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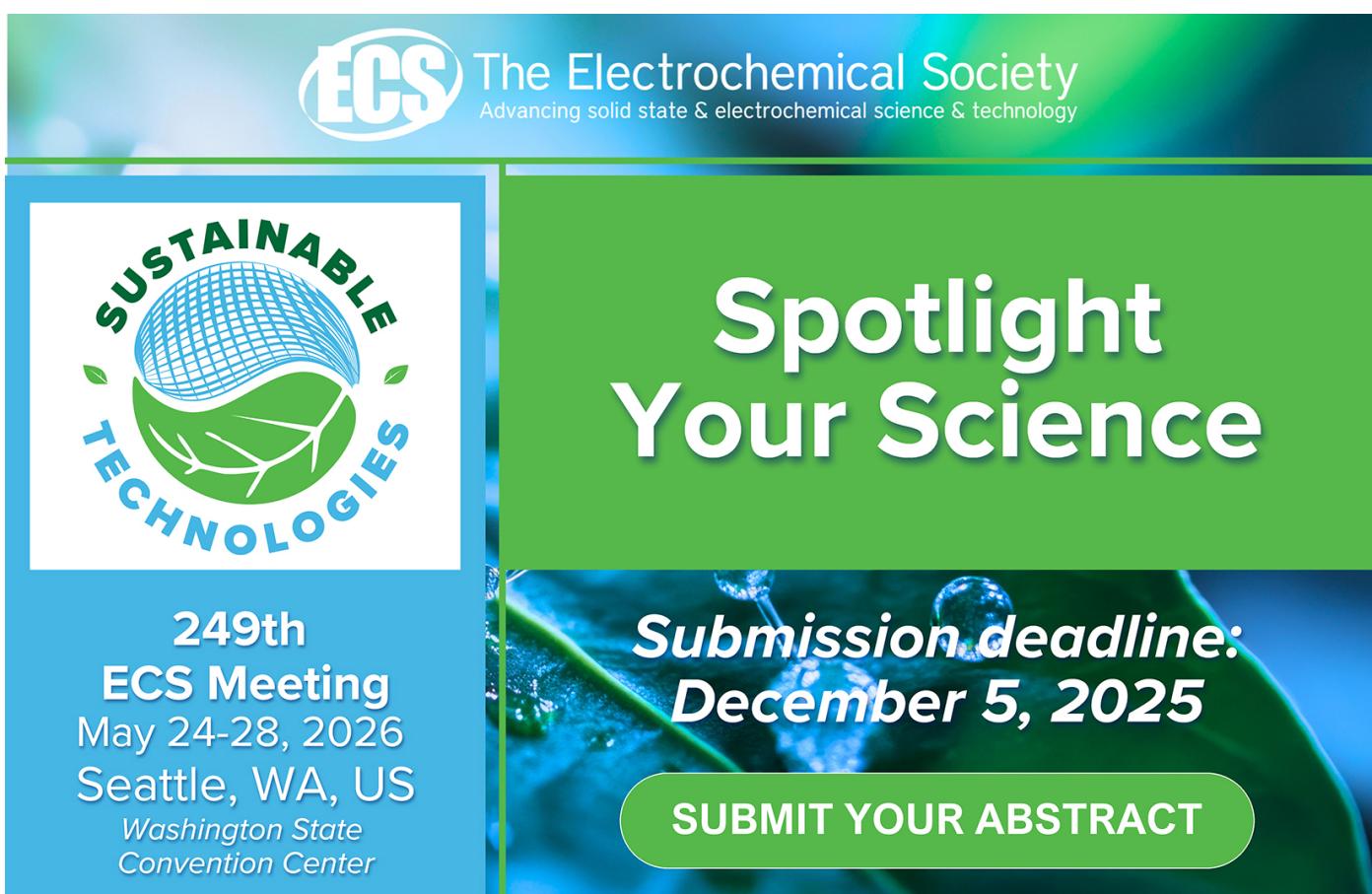
## Exercising Flag State Jurisdiction over Land-Based Remote Operation Centres for Unmanned and Autonomous Ships – an Analysis of the International Law of the Sea

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# Exercising Flag State Jurisdiction over Land-Based Remote Operation Centres for Unmanned and Autonomous Ships – an Analysis of the International Law of the Sea

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**Abstract.** The present paper deals with the question of flag State jurisdiction in the context of an emerging technology: autonomous and unmanned ships. The absence of a crew on board such ships calls for a new type of facility for the safety of operations, that is a remote operation centre (ROC). These centres will take on essential tasks, such as overseeing or steering manoeuvres, for ships potentially flagged in different States. In order to uphold their obligation to exercise their jurisdiction and control over ships flying flag (Art. 94 (1) UNCLOS), flag States must also necessarily exercise their jurisdiction over the ROCs and their personnel stationed therein. Based on an analysis of relevant UNCLOS provisions, this paper will look into why flag States may face challenges in the law of the sea to exercise such jurisdiction.

## 1. Introduction

Unmanned and autonomous navigation has become a reality, and commercial autonomous navigation becomes more and more feasible every year. One highly important aspect for the successful operation of unmanned ships is the transfer of personnel that were previously located on the ship to a shore-based remote operation centre (ROC). These land-based personnel take over most of the core functions and duties that are currently performed by the on-board crew of a conventional vessel. Therefore, despite being conceptually un-crewed, the human element – in the form of remote operators – is still considered a vital part for the operation of unmanned and autonomous ships (Amaxilati 2022: 144; MASS JWG 2023: para. 12-13).

Remote operators are, *inter alia*, responsible for planning and preparing the voyage, supervising the autonomous ship during its operation, establishing communication with other participants of maritime traffic and, in some cases, even actively taking remote control. Because of this vital role, both the remote operator and the ROC can be considered an essential feature for autonomous and unmanned navigation. Yet, the jurisdictional ties between the ship, the flag State and a possible third State in which the ROC might be located (ROC State) are far from solved. In the words of the International Maritime Organization (IMO), ‘the location where a ROC is established may give rise to complex legal issues on jurisdiction and the responsibilities of the flag State, the concurrence of the territorial jurisdiction of the State in which the ROC is located and flag State jurisdiction’ (MASS JWG 2023: para. 44). The problems are mainly related to the

constellation where the ROC is not located on the territory of the flag State but on the territory of a third State. The main issues are connected to the effective exercise of enforcement jurisdiction, which will be discussed in the present paper.

While certain matters of unmanned and autonomous navigation are regularly discussed in the literature, such as manning requirements of unmanned ships, the role of masters and remote operators or implications of international conventions, such as SOLAS, COLREGs, and STCW (Johansson et al. 2023; Ringbom et al. 2021; Stępień 2018), the topic of jurisdiction over an extraterritorial ROC has not gained as much attention (Ringbom 2025; Parlov 2025; Min/Choi 2024). Especially the question of the general applicability of UNCLOS to a land-based ROC is largely neglected in the contemporary literature. ROCs undoubtedly play a critical role in carrying out a safe and successful voyage by an unmanned and autonomous ship (Dybvik et al. 2020: 848; Ottesen 2014: 3-6). However, keeping in mind that UNCLOS is considered a 'constitution for the oceans' (Koh 1988: 11) and that its provisions are generally limited to specific maritime zones of the sea, the application of UNCLOS norms to land-based institutions is not self-evident and requires a deeper investigation. A further limitation in the subject matter concerns the application of flag State jurisdiction being confined to ships (Article 94(1) UNCLOS) and their crews (Article 94(2)(b) UNCLOS) as the objects of such jurisdiction. Therefore, it needs to be discussed if and how the jurisdictional link between the flag State on the one hand, and the ROC as well as its personnel on the other hand can be established.

The present article aims to address this research gap concerning the applicability of UNCLOS norms to the jurisdiction over land-based and extraterritorial operation centres. For this purpose, the terminology of the international law of the sea to apply to shore-based operation centres with a focus on the exercise of extraterritorial jurisdiction over ROCs beyond the flag State territory will be analysed. First, the essential role ROCs play in relation to autonomous ships will be outlined. Second, the question of UNCLOS' applicability to such ROCs will be examined. Third, the substantial requirements for flag States to exercise jurisdiction over their ships and ROCs will be addressed. In particular, special attention will be drawn to the challenges arising from the exercise of extraterritorial flag State jurisdiction concurrent to territorial jurisdiction of the ROC State. Finally, some potential solutions will be discussed before the findings are summarized in concluding remarks.

## 2. Remote Operation Centres and the Law of the Sea

Before diving into the specifics of flag State jurisdiction over ROCs on foreign State territory, some introductory elements ought to be established. Firstly, the basic functions and purposes of ROCs are outlined, as ROCs constitute the core of the present analysis. Secondly, the paper outlines considerations regarding the general applicability of UNCLOS, as a convention governing the sea, to land-based institutions.

### 2.1 ROCs as an Essential Feature of Autonomous and Unmanned Ships

In a technological trend where ships tend to see their functions rendered autonomous to a point where fewer personnel are required on board, ROCs become an essential element to guarantee the ship's safety. Prior to delving into the details of the functions carried out by such a facility, precision should be added to the term ROC itself. In various contributions to the topic, many different denominations are used, which all refer to the same general concept. For example, the

terms Shore Control Centre (Dybvik et al. 2020: 847), Onshore Control Centre (Choi/Lee 2021: 445) or Remote Control Centre (Yoo/Shan 2019: 562) can be found in the literature.

Depending on a ship's concrete degree of autonomy, different tasks are expected to be performed by ROCs. These degrees of autonomy have been established by the Maritime Safety Committee (MSC) of the IMO in preparation for the Regulatory Scoping Exercise on Maritime Autonomous Surface Ships (RSE) in 2021 (MSC 2021). The first degree corresponds to a ship with automated processes and decision support, where seafarers are still on board. The second degree designates remotely controlled ships with seafarers on board. The third degree is that of a remotely controlled ship without seafarers on board. The fourth degree describes a fully autonomous ship without mentioning the ship's manning status. Accordingly, the ROC can fulfil a variety of tasks depending on the degree of autonomy in question. For lower degrees, the ship will need to be steered and manoeuvred from a distance. It will also be on the receiving end of communication coming from the personnel on board. If the vessel finds itself in distress, the ROC will be the responsible facility to take appropriate measures. For higher degrees of autonomy and lower degrees of manning, the ship will still need human supervision and monitoring, as well as route planning and voyage preparation in advance. As the ship's autonomous system may require assistance by an operator, e.g. in case of an emergency, the remote operator must be able to take over control even in higher degrees of autonomy. Therefore, override mechanisms would still need to be available to the ROC in an emergency scenario (Yoo/Shan 2019: 565).

The aforementioned tasks are performed by the ROC personnel, whose qualifications may depend on the level of action required by the ships' autonomy level. If the vessel has to be actively steered and controlled remotely by an operator, the personnel in the ROC may be expected to possess certain standard qualifications as seafarers, the same that would be required from any crew member on board. If the autonomous ship, however, is only supervised in order to ensure its safety, such tasks can be performed by agents who would otherwise not qualify as seafarers (Yoo/Shan 2019: 565). In the view of the IMO, regardless of the relevant degree of autonomy, any autonomous ship, including those of the fourth degree of autonomy, will constantly need to be in contact with and be supervised by an ROC (MSC 2021: Para. 4.2 Assumption 8; Coello 2023: 24). Regardless of whether the latter will actually be in control of the ship or simply overseeing its operations, it is a question of maritime safety and security for all maritime traffic users that an autonomous ship should not be left unsupervised. Likewise, even for a ship at the highest autonomy level, a qualified seafarer should always be able to take control and manoeuvre remotely.

## *2.2 Application of the Law of the Sea Convention to Remote Operation Centres*

The primary purpose of the flag State constellation in UNCLOS is to subject the ship to the jurisdiction of a State and thereby create a legal order where in principle no State can exercise sovereign rights (Churchill et al. 2022: 463-464). Concretely, Art. 94(1) UNCLOS requires the flag State to effectively exercise its jurisdiction over ships flying its flag. Since a remote operator needs to take direct control over the autonomous vessel, this role can functionally be compared to the master of a conventional ship. Considering the importance of the ROC and its shore-based personnel for the successful operation of unmanned and autonomous ships, the requirement for the flag State to exercise control must also extend to the ROC in order to ensure safe and secure navigation. Since most features of safety and supervision are realised from the ROC, the flag State must be in a position to also exercise its jurisdiction over the ROC. This is necessary to ensure at least the same degree of safety and security compared to conventional ships; otherwise, the ROC would be left unsupervised and without regulatory guidance. Put differently, in order to ensure

jurisdiction and control over the unmanned and autonomous ship as a whole, the flag State necessarily must be able to establish jurisdiction and control over the ROC as well.

Most scholars dealing with this matter simply assume that Art. 94 UNCLOS is directly applicable to the remote operation centre even though it is located on the mainland territory of another State and not in any maritime zone (Ringbom 2025: 57-65; Parlov 2025: 222; Min/Choi 2024: 35-38). This result, however, requires further elaboration, as UNCLOS itself generally limits the applicability of its norms to maritime zones. In particular, Art. 86 UNCLOS states that the provisions of Part VII on the high seas, which includes rules on the exercise of flag State jurisdiction, apply to all parts of the sea that are not included in the exclusive economic zone (eez), in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State. Thus, the application of UNCLOS Part VII is generally limited to the high seas. In some instances, however, the application of this Part extends to other maritime zones by way of reference. This is for example the case for Art. 58 UNCLOS, which establishes the application of Art. 87-115 UNCLOS to the eez. Similarly, Art. 27 and 31 UNCLOS mention the flag State as relevant actor in the territorial sea, by which the application of the flag State law enshrined in Art. 91 *et seq.* UNCLOS to the territorial sea can be inferred. It is important to note, however, that no reference is made for the application of Part VII for inner waters nor the State territory of the coastal State. Therefore, it can be concluded that Art. 86 excludes the application of Part VII to the land territory where an extraterritorial ROC is located. Therefore, the general applicability of the relevant UNCLOS norms cannot be established.

Consequently, it is submitted in this paper that the provisions of the Law of the Sea Convention on flag State jurisdiction are not directly applicable to a land-based ROC. Before arguing that flag State jurisdiction over an extraterritorial ROC can be exercised effectively, one must first establish a jurisdictional link through which the flag State of the autonomous ship can exercise its jurisdiction over the operation centre. The jurisdictional link through the flag State system is, however, *prima facie* not applicable in the present case by virtue of Art. 86 UNCLOS.

In addition to this rather formal exclusion of the flag State principle, there are also substantial legal challenges that could exclude the effective exercise of flag jurisdiction over the ROC. Assuming, *arguendo*, that the provisions of Part VII were applicable to mainland territory, the application of flag State jurisdiction over an ROC is also questionable from a substantial point of view: Firstly, flag State jurisdiction is substantially limited to ships and their crew members, neither of which are present in a land-based operation centre. Secondly, even if flag State jurisdiction were established between the flag State and the ROC, the flag State would not be able to *effectively* exercise its jurisdiction on the territory of another State due to challenges arising from concurrent jurisdiction. Both concerns will be addressed in the sections to follow.

### 3. Legal Grounds for the Application of Flag State Jurisdiction to ROCs in General

In order to assess whether a flag State may exercise any form of jurisdiction over an ROC based in another State, a legal basis according to which it may do so has to be identified. The following part shall present two possible ways of conceiving such jurisdiction based on UNCLOS: First, as the flag State's jurisdiction applies to ships, and second, as it applies to the ship's crew.

#### 3.1 Flag State Jurisdiction over Ships Flying its Flag

Art. 94(1) UNCLOS on the duties of the flag State expects every State to effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag.

As established earlier, the ROC assumes important responsibilities for autonomous fleets that are traditionally carried out on board the respective ships. Therefore, to effectively control the ship, the flag State necessarily also needs to exercise control over the ROC. However, as flag State jurisdiction only applies to ships *per se*, the application of flag State law to the ROC is excluded. One possibility to extend flag State jurisdiction to the ROC could be to understand the ROC and the autonomous craft as a single functional entity. While the ROC is structurally independent of the craft, its essential features for navigation, as shown in section 2.2, render them indispensable and inseparable for the operation of an unmanned and autonomous ship. Considering the transfer of essential functions from the ship to an onshore facility, this section of the paper shall analyse whether the ROC could at least functionally be understood as part of the ship. This could, in turn, justify the application of the flag State jurisdiction based on the aforementioned provision.

### 3.1.1 Legal Definitions of ships

To ask what constitutes a ship may seem trivial at first. Indeed, anyone can spontaneously picture a ship, based on previous experiences or observations, without having to consider precise constitutive characteristics. This was expressed by Lord Justice Scrutton in the *Merchants Marine* case of 1926 with the now famous *Elephant Test*, by which he argued, '[o]ne might possibly take the position of the gentleman who dealt with the elephant by saying he could not define an elephant, but he knew what it was when he saw one' (Court of Appeal [of England and Wales] 1926: 203).

Likewise, many international conventions regulate ships without defining them. Generally, such instruments contain a series of legal definitions for specific terms to ensure the uniform application of the convention in question. However, when it comes to ships, there is no unanimous definition that could be applied throughout the whole field of the law of the sea. The most relevant legal framework for the oceans is the UN Convention on the Law of the Sea. The Convention regulates matters such as the spatial division of maritime zones, navigational rights, jurisdiction over maritime resources' exploration and exploitation as well as the protection of the marine environment, among other things. Throughout all these aspects, ships play an essential role. Yet, UNCLOS does not provide a legal definition, although certain elements can be deduced from the object and purpose of different provisions or the structure of the Convention. This follows the rules of treaty interpretation contained in the Vienna Convention on the Law of Treaties, specifically Art. 31 VCLT. For instance, the ability to float is not a necessary requirement to be considered a ship. Indeed, submarines are understood as ships in the framework of UNCLOS, as Art. 20 on submarines and other underwater vehicles finds itself in a subsection 'applicable to all ships'.

One of the core elements of UNCLOS is the freedom of navigation, which runs through the Convention as a guiding principle (Guilfoyle 2017). Depending on the respective maritime zone, the extent of that freedom may be more or less extensive. In the high seas, for example, Art. 87 UNCLOS recognises freedom of navigation as one of the core freedoms of all States. In the territorial sea, innocent passage as entailed in Art. 17 UNCLOS ensures that all States may cross these waters, subject to the limitations of Art. 18 and Art. 19 UNCLOS. In this context, freedom of navigation can only be given effect to if ships are able to move through waters, possibly across different maritime zones.

Another element speaking for UNCLOS' understanding of ships as mobile units is the system of the Convention itself. UNCLOS separates rules applicable to ships and to other types of structures and facilities at sea, such as artificial islands, installations and structures covered by Art. 60 UNCLOS. What differentiates such structures from ships is the former's attachment to the

seafloor, i.e. the incapacity to move (Proelß 2017: MN 10; Jessen 2021: 235). This is also showcased in the arbitral tribunal in the *Arctic Sunrise*, in which the crew of a ship flagged in the Netherlands intended to board a Russian oil rig. The crew was detained and originally indicted on piracy charges. However, the tribunal refused to qualify the acts in question as piracy acts, as they can only be targeted at ships (Art. 101(a)(ii) UNCLOS). It followed that the oil rig, as it was a fixed platform, could not qualify as a ship. This reasoning implied the Court's understanding of ships as mobile units (PCA 2015: para. 238).

Besides the legal framework created by UNCLOS, the regulation of shipping and maritime safety is principally carried out by the IMO. For example, SOLAS addresses technical requirements and safety standards applicable to ships. The Convention, however, does not contain any definition for what it considers a ship. Rather, it details the type of ships it is applicable to. As per Chapter I Regulation 1, those are ships engaged on international voyages. Regulation 3 contains a list of exceptions for ships to which the Convention does not apply: Those are for instance ships of less than 500 gross tonnage or ships not propelled by mechanical means. Such criteria do not speak for the Convention's understanding of ships, as no other provision allows to establish that vessels falling outside SOLAS' application scope could not qualify as ships.

The IMO also drafted conventions which do contain a legal definition of ships or vessels. Rule 3(a) COLREGs states: The word 'vessel' includes every description of water craft, including non-displacement craft, WIG craft and seaplanes, used or capable of being used as a means of transportation on water.' Art. 2(4) MARPOL states: 'Ship' means a vessel of any type whatsoever operating in the marine environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft and fixed or floating platforms.' The common trait between both definitions is the rather comprehensive understanding of ships, which, in the case of MARPOL, also includes floating and fixed platforms. However, these definitions only find application within the framework of their respective conventions, which aim at expanding their scope of application by including a vast variety of crafts and structures. They do not contain any precise construction or equipment requirements ships have to fulfil. Accordingly, some argue that structures such as platforms are not defined as ships *per se* but are included in the definition's scope via a legal fiction (Ehlers 2022: 43).

To conclude, there cannot be a one-size-fits-all definition of ships. The legal qualification of a certain craft or structure will be dependent on the convention in question. Except for one element from the definition in MARPOL, however, all conventions assume that ships can move on water. With these observations in mind, the following part will intend to apprehend the status and legal qualification of an ROC as it fulfils essential functions of a ship.

### *3.1.2 Conceiving ROCs through the Prism of Ships' Legal Definitions*

Even though a general legal definition of ships cannot be given based on the international law of the sea, one aspect is certain: ROCs themselves cannot be considered as ships. Despite the essential navigational functions carried out by the onshore structure, intending to fictionally consider ROCs as ships goes against an intuitive understanding of ships but also some of the aforementioned elements of definition. As explained before, ships under UNCLOS are to be understood as mobile units, which is not the case for an ROC. Thus, there is little doubt that the ROC as an immobile structure based on land cannot be defined as a ship by itself under international law. The question to be asked here is rather whether the autonomous ship and the ROC responsible for its security could be understood as a functional unit. This could in turn justify the applicability of the flag State jurisdiction on activities carried out by the ROC, as the ship could not function without it. Such an approach has been suggested by Yoo and Shan, who understand

an autonomous ship and the ROC as a 'comprehensive system' (Yoo/Shan 2019: 563). The authors' intention is to bring the regulation of such ROCs under the application framework of UNCLOS and other IMO conventions.

The idea of a functional entity can be based on the tasks performed by the ROC, which are essential to the ship's security and overall operation. As explained earlier, such missions can vary from surveillance and overseeing activities to active steering manoeuvres. If the ship finds itself in any danger, it is the ROC's role to take appropriate measures. In that regard, an autonomous ship cannot fully function on its own. Hence, the idea that autonomy cannot be understood on the simple 'ship level' but only in connection with all other elements permitting a safe navigation. Thus, the ROC would be part of the ship without actually being a ship in itself.

Such an extensive perception of what constitutes part of a ship could be supported by how international jurisprudence conceives the extent of the flag State jurisdiction over ships. In 1999, the International Tribunal for the Law of the Sea (ITLOS) rendered a decision in the framework of the *M/V "Saiga" (No. 2)* Case between Saint Vincent and the Grenadines and Guinea. In that case, the ITLOS theorised the concept of 'ship as a unit', according to which 'the ship, every thing on it, and every person involved or interested in its operations are treated as an entity linked to the flag State' (ITLOS 1999, para. 106). The ITLOS argued that the flag State – Saint Vincent and the Grenadines – had the right to seek reparation for loss or damage for non-nationals forming part of the crew. The findings of this decision have been upheld by subsequent ITLOS jurisprudence, such as the *M/V "Virginia G"* Case rendered in 2014 between Panama and Guinea-Bissau (ITLOS 2014: para. 126).

However, the 'ship as a unit' principle does not engage with the actual definition of ships as objects. It rather deals with the extent of the flag State's jurisdiction. As Art. 94 UNCLOS considers such a form of jurisdiction to apply to *ships*, one could read that provision as only applying to the craft itself as a physical object. The ITLOS clarified that it was not solely the case, as additional elements such as the crew and the cargo on board were also encompassed. Thus, the *M/V "Saiga" No. 2* case and the principle derived therefrom will not allow arguing in favour of the ROC's qualification as a functional element of the autonomous ship. Rather, it could justify the extension of the flag State's jurisdiction, as the ROC could be understood as 'every person involved or interested in [the ship's] operations'. It could be held against this argumentation that the ITLOS rendered the *Saiga* decision in 1999 and that autonomous ships were not a reality by then. Intending to extend the implications of the case to technologies never meant to be encompassed by it would not be a satisfactory solution. Moreover, the decision was rendered with regard to elements physically involved with the ship's structure, such as the crew or the cargo. The ROC, as an entity physically detached from the ship itself, departs from such an understanding.

In order to classify ROCs as functional components of a ship, one should rely on an evolutionary understanding of ships. Indeed, from a traditional point of view, ships represent a spatially limited entity, confined to the outside of the hull or the edges of the deck. Such ships are capable of movement through bodies of water and can withstand adverse weather and sea conditions. Such traditional conceptions are not only hinted at in the aforementioned international conventions but also reflected by national legal orders and their numerous statutory definitions and judicial decisions (Gahlen 2014). As a convention that was negotiated and drafted several decades in the past, UNCLOS should be read – as far as possible – through the lens of evolutionary interpretation. This has been done in the context of unmanned and autonomous vessels, as such crafts themselves are legally considered as 'ships' despite the fact that UNCLOS' drafters could not have had them in mind when formulating provisions applicable to 'ships'. Such

a view is also supported by the literature on the topic, as most authors argue in favour of the qualification of MASS *per se* as 'ships'. When it comes to understanding ROCs as at least functional entities belonging to ships, however, evolutionary interpretation may find its limits within the context of UNCLOS.

Going beyond the traditional conception of ships would represent a significant shift in understanding, which is not to be observed in current academic and practical developments around autonomous and unmanned ships. With the gradual introduction of such vessels, an international State practice could be developed which could tend to consider ROCs as functional elements of a ship. However, a certain amount of time is required for such State practice to come to fruition and have an impact on the international legal order. The safety of autonomous vessels and other maritime road users cannot afford to operate in a legal vacuum waiting for State practice to emerge. Thus, the statutory developments currently taking place will need to address the issues touched upon in this paper.

To sum up, one possibility for flag States of autonomous ships to exercise their jurisdiction over ROCs according to UNCLOS has been analysed. Art. 94(1) UNCLOS establishes that such jurisdiction should extend over *ships* flying the flag of said flag State. This part has examined whether – to some extent – ROCs could be recognised as ships or at least entities functionally belonging to the ship, due to the essential role they play in the autonomous ship's safety. The possibility for the ROC to be recognised as a ship itself has been dismissed, as international conventions understand ships as mobile units and find application within the maritime domain. As land-based structures fixed to the ground and located on mainland territory, ROCs can neither be legally qualified as ships nor fall under the application scope of the aforementioned conventions. It has also been shown that establishing ROCs as a functional part of autonomous ships stumbles on the traditional understanding of ships. These are crafts forming a physical entity, for the functioning of which exterior elements such as a crew may be necessary. Such elements however, are not of a constitutive nature for the ship itself. The 'ship as a unit' principle establishing that the crew or any other party interested in the ship's operation – under which ROCs could arguably be understood – only clarifies the extent of the flag State jurisdiction. It does not give further precision on how ships as objects should be understood in UNCLOS.

### *3.2 Application of Flag State Jurisdiction to ROC-Personnel*

Another possibility of exercising flag State jurisdiction can be based on Art. 94(2)(b) UNCLOS. According to this norm, every flag State shall assume jurisdiction under its internal law over each ship flying its flag and its master, officers and crew in respect of administrative, technical and social matters concerning the ship. It should be noted that the flag State's obligation to exercise jurisdiction over the ship's personnel – master, officer, crew – is mentioned separately from the ship. It can therefore be concluded that the flag State can assume its jurisdiction over the ship and the personnel separately. As long as the personnel constitutes the ship's crew, the flag State could exercise its jurisdiction independent of whether the crew is physically located on the ship. Therefore, in principle, a legal point of reference for exercising flag State jurisdiction over the ROC on foreign territory could be found in Art. 94(2)(b) UNCLOS, provided the ROC personnel can be considered a crew. However, neither the Law of the Sea Convention itself nor general international law provides a definition for the crew. Thus, it is unclear whether land-based ROC personnel can be considered an equivalent to a ship's crew in the sense of UNCLOS. The following section analyses the scope and meaning of this term and determines whether Art. 94(2)(b) UNCLOS is applicable to remote operators.

In the following, the term crew is understood as a collective term for all personnel working on board a ship, including the master and officers of a ship. This is also in line with how UNCLOS understands this term. Despite being listed separately in Art. 94(2)(b) UNCLOS, the Law of the Sea Convention does not in general distinguish between the master and officers on the one hand and the rest of the crew on the other hand. For instance, Art. 98(1)(c) UNCLOS states that the master of a ship shall after a collision between two ships render assistance to the other ship, its crew and its passengers. It would not be reasonable to distinguish between master, officer and crew in this case with the result that the master and officers of a ship in distress would not be eligible for assistance by the other ship. Rather, it should be read in a way that the master is implicitly understood as part of the general crew of the ship. In a similar vein, both Art. 73(2) UNCLOS and Art. 292 sections 3 and 4 UNCLOS deal with the prompt release of a ship and its crew that have been detained by another State Party. Here, too, the norms address the release of the crew in general without mentioning the master or officers separately. Nothing in these articles leads to the conclusion that only seafarers without the status of master or officer are to be released by the detaining State. Consequently, it can be safely assumed that UNCLOS understands 'crew' as a generic term that also includes the master and officers of a ship.

Based on the ordinary understanding of a 'crew', the term generally describes a group of persons working together, typically to operate a vehicle such as a ship, an aircraft or a spacecraft (Cambridge Dictionary, n.d.). The term 'crew' does not inherently carry a maritime element. Accordingly, in principle, land-based personnel could also fall under this very broad understanding of the term. Therefore, it can be argued that the term is sufficiently wide in order to also include personnel not working on the ship *per se* but in a location remote from the ship. Considering that the multitude of functions of a conventional crew on board a ship is largely transferred to the land-based personnel in an onshore ROC (Baughen 2020: 146; van Hooydonk 2014: 411-418), such an understanding would also underline a general functional equivalence between a ship's crew and the ROC personnel. In other words, the personnel working in an ROC essentially performs the tasks that are typically performed by a conventional ship's crew. This holds especially true when the remote operator is involved in the decision-making process of the ship and even taking over direct control of the ship's actions via remote-control (Choi/Lee 2021: 448). Such a broad understanding of the term crew appears to be the dominant opinion in the contemporary literature on this subject, see for example Parlov (2025: 217-219) and Ringbom (2025: 57-58).

On the other hand, the broader contextual understanding of UNCLOS as a framework convention must be taken into consideration when defining the respective terms at hand. For this specific case, Art. 86 UNCLOS is again especially relevant as it defines the application of the provisions of Part VII on the high seas. As has been mentioned earlier, the provisions on the high seas are only limitedly applicable to specific maritime zones, i.e. the high seas and, by reference, the eez and the territorial sea. According to the explicit wording of Art. 86, Part VII, including Article 94 UNCLOS, is limited to all parts 'of the sea'. Since the sea is explicitly mentioned, it can be concluded that the application of the norms of UNCLOS is generally excluded for mainland territory (Mandrioli 2022: 210-211). In a similar vein, Paragraph 4 of the preamble states the desire to establish a legal order for the seas and oceans through the Convention. It is therefore not the intention of UNCLOS to extend jurisdiction of States over their respective land territory, as this would be beyond the conceptual scope of the Convention for the Law of the Sea. With these contextual aspects in mind, it can be concluded that the term 'crew' as used in Art. 94(2) UNCLOS, in connection with the manning requirement of Art. 94(4) UNCLOS is to be understood in a

maritime context. Therefore, it is submitted that the term crew, as it is used in Art. 94(2) UNCLOS, does not include the personnel in the ROC as it does not serve on a sea-going ship. As a consequence, with regard to the Law of the Sea Convention, the flag State is not capable of exercising its flag jurisdiction over the ROC-personnel located within the territory of a third State through Art. 94(2)(b) UNCLOS.

#### 4. Effectively Exercising Flag State Jurisdiction over ROCs

In addition to the formal challenges posed by the wording of UNCLOS concerning the basis of flag State jurisdiction, there are also substantial questions regarding the exercise of jurisdiction that need to be addressed. Since the application of Art. 94 UNCLOS to land-based ROCs has been dismissed in the previous sections, the following section is argued under the assumption that the flag State was able to exercise its jurisdiction over the ROC or its personnel located on another State's territory. Under that assumption, Art. 94(1) UNCLOS explicitly requires this exercise of flag State jurisdiction to be effective. In general, this effective exercise of jurisdiction constitutes the fundamental purpose of the concept of the flag State (ITLOS 1999: para. 83; Parlov 2025: 222-223; Tanaka 2023: 206), which is to establish a legal system of jurisdiction and control in an area that is beyond national jurisdiction and territorial claims (Churchill et al. 2022: 463-464). It is an essential prerequisite for the effective exercise of jurisdiction under the Law of the Sea Convention to be able to prescribe laws as well as enforce compliance with such laws (ITLOS 2015: para. 138). However, in the constellation at hand, in which the ROC and its personnel are located neither within the territory of the flag State nor on its flagged ship but rather on the territory of the ROC State, practical challenges arise that might hinder such an effective exercise of jurisdiction. These challenges constitute the heart of the 'complex legal issues' described by the MSC-LEG-FAL Joint Working Group (2023: para. 44) mentioned in the introduction.

Some concrete challenges have also been identified by the Comité Maritime International (CMI) in its report on a survey on current issues concerning Remote Operation Centres (CMI 2025). The CMI surveyed 12 States that comprise a significant share of world shipping tonnage (CMI 2025: para. 4, 5). While some States expressed that there were no legal or practical impediments to an ROC being located outside the territory of a flag State, others mentioned issues of definition, conflict of legislations, enforcement of regulations (CMI 2025: para. 6). This shows that important State actors share the view that extraterritorial ROCs pose major regulatory issues. These issues will now be discussed in detail.

##### *4.1 Concurrent Jurisdiction and the Primacy of Territorial Jurisdiction*

One crucial distinction between the operation of a ship and the operation of an ROC is the fact that the ROC is stationary located on land territory, whereas a conventional ship can be navigated from within the coastal State to its port of departure. This means that a conventional ship is usually able to return to the flag State territory in order to be subjected to controls and inspections directly by the flag State. Additionally, conventional ships are also inspected in ports of other States through the port State control authorities (IMO, n.d.) adding another layer of control and surveys to the operation of ships. In contrast to that, the ROC is permanently located in the territory of the ROC State. In order to undertake necessary surveys, inspections and controls, the flag State must be able to access the ROC, as the land-based ROC is unable to enter the territory of the flag State. As long as the ROC State and the flag State are in an understanding on how these control mechanisms are to be undertaken, there is hardly a problem with regard to the exercise

of jurisdiction and control. However, problems can be caused by disagreements over the scope of the respective jurisdictional powers.

As expressed by the IMO Joint Working Group, the main concern about extraterritorial ROCs lies with the concurrence between the ROC State jurisdiction and the flag State jurisdiction. In essence, concurrent jurisdiction means that two or more States assert claims to exercise their respective jurisdictional powers and sovereign rights over the same subject matter, the same person or the same object (Orakhelashvili 2015: 15-17). If the ROC and its personnel are located on the territory of the ROC State, the law of the ROC State as the territorial State applies primarily (Min/Choi 2024: 37-38). This primacy of territorial jurisdiction is considered the 'most traditional form of jurisdiction' (Molenaar 1998: 78; Oxmann 2007: para. 51) and expresses that the territorial State has generally unlimited and exclusive sovereignty over its entire territory. Unless otherwise provided for by another rule of international law, territorial jurisdiction is unrestricted, with the consequence that the territorial State can regulate and decide all subject matters on its territory (Molenaar 1998: 78-79). Therefore, the ROC State as the territorial State enjoys primary jurisdiction over all legal matters – including the ROC – on its territory. Additionally, under the assumption of flag jurisdiction's application over the ROC, the flag State also enjoys jurisdictional rights. Therefore, flag and territorial jurisdiction exist concurrently. This also means that neither State acquires exclusive jurisdiction over the subject matters of regulating ROCs.<sup>1</sup> Rather, flag State jurisdiction is substantially limited to flag affairs and territorial jurisdiction still exists unlimited in its subject matter.

Having established the concurrent nature of flag State and ROC State jurisdiction in the present constellation, it must be clarified to what extent the respective States are able to exercise their jurisdictions. This is linked to the fact that, in general, jurisdiction can be divided into prescriptive jurisdiction and enforcement jurisdiction.<sup>2</sup> Prescriptive jurisdiction means 'to make its law applicable to the activities, relations, or status of persons, or the interests of persons in things, (...)' Enforcement jurisdiction is considered 'to enforce or compel compliance or to punish noncompliance with its laws or regulations (...)' (Honniball 2016: 501<sup>3</sup>). Briefly summarised, prescriptive jurisdiction is the power to legislate a subject matter by establishing rules while enforcement jurisdiction is the power to execute a State's legislation through administrative or other enforcing means, especially in the form of imposing forcible consequences.

However, as a general rule of international law, based on the sovereign equality and territorial integrity of the States, the enforcement of territorial jurisdiction, in contrast to prescriptive jurisdiction, is generally exclusive (Molenaar 1998: 78-79). As held by the Permanent Court of International Justice (PCIJ) in its famous *Lotus* decision, a State 'may not exercise its power in any form in the territory of another State. In this sense, jurisdiction is certainly territorial; it cannot be exercised by a State outside its territory except by virtue of a permissive rule derived from international custom or from a convention' (PCIJ 1927: 18-19). This means that a State does not have the right to enforce its laws on the territory of another State unless the territorial State gives its consent to do so. If applied to the constellation of an extraterritorial ROC, the flag State – or any other State other than the ROC State – does not possess the power to exercise its enforcement

<sup>1</sup> This is in contrast to the high seas, where the flag State generally has exclusive jurisdiction over ships flying its flag, see Article 92 (1) UNCLOS.

<sup>2</sup> For the sake of completeness, it should be mentioned that there is also adjudicating jurisdiction as the power to hear and decide a case in a court of law. As this is, however, not particularly relevant to the issue at hand, it is not discussed in further detail.

<sup>3</sup> With reference to the American Law Institute, Restatement (Third) Foreign Relations Law of the United States (1987), § 401 (b) and (c)

jurisdiction on the territory of the ROC State (Mandrioli 2022: 207-208). In other words, the ROC State as the territorial State has the sovereign authority to exclude other States from enforcing their jurisdictional powers on their territory, rendering its available jurisdictional means more effective in comparison to any other State.

#### *4.2 Flag State Jurisdiction and Extraterritorial ROCs*

As the flag State is still under an obligation of Article 94(1) UNCLOS to exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag. The remaining sections of Art. 94 UNCLOS specify the nature of this rather broad duty. In particular, according to Article 94(4)(a) and (c) UNCLOS, the ship has to be surveyed before registration and at appropriate intervals thereafter. According to Art. 94(4)(c) UNCLOS international regulations regarding the safety of life at sea, the prevention of collisions, the prevention, reduction and control of marine pollution, and the maintenance of communications by radio are to be complied with. This requires inspections of the ROC's premises as well as the personnel operating at the facility in order to identify and correct any deficiencies. It also includes undertaking surveys, issuing certifications, investigate accidents and also sanctioning unlawful behaviour that originates in the ROC. The central question is now how these basic characteristics of flag State jurisdiction can be applied to ROCs that are located beyond the territory of the State to which the associated autonomous ship belongs.

Flag State jurisdiction in the sense of the Law of the Sea Convention comprises both prescriptive and enforcement jurisdiction (Barnes 2015: 311-312; Molenaar 1998: 95-96; Min/Choi 2024: 31-32). The flag State therefore is under an obligation to enact laws and regulations over its ships – and also the ROCs – but also to enforce those laws to effectively exercise its jurisdiction. With regard to which measures the flag State has to take in particular, the ITLOS held in its Sub-Regional Fisheries Commission Advisory Opinion: 'While the nature of the laws, regulations and measures that are to be adopted by the flag State is left to be determined by each flag State in accordance with its legal system, the flag State nevertheless has the obligation to include in them enforcement mechanisms to monitor and secure compliance with these laws and regulations' (ITLOS 2015: para. 138).

In drafting the MASS Code, the IMO also addresses the exercise of flag State jurisdiction and control over ROCs in general via the process of survey and certification. The draft of the MASS Code requires that '[e]very ROC should have a valid MASS ROC Certificate, issued after an initial or renewal survey' (MSC 2023: Annex, para. 8.2). At the time of drafting the present article, the Draft Code does not explicitly address ROCs that are located on the territory of another State. However, in the MSC-LEG-FAL Joint Working Group, the idea has been discussed that an approach similar to the model of the IMO Code on International Safety Management (ISM Code) could be established for the oversight of ROCs (MASS JWG 2023: para. 44.4). According to this approach, Documents of Compliance over companies operating ships of the flag State can be issued by a recognized organization and by another contracting government to the Convention, irrespective of said company's location (MASS JWG 2024: para. 4). The Legal Committee expressed its general support for the option to use the ISM Code as model for dealing with extraterritorial ROCs (LEG 2024: para. 10.26).

However, it must be considered that surveys and certification audits according to the ISM model can be seen as an administrative delegation rather than actual operational control. If the company operating a conventional ship is located abroad, the ship is physically operated by personnel subject to the flag State's jurisdiction. The recognized organization or the other State only verifies compliance and issues certificates on behalf of the flag State. In contrast to that, the

personnel in the ROC, which is under the territorial jurisdiction of the ROC State, assume primary navigational tasks for the autonomous ship. If the ROC is located abroad, the flag State cannot simply access it or enforce its jurisdiction without the ROC State's cooperation. Therefore, compliance with the flag State obligations, which requires access to the ROC, is entirely dependent on the willingness of the ROC State to cooperate. By not granting access to the premises of the ROC, the ROC State could unilaterally restrict or even completely refuse the flag State's ability to exercise its jurisdiction. In that case, without direct access to the ROC, the flag State by itself can no longer independently guarantee compliance with safety and quality aspects of the ROC and autonomous ship.

Therefore, it is submitted that this dependency of the flag State towards another State fundamentally renders its exercise of jurisdiction and control ineffective. In this context, multiple delegations of the Legal Committee also expressed doubts as to the effectiveness of the flag State's exercise of jurisdiction and control (LEG 2024: para. 10.24). It was stated, among others, that '[b]y virtue of the principle of sovereignty, ROCs located in a State other than the flag State of the MASS it was operating would not be under the effective jurisdiction of that flag State' (LEG 2024: para. 10.24.5) and that '[f]lag States might not have sufficient access to ROCs that were located abroad' (LEG 2024: para. 10.24.6). This leads authors on this topic to conclude that 'it is difficult to see how a flag State can live up to these duties if the person controlling an unmanned ship is not in its territory and thus not subject to its full prescriptive and exclusive enforcement jurisdiction' (Petrig 2024: 57).

This shows that the ability to institute enforcement mechanisms is essential to the effectiveness of the exercise of flag State jurisdiction. However, while a flag State under the Law of the Sea Convention is generally able to exercise its prescriptive jurisdiction (Petrig 2024: 61; Ringbom 2025: 61), it does not have the jurisdictional competence to independently enforce these laws on the territory of the ROC State (Min/Choi 2024: 37-38). While the flag State would need the consent of the ROC State to be able to do so (Yurika 2023: 275, 281; Petrig 2024: 55-56), the ROC State, as the territorial State, is neither limited in access nor in jurisdictional subject matter to inspect, control, and regulate the processes and operations independent of any third State. Therefore, it is argued that the flag State is unable to ensure its flag jurisdiction over an extraterritorial ROC effectively. This view is also shared by some flag and port States as evidenced by the CMI survey mentioned above as one State expressed doubts concerning the effectiveness of the flag State's jurisdiction and control under Art. 92 and 94 UNCLOS (CMI 2025: para 6.6).

A specific example that reveals challenges in the constellation around extraterritorial ROCs is presented by Yurika (2023: 281). The author argues that if an unmanned and autonomous ship or its ROC falls victim to an attack, the flag State cannot adequately fulfil its obligation to ensure the safety of navigation. If the attackers gain unauthorised access to the control centre on foreign territory, the flag State has no way of accessing the ROC on the territory of the ROC State to mitigate the danger without consent. Quite the contrary, in this scenario it seems more obvious that – as the territorial State – the ROC State would exercise its territorial jurisdiction to avert any danger and prosecute the offenders instead of transferring this matter to another State (Min/Choi 2024: 38). In this potential constellation, the flag State would be in a difficult position where it is excluded from exercising its jurisdiction and unable to fulfil its duties under the Law of the Sea Convention. Therefore, part of the literature agrees that 'the flag State will not always be able to effectively exercise its jurisdiction and control, unless the ROC is located in the flag state or the flag state has a special agreement with the ROC state' (Parlov 2025: 224) and that 'some of the flag state duties (...) almost inevitably will have to be performed by another state, if the ROC is

located beyond the borders of the flag state' (Ringbom 2025: 59). In general, as put by Coello, the ROC State 'would be in a better position to assure compliance with IMO regulations. Nonetheless, they will have no obligation to exercise their jurisdiction under Article 94 of UNCLOS, since the "Drone" is not flying their flags' (Coello 2023: 30).

#### *4.3 Accommodating Extraterritorial ROCs*

Some potential solutions to address these challenges and to facilitate the operation of extraterritorial ROCs under the current flag State system have been presented in the literature. Firstly, it is proposed that the ROC State and the flag State enter into a bilateral agreement where the ROC State contractually grants the flag State access to the ROC and consents to the exercise of extraterritorial jurisdiction with regard to flag State matters (Ringbom 2025: 57-62; Min/Choi 2024: 38; Yurika 2023: 280; CMI 2025: para. 10). While granting consent can circumvent the exclusivity of territorial jurisdiction, the ROC State is theoretically still capable of unilaterally withdrawing its consent or limit the extent of the conceded delegations to certain subject matters. Of course, such an action would most likely constitute a violation of the bilateral convention in question. However, in that case the flag State is still limited to general means of State responsibility whereby immediate access to and control over the ROC cannot be realised. One potential countermeasure could be to withdraw the Safety Management Certificate of the autonomous ship. In cooperation with port State authorities, the ship could then be detained until any concerns about safety are resolved. However, that does not equal the exercise of jurisdiction and still requires assistance from another authority. This shows that even with a bilateral agreement, the flag State is still dependent on the consent and cooperation of the ROC State. A conflict between the flag State and the ROC State as the territorial State could therefore still lead to the flag State not being able to exercise its duties.

This is why some authors propose that the flag State delegates the relevant responsibilities onto the ROC State altogether (Ringbom 2025: 58-59). Thereby, the ROC State would essentially become the State responsible for ensuring compliance with the tasks prescribed by the Law of the Sea Convention, especially Art. 94 UNCLOS. It is argued that the ROC State would perform the relevant duties on behalf of the flag State, similar to how a flag State makes use of a private classification society which is also working from a place outside the flag State territory. However, this raises the question of the connection between the flag State and the unmanned and autonomous ships if there are no personnel on the ship and if all the duties and responsibilities fall primarily to another State. If a State other than the flag State assumes the primary responsibility of supervising and controlling the ROC, this may be interpreted as a transfer of authority rather than a mere delegation of tasks. As a consequence, the link between the flag State and the unmanned and autonomous ship, which according to Art. 91(1) UNCLOS needs to be genuine, would become 'virtual to the highest degree' (van Hooydonk 2014: 410). Ringbom describes the heart of this issue: 'In the longer run, however, if MASS operated from non-flag states will turn out to be a regular feature of shipping in the future, it is clear that the development will represent a (further) weakening of the role of the flag State. The ROC state not only represents a new jurisdictional basis for placing claims (...) but also represents another challenge for – and encroachment of – flag state jurisdiction, which over time may call for regulatory adjustment' (Ringbom 2025: 65). In similar vein, one State in the CMI survey stated that 'such arrangements would dilute [flag State] duties to notional rather than actual control' (CMI 2025: para. 11.2).

As a result, from a substantive perspective, the ROC State could be considered as better equipped to fulfil the flag State's conventional duties. The latter steps further into the background, with the consequence that its connection to the unmanned and autonomous ship becomes merely

a legal fiction and can no longer be described as genuine. Transferring the core flag State duties to another State therefore questions the fundamental systematic of the flag State law, as the latter could progressively lose its status. Accordingly, part of the literature plausibly submits that the flag State would not be capable of fulfilling its obligations under the Law of the Sea Convention (Yurika 2023: 281) or even that the flag State system when addressing extraterritorial ROCs would become obsolete (Coello 2023: 28-31). Therefore, under the current legal system of flag States, because the flag State is unable to ensure its jurisdiction and control in an effective way, extraterritorial ROCs can hardly be operated in a sensible manner. This is explained by the fact that the flag State system developed under the condition that navigation activities themselves do not require actions from the territorial mainland and can entirely be carried out from the ship (Mandrioli 2022: 209-211). This dislocation of maritime activities gives rise to unforeseen jurisdictional challenges. As a legal consequence, a flag State would not be permitted to register autonomous ships whose ROC is located in the territory of a State other than the flag State, as it would not be able to exercise its jurisdiction and control effectively. This is why the current flag State system can be described as unfit to properly incorporate the extraterritorial operation of autonomous ships.

Given these regulatory challenges, a profound revision of the law of the sea should be considered in order to accommodate the extraterritorial operation of unmanned and autonomous ships. This could be achieved by softening the rather rigid flag State system and instituting the possibility for a shared or functionally distributed jurisdiction, in which functions for supervision and control may be exercised jointly or by different States, irrespective of territorial ties. This, however, requires a fundamental shift in the allocation of jurisdiction within the law of the sea, where navigation is based primarily on the jurisdiction of the flag State. However, considering the fundamentally disruptive nature of the dislocation of maritime activities by unmanned and autonomous ships, such a paradigm shift would seem appropriate.

## 5. Concluding Remarks

This paper has shown that the application of flag State law to an extraterritorial land-based remote operation centre is not as straightforward as one might presume. Both formal and substantive considerations of the Law of the Sea Convention need to be considered. The argumentation to get to this conclusion is threefold: First, the elements of the flag State law under the Law of the Sea Convention are not applicable on the mainland, where the ROC is located, as the mainland is excluded from the application scope of UNCLOS. Second, even if UNCLOS regulations were applicable on land, the specific regulations on flag State law are neither applicable to the ROC as they do not constitute a ship nor to the ROC personnel as they do not constitute a crew in the sense of UNCLOS. In any case, even under the assumption that flag State law is generally applicable, the flag State is generally unable to exercise its enforcement jurisdiction effectively, which leads to the conclusion that it cannot fulfil the standard laid down in Art. 94(1) UNCLOS.

This shows further that unmanned and autonomous navigation – here in the form of supervision and control over the ROC – challenges established principles in the law of the sea, especially with regard to the Law of the Sea Convention. For centuries, it has been evident that all navigational actions take place on a sea-going ship. With this basic concept in mind, the flag State system developed in order to exercise some form of responsibility and control in an area where no territorial claims and jurisdictions are possible. The emergence of land-based remote

operation centres dislocates the activity of navigation onshore and results in a paradigm shift in the understanding of navigation itself. This fundamentally questions essential assumptions made in the Law of the Sea Convention and calls for the need to critically assess and re-evaluate the principles of jurisdiction and control. Perhaps the traditional flag State system is not the 'be-all-end-all' solution for navigation on the high seas and a more revolutionary approach in the form of a multi-layered control might be necessary. All in all, these questions need to be addressed on a fundamental level in order for commercial autonomous and unmanned navigation to realise its full potential. Otherwise, the restrictions of an otherwise generally open-to-change framework (Holst 2020: 287-290) may ultimately limit the opportunities to fully utilise all the benefits of new and emerging technologies.

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