available at: <https://bhattandjoshiassociates.com/section-5-of-the-admiralty-act-2017-legal-framework-for-ship-arrest-in-india/> (Accessed: 18 September 2025).



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