The work and legal liability of classification societies in the certification of autonomous vessels

Eliseo Sierra Noguero*

In the absence of legal regulation concerning autonomous vessels, which is not foreseeable in the short term, it is the maritime industry itself that will initially opt for self-regulation through its most influential private maritime safety bodies: the ship classification societies. Especially the major ones, which are members of the IACS, are playing a leading role in adapting their internal regulations and resolutions for the classification of autonomous and semi-autonomous vessels. Furthermore, the IACS is adopting recommendations for its members, for example on protection against cyber risks, in areas where autonomous vessels require more technology than traditional vessels. The legal gap for autonomous vessels is in addition to another gap at international level: the regulatory gap concerning the civil liability of classification societies in the exercise of their private and public functions when acting on behalf of vessels' flag states.

Comentat [SA1]: I've omitted 'ship' in 'ship regulation'; it seems clearer without

I. INTRODUCTION

Autonomous vehicles can be classified in terms of their technology into a series of categories ranging from non-automated vehicles (level 0) to fully automated vehicles (level 5). Semi-autonomous vehicles are those in the intermediate levels. In Spain, Instruction 15/V-113 of the Directorate General of Traffic of the Ministry of the Interior of 13 November 2015 incorporates into Spanish law the classification system for driving automation created by the Society of Automotive Engineers (SAE). This is available to the public[1].

However, there are other ways of classifying autonomous driving, as there is still no international standard that unifies the different interpretations of this phenomenon. For

* © Professor Dr Eliseo Sierra teaches Commercial as Associate Professor at the Autonomous University of Barcelona, Spain. He is the Principal Researcher of the Knowledge Generation Project 2021, "Autonomous Driving and Legal Certainty of Transport", PID2021-123070NB-I00, financially supported by the Spanish Ministry of Innovation and Science. Orcid: 0000-0002-6023-690X. Email: eliseo.sierra@uab.cat

[1] Viktória Ilková & Adrian Ilka, *Legal Aspects of Autonomous Vehicles – an Overview' in Proceedings of the 2017 21st International Conference on Process Control (PC)* (Štrbské Pleso, Slovakia, June 6-9 2017) 428, 429. Also on the association's website, at https://bit.ly/3RoOgox, accessed on 14 November 2022.

example, in the United States, the U.S. Department of Transportation (DOT) National Highway Traffic Safety Administration (NHTSA) classifies it into four levels[2].

Autonomous vehicles are already a technological reality, as well-known manufacturers (for example, Tesla Inc. or Google) have demonstrated. Their implementation is gradual and subject to appropriate testing. In addition, for autonomous vehicles to be rolled out, the roads must be suitably prepared for them. In theory, the trials carried out indicate that they could be more suited to certain types of road, such as motorways, than to smaller roads or those with a greater concentration of elements, such as other cars, street furniture and pedestrians.

In addition to the level of vehicle automation, another essential concept is that of connected mobility. The European Commission, within the digital strategy policy Shaping Europe's Digital Future[3], uses the term "Connected and Automated Mobility" (CAM) to refer to autonomous/connected vehicles or vehicles that can drive without human intervention. In contrast, current non-connected mobility is on the decline, with well-known vehicle manufacturers (for example, BMW) already connecting their vehicles to the 4G network.

Autonomous vehicles are entirely dependent on artificial intelligence (AI) systems. Advanced sensor and radar systems provide full 360° information on the context in which the vehicle is operating. This information, together with that provided by satellite and on-board digital maps, must be processed so the vehicle can identify its location, plan and follow the route, and recognise and respond appropriately to traffic signs and driving hazards. This procedure is carried out by AI systems using algorithms that are based on historical databases and constantly updated to redefine the operation of the vehicle in real-life conditions.

Autonomous vehicles are robots, and giving robots responsibility for transporting passengers or goods on public roads has huge safety implications. The expectation is that autonomous driving will be safer than human driving. However, it is imperative that a great deal of regulatory work be done first to ensure full respect for the right to life, including provisions for potential threats and risks.

These new technological advances, which go hand in hand with the process of decarbonisation of mobility and the move towards electrification and global interconnectivity inherent to Smart Cities, bring with them major challenges for the 21st century.

The key question is the timeframe for the implementation of the various phases of automation. The European Parliament Resolution of 15 January 2019 on autonomous driving in European transport, focusing on road transport (cars, trucks, buses and coaches), states in section (J) of its Preamble that[4]:

> *"automation levels exist, levels 1 and 2 already being on the market",*
>
> *"Conditional, high and full automation levels (when a vehicle becomes self-driving) are expected to become available only in 2020-2030."*
>
> *"driver assistance systems are therefore important as an enabling technology on the path towards full automation".*

[2] Brian A. Browne, *Self-Driving Cars: On the Road to a New Regulatory Era* 8(1) JOURNAL OF LAW, TECHNOLOGY & THE INTERNET (2017), 1-2.
[3] Information available at https://bit.ly/3y14XhO, accessed on 14 November 2022.
[4] *Official Journal of the European Union*, C 411/2 of 27 November 2020.

II. IMPLEMENTATION OF AUTONOMOUS VESSELS

The term used by the International Maritime Organisation (IMO) for the specific phenomenon of autonomous and semi-autonomous vessels is "Maritime Autonomous Surface Ships", widely known by the acronym MASS. According to its extensive and elaborate report "Outcome of the Regulatory Scoping Exercise for the Use of Maritime Autonomous Surface Ships"[5], the IMO distinguishes four degrees of autonomy:

- Degree one: Ship with automated processes and decision support: Seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated and at times unsupervised but with seafarers on board ready to take control.

- Degree two: Remotely controlled ship with seafarers on board: The ship is controlled and operated from another location. Seafarers are available on board to take control and operate the shipboard systems and functions.

- Degree three: Remotely controlled ship without seafarers on board: The ship is controlled and operated from another location. There are no seafarers on board.

- Degree four: Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself.

With regard to the implementation deadlines for MASS, the aforementioned IMO report avoids specifying any timeframes. However, IMO sources have stated that[6]:

> *"The first units of autonomous short sea shipping vessels are expected to be available between 2025 and 2030".*

MASS may offer an economical alternative for short sea shipping in the form of convoys of autonomous vessels led by traditional ships[7], without prejudice to their progressive use in inter-oceanic routes.

The main advantages of autonomous vessels are increased safety and lower costs, which result in improved competitiveness[8]. On the economic side, the success of autonomous vessels will depend on their impact on the profits of shipping companies[9].

---

[5] International Maritime Organization (IMO), *Outcome of the Regulatory Scoping Exercise for the Use of Maritime Autonomous Ships (MASS)*, approved by Resolution MSC.1/Circ. 1638, of 3 June 2021, at pp 3-4, available at https://bit.ly/3S7p4nK, accessed on 14 November 2022.

[6] Information attributed to Víctor Jiménez, Spanish representative to the IMO, at https://bit.ly/3y2Ftl9, accessed on 14 November 2022.

[7] Kryzstof Wróbel et al, *Towards the assessment of potential impact of unmanned vessels on maritime transportation safety*, 165 RELIABILITY ENGINEERING AND SYSTEM SAFETY (2017) 155, at para. 1.

[8] Sauli Ahvenjärvi, *The human element and autonomous ships*, 10(3) *THE* INTERNATIONAL JOURNAL ON MARINE NAVIGATION AND SAFETY OF SEA TRANSPORTATION (2016) at 517.

[9] Lutz Kretschmann et alt, *Analyzing the economic benefit of unmanned autonomous ships: An exploratory cost-comparison between an autonomous and a conventional bulk carrier* 25 RESEARCH IN TRANSPORTATION BUSINESS & MANAGEMENT (Dec. 2017) at 76.

Furthermore, in terms of safety, autonomous vessels are expected to be safer than traditional ships. Although there is still uncertainty about their design and operation[10], autonomous vessels are expected to eliminate the human factor on board, which is blamed for causing around 80% of maritime accidents[11]. Although this figure is not universally accepted[12], it seems clear that autonomous vessels can reduce certain types of human error, such as that resulting from fatigue, forgetting important matters or mistakes. However, autonomous vessels will still be operated or guided by human operators[13] and will also be designed and built by humans[14], meaning the human aspect and the potential for error will remain, albeit clearly reduced.

On the practical side, several initiatives have already been carried out to implement autonomous vessels which have shown their development and implementation to be possible[15]. These include, in the civil sphere, a European project on the technical feasibility of an unmanned bulk carrier[16], which includes legal aspects such as the applicability of the 1972 COLREG Convention on preventing collisions at sea and the 1978 SCTW Convention on training, certification and watchkeeping of seafarers[17]. In 2018, Rolls-Royce and Finferries in Finland sailed a ferry autonomously on an outbound voyage, while it was remotely piloted on the return trip[18]. Projects have also been carried out by the maritime industry, including building ships with decision-making functions and long voyage navigation trials of autonomous merchant ships with crew supervision[19]. It has been argued that, in the future, maritime journeys will very likely take a hybrid format, with voyages alternating between "remote navigation", where the ship follows the prepared schedule under human supervision, and "autonomous navigation", based on algorithmic decision-making[20].

III. LEGAL STATUS OF AUTONOMOUS VESSELS

A. Regulatory gap

Before the introduction of autonomous vessels, it will be necessary to implement certain hitherto unmade changes to maritime law[21]. Through its Maritime Safety Committee (MSC), the International Maritime Organisation has published the above-

[10] Wróbel (*supra* note 7), at section 1.
[11] Eric Van Hooydonk, *The law of unmanned merchant shipping - an exploration*, 20 THE JOURNAL OF INTERNATIONAL MARITIME LAW (2014) 403, 405-406.
[12] Ahventjärvi (*supra* note 8) at 518.
[13] Van Hooydonk (*supra* note 11) at 405-406.
[14] Ahventjärvi (supra note 8) at 518.
[15] Gam Thi Hong Nguyen et al, *Insights on the introduction of autonomous vessels to liner shipping networks* 7(12) JOURNAL OF SHIPPING AND TRADE (2022), at p 1.
[16] Munin Project, *Maritime Unmanned Navigation through Intelligence in Network's Project* (MUNIN)", at www.unmanned-ship.org, accessed on 14 November 2022.
[17] Van Hooydonk (*supra* note 11) at 404.
[18] *See* news item at https://bit.ly/3CdM4fj, accessed on 14 November 2022.
[19] International Association of Classification Societies (IACS), *IACS Position paper on MASS*, at https://bit.ly/3SHo89j, accessed on 14 November 2022.
[20] Manuel Alba Fernández, *Buques navegados por control remoto y buques autónomos en la evolución futura del Derecho de la navegación marítima* 28 REVISTA DE DERECHO DEL TRANSPORTE (2021) 59, 72.
[21] Juan Pablo Rodríguez Delgado, *La irrupción del buque autónomo (o controlado remotamente) en los aspectos jurídico-privados del Derecho marítimo*, in *El transporte como motor del desarrollo socioeconómico* (María Victoria Petit dir., 2018) 315, 319.

mentioned "Regulatory Scoping Exercise" and has produced interim guidelines for the testing of autonomous vessels. The IMO's Legal and Facilitation Committees are also discussing the introduction of autonomous vessels[22].

In the European Union, the European Commission has created an expert group and adopted the document "EU Operational Guidelines on trials of Maritime Autonomous Surface Ships (MASS)"[23].

The legal implications of the use of autonomous military vessels have also been analysed in detail.[24]

As regards private bodies, the Comité Maritime International is also carrying out studies on what it calls "unmanned ships"[25], mainly in the form of questionnaires submitted to the national associations of the member states[26].

The question is how to regulate the new phenomenon of autonomous vessels and to whom this power belongs. Ideally, it would be preferable if the IMO conventions on ship safety (SOLAS, MARPOL, Load Lines, COLREGS, etc.)[27] each laid down the technical and functional requirements for autonomous vessels within their specific area, although the SOLAS Convention, the main IMO Convention on marine safety, is based on the fact that there are a qualified master and crew on board the ship[28]. The same principle applies to the other IMO Conventions.

However, amending the international conventions to introduce the technical changes necessary to implement autonomous vessels does not seem feasible in the short term[29]. The system of tacit consent to amendments of IMO technical conventions will certainly be used in order to accelerate the implementation of technical requirements for ships. However, it is unrealistic to think that the legal rules will be adopted prior to the introduction of the technology; on the contrary, we believe that the opposite process will apply. The maritime industry will first implement voluntary automation systems for ships, which can then be progressively adapted for all ships on a mandatory basis through regulatory changes.

B. Self-regulation: The role of classification societies in autonomous vessels through internal regulation

Comentat [SA2]: I've omitted 'ship' in 'ship regulation'; it seems clearer without

In the self-regulation of the shipping industry and the verification and certification of ship automation systems, classification societies can initiate the first private regulation. Together with states and their public bodies, the contribution of private actors to innovation and regulation should by no means be underestimated[30]. It is true that classification societies are private for-profit entities with no regulatory power, but they

[22] International Maritime Organization (IMO), *Autonomous Shipping*, at https://bit.ly/3Upirhm, accessed on 14 November 2022. Also discussed in IACS (n 19).
[23] European Commission, *Maritime Autonomous Ships and Shipping*, at https://bit.ly/3frPTEA, accessed on 14 November 2022.
[24] Van Hooydonk (*supra* note 11) at 405.
[25] *See* https://bit.ly/3y3WzPL, accessed on 14 November 2022.
[26] Javier Portales, *El desafío legal de los buques autónomos*", in *El transporte como motor del desarrollo socioeconómico (*María Victoria Petit dir. 2018) 303, 305.
[27] At https://bit.ly/3RwR9nq, accessed on 14 November 2022.
[28] Natalie Klein et al, *Maritime Autonomous vehicles: new frontiers in the law of the sea*' 69 BRITISH INSTITUTE OF INTERNATIONAL AND COMPARATIVE LAW (BIICL) (July 2020) 719, 728.
[29] Core Advokatfirma and Nordic Association of Marine Insurers (Cefor), *Maritime autonomous surface ships. Zooming in on civil liability and insurance* (2018), available at https://bit.ly/2AV5lSe, accessed on 14 November 2022, at 16.
[30] Bryant Walker Smith, *Regulation and the risk of inaction*, in *Autonomous Driving. Technical, Legal and Social Aspects* (Markus Maurer ed., 2016) 571, 585.

can issue guidelines, procedures and requirements for the technical and functional operation of MASS, which serve as a basis for subsequent legislative changes[31].

Classification societies play an essential role due to their position as organisations dedicated to the promotion of high standards of ship safety and quality in the shipping industry[32], and in particular due to the fact that they are responsible for verifying and certifying autonomous vessels[33], both in terms of technical capabilities, as vessels equipped with more complex technology and information systems, and with regard to autonomous vessel operation, in terms of decision-making by the vessel, by the remote operator, and the vessel's communication with shore-based facilities[34]. In addition, it is necessary to ensure cybersecurity protection for the data generated by automated operation[35].

Comentat [SA3]: I'm not sure the original is very clear here. Would it be better to say: ', and the vessel's COMMUNICATION with shore-based facilities'. ? BETTER, Interface is too technical

The verification and certification of autonomous vessels follows the usual ship classification process, with whatever special technical standards may apply. For example, in 2017, Lloyd's Register adopted its "Unmanned Marine Systems Code", which aims to provide a technical framework to ensure the safety and operational requirements of unmanned marine management systems (2.1.1). It applies to autonomous vessels and remotely controlled vessels operating on the sea surface or underwater (art. 3.1.1). It consists of several chapters: general, structure, stability, control system, electrical systems, navigation systems, propulsion and manoeuvring, fire, auxiliary systems, and two annexes on concept of operations and verification methods. It is initially designed for small ships not covered by the IMO conventions and may be of use in creating future IMO or state regulations[36].

On completion of the appropriate surveys of all the ship's systems, the classification society, where appropriate, assigns the ship a technical value, a category and a class[37]. The ship is classified by a specific classification society and then subject to periodic inspections by the same society to maintain its class. By virtue of a contract with the shipowner or shipping operator, the classification society periodically carries out ship inspection and control tasks, from the construction of the ship and throughout its service life, in accordance with the parameters and criteria adopted for this purpose in its internal regulations (including seaworthiness, age, materials, state of equipment, accidents and repairs).

However, the operation of substandard ships that have been duly granted classification has led to a loss of credibility on the part of classification societies. The indissoluble problem is that of conflict of interest, since the classification society must grant certification in favour of ships operated by its client, which pays it for its professional certification services[38]. Especially because without such a class certificate, the ship cannot be insured against first- or third-party damages, nor will any cargo on

[31] Core Advokafirma (*supra* note 29) at 16.
[32] Lam Bee Goh & Tsz Leung Yip, *A way forward for ship classification and technical services*, 30(1) THE ASIAN JOURNAL OF SHIPPING AND LOGISTICS (Apr. 2014) 51.
[33] Core Advokafirma (*supra* note 29) at 15.
[34] Core Advokafirma (*supra* note 29) at 16.
[35] Iñaki Zurutuza, *Cuestiones sobre la problemática jurídica que plantean los buques no tripulados*, in *El transporte como motor del desarrollo socioeconómico* (María Victoria Petit, dir., 2018) 347, 359.
[36] Information available at https://bit.ly/3SBLsFo, accessed on 14 November 2022.
[37] Eliseo Sierra Noguero, *La relevancia de las sociedades de clasificación en la seguridad marítima*, 169 DERECHO DE LOS NEGOCIOS (2004) 5, 6.
[38] Mary R. Brooks, *The privatisation of ship safety* 23(3) MARITIME POLICY & MANAGEMENT (1996) 271, 276.

board be insured. It will therefore have a very limited commercial value[39], as there is no legal obligation for ships to be classed[40].

According to the IACS[41], which is discussed below, each classification society has its own classification rules, including technical requirements, relating to the design, construction and survey of ships, and has the capacity to apply, maintain and update these rules; it verifies compliance with its rules during construction and periodically during a ship's service life; it publishes a register of classed ships; it is not controlled by or does not have interests in shipowners, shipbuilders or others engaged commercially in the manufacture, equipping, repair or operation of ships; and, in addition, it is authorised by a Flag Administration as per SOLAS Chapter XI-1 and included in the IMO Global Integrated Shipping Information System (GISIS) list. For example, according to the latest update to the GISIS of 15 November 2016, Spain recognises the societies Bureau Veritas (BV), China Classification Society (CCS), DNV GL AS (DNVGL), Korean Register (KR), Lloyd's Register (LR), and RINA Services S.p.A (RINA).

Classification societies also play an essential role in the process of maritime safety regulation, as they assist the industry by providing an internal regulatory system[42]. Through the class certificate issued by a classification society in accordance with its internal regulations, operators are able to know the degree to which ships comply with internal maritime safety regulations (classification or private survey).

Furthermore, classification societies act as organisations recognised by Flag Administrations to monitor compliance with international and national requirements on ship safety and pollution prevention (statutory or public survey). This is what has been called the privatisation of the functions of state ship safety certification services[43].
Within the IMO, the "Code for Recognized Organizations" (RO Code) was adopted by Resolution MEPC.237(65) of the Marine Environment Protection Committee (MEPC) and Resolution MSC.349(92) of the Maritime Safety Committee (MSC) to replace previous regulations and to update the requirements for recognition and cooperation set out in the International Convention for the Safety of Life at Sea (SOLAS) of 1974, the International Convention for the Prevention of Pollution from Ships of 1973, and the 1978 Protocol (MARPOL) and the 1988 Protocol to the International Convention on Load Lines of 1966[44].

In the European Union, the reference standards for this public function of classification societies are Regulation (EC) No 391/2009 of the European Parliament and of the Council of 23 April 2009 on common rules and standards for ship inspection and survey organisations (recast)[45], and Directive 2009/15/EC of the European Parliament and of the Council of 23 April 2009 on common rules and standards for ship inspection and survey organizations and for the relevant activities of maritime administrations (recast)[46].

Comentat [SA4]: The original says 'pues en general no existe obligación legal ' and I have translated it faithfully, although I don't find the original meaning to be clear. Would it be better to say in English 'although there is generally no legal obligation'? I THINK THAT THE TERM GENERALLY CAN BE SUPPRESSED. As there is no legal obligation for ships to be classed

[39] Goh & Yip (*supra* note 32) at 52.
[40] NICOLAI LAGONI, THE LIABILITY OF CLASSIFICATION SOCIETIES (Springer, 2007), at 11.
[41] Annex 4 of the International Association of Classification Societies (IACS) *Charter* at https://bit.ly/3RiNv02, accessed on 14 November 2022.
[42] Goh & Yip (*supra* note 32) at 52; LAGONI (*supra* note 40) at 22.
[43] Brooks (*supra* note 38) at 273.
[44] Eliseo Sierra Noguero, *Sociedades de clasificación: entrada en vigor del Código de organizaciones reconocidas por los Estados de bandera* 15 *REVISTA DE DERECHO DEL TRANSPORTE* (2015) 199.
[45] *Official Journal of the European Union*, L 131/11 of 28 May 2009 (recast). The current version is available at Eurlex, accessed on 14 November 2022.
[46] *Official Journal of the European Union*, L 131/47 of 28 May 2009 (recast). The recast version is available at Eurlex, accessed on 14 November 2022.

As mentioned above, classification societies have no regulatory power of their own; they charge for their services as private for-profit entities, but cannot impose compliance with their safety regulations on shipowners[47]. Considering the conflicts of interest, these dual private and public functions of classification societies, carried out for the flag states they represent and for shipowners, could perhaps be assigned to separate organisations[48]. However, this separation, although it may be desirable, contrasts with the current state of the maritime industry and the uniform and mixed work of classification societies.

C. The de minimis harmonisation work of the International Association of Classification Societies (IACS)

The International Association of Classification Societies (IACS) encompasses eleven classification societies and states that more than 90% of the world's cargo tonnage and 50% of the world fleet is subject to the design, construction and through-life compliance rules and standards established by its member societies[49]. This is the organisation's own data, not data from official sources such as the IMO. This means that the IACS rules are the de facto minimum standards for the maritime industry; only smaller ships and vessels and operators with less organisational capacity are outside the IACS framework[50]. All ships may be classed by non-IACS societies, which are not members of the IACS but can apply for acceptance.

The IACS bears a close resemblance to the International Group of P&I Clubs, each in its own field (the former as an association of ship certifiers and the latter as an association of ship liability insurers), and together they are the cornerstones of maritime traffic. As we shall see, the task of the IACS replaces the legislative task of the States.

The purpose of the IACS, as expressed in its Charter, adopted by the Council of the Association on 27 October 2009[51] , is to establish, review, promote and develop minimum technical requirements in relation to the design, construction, maintenance and survey of ships and other marine related facilities (art. 2.1.1.a).

The IACS also assists international regulatory bodies and other standard organisations to develop, implement and interpret statutory regulations and industry standards relating to ship design, construction and maintenance, with a view to improving safety at sea and the prevention of maritime pollution (art. 2.1.1.b).

IACS is governed by a Council comprising one representative from each classification society that is a member of the association. Non-member societies may apply to join the IACS, although the Charter sets strict requirements for this, and the association has no obligation to admit other members. The same document also provides for the possibility, according to an internal procedure, for non-members to have access to and participate in certain IACS technical work (Annex 3).

The IACS carries out the task of harmonising the rules and standards of its members, facilitating the exchange of information, establishing minimum requirements and providing training to classification surveyors. Therefore, while each IACS member society defines the terms and conditions of its internal ship classification regulations, the

[47] Goh & Yip (*supra* note 32) at 51.
[48] Juan Luis Pulido Begines, *The EU law on classifications societies: scope and liability issues* 36(4, Oct.) *Journal of Maritime Law and Commerce* (2005) 487, 494.
[49] *See* https://iacs.org.uk/, accessed on 14 November 2022.
[50] Jan de Bruyne, 'Liability and classification societies: cases, challenges and future perspectives' 45(2) JOURNAL OF MARITIME LAW AND COMMERCE (Apr. 2014) 181, 184.
[51] IACS (*supra* note 41).

IACS promotes minimum standards for its members through the IACS Procedural Requirements, which are resolutions on technical procedural matters; the IACS Unified Interpretations, which are resolutions on matters related to the implementation of requirements of IMO Conventions and IMO Recommendations, which in the instrument are left to the satisfaction of the administration or where an interpretation is required; and the IACS Unified Requirements, which are the minimum technical requirements which, subject to ratification by each society's governing body, must be incorporated into its internal rules and practices[52]. They set minimum requirements and each classification society is free to set more stringent requirements (Annex 4 of the Charter).

The IACS Unified Requirements and Unified Interpretations play a key role in the maritime industry, as when they are adopted by the IACS, naval architects, shipbuilders, equipment manufacturers, shipowners and other stakeholders implement them in their shipbuilding processes. They are therefore able to accelerate the implementation of technical innovations that have not yet been adopted in the IMO international Conventions[53].

The IACS has specifically expressed its position as an association in relation to autonomous vessels. It considers that the main drawback for autonomous vessels and the main barrier to the development of MASS is the lack of hardware and software requirements, as verification and validation activities are not possible without them. To this effect, it supports the position of the IMO Maritime Safety Committee to create an ad hoc instrument focused on MASS along the lines of the generic guidelines for developing IMO goal-based standards (MSC.1/Circ.1394/Rev.2).

In addition to the background work already done to analyse its previous resolutions, the IACS will adopt new resolutions and amendments to previous resolutions concerning autonomous vessels, provide its expertise and knowledge where necessary, identify the technical aspects of autonomous vessels in which the IACS should be involved, and continue to participate in international bodies such as the IMO, ISO or the European Union regarding this matter. It shall also work with the industry to monitor technological developments related to MASS and to ensure best practices in the documents it produces.

D. Certification of protection against cyber risks

The implementation of autonomous vessels will occur gradually as advances are made in the technological systems that enable the transition from the traditional ship to the fully autonomous ship. For example, although protection against cyber risks is applicable to all ships, autonomous ships will require increased protection against cyber-attacks[54]. A practical application of the work of classification societies in dealing with these risks can be observed in the fact that some classification societies have opened a new line of business to advise shipowners on cyber risks and the necessary protection for their ships[55].

[52] LAGONI (*supra* note 39) at 24.
[53] LAGONI (*supra* note 39) at 25
[54] Hasan Mahbub Tusher et al, *Cyber security risk assessment in autonomous shipping* 24 MARITIME ECONOMICS & LOGISTICS (2022) 208.

[55] Maria Evelina Alifragki, *Cyber-Attacks: The new type of piracy in the Maritime World* (Master Theses University of Piraeus, Sept. 2019), at https://bit.ly/3hbAkBS, accessed on 14 November 2022, mentions specifically the action on cyber risks of the Det Norske Veritas (DNV GL) and Lloyd's Register, 35-40.

In addition, the IACS has adopted the joint document 'Recommendation on Cyber Resilience'[56] to provide technical requirements to stakeholders which would lead to delivery of cyber-resilient ships, whose resilience can be maintained throughout their service life (para. 1.1.1). This single, standalone Recommendation consolidates the IACS' previous 12 Recommendations related to cyber resilience (Nos. 153 to 164) and applies to the use of computer-based systems which provide control, alarm, monitoring, safety or internal communication functions which are subject to the requirements of a classification society. Furthermore, this Recommendation serves as support for the maritime industry to comply with Resolution MSC.428(98) of 16 June 2017 on Maritime Cyber Risk Management in Safety Management Systems[57]. It is likely that, when performing Port State Control, inspectors will take into account the ship's class certificates that prove its compliance with cyber risk prevention standards[58].

III. CIVIL LIABILITY OF CLASSIFICATION SOCIETIES FOR THE VERIFICATION AND CERTIFICATION OF AUTONOMOUS VESSELS

As the law currently stands, robots cannot be held liable for the damage they cause to third parties, so that liability will have to be attributed to some natural or legal person who could have foreseen or avoided such damage[59]; namely, the entity that has certified that such an autonomous vessel can be put to the intended use. The civil liability of classification societies for the verification and certification of autonomous vessels is not expected to be subject to any changes in the short term. However, they may see an increase in their contractual obligations towards their clients (both in terms of time and content), as well as in liability claims brought against them[60].

Limitation of liability clauses are commonly included in ship classification contracts.

Civil liability claims brought by injured third parties are not always successful. An example of this is the judgment of the United States Court of Appeals for the Second Circuit, New York, of 29 August 2012, which dismissed the appeal brought by the Kingdom of Spain against the classification society American Bureau Shipping (ABS), which classified the vessel the *Prestige*. The court dismissed the appeal on the grounds that there was insufficient evidence of a breach of any obligation that ABS could assume towards the Kingdom of Spain. Nor could any duty of care be presumed towards the flag state to prevent negligent certification[61].

Other examples in case law highlight the difficulties of bringing successful civil liability claims against classification societies[62]. Thus, when the classification society acts in the exercise of public functions attributed to it by the flag state, its immunity from

[56] International Association of Classification Societies, 'Recommendation on Cyber Resilience Contents' No. 166 (Apr 2020), available at https://bit.ly/3zIhYPh, accessed on 14 November 2022

[57] Fernando Juan Mateu, *El transporte marítimo y la ciberseguridad*, 323 *Revista de Derecho Mercantil* (2022), at para V.4

[58] *Ibid*

[59] Angélica Díaz de la Rosa, *Algunas cuestiones planteadas en torno al régimen jurídico de los buques autónomos*, 320 REVISTA DE DERECHO MERCANTIL (2021), at section 7.3.

[60] Core Advokafirma (*supra* note 29) at 16.

[61] Vibe Ulfbeck & Anders Møllmann, Public function liability of classification societies, in *Certification - Trust, Accountability, Liability* (Peter Rott, ed., 2019) 213, 216; Eliseo Sierra Noguero, *Caso <Prestige>: desestimada la apelación del Reino de España contra la sociedad de clasificación*, 10 REVISTA DE DERECHO DEL TRANSPORTE (2012) 207.

[62] De Bruyne (*supra* note 50) at 215.

being sued in foreign courts has been recognised, as has the possibility of extending the immunity that corresponds to the State itself to the delegated society. Indeed, there may be additional barriers to imposing civil liability on classification societies when they exercise public functions that are the responsibility of the flag state[63]. In common law countries, classification societies are often absolved from liability towards third parties, whereas in other, civil law countries, such as Belgium, they are held liable for contractual and non-contractual liability[64].

IV. CONCLUSIONS.

Several trials have proven the technical feasibility of the use of autonomous and semi-autonomous vessels. These are expected to be implemented gradually for certain, initially short-sea, shipping traffic. The implementation of autonomous and semi-autonomous vessels requires legal certainty for the ship operator, its first- and third-party insurers, flag and port states and other participants in maritime traffic. Ideally, legal certainty could be obtained by amending the technical Conventions of the International Maritime Organisation, in particular SOLAS, or by adopting a new ad hoc international instrument.

However, in the short term, such an amendment is not realistic considering the process of State-to-State pacts and because it is also uncertain what changes are required. In the absence of legal regulation concerning autonomous vessels, which is not foreseeable in the short term, it is the maritime industry itself that will initially opt for self-regulation through its most influential private maritime safety bodies: the ship classification societies. Especially the major ones, which are members of the IACS, are playing a leading role in adapting their internal regulations and resolutions for the classification of autonomous and semi-autonomous vessels. This internal regulation could be the basis for future legislative changes. An example of this is the internal rules of the classification societies and the IACS recommendations to protect ships against cyber risks. Autonomous vessels will require more technical protection against cyber-attacks than traditional ships.

The power and influence of classification societies is evident. In addition to the unresolved conflict of interest to which they are subject in the certification of their client's ships (certification functions), they can also be delegated by the flag state to perform technical inspections (administrative functions). However, the essential role of classification societies in setting minimum standards for ship safety and maritime pollution prevention is not supported by international regulation of their legal status and civil liability in the exercise of their business activities. There are also national differences when it comes to attributing civil liability to third parties for negligence in the certification of ships (for example, the case of the *Prestige* in the US).

V. BIBLIOGRAPHY

- Sauli Ahvenjärvi, *The human element and autonomous ships*, 10(3) *THE* INTERNATIONAL JOURNAL ON MARINE NAVIGATION AND SAFETY OF SEA TRANSPORTATION (2016) 517.

[63] Ulfbeck & Møllmann (*supra* note 61) at 219, 221.
[64] De Bruyne (*supra* note 49) at 231.

- Manuel Alba Fernández, *Buques navegados por control remoto y buques autónomos en la evolución futura del Derecho de la navegación marítima* 28 REVISTA DE DERECHO DEL TRANSPORTE (2021) 59.
- Maria Evelina Alifragki, *Cyber-Attacks: The new type of piracy in the Maritime World* (Master Theses University of Piraeus, Sept. 2019).
- Mary R. Brooks, *The privatisation of ship safety* 23(3) MARITIME POLICY & MANAGEMENT (1996) 271.
- Brian A. Browne, *Self-Driving Cars: On the Road to a New Regulatory Era* 8(1) JOURNAL OF LAW, TECHNOLOGY & THE INTERNET (2017).
- Core Advokatfirma and Nordic Association of Marine Insurers (Cefor), Maritime autonomous surface ships. Zooming in on civil liability and insurance (2018), at https://bit.ly/2AV5lSe.
- Jan de Bruyne, 'Liability and classification societies: cases, challenges and future perspectives' 45(2) JOURNAL OF MARITIME LAW AND COMMERCE (Apr. 2014) 181.
- Angélica Díaz de la Rosa, *Algunas cuestiones planteadas en torno al régimen jurídico de los buques autónomos*, 320 REVISTA DE DERECHO MERCANTIL (2021).
- European Commission, *Shaping Europe's Digital Future: Connected and Automated Vehicles*, https://bit.ly/3y14XhO.
- European Commission, *Maritime Autonomous Ships and Shipping*, https://bit.ly/3frPTEA.
- Lam Bee Goh & Tsz Leung Yip, *A way forward for ship classification and technical services*, 30(1) THE ASIAN JOURNAL OF SHIPPING AND LOGISTICS (Apr. 2014) 51.
- International Association of Classification Societies (IACS) *IACS Position paper on MASS*, https://bit.ly/3SHo89j.
- International Association of Classification Societies (IACS) *Charter,* https://bit.ly/3RiNv02.
- International Association of Classification Societies, Recommendation on Cyber Resilience Contents No. 166 (Apr. 2020), https://bit.ly/3zIhYPh.
- Viktória Ilková & Adrian Ilka, *Legal Aspects of Autonomous Vehicles – an Overview' in Proceedings of the 2017 21st International Conference on Process Control (PC)* (Štrbské Pleso, Slovakia, June 6-9 2017) 428.
- International Maritime Organization (IMO), *Autonomous Shipping*, https://bit.ly/3Upirhm.
- International Maritime Organization (IMO), *Outcome of the Regulatory Scoping Exercise for the Use of Maritime Autonomous Ships (MASS)*, in https://bit.ly/3CkY7ap.
- Fernando Juan Mateu, *El transporte marítimo y la ciberseguridad*, 323 *Revista de Derecho Mercantil* (2022).
- Natalie Klein et al, *Maritime Autonomous vehicles: new frontiers in the law of the sea*' 69 BRITISH INSTITUTE OF INTERNATIONAL AND COMPARATIVE LAW (BIICL) (July 2020) 719.
- Lutz Kretschmann et alt, *Analyzing the economic benefit of unmanned autonomous ships: An exploratory cost-comparison between an autonomous and a conventional bulk carrier* 25 RESEARCH IN TRANSPORTATION BUSINESS & MANAGEMENT (Dec. 2017) 76.
- NICOLAI LAGONI, THE LIABILITY OF CLASSIFICATION SOCIETIES (Springer, 2007).

- Munin Project, *Maritime Unmanned Navigation through Intelligence in Network's Project* (MUNIN), www.unmanned-ship.org.
- Gam Thi Hong Nguyen et al, *Insights on the introduction of autonomous vessels to liner shipping networks* 7(12) JOURNAL OF SHIPPING AND TRADE (2022).
- Javier Portales, *El desafío legal de los buques autónomos*", in *El transporte como motor del desarrollo socioeconómico (*María Victoria Petit dir. 2018) 303.
- Juan Luis Pulido Begines, *The EU law on classifications societies: scope and liability issues* 36(4, Oct.) *Journal of Maritime Law and Commerce* (2005) 487.
- Juan Pablo Rodríguez Delgado, *La irrupción del buque autónomo (o controlado remotamente) en los aspectos jurídico-privados del Derecho marítimo*, in *El transporte como motor del desarrollo socioeconómico* (María Victoria Petit dir., 2018) 315.
- Eliseo Sierra Noguero, *Caso <Prestige>: desestimada la apelación del Reino de España contra la sociedad de clasificación*, 10 REVISTA DE DERECHO DEL TRANSPORTE (2012) 207.
- Eliseo Sierra Noguero, *La relevancia de las sociedades de clasificación en la seguridad marítima*, 169 DERECHO DE LOS NEGOCIOS (2004) 5.
- Eliseo Sierra Noguero, *Sociedades de clasificación: entrada en vigor del Código de organizaciones reconocidas por los Estados de bandera* 15 *REVISTA DE DERECHO DEL TRANSPORTE* (2015) 199.
- Bryant Walker Smith, *Regulation and the risk of inaction*, in *Autonomous Driving. Technical, Legal and Social Aspects* (Markus Maurer ed., 2016) 571.
- Hasan Mahbub Tusher et al, *Cyber security risk assessment in autonomous shipping* 24 MARITIME ECONOMICS & LOGISTICS (2022) 208.
- Vibe Ulfbeck & Anders Møllmann, Public function liability of classification societies, in *Certification - Trust, Accountability, Liability* (Peter Rott, ed., 2019) 213.
- Eric Van Hooydonk, *The law of unmanned merchant shipping - an exploration*, 20 THE JOURNAL OF INTERNATIONAL MARITIME LAW (2014) 403.
- Kryzstof Wróbel et al, *Towards the assessment of potential impact of unmanned vessels on maritime transportation safety*, 165 RELIABILITY ENGINEERING AND SYSTEM SAFETY (2017) 155.
- Iñaki Zurutuza, *Cuestiones sobre la problemática jurídica que plantean los buques no tripulados*, in *El transporte como motor del desarrollo socioeconómico* (María Victoria Petit, dir., 2018) 347.