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The legal responsibility of coastal submarines and autonomous surface boats under international law

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الملخّص

This study dealt with coastal submarines and self-driving surface boats in public international law through two topics. The first topic dealt with the definition of coastal submarines and self-driving boats through two requirements. The first requirement dealt with what is meant by coastal submarines and self-driving boats. In the second requirement, the international legal challenges of coastal submarines and self-driving -boats. In the second topic, the rules of public international law related to coastal submarines and self driving boats through two requirements. The first requirement dealt with international agreements related to coastal submarines and self-driving boats. In the second requirement, the international norms applied to coastal submarines and self-driving surface boats. The study reached the conclusion that coastal submarines and self-driving surface boats constitute a huge leap in the field of maritime navigation technology, and are considered important sectors in terms of transportation, trade and maritime tourism. The researcher also concluded that it is necessary to reformulate international agreements regulating navigation and international maritime trade to suit the new circumstances that accompanied the emergence of coastal submarines and surface boats that are autonomous

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ABSTRACT

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THE LEGAL RESPONSIBILITY OF AUTONOMOUS COASTAL SUBMARINES AND SURFACE BOATS UNDER INTERNATIONAL LAW.

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ملخص

تناولت هذه الدراسة الغواصات الشاطئية والقوارب السطحية في القانون الدولي العام وذلك من خلال مبحثين تناول المبحث الأول التعريف بالغواصات الشاطئية والقوارب ذاتية القيادة وذلك من خلال مطلبين تناول المطلب الاول المقصود بالغواصات الشاطئية والقوارب ذاتية القيادة وفي الملطب الثاني التحديات القانونية الدولية للغواصات الشاطئية والقوارب ذاتية القيادة وفي المبحث الثاني قواعد القانون الدولي العام ذات العلاقة بالغواصات الشاطئية والقوارب ذاتية القيادة وذلك من خلال مطلبين تناول المطلب الأول الاتفاقيات الدولية المتعلقة بالغواصات الشاطئية والقوارب ذاتية القيادة وفي المطلب الثاني الأعراف الدولية المطبقة على الغواصات الشاطئية والقوارب السطحية ذاتية القيادة، وقد توصلت الدراسة لنتيجة أن الغواصات الشاطئية والقوارب السطحية ذاتية القيادة تشكل طفرة هائلة في مجال تكنولوجيا الملاحة البحرية، وتعتبر من القطاعات المهمة على صعيد النقل والتجارة والسياحة البحرية، كما توصل الباحثان لضرورة أن يتم إعادة صياغة الإتفاقيات الدولية المنظمة للملاحة والتجارة البحرية الدولية بحيث تلائم الظروف الجديدة التي رافقت ظهور الغواصات الساحلية والقوارب السطحية تلقائية القيادة

Abstract

Autonomous coastal submarines and surface boats are very innovative forms of maritime vessels that would dramatically transform maritime activities through technological advancement. After defining both concepts of autonomous coastal submarines and self-driving boats, the potential international legal issues raised by this new generation of vessels must be addressed. The current body of international legal agreements and norms regulating maritime activities is examined to determine whether they require revision to relevantly regulate navigation with autonomous submarines and boats.

Key-words

Maritime Autonomous Surface Ships (MASS), autonomous coastal submarines, self-driving surface boats, the International Maritime Organization (IMO), maritime technology, UN Convention on the Law of the Sea (UNCLOS).

Problem statement

1. Autonomous coastal submarines and surface boats represent a tremendous boom in maritime navigation technology and are important sectors in transport, trade and maritime tourism.

2. Although no international conventions or laws are specifically related to autonomous maritime vessels, the already existent general rules can be applied anywise.

3. Despite the possible application of current international regulations to autonomous coastal submarines and surface boats, international law could not keep pace with the dramatic technological developments and legal problems inherent to navigating with these autonomous forms of maritime vessels.

Methodology

RESEARCH METHODOLOGY

This research is based on the qualitative research methodology, descriptive research method. analytical research method through the criticism of legal texts.

Introduction

The evolution of international legal norms depends consistently on the physical reality of the international community to keep pace with the boom in technology, and in our precise study, with maritime navigation. Indeed, international norms are linked to the international conduct of persons of the international community. For many decades, States have been racing in technical and technological development[1], which has culminated in the maritime sphere by the creation of maritime devices (on the surface and underwater) that can operate themselves without a crew enjoying various degrees of autonomy, from remote control to full autonomy. Such advancements in the nature of maritime operations have to be addressed by the international community through various international conventions and laws. However, it appears that the legal corpus has experienced some shortcomings and has left a deliberate peremptory vacuum in the field of autonomous vehicles. Nowadays, such activities like trade and tourism, and precisely on the seas and oceans, are dominantly operated by auto-driving vehicles with no crew or cadre, and are also sometimes uninhabited to the extent that nobody is in charge of them. In other words, the machines control most of the executive and command operations in coastal submarines and surface boats, which are in one way or another independent of ordinary persons and would take decisions that might unfortunately be fateful in some instances. From an international perspective, the main convention regulating maritime operations is the 1982 Convention on the Law of the Sea. However, it has undeniably become obsolete[2], since this Convention has failed in keeping pace with the launching of most recent maritime devices such as the autonomous coastal submarines and surface boats that might constitute another option to traditional maritime activities. While the international legal corpus that regulates maritime activities can be perceived as not fitting with this modern and technical device, its rules might, though, be applied despite their limitations in terms of addressing legal issues pertaining to autonomous maritime vehicles. The research will therefore, try to demonstrate the extent to which these newer maritime vessels might be subjected to already existing international legal rules.

1. Definition of coastal submarines and self-driving boats.

Covering approximately seventy percent of the Earth's surface area, oceans and seas constitute the largest proportion of the globe surface, and they separate the five main continents, so those seas are one of the main means of transport between continents. Consequently, oceans and seas are teeming with different kinds of vehicles and watercourses, as they go forth and back through those vast maritime areas, be on international, States', or territorial zones. At the beginning, naval vehicles were manned by individuals conducting maritime navigation. From its launching to its final destination, any vehicle would be managed, directed and controlled by a crew. This continues to this day, but in recent times, as a result of

[1] 'In recent years, new ideas and new technologies, such as big data, cloud computing and artificial intelligence have advanced rapidly and aspects of these have provided strong technical support, in the development of unmanned maritime vehicles, continually improving their level of autonomy, functionality and safety'. Chang Y-C., Zhang, C., Wang, N. (2020). The international legal status of the unmanned maritime vehicles. *Maritime Policy*. Volume 113.

[2] Logchem van, Youri. (2022). *MASS and the 1982 Law of the Sea Convention-a Paradigm Shift or Old Wine in New Wineskins?*. The Institute of International Shipping and Trade Law. Swansea University.< https://iistl.blog/2022/01/27/mass-and-the-international-legal-framework-a-paradigm-shift-or-old-wine-in-new-wineskins/>

the significant development of maritime technology, submarines and autonomous boats have been built to sail by themselves according to their programming. Maritime vehicles have been improved by the use of artificial intelligence in such operations as their anchoring, submersion and diving onto the seas and oceans. These offshore vehicles usually move from one place to another and execute programs pre-developed by their operators.

1.1. Concept of coastal submarines and autonomous boats

Maritime mobility is one of the most important routes and modes of transport used by humans as provided that continents are connected by oceans and seas. There are different types of maritime vehicles to serve different purposes. Boats float on the surface of the water, and they are the most common maritime vehicles used for sailing. However, there are other types of maritime vehicles that drive deep into the water and can go down and underneath the water. Knowing that these different types of vehicles are travelling in international waters and may carry people and goods, it is imperative that we examine the extent to which these vehicles are subject to the provisions of international law.

1.1.1. Definition of autonomous coastal submarines

Etymologically, the term submarine[1] means 'underwater' or 'under sea[2]'. The submarine[3] is a warship equipped to dive into the water and stay underneath and to be able to launch torpedoes against enemy vessels. They differ from ships since they do not float on the surface of the water but are able to move and sail through the surface of the water, though, and can operate and move underwater. The first submarines were designed in the 19th century, but it was during World War I that the first submarines were operatively used to attack commercial and military vessels. More recently, submarines powered by nuclear reactors have emerged. Submarines are designed in large sizes so they can withstand water pressure and dive into deep areas. As for coastal submarines or littoral submarines, they are a kind of small-scale submarines that can be better maneuverable and can move easier, especially in shallow areas, such as water channels and coastal ports. Although the size of these submarines cannot be accurately determined, they are far smaller than war submarines designed to stay underwater for long periods. Moreover, coastal submarines are characterized by a smaller fuel tank and less supplies which prevent them from staying off the coast for long periods. These submarines may be manned, i.e. they have a crew in command and control, and may also be self-propelled. Without interference from the captain, these submarines can use remote sensing devices, cameras and positioning and telecommunications systems. They can appropriately perform tasks without human interference, artificial intelligence being used by the submarine independently of the human element. To sum up, coastal submarines are a form of maritime vehicle that can float on the surface of the water or float inside it and move and is used in military warfare operations to attack enemy vessels, as well as in tourism and exploratory campaigns and coastal submarines; are smaller than others, helping them maneuver in shallow waters, can also enter narrow spaces or maritime spaces with difficult terrain that would be inappropriate for large submarines to enter. They are called 'coastal' because of their obligation to stay near the shore to cope with the shortage of supplies.

1.1.2. Definition of autonomous boats

[1] Nakatani, K. (2008). Submarines. Max Planck Encyclopedias of International Law, MPIL.

[2] sub means "under" or "below" and maritime means "marinus" meaning "related to the sea'.

[3] https://www.britannica.com/technology/submarine-naval-vessel

Boats are defined as any navigable vessel used to transport persons or goods and that is driven by its own strength irrespectively of the amount of payload or the so-called designation and irrespectively of the intent of the trip, whether or not to obtain profit. Maritime boats include what is used for picnic, recreation, hunting, scientific research and military or security operations and the maritime is regarded as the field of boat traffic, and the 1924 Hague Rules defines a ship as 'any vessel used for the carriage of goods by sea.'[1]. Due to certain distinctions between the two, the convention uses the term "ship" rather than "boat.". Although the boat is very similar to the ship, both being considered to be maritime carriers, the boat is a smaller vehicle in terms of size[2]. The ship is larger and can be used for commercial and military purposes, and can carry boats on board. The ship is designed with a more complex heck than that of a boat to be able to withstand waves, high winds and water currents. Boats can be used in inland water, rivers and paddles, sails and engines can be used, Boats can sail through shallow and less deep waters, and that is why they are less used for transportation in many places. With regard to self-sailing, the concept of autonomy is no different from the same concept previously explained regarding submarines. The concept of self-driving boats is that the boat has the ability to control some or all of its functions of commuting and transferring from one place to another. These boats are characterized by the disappearance of the role of the captain or boat commander, as these tasks are assigned to the boat's command unit. These boats appeared in the first phase of testing where some international companies have built prototypes of this kind of self-driving boats, which is still under research and experimentation, but they are expected to receive a significant breakthrough in the near future[3]. Autonomous boats are characterized by a low rate of errors[4], while human errors are essentially committed by the captain. If we know that most maritime accidents occur as a result of human errors, autonomous boats can be used in order to carry out hazardous tasks that do not require the presence of human beings[5] on board such as discovering isolated and dangerous islands, for example. Self-driving boats may also reduce the risks of traditional piracy[6]. This type of boat can also be at offshore for longer sailing periods without returning to the coasts. Boats also have the advantage of reducing the boat's operating expenses, and self-driving boats reduce the human elements required to operate the boat.

1.2. Ambiguity of international legal rules[7] for autonomous coastal submarines and boats

In reality, self-driving coastal submarines and boats face practical problems. The most significant of these problems is the suitability of these vessels to navigate in the seas and oceans with international law rules. It includes key factors, most notably, the type of cargo the submarine or boat would transport, as well as

[1] Article 1 (d). International Convention for the Unification of Certain Rules of Law relating to Bills of Lading ("Hague Rules"), and Protocol of Signature (Brussels, 25 August 1924).

[2] Gauci, Gotthard. (2016). Is it a vessel, a ship or a boat, is it just a craft, or is it merely a contrivance? 47. 479-499.

[3] 'To help address a shortage (United Nations Conference on Trade and Development, 2018) of skilled professionals in the growing marine shipping industry, there have been significant efforts towards the rapid development of autonomous surface ships, or unmanned surface vehicles (USV). These are attracting increasing attention in both industry projects (Kongsberg Maritime, 2018; Rolls-Royce, 2016) and academic research because of their potential to increase safety and efficiency, while also reducing costs and environmental impact by removing the human element from certain steps in the shipping process'. Cui, Y., Osaki, S., & Matsubara, T. (2021). Autonomous boat driving system using sample-efficient model predictive control-based reinforcement learning approach. *Journal of Field Robotics*, *38*(3), 331-354.

[4] Jiri de Vos, Robert G. Hekkenberg, Osiris A. Valdez Banda, (2021). The Impact of Autonomous Ships on Safety at Sea – A Statistical Analysis, Reliability Engineering & System Safety, Volume 210.

[5] Ben Hayden. 'The state of autonomous vessels'. Workboat. May 16, 2024. <https://www.workboat.com/the-state-of-autonomous-vessels>

[6] Damilola D. Osinuga, (2020). Unmanned ships: coping in the murky waters of traditional maritime law, PPP god. 59 174, str. 75–105.

[7] Simon, McKenzie. (2020). International Law and Uncrewed Maritime Vehicles. Law School University of Queensland. <https://law.uq.edu.au/article/2020/10/international-law-and-uncrewed-maritime-vehicles>

its route and designated mission, in addition to the crew or those on board. The submarine or boat must be seaworthy from both a physical and legal standpoint. This also requires the presence of a human element in this type of vessel, particularly a commander, crew or any person responsible in order to determine legal obligations[1]. The absence of the human component in self-driving submarines and boats is one of the most important problems and challenges facing this type of vessels. This is problematic in providing it with the necessary human equipment, supplies and components, ensuring the safety of passengers and cargo on board, as well as the question of the legal liability of the submarine or boat. For example, in conventional submarines and boats, responsibility lies with the captain or commander of the vessel, whereas in autonomous submarines and boats there is no person responsible for the submarine or on board the boat. The researcher believes, however, that this does not conflict with the rules of international law in any way, navigation through unmanned submarines and boats being no different from navigation through manned vessels. International legal responsibility can be attributed to those who control autonomous submarines and boats even if they are not on board the boat or submarine and attribution of responsibility does not require the presence, full or partial, of a captain or crew in the submarine or boat[2]. It is the responsibility of the submarine or boat commander to assist and rescue and to abide by the rules for the prevention of collisions and all traditional maritime practices. Yet, one of the material challenges to navigation of autonomous submarines and boats from an international perspective is their suitability for navigation in accordance with the rules of international law, and in particular with the provisions of SOLAS[3]. Indeed, ships, submarines and boats are required to have certain specifications in boats and submarines and must have means of rescue and life jackets[4] when human elements, whether passengers, tourists or others, are onboard. They must also be provided with alarms, transmitters, receivers and distress devices, as well as having to assist the submarine commander or boat if there is reason to do so, which applies to submarines and autonomous boats. This is emphasized in article 1 (b) of the Convention. "*Contracting Governments undertake to promulgate all laws, decrees, orders and regulations and to take all other steps that may be necessary to ensure that, from the point of view of the safety of life, the ship is fit for the service allocated to it*". Although the previous text included the ship as the main maritime vessel at sea, these texts can be applied to any other maritime vessel such as submarines and boats, as countries must verify the safety of boats and submarines and their suitability for maritime navigation. In the researcher's view, autonomous submarines or boats do not collide with the respect to safety of navigation. This is certainly consistent with modern technical and technological development which enables submarine or boat to be operated through a small crew or with no crew at all. In fact, technological development of autonomous submarines and boats contributes to the reduction of maritime hazards that submarines and manned vessels may encounter, especially being aware that most accidents in the oceans and seas are the result of neglect and human errors[5]. Then, the absence of passengers aboard coastal self-driving submarines and autonomous boats contributes to reducing the risk surrounding exploration or transport operations to remote islands and shallow areas.

2. International law rules relating to autonomous coastal submarines and boats

As a matter of fact, maritime transport, whether goods or persons, as well as maritime operations, is one of the most important means used by humans since ancient times to conduct international trade. Given the

[1] Chang, *op. cit.*

[2] Vojkovic, Goran & Milenkovic, Melita. (2020). Autonomous ships and legal authorities of the ship master. Case Studies on Transport Policy. 8. 333-340.

[3] <https://treaties.un.org/doc/Publication/UNTS/Volume%201184/volume-1184-I-18961-English.pdf>

[4] International Convention for Safety of Life at Sea, Chapter III - Life-saving appliances and arrangements.

[5] Song, R., Papadimitriou, E., Negenborn, R. R., & van Gelder, P. (2024). Safety and efficiency of human-MASS interactions: towards an integrated framework. *Journal of Marine Engineering & Technology*, 1–20. https://doi.org/10.1080/20464177.2024.2414959.

significant importance of this activity sector, which constitutes the backbone of international trade, the international community and its active actors have therefore attempted to establish legal norms to regulate the relations resulting from trade and the transfer of persons. Various international organizations, including the former League of Nations and the current United Nations, have established rules governing maritime trade between various States in the world. A large group of agreements and treaties have been established and ratified by a number of States. The most important of these agreements are the United Nations Convention on the Carriage of Goods by Sea of 1978, the Hamburg Rules of 1978, as well as the 1924 'Hague Rules', Brussels 1968, the Brussels Convention of 1957 on the Limitation of the Liability of the Owner of Sea-going Ships, the York and Antwerp Rules, the Arbitration Rules prepared by the United Nations Commission on International Trade Law, the Treaty for the Unification of Certain Rules Relating to Maritime Collision, the International Agreements on the Unification of Certain Rules of Civil Jurisdiction in Matters of Maritime Collision, and many other agreements.

2.1. International conventions on autonomous coastal submarines and boats

A wide range of agreements have been concluded to regulate the operations of maritime vessels. These conventions apply to the maritime transport of individuals or goods on autonomous coastal submarines and boats. The most prominent are the Brussels Treaty Series concluded between 1905 and 1926 and a number of other conventions, at the request of the Belgian Government.

2.1.1. The 1910 Convention for the Unification of Certain Rules of Law with respect to Collisions between Vessels.

This Treaty addresses incidents of maritime collision occurring in internal and international waters, and defines responsibilities for physical damage to these submarines and boats, as well as injuries to persons on board or inside. The Convention also deals with collisions that may occur against shipwrecks, sea barges and floating objects of various forms, and floating objects that do not take the form of vessels and even submarines. It also delimits a distance of 24 nautical miles from areas adjacent to territorial waters in which adjacent States may carry out their own actions to counter tax evasion, immigration and other activities. The same treaty defines the economic zone that can be exploited by States at a distance of two hundred nautical miles from the baseline. This treaty has been signed by one hundred and sixty States up to this day.

2.2. International norms applicable to autonomous coastal submarines and self-driving surface boats.

First, it must be mentioned that coastal States[1] are fully sovereign of their territorial waters, and, if any coastal submarines or surface boats may sail through those territorial waters, they are fully subject to the coastal State, therefore, the laws and customs relating to the coastal State should be applied to them. Anything beyond that distance is subject to the limited sovereignty of States. It is the right of any maritime vessels to pass safely through other countries' sea lanes and coasts and the UNCLOS has defined the States' respective responsibilities within territorial, economic and high seas zones. The International Convention on Maritime Law stipulates that passage in archipelagic waters may be carried out by ships, submarines and naval boats, and has used the term *innocent passage*, i.e. there is no declared or undeclared target for carrying out acts of piracy or attacks on maritime plots, islands or other areas protected by law, as stated in article 52: "*(...), all States' ships shall enjoy the right of innocent passage through archipelagic waters, in accordance with section 3 of Part II. An archipelagic State may, without*

[1] UNCLOS, Part II, Section 1, Article 2.
<https://www.un.org/depts/los/convention_agreements/texts/unclos/part2.htm>

legal or de facto distinction between foreign vessels, temporarily suspend the innocent passage of foreign vessels in specific sectors of its archipelagic waters if such suspension is necessary to protect that State's security. Such suspension shall enter into force only after the due declaration has been made. ". One of the most prominent international norms applicable to autonomous submarines and boats is to abide with international seafaring conventions and regulations.

2.2.1. Compliance with international agreements and regulations related to navigation

Coastal submarines and surface boats sailing in regional or economic waters must adhere to various international conventions, particularly the International Convention for the Safety of Life at Sea (SOLAS). This convention requires submarines and vessels to adhere to strict standards that are binding on their owners and their respective countries. They also must adhere to the International Convention for the Prevention of Pollution from Ships. (MARPOL)[1]. This Convention aims to reduce the amount of pollution from coastal submarines and surface boats and to preserve the integrity of the maritime environment, pollution that may result from this type of maritime vessels. Besides, these types of maritime vessels must comply with international search and rescue conventions (SAR)[2]. Coastal submarines and surface boats must be equipped with systems enabling them to participate in search and rescue operations. As far as maritime regulations are concerned, those who control coastal submarines or surface boats or provide them with a command system must comply with the Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs)[3]. These international rules are concerned with establishing lines that such submarines and boats would use in order not to collide with each other or other maritime vessels. They must also be able to interpret signals from other maritime pieces (sound and light signals). They can also dodge various maritime obstacles. This form of maritime objects must comply with the rules of self-navigation, such as the necessity of having for an emergency system in the case of losing control of the submarine or boat.

2.2.2. Compliance with technical regulations

Maritime operations arouse a wide range of technical considerations. Shipping or the use of coastal submarines or surface boats cannot take place without the necessary techniques to navigate according to international standards. Subsequently, a wide range of maritime technology and techniques are available.

a. Availability of information and communication technology in ports:

Harbors form the link between submarines and boats since vessels depend on those facilities to dock and sail away. Accordingly, coastal submarines and surface boats must contain adequate equipment that enables them to communicate with ports in order to determine time for docking and launching, especially if these vessels contain cargo or are loading and unloading. Maritime communications and information technology also includes control operations like determining sea routes and the locations through which the submarine or boat travels, to prevent collisions or maritime congestion, and adherence to permitted international routes for safe navigation operations.

b. Information and communication technology between maritime vessels

[1] Entered into force on 2 October 1983. <https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx>

[2] The International Convention on Maritime Search and Rescue (SAR Convention) is a maritime safety convention of the International Maritime Organization. It entered into force on 22 June 1985. The convention forms part of the legal framework covering Search and rescue at sea.
<https://treaties.un.org/Pages/showDetails.aspx?objid=08000002800d43b3>

[3] <https://www.imo.org/en/About/Conventions/Pages/COLREG.aspx>

A basic requirement for coastal submarines and surface boats to navigate is that all these vessels can communicate with each other. These vessels must contain the technology of maritime engineering, maritime mechanics, electrical applications, power transmission and locomotion. A new generation of submarines and boats have appeared[1]. These vessels must contain cranes if they are intended for transporting goods and ladders for loading and unloading people inside or on the surface. These vessels must also contain devices that can read and simulate maritime maps. These vessels must have the ability to use satellites, especially determining locations, weather news and weather conditions.

2.2.3. The liability of autonomous coastal submarines and boats.

Maritime operations through international seas and oceans assess the legal responsibility of States for coastal submarines and surface boats flying their flags. This is emphasized in article 94 of the United Nations Convention on the Law of the Sea, which states: "*1. Each State exercises effective jurisdiction and control over vessels flying its flag in administrative, technical and social matters. Each State shall, in particular, (a) maintain a registry of ships containing the names of vessels flying its flag and their own qualifications other than those not applicable to them owing to the small size of generally accepted international regulations. (b) To assume jurisdiction under its domestic law over each vessel flying its flag, master, officers and crew members in respect of administrative, technical and social matters relating to the vessel, 3.3 For vessels flying its flag, each State shall take the necessary measures to ensure safety at sea, inter alia, in respect of (a) the construction of ships and their equipment and seaworthiness. and (b) the formation and training of ships' crews and working conditions, taking into account applicable international instruments. (c) Use signals, maintain connections and prevent clashes. The composition of each State is required to comply with generally accepted international regulations, procedures and practices and to take any steps that may be necessary to ensure their observance*. ". Based on the previous text, it can be said that liability is not limited to technological development and its implications, but rather extends beyond to include autonomous coastal submarines and surface boats' conduct when sailing. In this regard, the presence or absence of human elements on the surface or inside the maritime unit is equal. Eventually international legal responsibility is upon whoever controls the maritime vessel, so much that he can be held accountable for failure and negligence. Herein lies the issue: if the maritime unit is self-controlling and makes decisions on its own, any technical malfunction that leads to an error due to a manufacturing defect, such as failing to provide assistance to someone in need at sea[2], according to Article 98 of the United Nations Convention on the Law of the Sea, may arise. The researcher considers that, according to the previous legal texts regarding coastal submarines and surface boats, their international legal responsibility would be acknowledged even if the vehicle is autonomous. May be the responsibility removed from the machine itself when it makes decisions due to a manufacturing defect, software malfunction, or any other reason, then the responsibility would be transferred to the one who designed the system or the one who programmed it. This is indeed applicable to remotely controlled vehicles, so likewise may be extended to autonomous maritime vehicles. Therefore, if the submarine or boat fails to fulfill its duties towards the obligations of the UNCLOS, legal responsibility would arise against the controller, the designer, and the owner of the maritime unit.

2.2.4. Environment and sustainability

[1]Attia, Tarek. (2016). Importance of communication and information technology and its applications in the development and integration of performance in seaports. Renewable Energy and Sustainable Development. 2. 137-146. 10.21622/resd.2016.02.2.137.

[2] Irini Papanicolopulu. (2016). The duty to rescue at sea, in peacetime and in war: A general overview. International Review of the Red Cross, 98 (2), 491–514. War and security at sea.

In their different fields of application, international laws have focused significant attention to the protection of the maritime environment. Therefore, coastal submarines and surface vessels must comply with international regulations, laws, and agreements[3]. It is illegal for these submarines and vessels to discharge their waste into the seas and oceans, especially maritime fuel residues or the maintenance of sewage tanks and their waste. They must also refrain from dumping harmful substances in any form into the maritime environment, particularly substances that affect water quality and reduce its utility. Additionally, coastal submarines or surface vessels should engage in positive actions that do not affect the maritime environment or diminish its sustainability. Various international agreements have addressed the environmental protection of seas from the dangers of pollution and violations resulting from coastal submarines and surface vessels. Among these agreements are the Civil Liability Convention for Oil Pollution Damage, the 1976 Convention for the Protection of the Mediterranean Sea Against Pollution, and the 1981 Brussels Convention on Civil Liability in the Field of Maritime Transport of Nuclear Materials. These agreements, in their various forms, have defined the responsibilities that fall on states and owners of different maritime vessels. International agreements have also defined cross-border responsibilities resulting from maritime activities of submarines and vessels that fall under the jurisdiction or control of another state.

Conclusion

It can be said that international legislators early recognized the importance of autonomous coastal submarines and surface vessels. They applied a set of legal rules specific to submarines and ships, from maritime navigation agreements, to environmental safety, and even collision prevention rules. However, they did not dedicate exclusive agreements and laws specifically for this type of maritime vessel, as this type of vessel is considered new on the international stage, especially since these vessels can make decisions on their own without the need for a crew to operate them.

Results

1. The Convention of the Law of the Sea is obsolete and needs to be revised and upgraded to the use of modern technologies in the maritime field.

2. International legal experts have to work jointly with technological experts to come up with an adequate corpus of international laws that would fittingly regulate the operating of autonomous maritime vessels and to cope with the eventual risks accordingly.

3. Customary law is not sufficient to provide the legal frame for the use of autonomous coastal submarines and surface boats.

Recommendations

[3] Tsvetkova, A., Wróbel, K., Morariu, A.-R., Hellström, M., & Björkqvist, J. (2024). Steering towards sustainability: the impact of autonomous shipping on achieving sustainable development goals. Journal of Physics: Conference Series, 2867(1), Article 012014. https://doi.org/10.1088/1742-6596/2867/1/012014

1. International conventions governing international maritime navigation and trade should be reformulated to add special legal texts appropriate to autonomous coastal submarines and surface boats.

2. Periodic bulletins should be made by international institutions and organizations engaged with maritime affairs in order to clarify the nature of coastal submarines and autonomous surface boats in their inhabited and uninhabited forms and their relevance to transport and maritime trade.

3. International conferences should be held to upgrade international law rules for seas by specifically regulating activities of autonomous vessels, and such laws must emulate new developments that differ from traditional sailing and its subsequent characteristics.

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