

# ULUSLARARASI DENİZCİLİK ÖRGÜTÜ (IMO) HUKUKİ ARAÇLARININ OTONOM GEMİLERE UYGULANABİLİRLİĞİ ÜZERİNE KISA BİR DEĞERLENDİRME

## A Brief Review of the Applicability of International Maritime Organization (IMO) Legal Instruments to Autonomous Ships

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### Özet

"Dijital Çağ" olarak da adlandırılan günümüzde, hemen hemen her sektörün değişim ve dönüşümünü teknolojik gelişmeler temelinde şekillendirdiği görülmektedir. Bu anlamda denizcilik dünyası da gemi yürütmeye ilişkin olarak öngördüğü otonom, yarı-otonom ve uzaktan kontrol gibi yenilikçi sistemlerle bu trendi takip etmektedir. Ancak yeniliklerin bu derece köklü olduğu durumlarda mevcut hukuksal çerçevenin daha önce öngörülmemiş meselelere ne şekilde cevap vereceğinin sınanması büyük önem arz eder. Bu çalışmada, insan unsurunun azaltılmasına dayanan gemi modelleri ve operasyonları tanımlandıktan sonra Uluslararası Denizcilik Örgütü'nün ("IMO") yasal araçları olan SOLAS, COLREG, MARPOL ve STCW metinlerinin yeni sistemle çelişebilecek maddeleri incelenmiş, ardından uygulanabilirlik dereceleri kısaca değerlendirilmiştir.

### Abstract

Nowadays, which is called the "digital age", it has been seen that almost every sector shapes its change and transformation on the basis of technological developments. In this sense, the maritime world has followed this trend with innovative systems such as autonomous, fully autonomous, and remote-control, in order to operate ships. However, in cases where innovations are radical, it is of great importance to test how the current legal framework will respond to issues that were not foreseen before. In this study, after having defined ship models and operations based on reducing the human factor, the provisions of the legal instruments of the International Maritime Organization ("IMO"), namely, SOLAS, COLREG, MARPOL and STCW that may conflict with the new systems were examined, and then the degree of applicability was briefly evaluated.

**Anahtar Kelimeler:** Denizcilik, Otonom, Tam Otonom, Uzaktan-Kontrol, IMO.

**Keywords:** Maritime, Autonomous, Fully Autonomous, Remote-Control, IMO.

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## 1. Introduction

This century is known to be an age of technology. Every field has been surrounded by rapid technological developments, and the maritime world is not an exception to resist this movement. A set of tools have been already implemented thus far such as sonars, global positioning, and early warning systems and so on. Beyond the scope of this, the latest innovations have been focused on autonomous systems to operate vessels by reducing the proportion of human interventions or even eliminating the human factor.

There has also been ongoing experimental, and military-based research within the maritime industry but it has been shifted from small-scale to large-scale in terms of intended use in the last few years. For instance, Rolls-Royce, one of the major players in the high-tech engine sector, revealed plans for autonomous vessels and envisaged that the first vessel would be floated in the 2020 timeframe (Buchholz, 2018). Moreover, the European Commission has initiated a new research project on the autonomous ships to see the probability of actualisation of this idea (Rødseth and Burmeister, 2012:4) and the selected project name is "Maritime Unmanned Navigation through Intelligence in Networks" (MUNIN) which aims to develop technology for unmanned vessels (MUNIN, n.d.). In this sense, it can be said that autonomous technologies related to ships have gained a feature that concerns everyone rather than a specific segment in terms of usage and regulations.

On the other hand, the outcomes of such initiatives will create a regulation problem as the character of the matter evolved from domestic to international ground, and there is no possibility to tackle the issue with the help of the legislation that has been governed by local authorities solely anymore. Nonetheless, it is possible that the current international legislation, primarily in wording, has some shortcomings in covering the characteristics of unmanned ships. As a matter of fact, the current legislation is designed only for traditional navigation. Therefore, it is beneficial to analyze the extent to which current regulations can respond to innovations.

In this essay, primarily unmanned ships and their operations will be scrutinized. After that, the current legal instruments of the International Maritime Organization ("IMO") will be examined in terms of the contradictive provisions which is related to manning, and finally the degree of applicability will be assessed. Whilst performing analysis, it will be assumed that foremost safety issues such as possible communication and signal delays have already been solved by MUNIN. Otherwise, there will not be a solid ground to investigate the compliance degree between current regulations and unmanned vessels.

## 2. Unmanned Vessels: Definition and Operations

An autonomous ship is a ship that has some level of automation and self-governance (Nordahl and Rødseth, 2017:5). There are different labels which represent the autonomous ships, and they could be used interchangeably such as unmanned ships, unmanned craft, unmanned maritime vehicles and so on. Thus, the term of the unmanned vessel ("UV") might be a preferable option as it emphasises the two features explicitly that there is no crew on the board and no hesitations about either it is a ship or not (Veal, 2017:2).

According to Lloyds registration, there are seven levels of autonomy from AL0 to AL6, and through the AL6 the degree of human intervention will be declined (Lloyd's Register, 2016). Besides this, the unmanned ships are classified generally under three sub-categories due to the operational specialities which are a remote-based operation, autonomous operation, automated (fully autonomous) operation (MUNIN, n.d.).

Due to the remote-based operative system, relevant data will be collected by the advanced data-gathering devices and then will be transmitted from UV to the shore control centre ("SCC"), is located somewhere apart from the ship, in order to navigate the UV (Hooydonk, 2014:404).

Under automated operation, the UV have owned its decision-making system and reflexive specialities to manage its own voyage plan without human intervention except for uploading the target destination into the UV's onboard computer (Pritchett, 2015:199).

Autonomous operation system is a hybrid of remotely operated and fully autonomous systems (Pritchett, 2015:200). Routine manoeuvres within the context of the instructions can be performed by advanced onboard computers which are under the supervision of the operator in case of emergency or necessary corrections (Hooydonk, 2014:404).

## 3. Could unmanned ships be accepted as a ship within traditional meaning?

The maritime legal framework is composed of considerable conventions which incorporate the various definitions regarding the ships. When determining the status of such an innovative concept in the light of the current legal framework, the threshold movement has to be focused on the previous definitions in order to provide wording detection whether it includes any restrictions or not? The definitions of the ships are changeable among the conventions as they have particular subjects to concentrate (Hooydonk, 2014:406), however, some of them does not point out any wording expressly.

International Convention for the Safety of Life at Sea, London, 1 November 1974 ("SOLAS") Regulation 2 does not incorporate the precise definition of a vessel. Therefore, it could be assumed that there are no restrictive reasons to exclude unmanned vessels from the SOLAS about crew requirements notably.

International Convention On Salvage, London, 28 April 1989 , Article 1(b) defines vessel as “any ship or craft, or any structure capable of navigation”. International Regulations for Preventing Collision at Sea London, 20 October, 1972 (“COLREGs”), Rule 3(a) describes vessels as “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”. International Convention for the Prevention of Pollution from Ships London, 2 November 1973 (“MARPOL”) Article 2(4) defines the ship as “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 unique speciality of the unmanned ships is not to have needs of any crew on board for operating the vessel. In the light of those definitions which have been examined thus far to see what parameters consist of the essence of being a vessel and the sample of conventions have pointed out that none of them put forward a pre-requisite stipulation in terms of manning. As a result, there is no exclusion for UV to entitle having rights and also performing duties in comparison to traditionally crewed ships.

#### **4. The compliance of existing IMO instruments in terms of unmanned ships**

As it has been mentioned above, the discussion regarding the vessel status of UV has been successfully finalized with the help of the vessel definitions. However, there are still some provision problems which have to be tackled. These shortcomings are stemmed from the nature of UV. That is to say, related provisions have been designed for regular ships which have already had the crews, but UV does not have any. Therefore, there is a necessity to address the related provisions to decide the degree of applicability each of them.

On the other hand, the analysis will be made by considering the remote-based and autonomous vessels' points of view. Upon contemplating the automated operations, it can be seen that there will be no stable ground for making a comparison between the traditional crew and artificial intelligence (AI) as long as the blur status of the AI will be enlightened in terms of human-specific skills.

#### **4.1 SOLAS**

The first edition of the SOLAS was adopted in 1914 after the Titanic disaster, and it has been continued to update with new versions and to add such amendments hitherto. The purpose of this convention is to provide safety of life at sea by generating minimum standardization regarding the construction, the safety tools and the operating procedures (SOLAS, 1974). Therefore it has a pivotal role in regulating maritime safety.

Upon having considered the UV's nature, Chapter V has to be examined among the other chapters as the manning-based provisions mainly are covered by this chapter.

Chapter V-Regulation 14 is incorporated with the wording of “sufficiently and efficiently manned” for Reg.14(1) and “establishing the appropriate minimum safe manning and issuing a document” for Reg.14(2).

There are two options to interpret Reg.14(1). If preferring the strict way and accepting the minimum standard as appearing at least one crew on board physically, there would be no chance to navigate for UV. The second option is to concentrate the capability of UV without considering the traditional manning. Therefore, it can be assumed that as long as the provision has a chance to be fulfilled by the SCC or advanced computers which are under the supervision of the operator in case of emergency, the absence of crew in the ship would not affect the sufficiency. Moreover, after the credibility is fully gained in the future by UV, this requirements would be remembered as a deterrent nothing more (Pritchett, 2015:203).

On the other hand, Reg.14(2) prescribes that appropriate minimum safe manning document has to be issued and the last resort of this decision is the flag state regarding whether its eligible or not to be merit (Ringbom et al., 2016:43). Therefore, the flag state has to be convinced by the UV, but there is an uncertainty about under what criteria should be taken into account to reach such a decision. As a result, the provision would need to be amended in order to a resurgence in the degree of applicability.

Chapter V-Regulation 22(3) refers to the level of visibility which has to be a significant part of the ship design to maintain the safe navigation. Most of the ships have already implemented the advanced technology to enhance the visibility possibilities instead of hiring more crew to achieve it. Therefore, the provision has a higher degree of applicability. However, there might be added some amendments about the location points of the sensors to avoid the possible signal blockers as well as the regular ships which dealing with the poor eyesight by moving containers vicinity of the navigating bridge .

Chapter V-Regulation 33(1) refers to the liability of shipmaster in distress situation at sea and the entering reason of failure into the logbook in case of not being able to assist to the persons in distress. It can be seen that the applicability of the first part of this provision is not possible with respect to today’s technology. As providing assistance in certain matters is a considerably complicated process to manage and human intervention has to be performed by the ship crew, and this time SCC cannot be the substitution of actual crew. Therefore, in this case, there would be needed some serious amendments.

On the other hand, the second part of the provision would be amended by adding an electronic version of log-book for UV.

## 4.2 COLREG

The standards of navigational rules are determined by the COLREG constitutively (Baatz, 2014:228) which also known amongst mariners as The Rules of the Road (McLaughlin, 2011:111). This convention was entered into force in 1972, and the purpose is to procure prevention of collisions at sea (COLREG, 1972).

UV have to cope with some contradictive standards against its nature prescribed by COLREG. For example, Rule 2 deals with the responsibility matters that there will be no privilege whomever causes the neglect of precaution in terms of taking responsibility; Rule 5 is about the look-out instructions that every vessel has to have a proper look-out by sight and hearing in order to avoid risk of collision; Rule 6 refers to the safe speed that every vessel has to proceed safe speed in order to take proper precaution against unforeseen conditions; Rule 8 deals with the action to avoid collision that points out the success of this aim highly correlated with following the rules and the good seamanship.

Rule 2 and 8 are about the good seamanship issue. This concept is designed for the actual sailors to demonstrate the requirement of taking necessary precautions by the ordinary practice of seamen. In this sense, the capability of UV might become a controversial matter in terms of situational awareness and human judgement in the decision-making loop as they have SCC rather than a traditional crew (CMI, 2018:14-15). Even though, as long as the rules are carried out responsibly and contemporaneously by SCC, the rules would have a higher degree of applicability.

The subject of a proper look-out is primarily related to the visibility matters which has been discussed similarly under the section of SOLAS (Chapter V-Reg.22). In this case, the issue is the wording of "sight and hearing" which has to be necessitated by human factor. Even if UV does not have an actual crew, possible adrift stuff or multiple mobile objects at sea might have readily detected by the future advanced sensor technology (Pritchett, 2015:205) and gathering data might have assessed on time by SCC. Thus, the wording of sight and hearing might be accepted as a negligible.

There are significant parameters which have to be taken into account by determining the safe speed such as visibility, traffic density and so on due to Rule 6. Nevertheless, it is anticipated that most UV will travel at higher speeds than many manned vessels and they are not dumb. (McLaughlin, 2011:111) In this case, there is a probability of radar range-scale problem as the radar might be inadequate to detect closer objects whilst UV is floating, but it can be tackled by using two different scales of radars (Cockcroft and Lameijer, 2004:31-32). As a result, the safe speed issue once again might be solved with the help of technology and SCC.

### 4.3 MARPOL

The standards of prevention of pollution were determined by the MARPOL constitutively. This Convention was entered into force in 1973, and it has been continued to update with amendments. The Convention is comprised of regulations aimed at hindering and reducing pollution from ships whether caused by accidental pollution or that from regular operations.

The provisions of MARPOL will have to be implemented by UV as their manned counterparts, even though the adaptation would not be relatively straightforward, upon considering the other IMO regulations regarding unmanned operations (CMI, 2018:17). Because according to this convention, the matter of the manning is the least concern among other conventions of IMO.

### 4.4 STCW

Convention on Standards of Training, Certification and Watchkeeping for Seafarers ("STCW") was adopted in 1978, and the purpose of the convention was to prescribe minimum standards concerning training, certification and watchkeeping for seafarers (STCW, 1978).

UV have to cope with some contradictive standards against their nature prescribed by STCW. For example, Article III emphasises that "seafarers serving on board seagoing ships entitled to fly the flag of a Party". Chapter VIII is composed of watchkeeping regulations such as "at no time shall the bridge be left unattended", "keep the watch on the bridge" and "in no circumstances leave the bridge until properly relieved" as well as SOLAS and COLREG also have similar sections, but this time human actions are directly described.

It can be accepted that there is a significant disparity between shore-based controllers and seafarers in terms of using information technology ("IT") skills and the convention was designed for dealing with seafarers rather than unmanned operations (CMI, 2018:17). For this reason, there is no need to raise an assumption for demonstrating the substitution between seafarers and SCC personnel.

Furthermore, there is an open spot which enables retaining or adopting other educational and training arrangements for particular types of ships due to the Article IX(1) and this would pave the way for fulfilling the training requirements concerning UV. As a result, the nature STCW is not applicable for UV and need to have serious amendments to comply with UV (Ringbom et al., 2016:47-48).

## 5. Conclusion

In this article, firstly UV was defined, and then diversification was made with respect to operative features. Later on, the status of UV was investigated with the help of sample legal ship definitions and not being reached any exclusions for UV. After this challenge, contradictive provisions of current legal instruments of IMO was examined one by one in terms of compliance with the UV's nature, and then the degree of applicability was assessed.

The findings of this essay can be divided into two parts. First, the perspective of remote-based and autonomous vessels, and the second is the point of view of the automated vessels.

According to the first one, every convention has its applicability degree. Whilst making analysis, substitution possibilities between traditional manning and SCC have been contemplated. Accordingly, whether negligible or not there is a need to make some amendments. And if the necessary amendments are fulfilled by IMO with the help of tacit acceptance (Baatz, 2014:333), compliance with conventions will be provided readily or it might be tried to establish new conventions as STCW-F<sup>1</sup>, but this time the adequate ratification number might be a problem. Therefore, amendments seem to be the best option to take.

On the other hand, the second one is a highly complicated matter regarding status. Upon being assessed all of the conventions, it can be seen that the traditional manning approach was adopted by IMO. Hence, there will be no chance to assess compliance, unless the status of the AI becomes definite. Therefore, the new legal ground has to be constituted instead of heading an adaptation for automated operations.

1 Special version of STCW for fishing personnel.



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## Bibliography

International Convention for the Safety of Life at Sea, London, 1 November 1974 'SOLAS,1974'(Imo.org,) [http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-\(SOLAS\),-1974.aspx](http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-(SOLAS),-1974.aspx)

International Regulations for Preventing Collision at Sea London, 20 October, 1972 'COLREG' (Imo.org,) <http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/COLREG.aspx>

International Convention for the Prevention of Pollution from Ships London, 2 November 1973 'MARPOL' (Imo.org,) [http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-\(MARPOL\).aspx](http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx)

Convention on Standards of Training, Certification and Watchkeeping for Seafarers 7 July 1978 'STCW' (Imo.org) [http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-on-Standards-of-Training,-Certification-and-Watchkeeping-for-Seafarers-\(STCW\).aspx](http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-on-Standards-of-Training,-Certification-and-Watchkeeping-for-Seafarers-(STCW).aspx)

### Secondary Sources

Baatz Y. (2014) *Maritime Law* (3rd ed), Informa Law from Routledge.

Cockcroft A, J Lameijer. (2004). *A Guide To The Collision Avoidance Rules* (6th ed.) Elsevier Butterworth-Heinemann.

Hooydonk, E. (2014). The law of unmanned merchant shipping – an exploration. *JIML*, 20(1). 403-423.

McLaughlin, R. (2011). Unmanned Naval Vehicles at Sea: USVs, UUVs, and the Adequacy of the Law. *Journal of Law, Information and Science*, 21(2), 100-115.

Pritchett, P. W. (2015). Ghost Ships: Why the Law Should Embrace Unmanned Vessel Technology. *Tulane Maritime Law Journal*, 40(1), 197-226.

Ringbom H., Collin F and Viljanen M. (2016). AAWA, Remote and Autonomous Ships: The Next Steps. *Rolls-Royce plc*. 35-54.

[https://www.rolls-royce.com/~/\\_media/Files/R/Rolls-Royce/documents/customers/marine/ship-intel/aawa-whitepaper-210616.pdf](https://www.rolls-royce.com/~/_media/Files/R/Rolls-Royce/documents/customers/marine/ship-intel/aawa-whitepaper-210616.pdf)

Rødseth Ø. J. and Burmeister H-C. (2012). Developments Toward the Unmanned Ship. *Semantic Scholar*. 1-16. <https://pdfs.semanticscholar.org/6a8a/771d52e210f36d48cd345a13aab294d83780.pdf>

Veal, R. (2017). Unmanned ships on the IMO work agenda. *Lloyd's Shipping & Trade Law*. 17. 1-4.

Buchholz K. (2018). Rolls-Royce Sets Sail with Autonomous Ship Technology.

<https://www.sae.org/news/2018/04/rolls-royce-sets-sail-with-autonomous-ship-technology>

CMI. (2018). International Working Group Position Paper On Unmanned Ships and The International Regulatory Framework Regulatory Framework. <https://comitemaritime.org/wp-content/uploads/2018/05/CMI-Position-Paper-on-Unmanned-Ships.pdf>

Lloyd's Register. (2016). LR defines 'autonomy levels' for ship design and operation. <https://www.lr.org/en/latest-news/lr-defines-autonomy-levels-for-ship-design-and-operation>

MUNIN, (n.d.). About. <http://www.unmanned-ship.org/munin/about>.

MUNIN, (n.d.). The Autonomous Ship. <http://www.unmanned-ship.org/munin/about/the-autonomus-ship>

Nordahl H and Rødseth Ø. (2017). Definition for Autonomous Merchant Ships. 1-21. <https://nfas.autonomous-ship.org/wp-content/uploads/2020/09/autonom-defs.pdf>