Research on the Legal Status of Unmanned Surface Vehicle

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Abstract. With the advantages of security for life, Unmanned Surface Vehicle (USV) has a wide range of applications in military and commercial fields. However, the rules of Maritime navigation for USV and the recognition of the legal status of USV are both still in a blank stage. The existing maritime navigation rules cannot be fully adapted to the operation of USV. The legal status of USV should be implemented as soon as possible to ensure the security of USV maritime navigation and to have the legal basis for effectively resolving the dispute over the vessel in order to adapt to the rapid development of USV. Starting from the reality of the USV and drawing lessons from the research experience of the United States, this thesis analyzes the legal status of USV in three aspects: the navigation rules of USV, the navigational status of USV as a military (official) and civilian vessel in the water area and the applicable law of USV.

1. Introduction
USV is an unmanned and intelligent platform, which is placed by the carrying platform and navigate in the ocean by independent or remote control. On the basis of safe navigation, it is able to navigate autonomously and safely in a complex marine environment and effectively handle emergencies that occur during navigation. It has the characteristics of small size, good concealment, strong maneuverability and low cost. Due to the practical application value of the USV, many developed countries have applied it to the military field at present by researching and improving the performance of USV [1]. With the mounting number of USVs, the USV is bound to intersect with other ordinary ships at sea. As for the definition of USV, it is most appropriate for USV to comply with the corresponding navigation regulations in the identity of a “warship”. In the next few decades, large-scale and intellectualization of USV is a development trend, so USV will most likely be applied to commercial transportation as an important carrier of maritime trade and transportation, which may replace the current crew operation[2] [3] [4]. This thesis, according to the Convention on the International Regulations for Preventing Collisions at Sea 1972 (referred to as the COLREGS) and the maritime law, will expound the rules of action and legal status of USV on sea voyage respectively[5] [6]. This thesis intends to clarify the confusion of USV’s legal status, standardize the action guide of USV's navigation at sea, and solve the problem of liability judgment caused by disputes of the legal application when USV disputes happen.

2. Research on Navigation Rules of USV
The legal status is the qualification of the legal subject to enjoy the rights and undertake obligations. As a generalized vessel, the most important manifestation of USV’s legal status is the different navigation rights owned by ships in different waters. According to the comparison of the definition of the ship and the USV, the thesis will come to a conclusion on the legal status of USV.
2.1. The Definition of the Vessel
The vessel has broad and narrow sense, and the vessel in the broad sense refers to water mobile device. Therefore, in addition to the seaplane flying in air, light and floating docks at a fixed location, rigs in place, barges, dredgers, rafts, and water sliders that do not have autonomous navigation capabilities, all other marine installations should be identified as a vessel [7]. From this respect, USV is a kind of vessel for military, official and commercial transportation.

2.2. The Definition of USV
USV is currently applicable to navigation channel detection, military research and so on, so it has a very broad application prospect in the field of marine scientific research and military [8]. At present, there are many kinds of unmanned boats used in military, scientific research and other fields. As shown in Figure 1, we have developed a USV with small size that can conduct joint operations and search and rescue with Unmanned Aerial Vehicle (UAV). Figure 2 shows a sail-assisted USV manufactured by us, with wind turbine power generation, who can be used for maritime cruising.

![Figure 1. The USV equipped with UAV.](image1)

![Figure 2. The sail-assisted USV.](image2)

Among various kinds of USV, the SPARTAN of the United States and the Protector of Israel are typical representatives. Other countries have also carried out the corresponding research work on USV, such as the Chadie in Italy, the Springer in the UK and the Delfim in Portugal [9]. The USV with a small size is defined as a small boat under 20 gross tons; USV is equivalent to military vessel when carrying out a variety of tasks, such as anti-terrorism, combating smuggling or piracy, and search for suspicious targets; The USV, as a patrol craft, is the equivalent of a government vessel when patrolling in maritime or dangerous waters; USV as the anti-water-rafting boat, it removes mines in war zones by the mine clearance system. Its performance is equivalent to manipulating ability limited ship when it transports supplies to the area or send the wounded quickly to the emergency center for special operations; When the USV is widely promoted into the commercial field, as a new type of ship for
cargo transportation or other trade activities, USV is the same as ordinary transport vessel. Figure 3 illustrates various conditions of USVs, and this thesis analyzes the legal status of them in Section 3.

Figure 3. The legal status of USV in various conditions.

2.3. **The Applicability of COLREGS**

The growing use of USV poses a lot of challenges to law and policy. To deal with emerging things, it requires a series of action guides to adjust and constraint. At present, the rules of maritime navigation recognized and strictly implemented by all countries in the world are COLREGS. Therefore, the rules of preventing collision at sea are for reference when we probe into the navigation rules of USV. In COLREGS[6], the word “vessel” includes every description of watercraft, including non-displacement craft, WIG craft, and seaplanes, used or capable of being used as a means of transportation on water, and the term “power-driven vessel” means any vessel propelled by machinery, the term “every description of watercraft” means that vessels specializing in water transport include various types of cargo vessels and passenger vessels, or engaged in other water operations, performing other tasks, etc., which may not be used as a professional vessel for water transport including various types such as engineering vessels, scientific research vessels, military vessels or government vessels. In other words, COLREGS refers to vessels that, regardless of type, purpose, size, shape, or structure, can be used as any vessel for water transport. Therefore, USV is applicable to COLREGS and is also bound by COLREGS.

3. Legal Status

3.1. **The Legal Status of USV for Military Use or Official Business**

According to United Nations Convention on the Law of the Sea (UNCLOS) [10], a “warship” is a naval ship that is built and primarily intended for naval warfare. Usually they belong to the armed forces of a state. The point that military USVs most significantly differ from warships is that military USVs do not meet the term “under the command of an officer duly commissioned by the government of the State”. However, it is undeniable when USV is equipped with weapons, or the exterior is painted with iconic paint according to its own military service, and the naval flag or the national flag is hoisted and equipped with various electronic equipment for combat purposes, the USV is obviously different from civil or other commercial vessels. The author believes that the military USV’s legal status should lie between civilian vessels and military vessels. Therefore, according to the general provisions of various countries in the world, when a civilian vessel encounters a military USV, it obeys the directive issued by military USV and salutes military USV. When a military USV encounters a higher-ranking military vessel, it shall whistle according to the requirements of the Navy, meanwhile, obeys and enforces the directives issued by its own military ship.

According to the main work contents of cruising on the water, official USV is absolutely feasible to carry out the basic cruise work in water in the future. USVs carrying out their duties as business
vessels must have distinctive lacquered signs not the same as for warships and civilian vessels in order to clearly differentiate the identity of USVs as official vessels. Civilian vessels should actively cooperate with the official USV’s inspection work and strictly observe the handling measures issued by the USV. The law enforcement of the USV should maintain the legal effect equal to the enforcement of official vessels. Of course, business vessels can still dominate and govern the USV to perform a specific job.

3.1.1. The Status of USV in the Territorial Waters. Territorial waters include internal water and territorial waters. As is territorial land, inland water is an integral part of the territorial waters of the coastal State, and the coastal State has its own exclusive sovereignty over it. USV as the main function of military ships is to complete the designated task, so the author thinks the military USV cannot enter the coastal water unless the coastal state initiative to invite foreign USV to complete a task or functional display. As a result, foreign USVs may not enter or pass the domestic water without their consent, otherwise, they will constitute a violation of the sovereignty and territorial integrity of the coastal State and the coastal States may carry out the necessary security measures. As the main law enforcement area of a business vessel, it is even less likely to enter the internal waters of other countries within the jurisdiction of its own jurisdiction. If it is not permitted to enter or pass through other countries’ water, it will inevitably constitute a sovereign violation of other countries. Therefore, it can be said that a foreign USV has the innocent right of passage in the territorial sea, but it requires advance notice, permission or other requirements. In addition, the flag State shall bear international responsibility for any loss or damage suffered by the coastal States by the failure of the USV to comply with the laws and regulations of the coastal State concerning the territorial sea or to comply with the provisions of UNCLOS or other rules of international law.

3.1.2. The Status of USV on the Exclusive Economic Zone and the Continental Shelf. UNCLOS allows coastal countries to set up an exclusive economic zone in their territorial sea at a distance of 200 nautical miles from their coast. Sea areas in international rights are shown in Figure 4. In the EEZ [11], coastal States have sovereign rights that include the exploitation, conservation, and management of resources, including living and non-living resources. USV enjoys the freedom of navigation and most of the rights on the high seas within the exclusive economic zone. All countries in the exclusive economic zone, whether coastal or land-locked, enjoy freedom of navigation and over flight, freedom to lay submarine cables and pipelines and other internationally legitimate uses of the oceans associated with these freedoms. Therefore, the foreign USV enjoys the freedom of navigation and other rights in the exclusive economic zone. Beyond 200 nautical miles, the upper waters of the continental shelf are open sea and the USV enjoys the privilege of being on the high seas.
3.1.3. The Status of USV on the International Waters. The area beyond 200 nautical miles of the coastline of the coast is called "the high seas." The high seas are open to all countries for free navigation and over flights, fishing, the laying of submarine cables and pipelines, the construction of artificial islands and installations, and the implementation of scientific research [13]. Article 90 of UNCLOS provides for the freedom of navigation in the high seas, "Every State, whether coastal or land-locked, has the right to sail ships flying its flag on the high seas. Therefore, the USV enjoys the freedom of navigation on the high seas; it can operate on the high seas without the consent of the coastal state.

3.2. The Legal Status of USV as Civilian Transport Vessel

As civilian transport vessels, the essence of the USV is unmanned vessels. USV has three implicit advantages over merchant ships: the higher space utilization, lower cost and environmentally friendly. Based on these advantages, in the future, clearly the social trends of USV can be known, thus, it’s necessary to give a clear definition for laws of USV, which will help standardize the rights and the duties of voyage.

USV, as the civilian vessel and merchant vessel, should have the same rights and obligations with ordinary transport vessels. Those are entitled to the vessel navigation and the right of transportation in the coast, but also restrained by the laws of the flag state. Before sailing, a USV must get a country's shipping registration certification, obtain the national flag and hoist the flag of the country.

3.2.1. The Status of USV in the Internal Waters. The coastal states have completely exclusive absolute sovereignty over the internal waters and have the right to prohibit all foreign ships to enter the internal waters. Foreign USVs are allowed to sail in the internal waters or stay in the port, which must follow along with the coastal state's laws and regulations, and can only be docked in the port opening to the outside world. Without the permission of the coastal state, any foreign USV shall not sail in the internal waters.
internal waters. Therefore, foreign USV in other country’s internal waters ought to enjoy the Authorized Rights for Navigation.

3.2.2. The Status of USV in the Territorial Waters. The territorial sea is a part of the state’s territory; the coastal state enjoys sovereignty over its territorial sea, and can monopolize the Coastal transportation rights. Therefore, foreign USV unapproved does not have the cabotage rights, and are not allowed to operate maritime transport and the entrainment between their ports, but can only enjoy “Right of Innocent Passage”.

3.2.3. The Status of USV in the National jurisdiction Waters. National jurisdiction waters mainly refer to the outside of the inland sea and territorial sea, under the jurisdiction of the coastal state, such as the contiguous zone, exclusive economic zone. The legal status of the waters is different from that of the territorial sea and also different from the high seas. The Coastal States have sovereign rights only. USV navigating in these waters is a little freer than the Right of Innocent Passage. However, compared with the “Freedom of the seas” at international waters, it is restricted by the special regulations of the coastal state to this water area. Therefore, USV navigates in this area just enjoy the right which belongs to the "free right of innocent passage" or "limited freedom of the seas".

3.2.4. The Status of USV in the International Waters. The international waters do not belong to any country and are under the jurisdiction of the countries for equal use. So it determines the USV on the international waters to enjoy “Freedom of the seas”. As long as the USV is registered in one country, the country's national flag is obtained and hoisted on the ship, so it is possible to sail on the high seas. Of course, USV in the high seas still need to obey the international laws and the laws of the flag State shall when it is under the flag state jurisdiction.

4. Conclusions
Based on the characteristics of USV's unmanned ness and intelligence, this paper analyzes the action rules that USV should abide by under different shipping conditions according to COLREGS and relevant maritime laws, and presents its legal status under different identities in different seas and issues concerning the application of maritime law.

The innovation of this paper is to find out the commonality between USV and military vessels, official vessels, and civilian transport vessels to maximize the use of existing laws and regulations. For the differences, this paper presents the corresponding measures, which fills the gap of USV navigation status and legal status.

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