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MARITIME AND AIR LAW FACING UNMANNED VEHICLE TECHNOLOGY

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Introduction

This doctoral thesis aims at reconstructing the reaction of the law towards the introduction of unmanned civil vehicles. To this end, some preliminary clarifications will be necessary regarding the angle through which I have decided to observe the phenomenon. The origin of the research is to be found in the context of the Italian so-called "navigation law". This means that the scope of this work is corresponding to the mentioned field of the law.

Unlike the vast majority of jurisdictions worldwide, the Italian legal system, since 1942, has embraced a unitary approach, namely that of considering maritime and air law as parts of the same legal branch. [1] The reference to the year 1942 is due to the adoption of the legal source which is regarded as the core of the subject, as typically occurs in civil law jurisdictions: on the 30th March 1942, the Royal Decree n. 327 was enacted, introducing the "*codice della navigazione*" (Navigation Code). It was the outcome of the thoughts of the founding father of the Italian navigation law, Antonio Scialoja, whose work and school had started to show that direction already in the Twenties of the Century. [2]

The principle of unity forms the basis of the navigation legal system as designed by Scialoja, whereby the central feature of the two sectors is the navigation conceived in a similar way. Both ships and aircraft are, indeed, intended to be navigated in contexts where humans abandon their natural habitat, creating a community of individuals separated from the land. This justified the need for these two types of navigation to be governed by special rules, kept distinguished from those regulating transport by land. In particular, both are based on what was called «*trasporto autarchico*», [3] intending the circumstance in which the vehicle is in an environment far from where humans normally live, totally relying on the expertise and the authority of a person, the pilot-in-command and the shipmaster, who is the head of the human organisation called crew.

One of the goals of this work is to find out whether such exigencies,

[1] A feature rarely to be found in other legal systems: ROMANELLI, G. "Diritto aereo, diritto della navigazione e diritto dei trasporti", *Rivista Trimestrale di Diritto e Procedura Civile* 1975, 1331.

[2] Scialoja's first contribution, *Sistema del diritto della navigazione*, first edition, dates back to 1927.

[3] SCIALOJA, A., *Sistema del diritto della navigazione*, third ed., Roma, 1933, 12.

considered common to both kinds of navigation at the time of drafting the Navigation Code, will still be a driving force in the era of technology.

The first remarkable aspect of unmanned vessels and unmanned aircraft is that, despite the still existing separation of the construction from the land, this will no longer involve the crew, located on the ground in both cases. The main feature, shared by the two sectors, when discussing unmanned navigation, is the circumstance that both unmanned ships and unmanned aircraft are somehow questioning the indispensability of the crew and master on board the vehicle. [4] This is undoubtedly proving disruptive reactions, considering the conception of the human factor on board as an essential presence for the navigational operations. After all, the law has widely addressed, especially through provisions of penal nature, the risk of a ship being abandoned by her master or her crew. [5]

Despite the scope of the present thesis, which is inspired by the Italian navigation law, thus covering its corresponding areas, the investigation will not be limited to the Italian domestic law. On the contrary, my vision will be as wide as possible, always focussing on the international law, with some brief references to national provisions, mainly Italian. As a matter of fact, unmanned aircraft and unmanned ships are both involving actors of their relevant sectors and their relative regulatory bodies at a global level, emphasising the need of common solutions to be taken worldwide, given the transnational nature of maritime and aviation law. [6]

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[4] The operation of a ship has been considered unimaginable without a crew and a commander by LA TORRE, U., "Equipaggio, comando e determinazione della rotta nella navigazione marittima", *Rivista del Diritto della Navigazione* 2013, 95.

[5] Cf., for instance, the criminal offences of Article 1091 of the Italian Navigation Code on the seafarer's desertion or Article 1097 on the master's abandonment of the ship. For details on desertion, see NORRIS, M.J., *The Law of Seamen*, Vol. I, third ed., Rochester, 1970, 199.

[6] Considered as the first sectors where the transnational and global economic interests arose: VERMIGLIO, G., "Sicurezza: security, safety e sviluppo sostenibile", *Sicurezza, navigazione e trasporto*, Tranquilli Leali, R. – Rosafio, E.G. (eds.), Milano, 2008, 148. Such characteristic was described as a natural tendency to the openness, the resistance to the establishment of geographical borders and the inherent international vocation of transportation: PAPI, E., "Evoluzione del trasporto nel contest della globalizzazione", *Trasporti e globalizzazione: materiali per una ricerca*, Xerri, A. (ed), Cagliari, 2004, 187. The nature of the maritime industry as a «globalised industry» is pointed out in ALDERTON, T. – WINCHESTER, N., "Globalisation and de-regulation in the maritime industry", *Marine Policy* 2002, 36 and by OKERE, B.O.,"The Technique of International Maritime Legislation", *International & Comparative Law Quarterly* 1981, 513, who stresses how every ship is «obliged to reckon with the interest of the international community and to observe international regulations governing maritime navigation while passing through international waters». However, in the context of unmanned shipping, an attempt to introduce the new technology at a domestic level first has been deemed to be perhaps the most convenient solution, at least at the initial stage: cf. VEAL, R.-RINGBOM, H., "Unmanned ships and the international regulatory framework", *Journal of*

The structure of the thesis follows the classic approach of the Italian navigation law, although in a reversed manner: whereas maritime law usually forms the first part of every work generally on navigation law, [7] given its much longer history and tradition, the present thesis will firstly discuss, in each of its chapters, air law, then moving on to maritime law. This was considered the best solution, consistently with the current state of the art in the field of unmanned vehicles technology: both from the technical perspective and from the legal standpoint, we can assert that it is unmanned aviation which has a longer history and tradition. It might, then, be taken as a model for the identification of the legal issues and the relevant solutions also in the context of maritime law.

Therefore, the work will be divided into three chapters, each one formed by two parts, firstly aviation law, secondly maritime law, with the aim of having a parallel look to the two fields of the law in the specific areas subject to investigation. [8] The first chapter, after introducing the civil use of unmanned aircraft and unmanned ships, will try to frame them within the existing legal categories respectively of aircraft and ship, attempting as well at providing a definition of these new kinds of vehicle. The second chapter will move on to reconstruct the technical regulatory framework, mainly related to the public law issue of safety, concerning unmanned aircraft and unmanned ships: for the former, we will focus on what is already existing, whereas for the latter the analysis will be concentrated on the technical rules which might prove as barriers to the introduction of such a new technology in the maritime context. Finally, the third chapter will be dedicated to the private law issues, mainly responsibilities of the actors of aviation and shipping industry, in the light of the use of unmanned vehicle technology.

The division of the second and the third chapter, respectively into public law and private law, reflects another feature of navigation law, the interpenetration between the two broad categories, not subject to a clear separation as in other branches of the law. [9] Navigation law, more than other fields, although essentially

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International Maritime Law 2017, 115.

[7] Even the Navigation Code is divided into a first part dedicated to maritime law, a second part on aviation law (and two more parts respectively on criminal and transitional provisions).

[8] The presence of an emphasised parallelism between the two parts of navigation law was pointed out by ROMANELLI, G., *supra* note 1, at 1334.

[9] The coexistence of rules of private law and public law in the same subject is considered a uniqueness of navigation law, for the link between the public interest to safety and the risk of

born as a regulation of the commercial interests between private actors, has always witnessed a necessary State intervention for the ultimate goal of the safety of maritime and air navigation. [10] Indeed, safety is already proving the guiding light of all discussion concerning unmanned navigation.

The present thesis is submitted in fulfilment of the requirements for the degree of Doctor of Philosophy and Doctor Europaeus at the University of Cagliari. It is also the result of three different research experiences abroad conducted at the Erasmus University Rotterdam, University of Tehran and National University of Singapore. [11]

navigation: cf. XERRI SALAMONE, A., "La sicurezza come valore nel diritto della navigazione e dei trasporti e nella formazione di un diritto comune europeo", *Sicurezza, navigazione e trasporti*, Tranquilli Leali, R. – Rosafio, E. G. (eds.), Milano, 2008, 166.

[10] QUERCI, F.A., *Note in tema di equipaggio della nave e dell'aeromobile*, Padova, 1977, 79.

[11] Thanks to the generous hospitality offered by the mentioned institutions, where I was warmly welcomed by their staff and especially by my local supervisors, to whom I express my sincere gratitude for their invaluable guidance during my months abroad: Professor Frank Smeele of the Erasmus School of Law of the Erasmus University Rotterdam; Doctor Morteza Adel of the Faculty of Law and Political Sciences of the University of Tehran; Professor Stephen Girvin of the Centre for Maritime Law of the National University of Singapore.

Chapter One

Unmanned vehicles: a legal definition

Part I – Air Law

SUMMARY - 1. Introduction to unmanned aircraft - *1.1. - Historical development of unmanned aircraft and their civil uses - 1.2. - Categorisation of unmanned aircraft* - 2. The legal definition of aircraft - *2.1. Definition of aircraft under international aviation law - 2.2. The Italian legislative evolution* - 3. Definition of aircraft and unmanned aircraft – 3.1. *Unmanned aircraft under the international legal framework - 3.2. Unmanned aircraft in the European Union legal framework – 3.3. Unmanned aircraft and their definition in the Italian legal system* – 4. Concluding remarks.

1. Introduction to unmanned aircraft

1.1 Historical development of unmanned aircraft and their civil uses

Before approaching any legal investigation on the subject of unmanned vehicles, I consider a brief historical introduction of such technology to be necessary, in order to find the origin of this new and innovative topic, which has made its entrance into the legal science only in very recent years. [1] This is a necessary preliminary step for a complete framing of the subject, without which a complete vision of its relevant problems would not be possible. [2]

Why has the aviation law recently started to investigate the legal issues related to the use of unmanned aerial vehicles? The answer to this question is to be found in the dissemination of new civil uses which have made their appearance only in the last decades.

The use of unmanned aircraft for civil purposes has started only in very recent years. On the contrary, the technology has existed since the aftermath of the Second World Conflict, although the military employment has so far been surely the protagonist in the history of unmanned technology.

The merit of giving a first input to the development of this technology is

[1] As a matter of fact, although unmanned vehicles are not an invention of the last decades, as we will see below, one of the very first work of legal content on the topic has been published only very recently: PETERSON, M.E., "The UAV and the Current and Future Regulatory Construct for Integration into the National Airspace System", *Journal of Air Law & Commerce* 2006, 521.

[2] Ibidem, at 527: «the road ahead is best understood and navigated with an understanding of the road already traveled».

acknowledged to Nikola Tesla, [3] who already in 1898 had demonstrated the use of a new technology called «teleautomation» for a remote control of a small boat for the first time in history with no wires connected to it. [4] Nonetheless, it is only a few decades later, with the so-called Curtiss Sperry Aerial Torpedo by the inventors Elmer Sperry and Peter Cooper Hewitt [5] that the first unmanned flight of a specifically designed pilotless aircraft occurred, [6] with only one successful attempt on March 6, 1918. Subsequently, we need to wait six more years to witness the first remotely controlled flights in the United States and in Great Britain. [7]

Nevertheless, it should be noted that their initial structure in the military sector was nothing more than that of flying bombs and torpedo, largely employed during the Second World Conflict, rather than real unmanned vehicles. Only when such devices were used for the purpose of carrying and dropping bombs, we can say that their transformation into real unmanned aircraft was completed. [8]

The main advantage of such machines was clear since their first employment: reducing to the minimum extent the exposure of personnel during conflicts. However, during the second half of the XX century, we still cannot assert that their use was actually widespread, even in the military context. Perhaps only Israel made a large use of unmanned aircraft, which revealed to be successful and led to wide investments on this technology by that country. [9]

With regard to the military sector, the event that more than others encouraged a large employment of unmanned aircraft for war purposes was the terrorist attacks of the 11 September 2001 in New York. [10] The subsequent American military

[3] Nikola Tesla (10 July 1856 – 7 January 1943) was one of the most famous Serbian-American inventor, electrical engineer, mechanical engineer and physicist of his time, best known for his contributions to the design of the modern alternating current electricity supply system.

[4] PETERSON, *supra* note 1, at 538.

[5] Elmer Ambrose Sperry, Sr. (October 12, 1860 – June 16, 1930) was an American inventor and entrepreneur; Peter Cooper Hewitt (May 5, 1861 – August 25, 1921) was an American electrical engineer and inventor, who invented the first mercury-vapor lamp in 1901. They can be regarded as the inventors of the forerunner of unmanned aircraft.

[6] PETERSON, *supra* note 1, at 538.

[7] Ibidem, at 540.

[8] Ibidem, at 542.

[9] GOGARTY, B. – HAGGER, M., "The Laws of Man over Vehicles Unmanned: The Legal Response to Robotic Revolution on Sea, Land and Air", *Journal of Law, Information and Science* 2008, 77, note 9.

[10] Ibidem, at 80.

intervention in some countries in the Middle-East increased the need for unmanned aerial vehicles used for intelligence, surveillance and reconnaissance purposes. These first two decades of the current century have witnessed the boosting of Predators, Reapers and other new vehicles which have evolved from simple surveillance devices to bearing real combat roles. [11]

Nevertheless, the military sector was not the only area where unmanned vehicles have been employed. As a matter of facts, they have also been intended for decades for civil uses, e.g. for undersea operations, such as mapping, wreck detention and submarine rescue, and particularly in the field of agriculture. [12]

The spraying of pesticides and fertilisers through unmanned aircraft started in Japan in the 1950s. [13] Their widespread dissemination has brought to autonomous pre-programmed vehicles widely employed at the turn of the XXI century in that country, making it the largest market for civilian unmanned aircraft, with an approximate 65% of these devices used worldwide. [14]

As happened in Japan, the real explosion of civil unmanned aerial vehicles occurred in the XXI century, when the increasing international demand, the large public research and development investments, the digital revolution, making the development of highly computerized technologies possible, all contributed to the final diffusion of unmanned vehicles in the civil market.

Its ability to replace human beings in the so-called «dirty, dangerous and dull» roles, [15] made it the perfect device for many civil uses, such as petrochemical and mineral extraction, subsea pipeline and cable laying and maintenance, border

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[11] Ibidem, at 88.

[12] There is, in particular, an interesting range of possible uses in the marine context: cf. DE CORBIERE, C., "Les drones maritimes", *Droit Maritime Français* 2017, 994.

[13] Or from the eighties, according to LA TORRE, U., "La navigazione degli UAV: un'occasione di riflessione sull'art. 965 c. nav. in tema di danni a terzi sulla superficie", *Rivista del Diritto Navigazione* 2012, 555.

[14] PETERSON, supra note 1, at 546.

[15] The concept of «dirty, dangerous and dull», also known as the 3Ds, is used in the labor sector to indicate those kinds of jobs or tasks that may be considered repetitive and tedious, dirty or hazardous for humans, therefore implying low labor conditions. Robots in general are said to be useful precisely for this 3Ds functions, and nowadays the expression is regarded as particularly suitable for the tasks performed by unmanned aircraft, such as inspections or explorations in potentially dangerous unknown environments or in the occasion of natural disasters. See GUERRERO LEBRÓN, M.J. - CUERNO REJADO, C. - MÁRQUEZ LOBILLO, P., "Aeronaves no tripuladas: estado de la legislación para realizar su integración en el espacio aéreo no segregado", *Revista de derecho del transporte* 2013, 71.

security, policing, patrolling and inspection; emergency and hazard management, remote exploration works and repair, event coverage, traffic management and monitoring, environmental protection, aerial photography. [16]

It is useful to have a look on the very recent studies on the field, which show the current situation of the civil market of unmanned vehicles and the forecast for the foreseeable future. To this end, we can analyse the work of SESAR, [17] the European Drones Outlook Study "Unlocking the value for Europe". [18]

According to this study, the following can be seen as the directions and the potentials which unmanned aerial technology are likely to undertake in the future decades:

- «Agriculture: Drones could help enable precision agriculture that will be critical to meet productivity needs for Europe and support greener farmer practices that are a focus of the EU Common Agricultural Policy (CAP) of 2020;
- Energy: Drones may reduce a variety of risks including to personnel performing hazardous tasks, to the environment by properly maintaining assets and to the infrastructure overall by limiting the amount of downtime to Europe that already is a heavy importer of resources and pays higher energy prices than other regions;
- Public safety and security: Drones could be used by a variety of authorities to better assess and monitor hazardous situations, complete search and

[16] PETERSON, *supra* note 1, at 549; SIA, A.L.M., "Profili attuali della disciplina giuridica dei mezzi aerei a pilotaggio remoto e il regolamento dell'Ente nazionale dell'aviazione civile italiana (ENAC)", *Diritto dei Trasporti* 2014, 748. For the legal issues arising from their use for surveillance purposes, see VACEK, J., "Big Brother Will Soon Be Watching--Or Will He? Constitutional, Regulatory, and Operational Issues Surrounding the Use of Unmanned Aerial Vehicles in Law Enforcement", *North Dakota Law Review* 2009, 673.

[17] SESAR Joint Undertaking is the European public-private partnership, which is managing the development phase of the Single European Sky ATM Research (SESAR) Programme. It will give Europe a high-performance Air Traffic Management infrastructure which will enable the safe and environmentally friendly development of air transport. Established in 2007 as a public-private partnership, the SESAR Joint Undertaking (SESAR JU) is responsible for the modernisation of the European air traffic management (ATM) system by coordinating and concentrating all ATM relevant research and innovation efforts in the EU. See http://www.sesarju.eu/ (last accessed 18.01.2019).

[18] The document is a very recent study carried out by the SESAR JU, concluded in November 2016 and containing the Group's forecast and insights on the future development, up to 2050, for drones' civil market. It was conceived to be a starting point for the European Union on the topic, in order to allow the institutions to develop a policy for the future of unmanned aircraft operations, starting from the data collected by this study.

rescue missions, gather evidence for investigations and detect and prevent other crises;

- E-commerce and delivery: Urgent packages, including medical supplies, could be completed in a fraction of the time and online retailers could benefit from increased accessibility in both urban and remote areas;
- Mobility and transport: The infrastructure of today, i.e., railways, may be monitored and kept secure and future forms of passenger aircraft could someday operate safely without the requirement of on-board pilots»[19].

The study shows interesting data and statistics related to the future spread of civil unmanned vehicles, highlighting how such technology will prove essential in the future civil aviation market. [20]

This is the reason why the legal sciences should not be left behind in studying and addressing the issues related to the civil use of unmanned technology. On this wave of renewed interest towards unmanned aircraft, the first instruments by State Authorities have been enacted to regulate the conditions of unmanned flight operations and provide rules on their categories and requirements, usually framing such rules within the existing liability regime provided in every legislation. The first in time adopting a technical regulation was Australia in 2002, [21] followed in the last two decades by many other countries: [22] among them Italy,[23]France, [24] Spain, [25] and,

[19] SESAR Joint Undertaking «European Drones Outlook Study "Unlocking the value for Europe"», at 14.

[20] Ibidem, at 17.

[21] Australian rules, issued by the Australian Civil Aviation Safety Authority (CASA), are now contained in Part 101 of the Civil Aviation Safety Regulations 1998.

[22] Today, besides the mentioned countries, many more have adopted regulations on unmanned aircraft, such as Germany, Czech Republic, Denmark, Ireland, the Netherlands, Norway, Sweden, Austria, Belgium, Canada, New Zealand and Singapore: cf. SIA, A.L.M., *supra* note 16, at 757, note 45.

[23] The Italian Civil Aviation Authority (Ente Nazionale per l'Aviazione Civile – ENAC) issued a first edition of the Regulation on Remotely Piloted Aerial Vehicles in December 2013, now repealed by the second edition dated 16 July 2015, last amended in May 2018.

[24] Regulation on unmanned aircraft in France is currently contained in two *Arrêté du 17 décembre 2015*, one relating to the conception of civil aircraft operated without any person on board, the conditions of their use and the capabilities of the persons who use them, another one relating to the use of the airspace by aircraft travelling without persons on board, adopted by the Minister of Ecology, Sustainable Development and Energy, the Minister of Defence and the Minister of Overseas.

[25] Spain has recently adopted the *Real Decreto 1036/2017*, of December 15, regulating the civil use of remotely piloted aircraft, and amending the *Real Decreto 552/2014*. For a thorough comment, see GUERRERO LEBRÓN, M.J. (ed.)*, La regulación civil y militar de las aeronaves civiles pilotadas por*

subsequently, the United States of America. [26]

The technical regulatory framework will be subject to analysis in the second chapter of this work.

1.2 Categorisation of unmanned aircraft

After the introduction on the historical development of unmanned vehicles and their potential impact on the civil aviation for the near future, prior to the analysis of their status into the legal dimension, it is useful to draw a categorisation of the different kinds of unmanned aircraft, which have been created by the technological evolution. This will make the use of the terms and expressions of the present work clearer, before discussing the terms chosen to address the subject by different legal sources.

The general term used in the present work is «unmanned aircraft», considered to be the best expression to frame this subject matter in all its aspects. Nevertheless, as we will see from the analysis of the definitions given by the different legal systems, we can remark a lack of clarity in the use of the terminology itself, both among scholars and lawmakers. [27]

Before an examination of a legal nature, it is preferable to analyse the various expressions according to their meaning in the common language, starting from the term more frequently adopted in the present work: «unmanned aircraft». Assuming the existence of a perfect correspondence between the term «aircraft» used in this expression and the general concept of aircraft, on which the position of the law will be discussed below, we can now focus on the term «unmanned».

The definitions found in different dictionaries [28] describe the adjective «unmanned» as meaning «[n]ot having or needing a crew or staff», hence without

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control remote. Comentario al RD 1036/2017, de 15 de diciembre, Marcial Pons, Madrid, 2018.

[26] The main provisions on unmanned aircraft in the United States federal system are contained in Part 47, Part 48, Part 101, and Part 107 of the Federal Aviation Regulations. For a recent comment on the legal framework in the US, see MACPHERSON, E., "Is the World Ready for Drones?", *Air & Space Law,* 2018, 149.

[27] HUTTUNEN, M., "Unmanned, Remotely Piloted, or Something Else? Analysing the Terminological Dogfight", *Air & Space Law* 2017, 350.

[28] The quoted definition is to be found in the online version of the Oxford dictionary, available at https://en.oxforddictionaries.com.

the physical presence of people in control. Whereas the verb «to man» describes the action of furnishing with men, as for service or defence, one of the oldest activities known by shipowners, the presence of the prefix «un» reveals the lack of such manning activity, hence the lack of men on board the vehicle.

An unmanned aircraft is therefore an aircraft which, defining it in a negative sense, has not been manned, namely not furnished with men on board it. This lack of men on board clearly shows that its mechanical and technological features allow the use of such aircraft according to their normal destination, despite the absence of human beings. As a matter of fact, if we describe the aircraft as «any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface», [29] the lack of men on board, which is not required in the definition, should not prevent the vehicle from performing this identical function. If any device cannot derive support in the atmosphere as described in the definition, for instance because there are no men making it possible, then it cannot be considered an aircraft. After all, in the above-mentioned dictionary definition a reference is also made to the absence of a «need» of a crew or staff on board.

Therefore, an unmanned aircraft cannot simply be an aircraft which has not been manned, since if it has not been created for being flown without men on board, it would not be capable of flying, losing his quality of aircraft. Unmanned aircraft are rather a real category of aircraft, specially designed for flying with no men on board them.

That said, we should specify that the term «unmanned aircraft» is a very general one, including in itself many possible configurations of vehicles. It is accompanied by its acronym "UA", which has recently replaced the acronym "UAV", standing for «Unmanned Aerial Vehicles». The use of such latter expression and its acronym was popular in the first years of the legal analysis of unmanned vehicles. However, as correctly observed, "aerial vehicle" was an obsolete phrase, not suitable for the legal context, since it could not find a corresponding term in the tradition language of aviation law. [30]

[29] As I will deeply describe below, the quoted definition is the one in use by international air law. In this context we take it as a basis to define the concept of unmanned aircraft, postponing to another moment all legal discussion on such a definition.

[30] HUTTUNEN, M., *supra* note 27, at 359.

Indeed, it is the term «aircraft», not «aerial vehicle» to be at the centre of all discourses in the legal context, forming the basis of the entire system of aviation law. This is the reason why the phrase unmanned aerial vehicle has been often substituted with unmanned aircraft and its acronym UA, which should be considered more appropriate for a work of a legal content such as the present one.

The only justification of the previous phrase can be found in its possible origins, since the very generic phrase unmanned vehicle (UV), indicating any vehicle operated without a direct physical contact of a person on board it, knows many variants, adopted to describe unmanned vehicles navigating in different environments: in addition to the aforementioned UAV, the technological development has created unmanned ground vehicles (UGV), unmanned [water] surface vehicles (USV) and unmanned underwater vehicles (UUV). [31]

However, for the reason set forth above, I consider the expression unmanned aircraft to be more appropriate for this work, for a better framing of this subject matter within the framework of the overall air law.

Moreover, it should be remarked that the term "system" has been frequently added to the expression unmanned aircraft, creating the acronym often seen in official documents «UAS». This is due to the interest in emphasizing the vision of such aircraft not as a mere flying machine, but rather as a complex of tool and devices, both on board the aircraft or on a remote position (such as the remote control station) in addition to all communication facilities. [32]

This is an interesting aspect, if we consider that all such equipment and communication tools have been always existing even for traditional manned vehicles. The only, fundamental difference is that for these latter devices, such equipment have only an auxiliary and serving function, not being absolutely necessary for them to be flown. On the contrary, unmanned vehicles totally rely on the presence of communication systems and a remote station, which allow their navigation through the air. [33] This is the reason why the word «system» should be

[31] GOGARTY, B. – HAGGER, M., *supra* note 9, at 74.

[32] MCBRIDE, P., "Beyond Orwell: The Application of Unmanned Aircraft Systems in Domestic Surveillance Operations", *Journal of Air Law & Commerce* 2009, 629.

[33] However, even for unmanned aircraft the degree of necessity of such equipment may vary depending on the level of automation achieved by the technology. A remotely operated aircraft surely relies completely on the systems conceived as a whole, but the same cannot be said for a fully autonomous vehicle.

taken into account in a legal work, especially when it comes to discussing the responsibility issues arising from the use of such technology. Bearing this in mind, I will continue to use the phrase «unmanned aircraft» throughout the present work, introducing the possible relevance of the system as a whole in the following chapters.

The easiest and most evident way to describe the different possible configurations of unmanned aircraft is by dividing them into two main subcategories. It is a division based on the level of human intervention in their operations. In order to make such categorisation simpler, it should be designed on the existence or absence of a human operator navigating the aircraft. Such a dividing line creates two subcategories: on the one hand the remotely piloted aircraft (often referred to with the acronym RPA); on the other hand, the autonomous aircraft (with their less-used acronym AA).

With regard to the first class of vehicles, we can arguably infer that they fall within the general category of unmanned aircraft. [34] A deeper analysis of the words used in the expression makes this statement evident: this kind of aircraft is defined «piloted aircraft», therefore stressing the need of a pilot to make their navigation activity possible. However, the adverb «remotely», referred to «piloted», adds something very important to the phrase, making such devices aircraft operated at a distance, rather than on board. This creates the main difference with traditional manned aircraft, which are, on the contrary, piloted by a person who is inside the vehicle.

Thus, a remotely piloted aircraft is not endowed with men on board it. Pursuant to what has been above stated, a remotely piloted aircraft is hence an unmanned aircraft.

Starting with the consideration that a remotely piloted aircraft is operated from a remote pilot station, it is evident that such a change of technology must be followed by a consequent change in the configuration of the role of the pilot, whose tasks, such as manipulating the controls, monitoring the engine and all aircraft equipment, maintaining a constant vigilance in order to avoid any collision

[34] Not exactly in conflict with the term UAV, which is, instead, the *genus* of the *species* RPA: see ANTONINI, A., "Le future sfide del diritto aeronautico: nuovi aeroporti, nuovi aeromobili", *Diritto dei Trasporti* 2015, 747.

whatsoever, must be transferred to the homologous figure of the remote pilot. [35]

With regard to the second main category, that of autonomous aircraft (AA), their main feature is considered to be the total absence of a pilot operating them. No decision concerning their navigation is left to the human operator, since they fly following pre-programmed instructions and totally rely on their artificial intelligence. [36]

Therefore, this class of unmanned aircraft cannot be said to be piloted at all. Their feature as unmanned vehicle is brought to the maximum extent possible, with no human taking part in their navigational operations. Thus, they can also be referred to as «pilotless aircraft», using an expression that, as we will see below, has found little fortune among the terms adopted in the legal context. [37]

Once this line has been drawn, however, a clarification must be made with regard to the possible configurations of unmanned aircraft that we can see as existing in practice. The problem is the existence of a wide variety of devices which do not fall completely in either category, being not completely remotely controlled nor fully autonomous.

In order to frame them into one category, the phrase «semi-autonomous aircraft» may be used, to describe all unmanned aircraft which can be placed in the middle between the two main subcategories of RPA and AA. Such aircraft have been described by scholars as vehicles intended to carry out their functions autonomously within the parameters given by human operators, whereas critical decisions are «left to a human operator to veto or directly control». [38]

Such a definition is, nevertheless, still too broad and encompasses aircraft which may differ too much from one another in their characteristics and functions. [39] Moreover, whereas the presence of a pilot is the main feature of an RPA, «nowhere has it been determined how much manipulating of flight controls and at

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[35] MARSHALL, D., "Unmanned Aerial Systems and International Civil Aviation Organization Regulations", *North Dakota Law Review* 2009, 696.

[36] GOGARTY, B. - HAGGER, M., *supra* note 9, at 76.

[37] However, the expression «pilotless aircraft» here mentioned, is unlikely to bear the same meaning of those appearing in some legal sources, which are most probably adopted as inappropriate synonym of the general unmanned aircraft. For this analysis of the legal terms, see below.

[38] GOGARTY, B. - HAGGER, M., *supra* note 9, at 76.

[39] MARSHALL, D., *supra* note 35, at 696.

what interval is necessary to meet the standard of 'piloting'». [40]

Therefore, how can the law address the issues related to such categorisation, paying a special attention with regard to this undefined class of aircraft?

The creation of subcategories is not only important for a clearer classification of the technological variety existing in reality. It also shows, in some cases, the interests of the lawmakers at different levels in regulating only a class of unmanned vehicles, rather than another category. [41] It has been pointed out that such distinction should not serve as a basis for regulatory purposes: in a legal context, all attentions should be given to the general category of unmanned aircraft, avoiding a direct address to the single subcategories. [42] However, the way in which such aircraft are operated somehow affects the approach which aviation law should embrace in regulating them. A generalisation is perhaps the easiest way to overcome the issue of defining once and for all the subject, bringing clarity to the terms used to the highest extents, as suitable in the context of the legal sciences, highlighting at least the common needs of the different subcategories.

To conclude this section, it is noteworthy to point out how, given a certain level of automation, the types of aircraft may considerably change according to shapes, dimensions and other features. They may range from micro flying robots, resembling to birds, insects or frisbees, to vehicles designed as traditional aircraft or rotorcraft, which may have a wingspan wider then a Boing 737, or virtually deriving from the conversion of traditional aircraft. [43]

This aspect is likely to create even more confusion in the establishment of a legal framework on unmanned vehicles. However, their different characteristics in the above described terms should not serve as a basis for creating different legal categories of aircraft, but, at most, should be taken into account when enacting technical regulations, just as is already the case for traditional manned aviation.

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[40] HUTTUNEN, M., *supra* note 27, at 361.

[41] See below, particularly with regard to remotely piloted aircraft.

[42] HUTTUNEN, M., *supra* note 27, at 362.

[43] The biggest machines may indeed perfectly resemble to traditional manned aircraft, some having a flight range of even 36 hours, making possible, for instance, a complete overflight of Europe starting from and arriving to California with no stopovers. See FRANCHI, B., "Aeromobili senza pilota (UAV): inquadramento giuridico e profili di responsabilità – prima parte", *Responsabilità Civile e Previdenza* 2010, 735. Moreover, the US Air Force Global Hawk can be compared, in size and capacity to a traditional aircraft: see PERRITT, H.H. – SPRAGUE, E.O., "Law abiding drones", *The Columbia Science & Technology Law Review* 2015, 392.

To conclude this section, before passing once and for all to an examination of a legal nature of the subject, there is one term left to be discussed, characterised by its wide dissemination especially in common language: the word «drone».

The term «drone» has existed in English language far before the invention of unmanned aircraft (and of that of any aircraft whatsoever): in zoology it refers to «[a] male bee in a colony of social bees, which does no work but can fertilize a queen». [44]

The term has shifted to the aviation technology language already in the 1930s [45], because of the typical sound made by the first unmanned aircraft, which resembled to that of the drone animal. From that moment, many languages have borrowed the word form English, adapting it to their own writing and reading rules. [46]

Nevertheless, however widespread the term is in common language, in the legal context it has often been considered unprofessional, perhaps too much perceived as referring to the military device used in combat activities. Beyond any judgement on the term ««drone», we prefer to make use of the expression «unmanned aircraft» for the reason above proposed, considering its greater adherence to the traditional language of aviation law.

2. The legal definition of aircraft

2.1 Definition of aircraft under international aviation law

The main goal of this first part of the present work is to draw a definition of aircraft, according to the provisions of the different legal systems analysed. This is a necessary step in order to find out whether unmanned vehicles have been included in the notion of aircraft, as interpreted by the doctrine or through the direct intervention of legislators at all levels.

In which legal sources can we find the definition of aircraft? Has this means

[44] From https://en.oxforddictionaries.com/.

[45] HUTTUNEN, M., *supra* note 27, at 365.

[46] Therefore, some languages have kept the word «*drone*» (e.g., Italian and French) as spelled in English, only changing the pronunciation, whereas some others have slightly changed its spelling (see, e.g., the Spanish «*dron*»).

of transport ever been defined as a legal category in any of the sources that provide relevant rules?

This is the purpose of this paragraph, implicitly aiming to trace the borders of what is named «aviation law», considering the aircraft as its centre for defining its field of competence.

There is clearly no universal definition of the term «aircraft». Thus, in order to retrace it, we need to take a look at the individual legal systems that take the aircraft into consideration. We will start from the highest level, the international legal system.

The first definition which has to be taken into account is the one contained in the 1944 Chicago Convention on International Civil Aviation. [47]

The Convention is considered to be the constitution of aviation law, [48] and has a particular importance for laying the foundations of this field of law, together with the institution of the International Civil Aviation Organisation, nowadays a specialised United Nation agency.

Why do we question about the definition of aircraft? First of all, because this sector of law is basically built around the concept of aircraft, which, since its first appearance among human inventions, [49] has allowed the conquer of the skies by humans and created their possibility to move through the air. The interest of the law in this sector has followed as a result of the need to regulate this use of the skies and all other aspects related to the aircraft as a means of transport. This is why the notion of aircraft is of particular importance for aviation law itself.

Starting from its origin, even before the Chicago Convention, the aircraft has been defined in the first international instrument regulating the field of aviation law:

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[47] The Treaty was signed on December 7, 1944, at Chicago by 52 signatory States. It received the requisite 26th ratification on March 5, 1947 and went into effect on April 4, 1947. At present, it has 192 States Parties and it has been amended eight times. The Convention is supported by nineteen annexes containing Standards and Recommended Practices (SARPs).

[48] BOWEN, H.A, "Chicago International Civil Aviation Conference", *George Washington Law Review* 1945, 308.

[49] Unlike the appearance of the ships, the first appearance of the aircraft, as a relatively new human invention, can be set in a determined date: it was December 17, 1903 when Wilbur and Orville Wright experienced the first flight in history. That morning, for the first time a flying machine, which can therefore be deemed as the first aircraft, had taken off the ground, traveled in the air and landed under the control of its pilot. It was the beginning of a new era for the transport sector and the consequent creation of a new field of law, one of the youngest, considering its very short history of a little more than one hundred years.

the Paris Convention of 1919 [50]. If we take a look at the first flight of the Wright brothers in 1903, we can easily see how fast the development of the industry has been, bringing the consequent need of the intervention of the legal interests at an international level after only sixteen years from that first flight.

The definition of aircraft was contained in Article 1 of Annex D of the above-mentioned Convention, stating that aircraft is «any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface».

Mentioning this old Convention derives its importance from the consequent success acknowledged to such a definition by the following legal sources. Indeed, the following Convention, the Chicago Convention, essentially reproduces the definition contained in the 1919 Paris Convention, which is still to this day our benchmark to define the aircraft in the international legal system. [51]

The above-mentioned definition, still in force in international aviation law, clearly encloses a too broad description, which has been criticised by many scholars already at that time. [52] This is perhaps the reason why it is not necessarily corresponding to the ones provided by the different national legal systems. [53]

However, the European Union too has embraced such definition, including it in Article 2, paragraph 1, letter (a) of its Commission Regulation 2042/2003, [54] defining the aircraft as «any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface».

From this definition we can identify the only element required to any machine

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[50] The Convention on the Regulation of Aerial Navigation was signed in Paris on 13 October 1919, as part of the Versailles Peace Treaty signed in the aftermath of the First World conflict. Despite the low success represented by only thirty-two Sates ratifying it, the Paris Convention was the first international instrument creating at a global level a legal framework for civil aviation, as well as the first attempt to establish an organization such as the International Commission for Air Navigation, which can be considered predecessor of ICAO. See JENNINGS, R.Y., "International Civil Aviation and the Law", *British Yearbooks of. International Law* 1945, 192.

[51] The current definition of aircraft is now contained in Annex 6 (Operation of Aircraft), Annex 7 (Aircraft Nationality and Registration Marks), Annex 8 (Airworthiness of Aircraft) to the Chicago Convention.

[52] SCIALOJA, A., *Corso di diritto della navigazione*, Roma, 1943, 57.

[53] On the freedom enjoyed by the Contracting States to create their own categories and definitions of aircraft, see MARSHALL, D., *supra* note 35, at 700.

[54] Regulation (EC) No 2042/2003 of 20 November 2003 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these tasks.

to be considered an aircraft. It is the technical feature of its aerial support due to its reaction of the air, different from the reaction against the earth's surface. Therefore, no mention to other aspects such as the presence of a pilot or a crew on board, the purposes for which the machine is used or others, is made by the international aviation law.

After this brief look at the supranational level, I will now move to analyse the definition given by some domestic legal systems, starting with the Italian navigation law. Thereby we can observe whether those definitions differ from the one provided by international law and how this might reflect the inclusion of unmanned aircraft in such concept.

2.2 The Italian legislative evolution

The first Italian Aviation Statute[55] did not contain any mention to the definition of aircraft, which was first introduced with the following Regulation for Air Navigation of 1925, defining aircraft as any «mechanism or any structure which, deriving static and dynamic support from the air, is suitable for the carriage of goods and persons». [56]

This definition differs from the one adopted at the international level. The main feature required for a machine to be deemed aircraft is its capacity to transport goods and persons, whereas the technical capability of deriving support from the air is only subsidiary to such transport.

However, although this additional element made the Italian definition much more specific compared to that of the international conventions, it was still subject to criticism by the Italian doctrine, [57] considering this notion still too broad: the mention to the element of «transport» was still regarded as being too general, including vertical transport, which, instead, was not meant to be involved in the concept of aircraft. The aspect of including vertical transport might have a particular importance for the scope of this work, considering it as the main type of air

[55] The *Regio Decreto Legge* n. 2207 of 1923 was the first statute in the Italian legal system dedicated to aviation law, implementing the principles of the 1919 Paris Convention.

[56] Free translation from the Italian: «*un meccanismo od una qualsiasi struttura che, utilizzando il sostentamento statico o quello dinamico dell'aria, sia atto a trasportare cose o persone*».

[57] AMBROSINI, A., *Istituzioni di diritto aeronautico*, Roma, 1939, 116ff.

navigation currently operated by unmanned vehicles, which do not usually move from one place to another, landing, instead, in the same station as from where they take off.

The above-mentioned critics were superseded with the adoption of the first edition of the Italian Navigation Code of 1941, [58] defining the aircraft as «any machine capable of navigating the airspace and of carrying persons and goods from one place to another». The following final edition of the Italian Navigation Code, passed in 1942, slightly changed the definition in its Article 743 as «any machine suitable for carrying persons or goods through the air from one place to another». [59]

Hence, any machine, in order to be considered aircraft in the Italian legal system, has to be featured with the following two elements: the capability of navigating through the air; the capability to carry persons and goods from one place to another.

The concept of «capability» and its differences from the concept of «destination» used in the definition of ship [60] have been discussed by scholars in the Italian literature, [61] culminating with the final amendment of Article 743 by the legislative decree n. 96 of 2005. The current definition is therefore the following: «[a]ircraft means any machine intended for carrying persons or goods through the air». [62]

From the quoted definition we can draw two considerations: the first is the strengthening of the concept of unity of navigation law within the Italian legal system. The new definition of aircraft is perfectly in line with the definition of ship, reinforcing the parallelism between the two parts of the Italian Navigation Code

[58] This was the first Navigation Code, enacted on January 27, 1941, anticipating the adoption of the subsequent Navigation Code of March 30, 1942, conceived with the ambition to regulate the whole subject concerning navigation through air, sea and inland waters. It is considered the centre of all navigation law, representing its autonomy from other areas of law and the peculiarity of the unity of aviation and maritime law, which can be rarely found in other domestic jurisdictions.

[59] Free translation from the Italian text: «*[p]er aeormobile si intende ogni macchina atta al trasporto per aria di persone o cose da un luogo ad un altro*».

[60] Under Article 136 of the Navigation Code «*[p]er nave s'intende qualsiasi costruzione destinata al trasporto per acqua, anche a scopo di rimorchio, di pesca, di diporto, o ad altro scopo*», as will be discussed in the maritime part of this chapter.

[61] SCIALOJA, A., *supra* note 52, at 56.

[62] Free translation from the Italian text: «*[p]er aeromobile si intende ogni macchina destinata al trasporto per aria di persone o cose*».

and the idea of a unitary navigation law, encompassing maritime and air law with respectively the ship and the aircraft at their centre. [63]

The functional concept of «destination» is now required for the notion of aircraft, thus needing a step forward vis-a-vis the static concept of «suitability» to navigating. [64]

The second consideration is the repeal of the spatial requirement of the transportation «from one place to another», therefore reintroducing the concept of vertical navigation within the scope of the Italian navigation law. This somehow paved the way for the inclusion of the unmanned aerial vehicles within the definition of aircraft, as immediately occurred with the following amendment of Article 743 itself.

However, the mention to the carriage of people or good may be in contrast with the normal use of unmanned vehicles, which are rarely employed for carriage purposes. This contrast is solved by the introduction of an express inclusion of such machines in the definition of aircraft with a following amendment of 2006, as discussed in the following section.

It is finally noteworthy taking a brief look at some definitions provided in other domestic laws.

For instance, the definition of aircraft provided by the legal system of the United States of America is the following: «[a]ircraft means a device that is used or intended to be used for flight in the air». [65]

As we can see, it shares with the Italian one the concept of destination of the machine, since not only the actual use, but also the intention of its use for air navigation purposes is mentioned in the first part of the definition. What differs from the previously examined definition is the absence of any reference to the use for transportation purposes, given the preference to the generic «flight in the air».

The definition of aircraft provided by French aviation law is, instead, much more generic and containing the above discussed concept of capability. It can

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[63] LEFEBVRE D'OVIDIO, A. – PESCATORE, G. – TULLIO, L., *Manuale di diritto della navigazione*, XIV ed., Milano, 2016, 12.

[64] MASTRANDREA, G. – TULLIO, L., "La revisione della parte aeronautica del codice della navigazione", *Diritto Marittimo* 2005, 1217.

[65] This definition is contained in the Code of Federal Regulation, Title 14: Aeronautics and Space, paragraph 1.1.

translate as follows: «Aircraft means any device capable of rising or circulating through the air». [66]

From the conducted analysis, we can infer the existence of a certain variety in designing the concept of aircraft by the law. But what really matters for our purposes is the examination of the definition of unmanned aircraft under the law and its potential inclusion within the general concept of aircraft. [67]

3. Definition of aircraft and unmanned aircraft

3.1 Unmanned aircraft under the international legal framework

Thanks to the rapid development experienced by unmanned aircraft, many of the legal systems have already taken them into consideration, thus expressly providing a definition and including them within the definition of aircraft. [68]

Moving from the international level, the necessary reference should be made to the Chicago Convention and the ICAO instruments.

It is indeed in this fundamental treaty that the first mention to unmanned vehicles was made in order to provide a very first norm to regulate the subject. It is impressive how in the vanguard of technological innovation the drafters of the Convention were, taking unmanned vehicles into consideration already in the Forties of the twentieth century. After this first introduction of the topic into the legal dimension, the law has been silent for decades on the matter, reopening the discussion only in recent years.

It is noteworthy to see whether the Chicago Convention has given any definition of unmanned aircraft and whether a clear position has been taken on their

[66] Art. L110-1 of the French Code of civil aviation provides as follows: «*[s]ont qualifiés aéronefs pour l'application du présent code, tous les appareils capables de s'élever ou de circuler dans les airs*».

[67] For a definition of aircraft and the assimilation of unmanned aircraft into its notion in Spain, see LA TORRE, U. - PETIT LAVALL, M. V., "Studio preparatorio alla modifica degli articoli 25 e 26 del nuovo Proyecto de Código aeronáutico latino americano", *Il Diritto Marittimo* 2017, 944 and RUIZ, M.M., "La necesaria ordenación jurídico-administrativa de los drones en el derecho español entre la libre competencia y la protección del interés general*", Revista de derecho del transporte* 2016, 65.

[68] For the issues related to the difficulties in defining unmanned aircraft, see KAPNIK, B., "Unmanned but Accelerating: Navigating the Regulatory and Privacy Challenges of Introducing Unmanned Aircraft into the National Airspace System", *Journal of Air Law & Commerce* 2012, 442.

inclusion into the notion of aircraft. To this end, the article of the mentioned Convention which should be analysed is Article 8, which states as follows:

> «No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization. Each contracting State undertakes to insure that the flight of such aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft».

Although this is not the only article which may be considered applicable to unmanned aircraft, as described later in this work, Article 8 is the only article expressly mentioning unmanned aircraft, or rather «pilotless aircraft». Its presence allows some Author to infer that international aviation law takes the assimilation of unmanned aircraft into the general concept of aircraft for granted. [69]

The expression used at that time was therefore different from the ones currently in use to describe such phenomenon. This may be regarded as evidence of the unsuccessful choice of terms, making the absence of a pilot the centre of the concept.

Indeed, the title of Article 8, «pilotless aircraft» correctly reflects the phrase used in its text, namely «aircraft capable of being flown without a pilot». However, as we have above made clear, the reality shows that what precisely describes an unmanned vehicle is not the total absence of a pilot, but the lack of a pilot *on board* the aircraft. [70] The concept of a pilotless aircraft, which is capable of being flown without a pilot rather recalls the concept of «autonomous aircraft», where the flight is programmed and the intervention of a human operator during flight operation is not considered. [71]

It is unlikely that the intention of the drafters of the Chicago Convention was that of covering the subject of fully autonomous aircraft, rather than the wider category of unmanned aircraft. This assumption derives not only from the early stage of the development of that technology, which was, on the contrary, more

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[69] SEVERONI, C., "Aeromobili", *Diritto della Navigazione*, Deiana, M. (ed.), 2010, 2.

[70] Unless the real meaning of the term «pilot» itself is questioned: see HUTTUNEN, M., *supra* note 27, at 354.

[71] As we have seen in section 1.1.2 of this chapter.

advanced than we may think, but most of all from the subsequent consideration given at the international level, primarily by ICAO itself to the subject and its categorisation.

For this purpose, in order to grasp the meaning of «pilotless aircraft», a look should be given to the first intervention on this subject matter operated by ICAO after decades of silence: Circular 328.AN/190 titled «Unmanned Aircraft Systems (UAS)», issued in 2011 by this international organization. [72]

The document reminds the endorsement by ICAO Assembly of the definition of unmanned aerial vehicle provided by the Global Air Traffic Management Operational Concept [73] (DOC 9854) as follows: «[a]n unmanned aerial vehicle is a pilotless aircraft, in the sense of Article 8 of the Convention on International Civil Aviation, which is flown without a pilot-in-command on-board and is either remotely and fully controlled from another place (ground, another aircraft, space) or programmed and fully autonomous».

From this definition we can draw two conclusions: on the one hand, this confirms how inaccurate was the use of expression «pilotless aircraft», since it is subsequently specified that the meaning was not that of aircraft without pilot at all, but of aircraft «without a pilot-in-command *on-board*». [74] Secondly, the last part of the definition shows the all-inclusive meaning intended for «pilotless aircraft», now «unmanned aerial vehicle», encompassing aircraft «either remotely and fully controlled from another place (ground, another aircraft, space) or programmed and fully autonomous».

This all-inclusive approach is further proved by the following statement contained in the Circular: «All UA, whether remotely-piloted, fully autonomous or a combination thereof, are subject to the provisions of Article 8». [75]

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[72] The Circular, approved by the Secretary General and issued in 2011, is a first step in reaching the goals set by ICAO in the field of unmanned aviation, namely providing the fundamental international regulatory framework through Standards and Recommended Practices (SARPs) and guidance material, underpinning routine operation of unmanned aircraft throughout the world in a safe, harmonized and seamless manner comparable to that of manned operations.

[73] The operational concept was intended to guide the planning and implementation of global air traffic management by providing a description of how the emerging and future ATM system should operate. It was developed within ICAO by the Air Traffic Management Operational Concept Panel (ATMCP) and was endorsed by the Eleventh Air Navigation Conference in 2003 and the Thirty-Fifth Session of the Assembly in 2004.

[74] Emphasis added.

[75] See page 3 of the Circular.

After all, the exclusion of the narrow meaning referring to only autonomous aircraft is further proved by the phrase «shall be so controlled», contained in the quoted Article: the provision requires operators of unmanned aircraft to control their flight in such a way as to obviate danger to civil aircraft (here probably intended as traditional manned aircraft). [76]

It is unlikely that the intention of the drafters by using such wording was that of referring to operators with only monitoring roles, whereas the verb «to control» is most likely used in the meaning of «piloting», thus requiring the presence of a pilot, albeit remote.

That said, it is subsequently stated that only some of the category of unmanned aircraft will be considered in the Circular, since «only the remotely-piloted aircraft (RPA), however, will be able to integrate into the international civil aviation system in the foreseeable future». [77] Here we can find one example of the express choice of regulating only one class of unmanned aircraft, particularly remotely piloted aircraft, considered to be much more suitable, at this stage of the evolution, for the future integration into the civil aviation system.

With regard to the inclusion of unmanned aircraft within the general definition of aircraft, according to the terms used, it seems that there is no doubt about their conception as aircraft. [78] The use of the adjective «unmanned» is nothing else than a specification of the general concept «aircraft», therefore creating a relation of the type *genus-species* between the two.

This finds a confirmation in the words used in the above-mentioned circular, where ICAO states the full applicability of its Standards and Recommended Practices for unmanned vehicles, since «Unmanned Aircraft (UA) are, indeed, aircraft». [79] ICAO seems to be solving once and for all doubts whether the presence of a crew on board the aircraft is a necessary element for it to be considered an aircraft. It is indeed stated that «whether the aircraft is manned or unmanned does not affect its status as an aircraft. Each category of aircraft will potentially have

[76] See HUTTUNEN, M., *supra* note 27, at 357.

[77] Indeed, ICAO considers the remote pilot an essential figure: chapter 4.6 of the Circular.

[78] MARSHALL, D., *supra* note 35, at 699.

[79] See chapter 1.7 of the Circular.

unmanned versions in the future». [80]

3.2 Unmanned aircraft in the European Union legal framework

This being the situation in international law, we can now have a look at other legal systems, starting from the European Union law.

Many times, and at different levels, the EU institutions have intervened in order to release statements or declarations on their policy on unmanned aerial vehicles, in a process aimed at intervening in the field with the introduction of new rules on the subject. Such a process has very recently witnessed a first, particularly important outcome: the adoption of Regulation (EU) 2018/1139, the new Basic Regulation, which will be subject to analysis in the present and in the following chapter.

Looking at the different stages of such a process, the first mention to unmanned vehicles on a European Union act was made in Regulation (CE) 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC, [81] which gave the European Aviation Safety Agency (EASA), [82] jurisdiction to regulate unmanned aerial vehicles of more than 150 kg MTOM (Maximum Take Off Mass), no longer in force since 11 September 2018.

It is a Regulation which had, as its primary objective, that of establishing and

[80] See chapter 2.5 of the Circular. For this last statement, see also FRANCHI, *supra* note 43, at 735.

[81] Regulation (CE) 216/2008, known as Basic Regulation, had as its principal objective that of establishing and maintaining a high uniform level of civil aviation safety in Europe together with, among others, assisting Member States in fulfilling their obligations under the Chicago Convention.

[82] The European Aviation Safety Agency was established with «Regulation (EC) n. 1592/2002 of the European Parliament and of the Council of 15 July 2002 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency». The aims of such specialised agency are to ensure the highest common level of safety protection for EU citizens in the aviation sector; to ensure the highest common level of environmental protection; to supervise the creation of a single regulatory and certification process among Member States; to facilitate the internal aviation single market and to work with other international aviation organisations and regulators. Its powers are mainly drafting implementing rules in all fields of its competence and certifying and approving products and organisations. EASA has contributed to the creation of the most developed regional implementation system of safety oversight, according to ABEYRATNE, R. "Ensuring Regional Safety in Air Transport", *Air and Space Law* 2010, 260.

maintaining a high uniform level of civil aviation safety in Europe. [83]

The Community, which makes large use of definitional articles in its legal instruments, has however not provided any definition of unmanned aircraft, not even in its first document, such as the above-mentioned Regulation, introducing for the first time this subject matter in the jurisdiction of the European Union.

The only reference to unmanned aircraft contained in the said Regulation was to be found in Annex II, where the aircraft excluded from the application of Article 4, paragraph 4 of the Regulation, were listed. This latter required compliance with the Regulation for all aircraft which presented a certain bearing with the Member States or the European Aviation Safety Agency. [84]

Notwithstanding such potential link with a Member State or the EASA, the aircraft listed in the above-mentioned Annex II were excluded from the scope of the Regulation. Among such aircraft we could find «unmanned aircraft with an operating mass of no more than 150 kg». [85] We could therefore state that, by interpreting *a contrario*, unmanned aircraft with a mass of more than 150 kg certainly fell within the scope of the European Union Regulation.

For the purpose of our examination of the terms and concepts, it is interesting to have a look at some of the other official texts of Regulation 216/2008, taking advantage of the existence of many official languages within the European Union.

If we take, for example, the French version, letter (i) of Annex II used the expression «*aéronefs sans pilote*». This can be considered a clear reference to the expression used in the Chicago Convention, the very first legal instrument which mentioned unmanned aircraft. The inaccuracy of the use of the words «without a pilot» has already been observed. However, it may occur that the use of such an expression in the French language is due to the absence of a more proper word, such as the term «unmanned», existing in the English language and therefore chosen as more appropriate to describe this phenomenon.

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[83] Article 2, paragraph 1, of the Regulation.

[84] Precisely aircraft designed or manufactured by an organisation for which the Agency or a Member State ensures safety oversight; registered in a Member State; registered in a third country but used by an operator for which any Member State ensures oversight of operations or used into, within or out of the Community by an operator established or residing in the Community; or registered in a third country, or in a Member State which has delegated their regulatory safety oversight to a third country, and used by a third-country operator into, within or out of the Community.

[85] Annex II, letter (i), of the Regulation.

As a matter of fact, this has never been used again in the French legal context, where other terms are employed to indicate unmanned aircraft. The most important mention has to be made to the «*Arrêté du 17 décembre 2015 relatif à la conception des aéronefs civils qui circulent sans personne à bord, aux conditions de leur emploi et aux capacités requises des personnes qui les utilisent*». [86] Despite its peculiar rejection of a short term in its title, preferring to use a long periphrasis, the document is not lacking a detailed list of terms and definitions, proving the unsuccessful use of the term «*aéronefs sans pilote*», employed in the European Regulation.

The most frequent term used is «*aéronef télépiloté*», which can be considered the perfect translation of the English expression «remotely piloted aircraft». It is defined as «*aéronef qui circule sans personne à bord sous le contrôle d'un télépilote*»[87], whereas a «*télépilote*» is a «*personne contrôlant les évolutions d'un aéronef télépiloté, soit manuellement soit, lorsque l'aéronef évolue de manière automatique, en surveillant la trajectoire et en restant en mesure à tout instant d'intervenir sur cette trajectoire pour assurer la sécurité*»[88]. It is the evidence of the imprecision of the term «*aéronefs sans pilote*», which has indeed never been subsequently used in the French legislation.

Even more inappropriate were the words used in the Italian version of the Regulation. Here unmanned vehicles were called «*aeromobili non pilotati*», literally «not piloted aircraft». As for the expression used in the Chicago Convention, such a locution may only refer to autonomous aircraft, which do not require any intervention of a pilot at all. On the contrary, unmanned aircraft are a wide category, including both remotely piloted and fully autonomous aircraft. And indeed, from the following works issued by the EU Institution, it is evident that what the European law-makers are bearing in mind is more the remotely piloted

[86] Adopted by the Minister of Ecology, Sustainable Development and Energy and the Minister of Overseas, with the aim of laying down special provisions for the design of aircraft operating without any person on board, the conditions of their use and the capabilities required to the persons using them.

[87] Article 2 of the above mentioned *Arrêté du 17 décembre 2015.*

[88] Which can be translated to «a person controlling the evolution of a remotely piloted aircraft, either manually or, when the aircraft is operated automatically, by monitoring its trajectory and remaining able to intervene at any moment on its trajectory, in order to ensure its safety».

aircraft rather than the fully autonomous ones. [89]

The evident inaccuracy of such an expression in the Italian language was once again due to the absence of a single word which can translate the English term «unmanned». Perhaps the most accurate way to translate «unmanned» in Italian is by using the expression «*senza equipaggio*». However, this has so far never been used in any of the works by scholars nor in legally binding documents, preferring the English acronyms «UAV» or «UAS», or directly referring to the sub-category of «*mezzi aerei a pilotaggio remoto*». [90]

Otherwise, if we take into account the official text in other languages, such as Spanish or Portuguese, things may be a little clearer. The category considered in such versions of the Regulation are as follows: «*aeronaves no tripuladas*» and «*aeronaves não tripuladas*». We can consider both expressions as the exact translation of the English «unmanned aircraft». It may be regarded as a proof of the intention of the European legislator to provide an all-encompassing category, including all devices sharing the characteristic of the absence of any pilot or crew member on board it.

Subsequently, it is necessary to analyse the terminology used by European authorities in the following works and instruments, representing the single steps which have brought to the adoption of the brand-new Regulation.

The first of such soft law instruments is probably the Commission Staff Working Document entitled «Towards a European strategy for the development of civil applications of Remotely Piloted Aircraft Systems (RPAS)». [91] Curiously, the term «unmanned vehicles» and its acronym are suddenly abandoned, after their first appearance in the EU legal system. The document, starting from its title, only refers to «remotely piloted aircraft systems».

Fortunately, this change is not left without an explanation. At the first appearance of such expression, the drafters specify that the term «Remotely Piloted Aircraft System (RPAS)» was adopted instead of «unmanned aircraft system», previously used by the international community, in line with ICAO, «to highlight

[89] Despite the express inclusion of autonomous aircraft in the new Regulation 2018/1139, at least for definitional purposes.

[90] Meaning «remotely piloted aircraft». See, e.g., Article 743 of the Italian Navigation Code.

[91] Commission document SWD (2012) 259 final.

the fact that the systems involved are not fully automatic but have always a Pilot in Command responsible for the flight». [92]

From that moment, it seems that the EU has abandoned the idea of including fully autonomous aircraft systems in its aviation policy. Therefore, the wide category of unmanned vehicles is no longer appropriate for the EU interests. That is why in all the following documents, [93] the only term used has been RPAS, acronym of Remotely Piloted Aircraft Systems.

Among these documents, one can be found particularly noteworthy for our definitional purposes: «Opinion 01/2015 on Privacy and Data Protection Issues relating to the Utilisation of Drones» adopted by the Article 29 Data Protection Working Party on 16 June 2015. [94] As we can see, the term used in the title of the text is even less formal then those mentioned in other documents: Article 29 Working Party makes use of the term of common use, «drones», widespread in the current language, but never adopted by the legal language. However, it is immediately specified that the use of the term «drone» was made for the sake of simplicity to refer to Remotely Piloted Aircraft Systems (as defined by ICAO), as a subcategory of unmanned aircraft. [95]

And this employ of the expression Remotely Piloted Aircraft Systems with its acronym RPAS did not change until the issue of the «'Prototype' Commission Regulation on Unmanned Aircraft Operations»[96] on the 22 August 2016, a document which is currently being subject to the study of the European Union

[92] See the Commission document, at 3, note 1.

[93] For instance the EC Communication «COM(2014)207 on a New era for aviation - Opening the aviation market to the civil use of remotely piloted aircraft systems in a safe and sustainable manner»; the Riga Declaration on Remotely Piloted Aircraft (drones) «Framing the Future of Aviation», issued at Riga on 6 March 2015; The European Parliament resolution on safe use of remotely piloted aircraft systems of 29 October 2015.

[94] The Article 29 Working Party (Art. 29 WP) is an advisory body of the European Union, whose composition and purpose were set out in Article 29 of the Data Protection Directive (Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data).

[95] Art. 29 WP Opinion 01/2015, at 5, note 1. According to LA TORRE, U. - PETIT LAVALL, M. V., supra note 67, at 937, note 15, the use of such a term, instead, does not help for the purposes of a greater terminological clarity.

[96] As stated in its introductory legal notice, the document represents «a 'prototype' regulation for the operation of unmanned aircraft in the 'open' and 'specific' categories. Its sole purpose is to inform and consult stakeholders in view of the ongoing negotiations with the Parliament and the Council on the review of Regulation (EC) No 216/2008 and in view of giving indications on the possible direction that EASA will take on its implementation».

authorities, in order to introduce a new regulation on this field.

As evident from the title itself, the expression unmanned aircraft is once again in use, although there is no evidence that it may be due to a renewed interest of the European Union in regulating all kinds of unmanned aerial vehicles, including fully automatic aircraft.

This document was the first to expressly provide definitions for many of the terms of our interest.

First of all, unmanned aircraft (UA) are defined as «any aircraft operated or designed to be operated without a pilot on board», [97] whereas unmanned aircraft systems are «UA and any equipment, apparatus, appurtenance, software or accessory that is necessary for the safe operation of the UA». [98] No reference is made to Remotely Piloted Aircraft Systems, although we can find a definition of remote pilot as «a natural person who manipulates the flight controls of a UA, as appropriate, during a flight and is responsible for safely conducting the flight» [99].

We can as well remark the presence, in the same Article, of a definition of «automatic flight», as «a flight following pre-programmed instructions, loaded in the unmanned aircraft (UA) flight control system, that the UA executes». [100] Whereas it does not necessarily indicate an intention of the EU regulator to include aircraft operated with automatic mode, as we will see below, at least it shows the intention of taking automatic aircraft into consideration in its documents and justifies the use of the expression unmanned aircraft as an all-encompassing term, including both remotely piloted aircraft systems and fully autonomous aircraft.

After all, although belonging to a lower rung of the hierarchy of the EU sources, the 'Prototype' Commission Regulation on Unmanned Aircraft Operations, once adopted, will constitute the legal framework of unmanned aircraft, as legitimised by Regulation 2018/1139.

On 22 August 2018, the new Basic Regulation was published on the Official Journal of the European Union and entered into force on 11 September of the same year. It is the mentioned Regulation (EU) 2018/1139 of the European Parliament

[97] Article 2(t) of the Prototype Regulation.

[98] Article 2(v) of the Prototype Regulation.

[99] Article 2(p) of the Prototype Regulation.

[100] Article 2(c) of the Prototype Regulation.

and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91. Apart from the achieved extension of the EU jurisdiction to unmanned aircraft of all weights, for the purpose of this chapter we will focus on the definitions provided by the new Basic Regulation.

Article 3(30) defines «unmanned aircraft» as «any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board». The choice made by the EU Institutions is consistent with our reasoning: the primary feature characterising unmanned aircraft is the absence of a pilot on board and the category includes the two main groups of autonomous aircraft and remotely piloted aircraft. [101] Moreover, the observations made on the inaccurate use of the terms in some other languages has been confirmed by the change of direction taken by the EU: the Italian term of the new Basic Regulation is «*aeromobile senza equipaggio*», whilst the French one is «*aéronef sans equipage à bord*», contrary to what had been previously used. [102] Moreover, the new Regulation provides the definitions of «remote pilot» [103] and «equipment to control unmanned aircraft remotely». [104]

However, what is still lacking is any express reference to their inclusion in

[101] It is also noteworthy to remark the new approach towards model aircraft, which, under Recital (34) of the Regulation, «are considered to be unmanned aircraft for the purposes of this Regulation and are used primarily for leisure activities».

[102] The Spanish and Portuguese versions have, instead, maintained their old terms, hence considered appropriate, as I have above observed: respectively «*aeronave no tripulada*» and «*aeronave não tripulada*».

[103] Article 3(31), which reads as follows: «'remote pilot' means a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change the course at any time». It is interesting to remark how similar such a definition is with the one provided by the mentioned French regulation of 17 Decembre 2015, above described. Its importance is given by the extension of the category of pilot also to the person charged of merely monitoring the flight of the aircraft in case of fully autonomous ones.

[104] Article 3(32), which reads as follows: «'equipment to control unmanned aircraft remotely' means any instrument, equipment, mechanism, apparatus, appurtenance, software or accessory that is necessary for the safe operation of an unmanned aircraft, which is not a part, and which is not carried on board of that unmanned aircraft».

the general concept of aircraft. As for the international level, this needs to be interpreted depending on the available documents and definitions, or even taken for granted, as occurred in the ICAO documents.

As we have above seen, the definition of «unmanned aircraft» in the European Union legal system is now to be found in the new Basic Regulation, whereas the general one of «aircraft» is provided by the mentioned Commission Regulation 2042/2003.

First of all, we can assume that since we are discussing «unmanned aircraft», there is no reason why the term «aircraft» in this context should be treated differently from its general term. Secondly, even simply referring to the quoted definition, it is evident that unmanned aircraft fall within the scope of such a definition, being capable of deriving support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

We believe that this conclusion is confirmed by the presence, in the new Basic Regulation, of the phrase «other than unmanned aircraft», repeated several times throughout the text: every time that the EU legislator felt the need of excluding unmanned aircraft from the applicability of specific provisions of the Regulation, it had to provide an express exclusion through the mentioned phrase. This means that, without the expression «other than unmanned aircraft», there would have been an automatic extension of those rules to unmanned aircraft. We can therefore infer that unmanned aircraft, under European Union law, are to all extent deemed to be aircraft.

3.3 Unmanned aircraft and their definition in the Italian legal system

Moving now the analysis to a domestic legal system, I will start discussing the definition of unmanned aircraft provided by Italian law and its inclusion in the general notion of aircraft.

Obviously, the investigation must start from the central document of Italian aviation law: the Italian Navigation Code.

As above noted, the legislator's intervention in 2005 has amended the definition of aircraft from «any machine suitable for carrying persons or goods through the air from one place to another» to «any machine intended for carrying

people or goods through the air».

The same Law of 9 November 2004 n. 265 transferred to the Government the power to adopt corrective and supplementary provisions to the above mentioned legislative decree n. 96/2005. This is how the Italian Government immediately returned on Article 743 of the Navigation Code, containing the definition of aircraft: with this intervention, it took unmanned aircraft for the first time into consideration.

Article 743, paragraph 2, of the Italian Navigation Code now provides as follows: «*Sono altresì considerati aeromobili i mezzi aerei a pilotaggio remoto, definiti come tali dalle leggi speciali, dai regolamenti dell'ENAC e, per quelli militari, dai decreti del Ministero della difesa*». The paragraph can be translated as «remotely piloted aerial vehicles, as defined by special laws, ENAC regulation and, for the military ones, by the Ministry of Defence decrees, are also considered aircraft».

Unlike the supranational legal systems above analysed, the Italian legislator has opted for an express inclusion of unmanned aircraft within the general concept of aircraft. [105] But it is necessary to take a deeper look at the wording used in such provision.

The use of the expression *«[s]ono altresì considerati»* at the beginning of the Article, has made some Authors doubt about the real nature of this inclusion, whether this latter can be considered an evident result of their nature, or, on the contrary, merely a *fictio iuris*, purposely made for legal interests. [106]

If we take a look at the definition of aircraft, we can infer that the presence of a crew on board is not a necessary feature of such a machine in order to be considered as an aircraft. The only element seems to be its transportation capability though the air.

This means, first of all, that we cannot exclude unmanned vehicles from the notion of aircraft only because they lack a pilot or a crew on board. However, one of the doubts raised by the doctrine is due to their scarce use (if not so far totally non-existent) as means of transport for goods or persons, therefore lacking what is

[105] Considered unnecessary, given the already existing natural destination to transport of goods and, in the future, of persons, by SEVERONI, C., *supra* note 69, at 2.

[106] FRANCHI, B., "Aeromobili senza pilota (UAV): inquadramento giuridico e profili di responsabilità – seconda parte", *Responsabilità Civile e Previdenza* 2010, 1214.

the main feature of aircraft required by Italian law. [107]

This last statement can be strengthened by the previous amendment of Article 743 of the Italian Navigation Code, whereby the concept of «capability» has been repealed by the concept of «destination». Under the previously enforced definition, there would have been no doubt that unmanned aircraft, although not currently used for transportation purposes, would be suitable for such uses. On the contrary, with the concept of destination, one may state that none of the unmanned vehicles currently in use within the civil aviation are intended to be used for transportation purposes. This will probably be the case in the future, since the current rejection of such uses is not due to their technical incapability and does not prevent a future destination of that kind. [108]

Furthermore, a second element of doubt raised by the above-mentioned doctrine [109] is somehow linked to the absence of crew on board the aircraft. There are a few distinguishing characteristics of the air navigation that are unlikely to be found in unmanned aircraft, such as «the risk of navigation, the solidarity of interests, the distance of the vehicle, the confidence and trust to the authority and the expertise of a single subject (the commander)». [110]

In particular, the pilot of a manned aircraft makes use of his personal senses to perceive what happens in the surrounding environment, even exposing his life to the risks of navigation. On the contrary, a pilot of an unmanned aircraft does not experience the same degree of empathy with his means, operating it at a distance, without a personal perception of its surroundings. [111]

Nevertheless, we can consider these latter aspects as simply deriving from the nature of traditional aircraft, not as inherent elements of the notion of aircraft. For a correct interpretation of the legal meaning of aircraft, one should not necessarily refer to those aspects that have characterized the aviation technology for decades, despite the fact that they may have formed the basis for the adoption of certain rules

[107] LA TORRE, U., "Gli UAV: mezzi aerei senza pilota", *Sicurezza, navigazione e trasporto*, Tranquilli Leali-Rosafio (eds.), Milano, 2007, 93.

[108] As clearly showed in the article by MICHAELIDES–MATEOU, S. – EROTOKRITOU, C., "Flying into the future with UAV: the Jetstream 31 Flight", *Air &Space Law* 2014, 111.

[109] LA TORRE, "Gli UAV", *supra* note 107, 93ff.

[110] LEFEBVRE D'OVIDIO, A. – PESCATORE, G. – TULLIO, L., *supra* note 63, at 1.

[111] LA TORRE, U., *supra* note 107, at 114.

and the creation of a certain legal system.

The potential absence of the same needs should not determine a total departure from the results achieved up to that point, causing the exclusion of a new technology from the concept of aircraft and therefore from the entire aviation law. On the contrary, it is from such results that the study to create a legal progress should start, obviously taking into account the new needs and demands arising from the development of such a new technology.

After all, it has been observed that we can still consider those above-mentioned elements, such as the risks of navigation, the distance and independence of the vehicle, the trust and confidence to the authority and the expertise of a single subject, as still existing, merely applied to new circumstances due to the evolution of technology. [112]

Anyhow, some may find such a doctrinal debate as being too academic and devoid of practical consequences: as a matter of fact, any question of the real nature of unmanned aircraft as aircraft or their mere assimilation to traditional aircraft only to legal effects, raised by the use of terms «are considered», does not affect the applicability on unmanned vehicles of all the legislation already in force and applicable to traditional aircraft.

The second aspect deserving to be deeply analysed is the use of the expression «*mezzi aerei a pilotaggio remoto*». As we have previously observed, the English term «unmanned aircraft» translates to Italian «*aeromobili senza equipaggio*», whereas the Italian legislator has opted for the term «remotely piloted aerial vehicles».

We can interpret this reference as an express choice made by the Italian authorities in a specific historical moment, where not all categories of unmanned vehicles are widely used for civil applications. Therefore, it seems that the regulator's main concern was indeed only remotely piloted aerial vehicles, with the exclusion of all other forms of unmanned vehicles, especially fully autonomous ones.

The proposition «as defined by special laws, ENAC regulations» is worth a deeper examination, since it is in this context that we can find detailed rules

[112] FRANCHI, B., *supra* note 106, at 1222.

concerning unmanned vehicles and specifically remotely piloted aircraft.

As of the first part, «special laws», no legal act has been actually adopted on the field, pertaining to the higher levels of the hierarchy of sources. It is the ENAC, instead, which has provided to regulate the subject through the adoption of regulations.

ENAC[113] is the acronym for «*Ente nazionale per l'aviazione civile*», the Civil Aviation Authority in Italy. Article 687 of the Italian Navigation Code, as amended by legislative decree n. 96/2005, provides that «[t]he National Authority for Civil Aviation (ENAC), in compliance with the powers of the Minister for Infrastructure and Transport, and without prejudice to the specific competences of other aeronautical bodies, *operates as the sole authority of technical regulation, certification and supervision in the civil aviation sector*, through its central and peripheral structures, and is responsible of the presence and application of aeronautical quality systems complying with EU regulations» (emphasis added). [114]

Alongside this general attribution of regulatory powers in the field of civil aviation, Article 743 of Italian Navigation Code also attributes such a definitional power concerning remotely piloted aerial vehicles.

This latter power has been implemented through the adoption of a Regulation on Remotely piloted aerial vehicles, issued on December 2013. A second edition of the Regulation was adopted on July 2015 and last amended on May 2018.

Following the choice made by the Italian legislator of addressing only remotely piloted aircraft, ENAC has thus only regulated remotely piloted aircraft

[113] ENAC was established by the legislative decree 25 July 1997, n. 250. Under Article 2 of this decree, ENAC has, among others, the following functions: technical regulation and inspection, sanctioning, certification, authorization, coordination and control activities, as well as record keeping in the areas of competence; rationalization and modification of procedures relating to airport services; coordination with ENAV and with the Italian Air Force, within the scope of their respective skills for flight assistance activities; relations with national and international bodies, companies and organizations operating in the field of civil aviation. ENAC should not be confused with ENAV, which is instead a company owned by the Ministry of Economy and Finances and managed by the Ministry of Infrastructure and Transport. It is the Italian Air Navigation Service Provider (ANSP), therefore responsible for the provision of Air Traffic Control Service (ATCS) as well as other kinds of services related to civil aviation.

[114] My translation of the original Italian text «*[l]'Ente nazionale per l'aviazione civile (ENAC), nel rispetto dei poteri di indirizzo del Ministro delle infrastrutture e dei trasporti, nonche' fatte salve le competenze specifiche degli altri enti aeronautici, agisce come unica autorità di regolazione tecnica, certificazione, vigilanza e controllo nel settore dell'aviazione civile, mediante le proprie strutture centrali e periferiche, e cura la presenza e l'applicazione di sistemi di qualità aeronautica rispondenti ai regolamenti comunitari*».

through the adoption of the said document. Article 5.1 of the Regulation, containing the different definitions, describes remotely piloted aircraft as «remotely piloted aerial vehicle without persons on board, not used for recreation and sports».

It is noteworthy to see that, although not addressed in the document, a brief consideration to autonomous aircraft is made through the definition of «Autonomous System». The Italian Civil Aviation Authority has oddly included them within the class of remotely piloted aircraft, defining them as RPAS that do not allow the pilot intervention in the management of their flight on a real time basis.

What is particularly interesting in this context is the negative construction of the definition of remotely piloted aircraft, based on the use which should not be for recreational and sport purposes. Indeed, this is due to the major distinction pointed out by ENAC through the regulation: the distinction between proper remotely piloted aerial vehicles and model aircraft.

This latter, as provided under Article 1 of the Regulation, are not regarded as aircraft for the applicability of the provisions of the Italian Navigation Code, thus falling outside the scope of aviation law, and can be used for recreational and sporting activities only.

It is evidently an unstable dividing line between such two worlds, [115] based only on the purpose for which the device is used, but bringing crucial consequences, such as the exclusion from the entire applicability of the relevant field of the law.

4. Concluding remarks

The investigation so far conducted can be concluded with the following remarks. The time for unmanned technology to be definitively launched into the civil aviation market has now arrived. Despite the problems that may arise from the existence of a wide variety of unmanned aircraft, we should however acknowledge the promptness shown by the law on this topic. Although there might still be much to do on the subject of unmanned aircraft, at least taking them into consideration in an appropriate time can be regarded as a first achievement, highlighted in particular by the provisions of the new Regulation (EU) 2018/1139.

[115] See HUTTUNEN, M., *supra* note 27, at 353 and ANTONINI, A., *supra* note 34, at 749.

The same promptness has not been shown in other fields of the law, such as maritime law, where the legal evolution on unmanned technology has yet to start from scratch. This may not be necessarily due to a delay of the law in addressing the subject, but perhaps to a different level of evolution of the technology in such other sectors, as we will discuss in the relevant chapter of this work.

Part II – Maritime Law

SUMMARY - 1. Terminological introduction - 2. Unmanned technology in the maritime world - 3. Unmanned ships possible configurations - 4. Definition of ship under international maritime law - 5. Definition of ship under Italian law - 6. Unmanned ship: a definition - 7. Concluding remarks.

1. Terminological introduction

That the so-called "unmanned ships" will have a disruptive effect on the maritime world is already revealed by the uncertainty of a terminological nature. Since the dawn of the legal discourse on the application of unmanned technology in the maritime sector, there have been several expressions aimed at addressing these new contrivances, in a manner not dissimilar to what has happened in the aviation sector. Indeed, the translation of technology from the latter to the maritime field was accompanied by the adoption of the expressions used to define unmanned aerial vehicles.

The generic term «unmanned vehicles (UV)» was adapted to the different kinds of vehicle according to the environment of operation: in the maritime context, the new constructions were referred to as «unmanned surface vehicles (USV)» and unmanned underwater vehicles (UUV). [1] When the concept was brought to the attention of the maritime doctrine, the term also became more adapted to this field, being associated to the word «ship» or «vessel», approaching to the traditional categories of the subject for a better classification within its borders. [2] Subsequently,

[1] The adoption of this expression came naturally from the earliest doctrinal contributions: Gogarty and Hagger make use, in their article intended to deal with the phenomenon in relation to all modes of transport, of the generic term «Unmanned vehicles (UV)», defined as «any vehicle that operates without human contact». The expression then knows the individual specifications, accompanied by the respective acronym, depending on the environment in which the vehicle operates: the best known unmanned aerial vehicles (UAV), the unmanned ground vehicles (UGV), the unmanned underwater vehicles (UUV) and, finally, unmanned surface vehicles (USV): cf. GOGARTY, B - HAGGER, M. C., "The Laws of Man Over Vehicles Unmanned: The Legal Response to Robotic Revolution on Sea, Land and Air", *Journal of Law, Information and Science* 2008, 74.

[2] Thus, referring to a concept certainly more familiar to the eyes of maritime lawyers, considering that the ship has been regarded as the «*chattel symbol of the entire maritime community*»: LORENZON, F., *Shipbuilding, sale, finance and registration*, in *Maritime Law*, Baatz, Y (ed.)

attested the direct use of the term «ship», [3] the latter was declined in other expressions, such as «drone ships», [4] clearly borrowed from the most common term used in aviation, or «autonomous ships», [5] with the use, in this latter case, of an adjective potentially deceptive, in my opinion, for a risk of disorientation in the accurate delimitation of the subject matter. In fact, the term should more correctly refer to that category of «unmanned ships» which are not conducted by humans even remotely, as better described below, creating a terminological restriction of the area of interest that does not always correspond to the scope of analysis and study of the author. [6] Yet, lastly, the International Maritime Organization (IMO) has chimed in and has embraced a new phrase, with the corresponding acronym, which seems to move precisely in this latter direction, although here considered not particularly accurate: [7] MASS, which stands for «Maritime Autonomous Surface Ship». On the one hand, there is a superfluous reference to the «surface» next to the term «ship», almost a reminiscence of the first terminology that used the generic «vehicle»; moreover, the use of the term «maritime», which is not necessary for a specification of the concept of ship, is certainly redundant; but the point of greatest criticality of the new expression is perhaps the use of the adjective «autonomous», which, as mentioned, would more appropriately make reference to a single category of drone ships, those operated autonomously by an artificial intelligence. That the survey of IMO is not intended to be limited to this category is demonstrated by the definition of the various levels of autonomy provided in the same context, which,

Maritime Law, fourth ed., Abingdon, Oxon, 2018, 76.

[3] Although in some cases the generic term vehicle is still in use: ALLEN, C.H., *Determining the Legal Status of Unmanned Maritime Vehicles: Formalism vs Functionalism* (4 September 2018), available at https://ssrn.com/abstract=3244172 (last accessed: 18.01.2019).

[4] LORENZON, F., "From sails to drones: time to reconsider a uniform liability regime for multimodal transport?", *Journal of International Maritime Law* 2015, 332.

[5] Cf. CAREY, L., "All Hands off Deck? The Legal Barriers to Autonomous Ships", *Journal of International Maritime Law* 2017, 203

[6] Since it is anyway intended to cover all categories of «unmanned» vessels, not just those with autonomous navigation. It should be added that an autonomous ship is not necessarily also unmanned, given the possibility of navigational operation by means of new technologies, but with the presence of seafarers on board for various purposes, as we will see later.

[7] IMO Maritime Safety Committee, Maritime Autonomous Surface Ships: Regulatory Scoping Exercise, IMO Doc. 99/WP.9 Annex I.

as we will see later, includes in the concept also ships operated by a remote station. [8]

In my opinion, there should be more clarity and sharing of solutions, starting from the terms used, given the importance of precision in the delimitation of the categories which we are dealing with, especially when pronounced by the mouth of the legislator.

2. Unmanned technology in the maritime world

When it comes to maritime law, we cannot help but observe the main difference encountered with respect to air law, forming part of the same branch of the law in the Italian legal system, in investigating the advent of unmanned technology: the total absence of any mention, in the existing international legal system, of unmanned navigation of any kind whatsoever. In our opinion, this is probably the main difficulty and the principal limitation of a work of a legal nature at this stage of the debate. Unlike unmanned aviation, unmanned shipping is a brand-new subject, appeared in the stages of technical sciences only in very recent years and even more recently in the legal world, precisely in the new Millennium. In this context, it can be said that maritime law has somehow lost its role as a pioneer for legal solutions, as been for decades, or even centuries. This time, it is perhaps the aviation sector, witnessing the genesis of unmanned technology first, the one which will be the cradle of legal solutions. [9]

But where did the legal debate originate from? The involvement of the actors of all legal discussions on unmanned shipping has been driven by the needs of the

[8] The described terminological variety that has characterized the phenomenon in the English language has later had a full reflection in the Italian doctrine that, recently, has taken the first steps on the subject: «*navi-drone*» is the term used by BOI, G.M., "«Navi-drone»: primi interrogativi in tema di disciplina giuridica", *Rivista del Diritto della Navigazione* 2016, 175; «*navi autonome*» used by SEVERONI, C., "Soccorso e mezzi di trasporto autonomi", *Diritto dei Trasporti* 2018, 27 and «*navi senza equipaggio*» by SEVERONI, C., "Prime osservazioni in tema di responsabilità derivante da urto con navi senza equipaggio", *Diritto dei Trasporti* 2018, 67. Similarly, the French literature has adopted the following terms: PIETTE., G., "Les navires sans équipage", *Droit Maritime Français* 2017, 983 and DE CORBIERE, C., "Les drones maritimes", *Droit Maritime Français* 2017, 993.

[9] As described in part I of the present chapter, unmanned aerial vehicles made their first appearance into the Law with the Convention on International Civil Aviation, signed at Chicago on 7 December 1944. Currently, many States have adopted regulations on the safe use of unmanned aircraft and many more studies exist in the field, in comparison to maritime law.

growing industry to develop and implement such technology. The first work of a legal nature was the article published by Gogarty – Hagger, *The Laws of Man over Vehicles Unmanned: The Legal Response to Robotic Revolution on Sea, Land and Air*, covering all transports sectors and their relevant new issues raised by the adoption of unmanned vehicles. The maritime sector was described as well, despite the earliness of such a debate, since it was the least developed already at that time. [10]

As occurred in unmanned aviation, the origin of such technology is to be found in the military field, where unmanned vessels have been firstly studied and implemented. [11] This is the case for the United States and the Israeli Navy, where a remotely controlled craft, the Protector, is currently being used for protecting Israeli marine borders. [12]

A different and partly longer story is reserved to their homologous submarines, the unmanned underwater vehicles: these were employed in war scenarios since a few decades and mainly confined to military uses, thus not covered by maritime law nor by this work. [13]

The civil interest in unmanned navigation for marine vehicles has boosted in the current decade of the twenty-first century. The most famous project on unmanned shipping, funded by the European Commission, is perhaps Maritime Unmanned Navigation through Intelligence in Networks (MUNIN), aimed at developing and verifying a concept for an autonomous ship and investigating the technical feasibility of operations with an unmanned dry bulk carrier, [14] from a

[10] GOGARTY, B - HAGGER, M. C, *supra* note 1, at 92.

[11] For an overview on the history of unmanned vessels used in the military sector, see VALLEJO, D., "Electric Currents: Programming Legal Status into Autonomous Unmanned Maritime Vehicles", *Case Western Reserve Journal of International Law* 2015, 408.

[12] GOGARTY, B - HAGGER, M. C, *supra* note 1, at 92.

[13] See, generally, MCLAUGHLIN, R. "Unmanned naval vehicles at sea: USVs, UUVs, and the adequacy of the law", (2011) *Journal of Law, Information and Science*, 100; HENDERSON, A.H, "Murky Waters: The Legal Status of Unmanned Undersea Vehicles", *Naval Law Review* 2006, 55.

14 The reason for using the dry bulk carrier as a model is explained in MUNIN final brochure, "Research in maritime autonomous systems project results and technology potentials", page 2, available at http://www.unmanned-ship.org/munin/wp-content/uploads/2016/02/MUNIN-final-brochure.pdf (last accessed 18.01.2019), in particular the fact that dry bulk carrier typically operates from point to point in an uninterrupted voyage, hence more suitable for the application of unmanned technology.

technical, economic and legal perspective. [15] The project envisaged the concept for an autonomously operated vessel, through an autonomous navigation system, following a predefined voyage plan with monitoring functions left to the operator at the shore control centre. The crew would intervene on board the vessel during navigation in congested and restricted waters, therefore leaving the autonomous navigation in the deep-sea phase of the voyage. The partners of the project also analysed the benefits of autonomous shipping, shared by all stakeholders investing in such a new technology: the first advantage would be a reduction of operational expenses, due to the implementation of slow steaming navigation, with a reduction in fuel consumption and obviously the reduction of costs for crew wages. [16] Unmanned vessels would also have a positive impact on the environment, since the new designs would be conceived in a sustainable manner and the efficiency of a single voyage would derive from the reduction of fuel consumption, the use of alternative fuels and the omission of accommodation superstructures. Last but not least, perhaps the main rationale behind the investments on unmanned technology, at least from the perspective of the public interests, is the high level of safety which would result: assuming that human errors are the first cause of maritime accidents, the reduction, up to total elimination, of the human factor would bring to better conditions in terms of safety in comparison to traditional manned shipping. [17] However, MUNIN acknowledged that the implementation of unmanned navigation will become effective only when the benefits of costs reduction and increased safety will be guaranteed, taking into account its limitations deriving from the need for advanced technical and operational infrastructures to accommodate unmanned

[15] See http://www.unmanned-ship.org/munin/ (last accessed 18.01.2019).

[16] The expenses for the crew are ranked as second, after fuel costs, among the expenses of the shipowner's activity: cf. CHWEDCZUK, M., "Analysis of the Legal Status of Unmanned Commercial Vessels in U.S. Admiralty and Maritime Law", *Journal of Maritime Law & Commerce* 2016, 124.

[17] The truthfulness of this assertion should, however, be deepened: as a matter of fact, we should keep in mind that the human factor will not be totally eliminated, since the decision making in case of a remotely operated vessels will still remain in the hands of the human operator: cf. HOGG, T. – GHOSH, S., "Autonomous merchant vessels: examination of factors that impact the effective implementation of unmanned ships", *Australian Journal of Maritime and Ocean Affairs* 2016, 207. This has led an Author to consider fully autonomous ships even more reliable, precisely because the decision-making will be left in full to computers: PRITCHETT, P.W., "Ghost Ships: Why the Law Should Embrace Unmanned Vessel Technology", *Tulane Maritime Law Journal* 2015-2016, 200.

navigation and for totally new vessel designs, possibly with redundant technical systems. [18]

The value of MUNIN is certainly its input on effective researches on the feasibility of unmanned merchant ships, also through first insights of a legal nature.

However, one of the first contributions to the legal debate on unmanned shipping has been the renowned article by Professor Eric Van Hooydonk, [19] representing a first general examination of the legal issues related to the introduction of either remotely operated or autonomous merchant ships and the consequent endurance of maritime law vis-a-vis such innovation. It was somehow the kick off of the legal debate on the subject, involving scholars worldwide and the institutions and associations with an interest in this field. [20]

Currently the ball is in the hands of the industry, which is firmly working for the final implementation of unmanned technology in merchant shipping, especially in some countries which are at the forefront of the sector. [21] The shipping industry, indeed, aims at introducing unmanned vessels for the carriage of cargo worldwide, being the main use of marine craft in terms of economic revenues. However, such technology may prove beneficial for other civil purposes, such as in the field of

[18] Another feature is worthy a mention in this context, for its consideration both as a benefit and as a limitation of the implementation of unmanned shipping: The labour issue. According to MUNIN and other advocates of unmanned navigation, this would only bring benefits in working conditions of seafarers, attracting seagoing professionals and improving their lives. In particular, the new working conditions might have positive effects on safety given the reduction of the crew fatigue: BURMEISTER, H.C. – BRUHN, W.O. – RØDSETH, Ø.J. – PORATHE, T., "Can unmanned ships improve navigational safety?", *Transport Research Arena* 2014, Paris. For a description of the current living condition of the crew on board, see CARTNER, J.A.C. – FISKE, R.P. – LEITER, T.L., *The International Law of the Shipmaster*, London, 2009, 156, note 90. Nevertheless, such assumption must be carefully assessed, taking the possible changes of targeted workers into due account, for instance the possible reduction of available job. However, we believe that this kind of investigation does not fall within our field of competence, therefore will be not dealt with in this work.

[19] VAN HOOYDONK, E., "The law of Unmanned Merchant Shipping – An Exploration", *Journal of International Maritime Law* 2014, 403.

[20] The European Union has started showing its interest in unmanned shipping, for instance, through funding of research projects; the International Maritime Organisation has started working on the topic through its Maritime Safety Committee and the Comité maritime International has launched a working group on unmanned ships, which has already released a document «CMI Position Paper On Unmanned Ships», available at https://comitemaritime.org/work/unmanned-ships/ (last accessed 18.01.2019).

[21] For example Norway is strongly investing in unmanned marine technology, with the launch of the first unmanned container ship, "Yara Birkeland": http://fortune.com/2017/07/22/first-autonomous-ship-yara-birkeland/ (last accessed 18.01.2019).

offshore industry, scientific research, [22] environmental protection or for the purpose of salvage operations. [23] We believe that the type of use which will be made effective represents the first important difference with the aviation sector: as a matter of fact, the use of unmanned aircraft for transportation purposes has yet to establish itself within the public debate. The aviation industry is supporting the implementation of carriage of passengers or goods through remotely piloted aircraft, just as the actors of the shipping industry are currently doing. However, the legal debate between lawmakers and regulators, which has come to a rather developed level in air law for the growth and evolution of the market, has not yet covered transportation with unmanned aircraft, currently used for many other civil purposes. [24] Accordingly, we can infer an equivalent situation in the subject of transportation through unmanned vehicles with regard to air and maritime law, both not yet effectively covered by legislative or regulatory interventions to this end. The peculiarity of the maritime context is that the first use for which the industry is pushing is precisely the carriage of goods, by nature conducted internationally, therefore posing major problems than other uses, more locally oriented, and requiring legislative interventions shared between all States.

3. Unmanned ships' possible configurations

A second problem is linked to the effective configuration to be implemented by the industry with regard to unmanned vessels. The proposals emerged from the first projects have showed the variety of shapes of such new technological constructions. This is somehow another limitation for any legal examination of their status in these circumstances. An unmanned ship may be configured as a machine

[22] For instance, in environmental and oceanographic studies: cf. DE CORBIERE, C., *supra* note 8, at 996.

[23] See, to this end, SEVERONI, C., "Soccorso", *supra* note 8, at 27, whose original contribution is entirely dedicated to the use of autonomous vessels for salvage operations and the relevant legal issues.

[24] Such as petrochemical and mineral extraction, sub-sea pipeline and cable laying and maintenance, border security, policing, patrolling and inspection; emergency and hazard management, remote exploration works and repair, event coverage, traffic management and monitoring, environmental protection, aerial photography etc.

capable of navigating the waters through the conduct of a remotely located operator, who carries out essentially the same kind of activities as the traditional master; an unmanned ship may, likewise, belong to the category of fully autonomous craft, equipped with software in a manner as to allow a voyage planning prior to its realisation, fully performed autonomously by the vessel in accordance with such plan and with no intervention of human personnel whatsoever. [25]

Between these two extremes, we can find a series of many other hybrid solutions, according to the powers left to the human operator and the corresponding level of automation and autonomy of the vessel itself. Such hybrid solutions may be conceived with the possibility for the shore-based operator to take over the manoeuvring system as needed (for instance in case of emergencies or deviations, when not pre-set in the ship's artificial intelligence) or through a differentiation linked to the different phases of the navigation, manning the crew with the appropriate personnel during port or other congested phases of the navigation, then transferring the command either to the shore-based operator or to the artificial intelligence in full. [26]

In this regard, it is useful to introduce the work that has recently started within IMO, on the initiative of its body, the Maritime Safety Committee (MSC): [27] this is a first approach to the phenomenon by the International Organization, aimed at defining its boundaries and above all the methods of investigation, in order to address, in the near future, the legal problems that it poses at the international level. In that occasion, a definition was made of the various levels of autonomy, aimed at making clarity on the question of the actual configuration of this technology, analyzed in the present section of this work. IMO, indeed, identifies the following degrees of autonomy of the ship, intended as independence from human interference, naturally based on the level of automation of its equipment:

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[25] VEAL, R. - TSIMPLIS, M., "The integration of unmanned ships into the *lex maritima*", *Lloyd's Maritime and Commercial Law Quarterly* 2017, 313.

[26] This latter is, for instance, the configuration designed by MUNIN. Furthermore, there is another possible scenario, represented by vessels in convoy, called «platooning» in the automotive industry, where a manned "shepard-vessel" guides several unmanned vessels in a convoy, considered as a possible future evolution of unmanned technology, taking transport by land as a model: see https://northsearegion.eu/northsee/s-hipping/digitalization-of-shipping/ (last accessed 18.01.2019).

[27] Under the auspices of the CMI.

- Ship with automated processes and decision support: Seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated.
- Remotely controlled ship with seafarers on board: The ship is controlled and operated from another location, but seafarers are on board.
- Remotely controlled ship without seafarers on board: The ship is controlled and operated from another location. There are no seafarers on board.
- Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself. [28]

It is interesting to remark how the first two levels identified by the IMO can represent a useful compromise between the technological progress and the requirements of the international and national technical standards that make the presence of personnel on board currently essential. It would be a question of aiming, at least at first, on the solution of ships with dual operability. [29] This solution is recognized by IMO itself, which, in the same context, has observed how a ship could, in theory, operate in the condition of one or more degrees of autonomy described for the duration of a single journey. This, on the one hand, shows the difficulties observed above in terms of the legislative direction to be taken, given the variety of possible practical applications.

I believe that this issue is not of secondary importance, for the legal consequences it may bring. [30] If we consider, for example, the possibility of a transfer of duties and responsibilities of the current master to the future shore-based operator, we can easily observe how such a transfer may prove unlikely and difficult to be realised in the case of autonomous vessels, where the shore-based operator's chances to intervene are highly reduced. This clearly requires a different kind of

[28] See: http://www.imo.org/en/mediacentre/pressbriefings/pages/08-msc-99-mass-scoping.aspx (last accessed: 18.01.2019). For a more detailed classification of automation levels in human-computer interaction, see the document «Remote and Autonomous Ships. The next steps »published by Rolls-Royce in the framework of the project« The Advanced Autonomous Waterborne Applications (AAWA) », available on the website: https://www.rolls-royce.com/~/media/Files/R /Rolls-Royce/documents/customers/marine/ship-intel/aawa-whitepaper-210616.pdf (last accessed: 18.01.2019)

[29] VEAL, R.- RINGBOM, H., "Unmanned ships and the international regulatory framework", *Journal of International Maritime Law* 2017, 108.

[30] Ibidem, at 115.

examination, in line with the general debate on the role of artificial intelligence in the current legal systems. After all, if we take the case of unmanned aircraft as an example, somehow already passed under the observation of regulators, we can remark that a clear choice of addressing only one of unmanned aircraft categories, namely those remotely piloted, has been expressed at all levels, explicitly or implicitly excluding fully autonomous aircraft from the scope of the current and future regulations, precisely for their different and more advanced difficulties they are likely to pose in the legal context. [31]

Nevertheless, although still waiting for clear demands by the industry, the time has come for discussing the legal concept of unmanned ship, mainly referring to her main feature, which is the absence of persons on board it.

4. Definition of ship under international maritime law

In this section we will try to verify the current legal framework in which unmanned vessels are making their appearance. Luckily, the ship as a means of transport has existed almost since the dawn of human civilisation and her legal status has been discussed ever since (or at least coinciding with the birth of evolved legal systems, such as Roman law). [32] The same cannot obviously be said for

[31] For instance, the ICAO Circular 328-AN/190 of 2011 on «Unmanned Aircraft Systems (UAS)» explicitly states that only remotely-piloted aircraft (RPA) will be able to integrate into the international civil aviation system in the foreseeable future.

[32] The following Latin maxim by the classic jurist Ulpian is regarded as the leading definition of ship in Roman law: «*navis etenim ad hoc paratur, ut naviget*» (D. 7, I, 12, I; Ulp. 17 *ad Sabinum*). It translates to English «ship is in fact prepared for this: That it navigates». The definition is very broad and does not reveal the features of the ship under Roman law, emphasising, instead, what can be deemed as her purpose, namely navigation. However, if we consider, for instance, the definition used in Italian law and the Italian scholarly debate below described, we can remark how this element of navigating can be regarded as a constituent element, rather than merely a function. We may thus read Ulpian's definition as follows: «a ship is every craft with the capability of navigating». This would shed light on the only feature considered by Roman law and not at all inconsistent with some of the definitions existing in the current jurisdictions. The approach of openness towards the concept of ship characterised, in outline, the following centuries of history, up to include the moment when the centre of the global maritime trade moved from the Mediterranean traffics to the new ocean routes, referring to the ship as every vessel, even those of smaller capacity, for the mere fact that all of them were used for navigation. With the technical developments in shipbuilding activities, witnessed by the slow replacement of sailing ships with vessels using steam navigation and, later, by internal combustion, the ancient broad definition was considered no longer up with the times and the maritime countries have started narrowing the concept, by reference to other features such as the propulsion means. This is the case, for instance, of England, where the 1894 Merchant Shipping Act defined the ship as «every description of vessel used in navigation not propelled by oars». Such

unmanned vessels, which have made their appearance into the maritime engineering only in very recent times and have not yet been recognised by any legal system. The legal debate is only at an embryonic state and we cannot help but start from what has already been stated on the general concept of ship. We will start our investigation from an international law perspective; subsequently we will conduct an overview on the Italian navigation law.

International maritime law does not provide a clear-cut definition of ship. In order to find a definition of ship in international maritime law, we need to analyse the different conventions adopted by the international community, since each convention provides its own definition for the delimitation of its scope, adapted from time to time on the basis of the interests regulated by each single treaty.

The UNCLOS [33] does not provide any definition of ship, using this word interchangeably with the term «vessel». This is perhaps due to the existence, in the English language, of these two synonyms, approximately indicating the same construction, whereas the Spanish and French versions of the Convention make use of only one term, respectively «*buque*» and «*navire*». [34]

Another important instrument, particularly for the consequences it may have on the implementation of unmanned vessels, is represented by the so-called COLREGs. [35] Here the term «vessel» is defined as «every description of water craft,

limitation may be also due to the new practice by the States of registering the vessels, depending on their characteristics. Afterwards the definition of ship has continued to evolve, bringing new concepts in all jurisdictions, largely depending on the interests of the legislators and on the evolution of the techniques, questioning the adequacy of the historical definition vis-a-vis the new types of vessel from time to time designed, usually discussed in the judicial context. In the current decade of the Third millennium, time has come to raise new doubts facing the phenomenon of unmanned technology.

[33] The United Nation Convention on the Law of the Sea, signed at Montego Bay on 10 December 1982, is the renowned instrument representing the 'constitution of the oceans', through which the contracting States have regulated all aspects related to the law of the sea, governed by the interests of the States in the use of the marine spaces.

[34] Under Article 320 of the UNCLOS, the original texts in Arabic, Chinese, English, French, Russian and Spanish are all equally authentic.

[35] These are rules provided by the Convention on the International Regulations for Preventing Collisions at Sea, signed in 1972, with the aim of preventing collisions at sea through a general applicability to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels. The provisions of the mentioned Convention which will be involved in the context of unmanned ships will be analysed in the following chapter.

including non-displacement craft, WIG craft and seaplanes, used or capable of being used as a means of transportation on water». [36]

It is unlikely that the meaning of transportation is as broad as the one designed by the Italian legislator, [37] but it is in the full interest of the drafters of the COLREGs to achieve the highest possible applicability in order to guarantee an appropriate level of safety in preventing collisions at sea. This is confirmed by the other definitions provided by Rule 3, following the general one of «vessel». For instance, the term «vessel engaged in fishing» means «any vessel fishing with nets, lines, trawls or other fishing apparatus which restrict manoeuvrability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict manoeuvrability». [38] This reflects the circumstance that the word vessel does not only encompass ships effectively used for transport purposes, but also for any other purpose, such as fishing, since the term «engaged in fishing» is necessary to address specifically a certain kind of fishing vessels, namely those with restrict manoeuvrability, not even all of them. This holds true also with regard to other types of activities, given the wording of the provision contained in Rule 3(g): whereas a «vessel restricted in her ability to manoeuvre» includes a series of constructions used for operations such as dredging, laying cables or pipelines etc., also these types of construction should not be excluded in the general notion of ship. [39] In light of the above, we can infer that the COLREGs provide a very broad definition of vessel, regardless of their use which can be different from the mere transportation.

These Rules will prove fundamental when dealing with unmanned shipping, for their provisions on technical requirements which seem *prima facie* hardly

[36] Rule 3(a) of COLREGs.

[37] See below, section 5 of the present Part.

[38] Rule 3(d) of COLREGs.

[39] Rule 3(g) of COLREGs reads as follows: «[t]he term "vessel restricted in her ability to manoeuvre" means a vessel which from the nature of her work is restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel. The term "vessels restricted in their ability to manoeuvre" shall include but not be limited to: (i) a vessel engaged in laying, servicing or picking up a navigation mark, submarine cable or pipeline; (ii) a vessel engaged in dredging, surveying or underwater operations; (iii) a vessel engaged in replenishment or transferring persons, provisions or cargo while underway; (iv) a vessel engaged in the launching or recovery of aircraft; (v) a vessel engaged in mine clearance operations».

consistent with the concept itself of unmanned technology, as discussed in the second Chapter, Part II of this work.

Also the SOLAS Convention[40] bears a particular importance with regard to unmanned vessels. It does not provide a general definition of ship, but classifies them according to their type or use, such as passenger ship, cargo ship, fishing vessel, nuclear ship. [41]

The MARPOL Convention, [42] in its Article 2.4, defines the ship in very broad terms, 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». This is due to the goal of the Convention, which aims at covering the widest variety of constructions used in marine activities for the purpose of preserving the environment from pollution. A similar goal is set by the CLC, [43] although more precisely addressed to the allocation of responsibilities for compensating damages to the marine environment caused by oil pollution. This is why the definition of ship is designed on purpose following the scope of the Convention, thus including «any sea-going vessel and seaborne craft of any type whatsoever constructed or adapted for the carriage of oil in bulk as cargo». [44]

The Salvage Convention [45] provides as follows: «vessel means any ship or craft, or any structure capable of navigation». [46] This can be regarded as the broadest definition so far examined, even more generic than the one which we will find below in Italian law. Whereas this latter requires an additional element of the destination of the ship to certain functions, the Salvage Convention does not go beyond the objective requirement of the capability to navigate, the purpose of its

[40] The International Convention for the Safety of Life at Sea, opened for signature in 1974 and entered into force in 980, is an important instrument with a large set of rules covering all aspects concerning safety in the maritime context. The provisions of the mentioned Convention which will be involved in the context of unmanned ships will be analysed in the following chapter.

[41] Chapter 1, Part A, Regulation 2 of the Annex to the SOLAS.

[42] International Convention for the Prevention of Pollution from Ships, signed in 1973 and modified by the Protocol of 1978.

[43] International Convention on Civil Liability for Oil Pollution Damage (CLC), signed in 1969 and amended by the 1992 Protocol.

[44] Article 1.1 of the CLC.

[45] Convention on Salvage, signed in London on 28 April 1989.

[46] Article 1(b) of the Salvage Convention.

navigation being absolutely irrelevant and not limited to transportation. Unlike the Salvage Convention, the Hague-Visby Rules [47] limit their applicability on vessels «used for the carriage of goods by sea», [48] for the simple reason that their scope of application is restricted to the subject of the contract of carriage of goods by sea.

This was a brief overview of only a few of the existing international maritime conventions. We could continue with the fifty and more IMO instruments, but our aim was merely to show the absence of a universal definition of ship in the international context. This is mainly due to the rationale behind the adoption of such provisions in the various conventions, which is simply pointing out the scope of application of each convention, as we have explicitly observed for some of the instruments above cited. [49] In addition, the reason may be found in the interest of each State to determine the concept under its own national law, for its sovereignty in according the right to navigate. [50] Due to this limited nature, they are not suitable for finding a general legal definition of ship. [51] This would also mean that, with regard to unmanned navigation, the question concerning the applicability of the existing legislation will need to be addressed individually depending on each convention from time to time involved, as we will discuss later.

[47] The well-known set of rules provided by the 1924 International Convention for the Unification of Certain Rules relating to Bills of Lading and the following Protocols of 1968 and 1979.

[48] Article I(d) of the Hague-Visby Rules.

[49] The same holds true also for other conventions, such as the Rotterdam Rules, defining the ship as «any vessel used to carry goods by sea ». Other conventions contain a very broad definition, once again in line with their interest of being as widely applicable as possible: see, for instance, the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (HNS) 1996, amended by the Protocol of 2010, which provides that «[s]hip means any seagoing vessel and seaborne craft, of any type whatsoever»; the 2001 Bunker Convention, whereby the vessel is «any seagoing vessel and seaborne craft, of any type whatsoever», or the London Dumping Convention, the United Nation Convention on Conditions for Registration of Ships, the Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation, the Wreck Removal Convention and so forth.

[50] VEAL, R. -TSIMPLIS, M., *supra* note 25, at 309.

[51] Response of the Italian Maritime Law Association to the Questionnaire on Vessel Nomenclature, available: https://comitemaritime.org/work/ship-nomenclature/# (last accessed 18.01.2019). It is part of the work recently carried out by the Comité Maritime International on the Ship nomenclature.

5. Definition of ship under Italian law

When it comes to the Italian legal system, the presence of an article providing a legal definition of ship does not mean that the doctrinal debate was solved once and for all. Article 136 of the Italian Navigation Code provides as follows:

> «By ship we mean every construction destined to transport by water, also for the purpose of towing, fishing, recreation or other purpose». [52]

First of all, a clarification is needed with regard to the meaning of «transport». As stated by the most authoritative doctrine, supported by the preparatory work accompanying the Navigation Code, the concept is intended in a non-technical and broadest sense, as the autonomous transport, [53] namely the mere fact of the movement of the vehicle on water, thus corresponding to the general concept of «navigation». [54]

This being the first assumption on which the definition of ship is shaped, not made explicit by the wording of the article, we can now focus on the features required by the Italian legislator for a construction in order to be deemed as a ship.

If we analyse the Article word by word, we can firstly infer that the vessel has to be a «construction», namely an aggregation of related materials in order to create a body with particular characteristics of its own. [55] Secondly, the only express reference is made to the destination to transport. However, this implies other characteristics which have to be assumed as preceding the concept of destination. Indeed, the craft has to be, first of all, capable of floating on the water. Secondly, in order to be functionally intended for navigation, it must have such characteristics as to be also capable of navigating in such environment. This capability is a material

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[52] My translation from the Italian original text: «*[p]er nave s'intende qualsiasi costruzione destinata al trasporto per acqua, anche a scopo di rimorchio, di pesca, di diporto o ad altro scopo*».

[53] «Autonomous transport», in a sense different from the technological meaning that we intend in this work, is perhaps the most appropriate translation of the concept elaborated by the Antonio Scialoja of «*trasporto autarchico*», charactersing navigation law: see the introduction of this work.

[54] Which gives the name "navigation" to the whole field of law in the Italian jurisdiction, not by chance common to both sectors: SCIALOJA, A., *Sistema del diritto della navigazione*, third ed., Roma, 1933, 37.

[55] This brings us back to the concept of *rex connexa* of Roman law, whereby the ship was regarded as an aggregation of materials: MOSCHETTI, C.M., "Nave (diritto romano)", *Enciclopedia del Diritto*, XXVII, Milan, 1977, 568.

and objective feature, resulting from a series of conditions of the construction, such as the shape of the hull, its dimension, its steering system and is precedent to the act of destination, which is, on the contrary, a functional element and dependent on the human intention. [56]

Therefore, assuming the suitability of that construction to navigate on water, the effective destination to such navigation is what makes it a ship under Italian law, according to the human will. The material capability of the ship to navigate is thus not sufficient, under the Navigation Code, for a contrivance in order to be considered a ship in legal terms, but the additional functional element is required, hence excluding, for instance, a ship which is used as a restaurant or as a hotel.

This fundamental element is in line with the traditional definition of ship that we have received from Roman law. [57]

Moreover, it is important to remark the difference between the mere suitability to navigate and the concept of seaworthiness, not always properly distinguished by scholars and jurisprudence. [58] The former is a constituent element of the contrivance considered ship, or better, a precondition for it to have the required element of the destination to navigation. [59] The latter is a quality of the ship, representing an institute of paramount importance in several contexts of her life, starting from Article 164 of Italian Navigation Code, providing that «the ship undertaking navigation must be in state of seaworthiness, properly manned and equipped, suitable for the purpose for which she is destined», [60] up to Article 422 on the carrier's liability. [61] However, such distinction is not clear in all contexts: for

[56] BONDUÀ, S., "Nave in costruzione e abbandono", *Rivista del Diritto della Navigazione* 1943-48, 208, mistakenly does not consider the suitability to navigate as a precondition for the ship to be destined to transport but assumes that the legislator implicitly excluded that material feature for the definition of ship.

[57] See *supra* note 32.

[58] LOPEZ DE GONZALO, M., "Il regime giuridico della nave nel diritto interno, internazionale e comunitario", *Il Diritto Marittimo 2013*, 48; RIGHETTI, E., "Nave", *Digesto delle Discipline Privatistiche, Sez. Comm.*, Vol. X, Turin, 1994, 161.

[59] GAETA, D., "Nave", *Enciclopedia del Diritto, XXVII*, Milan, 1977, [602.]

[60] My translation from the original text in Italian: «*[l]a nave che imprende la navigazione deve essere in stato di navigabilità, convenientemente armata ed equipaggiata, atta all'impiego al quale è destinata*».

[61] Closely related to Article IV of the Hague-Visby Rules.

instance, in a case before the Italian Supreme Court, [62] the judge deems seaworthiness as a necessary feature for the ship to be called as such, albeit recognising a distinction between an «initial seaworthiness», as a constituent element of the concept of ship, and persistent seaworthiness. [63]

Seaworthiness, [64] unlike the objective element of suitability to navigate, is a relative concept, depending on different circumstances such as the type of ship, the quality of the load, the nature and time of navigation, the sea area to be crossed and concerns, as well, the ship's manning and equipment, thus containing a human component in its definition. [65]

In addition to the general concept of ship, Article 136 of the Navigation Code establishes a distinction between major and small ships and between proper ships and floating craft. [66] According to the first distinction, major ships are those engaged in deep-sea voyages, the small ones are coastal vessels and those engaged in navigation in port and internal waters. [67] The category of floating craft is not clearly unfolded by the Code, which only provides the applicability to floating craft of all legislation referred to ships. On their distinctive element with respect to vessels, Italian scholars have debated for decades, in an attempt to solve an issue which is scarcely important from the point of view of practical application, thanks to the aforementioned assimilation with the general notion of ship. [68]

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[62] Corte di Cassazione, 31 ottobre 1956, *Rivista del Diritto della Navigazione* 1957, 248. In the same direction, see App. Genova 28 gennaio 1953, *Il Diritto Marittimo* 1954, 40.

[63] Corte di Cassazione, 31 ottobre 1956, *Rivista del Diritto della Navigazione* 1957, 259. The Author commenting this case does not even mention this distinction, simply considering seaworthiness as the constituent element of the definition of ship, confusing it with the mere suitability to navigate. He describes this quality as formed by different elements, such as the physical state of the ship, the equipment and the manning: ALBANO, R. "Sui concetti di nave e navigabilità", *Rivista del Diritto della Navigazione* 1957, 248.

[64] The doctrine of seaworthiness will be analysed in detail in the third chapter of this work.

[65] RIGHETTI, E., *supra* note 58, at 161.

[66] «*Le navi si distinguono in maggiori e minori. Sono maggiori le navi alturiere; sono minori le navi costiere, quelle del servizio marittimo dei porti e le navi addette alla navigazione interna. Le disposizioni che riguardano le navi si applicano, in quanto non sia diversamente disposto, anche ai galleggianti mobili adibiti a qualsiasi servizio attinente alla navigazione o al traffico in acque marittime o interne*». A further distinction is made with regard to pleasure craft, according to their size, by the Legislative Decree 171/2005.

[67] GAETA, *supra* note 59, at 611.

[68] The Preparatory work to the Code of Navigation, n. 89, gives a first insight on the possible distinctive element, reflecting the opinion of the most influential Author on the subject: floating craft

6. Unmanned ship: a definition

The last section of this chapter aims at designing a definition of unmanned ship and finding out whether this new construction may be fully integrated in the general concept of ship as defined by the different legal systems above examined.

Unlike the current situation of unmanned navigation in air law, unmanned vessels have not yet been defined by any legal document, nor have they been formally assimilated to traditional ships under the existing regulations. This represents the first obstacle to their integration into the maritime world and, at the same time, the first question which will need an answer in the near future, in order to allow their lawful and safe implementation.

Today, the concept of ship is certainly facing new challenges, common to many other sectors of human knowledge: digitalisation and robotization are opening new scenarios in the approach to the concept, to the point of raising a question never asked so far, for the natural characteristics of the ship, which has always been conducted by human beings on board the craft, sailing through the oceans together with the vessel. Nowadays this natural feature has been questioned with the advent of unmanned technology in the maritime world.

First of all, in the absence of any legal definition, we could try to delineate our own concept of unmanned ship, according to the common meaning of the single words used. According to the Concise Oxford Dictionary of Current English, [69] the verb «to unman» merely means «to deprive of men». Hence, the term «unmanned» is basically the negative form of the past participle of the verb «to man», meaning to furnish with men. Therefore, an unmanned ship is a vessel which is deprived of

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are supposedly distinguished from ships because they do not transport and are characterized by the destination to several services divided into two groups, services related to the navigation in general and services related to the traffic. See, generally, SCIALOJA, A. *Corso di diritto della navigazione*, I, Roma, 1943. This opinion has been criticised by other scholars, who pointed out its inconsistency with the general concept of transport as embraced by the Italian law (SPASIANO, U, "Sul concetto giuridico di nave", *Rivista del Diritto della Navigazione* 1935, 8). Whereas ship is any construction destined to transport on water and transport is intended in its broadest sense as movement on water of any floating craft for any purpose whatsoever, there should be no reason for excluding the services of the floating craft from such a general concept of transport. The reply to this criticism leveraged the circumstance that the floating craft only use navigation in order to move to the place where they will operate, whereas ships cannot pursue their purpose without navigating: see BERLINGIERI, F. *I diritti di garanzia sulla nave, sull'aeromobile e sulle cose caricate*, Padova, 1965, 125, note 65.

[69] *The Concise Oxford Dictionary of Current English*, Ninth Ed., Oxford, 1995.

men, not furnished with men. In the maritime context this word assumes a specific meaning, whereby the activity of manning a vessel is a reference to the conclusion of seafarers' employment contracts, [70] with the purpose of identifying the necessary number of persons to involve in the functioning of the ship, according to their qualifications and the characteristics of the vessel. [71] In the quoted definition, we can also remark a certain negative sense, whereby the concept of depriving of men may refer to something which should by nature be furnished with men, such as a ship. Hence, the term unmanned ship in itself reveals the presence of a feature never seen before in vessels and shows, in its literal meaning, the main characteristic of this new kind of craft, namely the absence of crew members on board.

Very recently, IMO has started a regulatory scoping exercise, as a first step in addressing unmanned vessels. In this context, a first definition has been introduced, of unmanned ships as «a ship which can operate independently of human interaction» and a new acronym is raising in the debate, namely MASS, which stands for Maritime Autonomous Surface Ship. [72] The quoted definition certainly bears no legal value, but it can be regarded as the starting point of the design of a legal concept for unmanned vessels.

Such a definition was only designed for the IMO regulatory scoping exercise. Nevertheless, it is desirable that, before it becomes part of any legal instrument, it will be reconsidered, given its inaccurate use of the wording: as a matter of fact, it is not clear what «human interaction» exactly means. The independence from this interaction for navigational operation may refer to the concept of fully autonomous vessels, where there is no human control during navigation. However, a human intervention will anyway be needed in the phase of programming the voyage: shall it be regarded as human interaction? Moreover, it is unlikely that IMO intended to cover only this narrow category of unmanned vehicles, even less consistent with the existing legal requirements, and to exclude the remotely operated ones. For

[70] The contract of employment between the master and the seamen is called “shipping articles”: cf. NORRIS, M.J., *The Law of Seamen*, Vol. I, third ed., Rochester, 1970, 142.

[71] And in line with the principle of minimum safe manning, established in Regulation V/14 of SOLAS.

[72] See http://www.imo.org/en/MediaCentre/PressBriefings/Pages/08-MSC-99-MASS-scoping.aspx (last accessed 18.01.2019).

these latter the existence of a human interaction is evident. The only element which marks the difference is that such an interaction does not occur on board the vessel. And this is acknowledged by IMO itself, which, in the same context, has started dealing with the different degrees of autonomy.

As observed when analysing the literal meaning of the term «unmanned», the main feature of this new type of vessels, most suitable for encompassing all of its sub-categories, is undoubtedly the absence of humans on board the ship. And this is perhaps the most relevant element to be taken into account in a future legal definition of unmanned ship, overlooked by IMO in this first attempt to define this new kind of craft. I agree, ultimately, on the description of the drone-ships provided in the literature, such as a ship «capable of controlled, self propelled movement on the water in the absence of any onboard crew». [73]

At least one conclusion on which we agree can be inferred from the quoted IMO definition: unmanned ship is indeed a ship.

The consequences of considering unmanned ships as ships are the same as those which have already occurred to unmanned aircraft: the applicability of all existing legislation generally referring to ships. In the absence of any legal consideration of unmanned ships, the atomistic approach shown in relation to the definition of ship by international maritime law might suggest a similar attitude to be used for unmanned vessel: in other words, the applicability of a specific set of rules to unmanned navigation should be verified on a case-by-case basis, according to the definition provided by the specific Convention.

It is also true that, as we have noted earlier, none of the existing definitions expressly refers to the presence of a crew and a captain on board the vessel, in order to be included in the definition of ship. [74] There are many elements constituting the legal concept of ship, but the human presence aboard is not among them, neither in international law, nor in domestic legal systems. Hence, we can infer that there would be no need to verify every single international instrument in order to make sure of the applicability of such convention to unmanned ships. The most logic

[73] VEAL, R.- RINGBOM, H., *supra* note 29, at 100.

[74] The fact that the COLREGs are currently based on human action is not a justification for an exclusion from the category of «vessel» described by these Rules, contrary to what was stated by HOGG, T. – GHOSH, S., *supra* note 17, at 209.

conclusion is that, under all legal systems currently in force, unmanned ships are indeed ships, just as unmanned aircraft are indeed aircraft. [75]

It is in this context that all scholars intervened in the debate agree on the point of considering the current maritime law fully applicable, with the due adjustments, to unmanned shipping, to the point of looking at it as an undisputed assumption. [76] The consequence is an uninterrupted functioning of the law currently in force in respect of unmanned vessels. [77]

After all, excluding the applicability of all existing maritime law would risk being a loss rather than an advantage, for the tremendous lacuna which would arise from the absence of appropriate rules to guarantee the safety of maritime navigation. [78] Particularly with regard to the sectors in which unmanned vessels are not different from the conventional ones, there is no need to exclude the applicability of the current framework, which is the upshot of decades of work in the field. [79]

The opposite approach would be a mere workaround, only allowing an initial circumvention of the rules currently in force, but not necessarily to the benefit of safety or even of the unmanned ships' market itself. Yet it is in the interest of all stakeholders that unmanned vessels will not navigate unsafe waters.

7. Concluding remarks

In conclusion, in the legal definition of ship navigation and transport have always been the core element of the concept. When it comes to the human component, namely the presence of master and crew on board, this has never been

[75] To use the expression of ICAO in the mentioned ICAO Circular 328-AN/190 on Unmanned Aircraft Systems (UAS). The same conclusion has been reached in the French literature, despite the reference to the manning requirement in the French definition of ship, not deemed to be a qualifying element of the concept of ship: cf. PIETTE, G., *supra* note 8, at 985.

[76] CAREY, L., *supra* note 5, at 202 note 2, states that «[i]t is widely accepted that the proposed autonomous vessels will come within the various legal definitions of a 'ship'». See also BOI, G. M., *supra* note 9, at 177; and, specifically for the United States, CHWEDCZUK, M., *supra* note 16, at 130.

[77] VAN HOOYDONK, E., *supra* note 19, at 409.

[78] Creating a completely new legal framework, as proposed by PRITCHETT, P.W., *supra* note 17, at 223, is, instead, not the most viable way.

[79] VEAL, R. – TSIMPLIS, M., *supra* note 25, at 315.

taken into account in any legal definition, surely not for its irrelevance in the context of operating the ship, but more likely for the natural and obvious necessity of the human presence for traditional navigation.

Now that such a necessity is questioned, a decision must be made whether an inclusion into the conventional concept of ship is to be preferred or not. Such a decision might consistently affect the endurance of maritime law as a whole.

At this stage of the "unmanned revolution", legal scholars can at least work on a proper definition on this new type of craft, to pave the way for their introduction into maritime law. For many other issues, instead, much will depend on the different configurations which might arise within the industry. After all, we should bear in mind that a statement expressed more than a decade ago with regard to unmanned aircraft can be deemed still applicable today to unmanned vessels: most of the work left for a full integration of unmanned ships «is unfinished business behind the chalk boards, computers, and labs of inventors, engineers, and scientists, rather than behind the desk» of lawmakers and regulators. [80]

By the time inventors' work will be over, the law should at least be ready to frame unmanned vessels into the existing legal concept of ship.

[80] PETERSON, M. E., "The UAV and the Current and Future Regulatory Construct for Integration into the National Airspace System", *Journal of Air Law & Commerce* 2006, 593.

Chapter Two

The international regulatory framework

Part I – Air Law

SUMMARY - 1. Introduction - 2. International air law - *2.1. Article 8 of the Chicago Convention - 2.2. Other provisions of the Chicago Convention - 2.3. The annexes to the Chicago Convention - 2.4. International soft law* - 3. The position of the European Union - 4. Italian navigation law - 5. Concluding remarks.

1. Introduction

After framing the category of unmanned aircraft and introducing their assimilation into the general definition of aircraft, the next step is to verify the consequences of such assimilation in the different sectors of air law and the applicability of the different existing rules to unmanned aircraft. Beside this operation, it is interesting to make an overview of the other rules, fortunately some already existing, unlike the maritime law case, expressly considering unmanned aerial vehicles. They generally bear a technical nature.

This necessarily means focussing on the technical aspects concerning this device in constant development, given the recently introduced regulations in the field. The main question is the following: What is the current legal status of unmanned aircraft?

This operation implies, once again, an examination of all the relevant documents affecting the civil use of unmanned vehicles, taking all levels of regulation into due consideration.

2. International air law

2.1 Article 8 of the Chicago Convention

The starting point of this study must be, once again, the relevant legislation of the international civil aviation legal system. As previously mentioned, the consideration of unmanned aircraft by the law made its appearance with the first binding instrument of modern air law, [1] the Convention on International Civil

[1] Actually, the very first Convention on civil aviation was the one signed in Paris on 13 October 1919, which did not prove as successful as the Chicago Convention. However, this latter somehow represents the evolution of the 1919 Paris Convention, from which it borrowed many provisions,

Aviation signed at Chicago on 7 December 1944, to this day still in force.

Article 8 of the Chicago Convention states as follows:

> No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization. Each contracting State undertakes to insure that the flight of such aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft.

It is an important rule which paved the way for an entire legislation in the field of unmanned aircraft worldwide. This is the reason why basically every legal work on the subject starts with a mention to this provision, introduced in the "ancient" international instrument by a «group of aviation prophets». [2]

We cannot help but observe the historical period in which the mentioned Article was drafted, taking the relevant technological development into consideration. The existence of such a provision can already be deemed a great achievement for the legal advancement of the subject, although it remained an isolated rule for the rest of the Century.

At that time the world of unmanned aircraft was dominated by the military drones, particularly deployed by Nazi Germany, although technologically much less advanced than those of the 2000s. It is in this context that some Author places the intervention of this rule of the Chicago Convention: their drafters still had the vivid memory of the guided missiles which destroyed persons and properties in England during the Second World War. [3] However, since the scope of the Convention is limited to civil aircraft, as we will see below, such military unmanned vehicles, although certainly borne in mind by the drafters, were not covered by its provisions.

Taking a deeper look at the provisions of Article 8, we can identify two parts, containing several norms regarding unmanned aircraft. First of all, the Convention

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including also the one on pilotless aircraft, added by the Protocol of 15 June 1929 amending the Paris Convention, entered into force in 1933 and stating, in a sub-paragraph of Article 15, that «no aircraft of a contracting State capable of being flown without a pilot shall, except by special authorization, fly without a pilot over the territory of another contracting State».

[2] PETERSON, M.E., "The UAV and the Current and Future Regulatory Construct for Integration into the National Airspace System", Journal of Air Law & Commerce 2006, 554.

[3] MARSHALL, D., "Unmanned Aerial Systems and International Civil Aviation Organization Regulations", *North Dakota Law Review* 2009, 699.

establishes a principle of a need of authorization for the operation of an unmanned aircraft, in a manner that is partially different from the general rules established for conventional aircraft. As a matter of fact, it is noteworthy to mention the set of rules in which Article 8 is inserted within the first part of the Chicago Convention, precisely Chapter II, dedicated to «flight over territory of contracting States».

As is known, Articles 5, 6 and 7 introduce a distinction for manned aircraft according to the type of flight considered: respectively non-scheduled, scheduled and cabotage services.

Article 5 introduces a right for aircraft not engaged in scheduled international air services to fly into or in transit non-stop across the territory of a contracting State and to make stops for non-traffic purposes without the necessity of obtaining prior permission. On the contrary, under Article 6, all scheduled international air services need a special permission or authorization by the contracting State for being operated over or into the territory of such State. Finally, the institute of cabotage refers to the operation of an air service for carriage of persons, goods or mail for remuneration within the territory of one single State. The well-known rule established by Article 7 of the Chicago Convention reserves each contracting State the right to refuse permission to the aircraft of another contracting state to perform cabotage services. [4]

As we can notice, the regime established by these mentioned Articles regulates differently the need of an authorization by the contracting State according to the service performed, granting a general permission for non-scheduled flights, except for the right of the State flown over to require landing or require a special permission for flights over regions which are inaccessible or without adequate air navigation facilities. [5]

Another particular provision should be added, contained in the International Air Services Transit Agreement (Transit Agreement), signed at Chicago on 7 December 1944. [6] Article I of the Transit Agreement provides the renowned first

[4] SIA, A. M., "Il cabotaggio aereo nella Convenzione di Chicago", *Diritto dei Trasporti* 2000, 31; MENDES DE LEON, P., *Cabotage in Air transport regulation*, Dordrecht, 1992; SHEEHAN, W. M., "Air Cabotage and the Chicago Convention", *Harvard Law Review* 1950, 1157.

[5] See LEFEBVRE D'OVIDIO, A. – PESCATORE, G. – TULLIO, L., *Manuale di diritto della navigazione*, XIV ed., Milano, 2016, 219.

[6] The International Air Services Transit Agreement refers to a multilateral agreement drawn up in addition to the Chicago Convention, establishing for the first time the principle of automatic right

two freedoms of the air: [7] the right to fly over a foreign country without landing and the right to land for non-traffic purposes (for instance, the right to refuel or carry out maintenance in a foreign country without embarking or disembarking passengers or cargo). [8] These two freedoms created a regime of higher liberalization in operation of air flights and international circulation of aircraft and were positively welcomed by many States, which signed the relevant Agreement, unlike its twin agreement, the International Air Transport Agreement, also signed at Chicago on 7 December 1944. [9]

We may wonder how these provisions relate to that of Article 8 of the Chicago Convention concerning unmanned aircraft. Certainly, its location right after the provisions on scheduled, non-scheduled and cabotage services suggests its nature of a special rule derogating the norms established for manned aircraft. [10] After all, even the two freedoms of the air, contained in the Transit Agreement, do not affect the full applicability of the Chicago Convention provisions, including its Article 8, since, under Section 2 of Article I of the Transit Agreement, «the exercise of the foregoing privileges shall be in accordance with the provisions of the Chicago Convention», therefore without prejudice to the full applicability of Article 8. Hence, neither the rules on scheduled, non-scheduled and cabotage services nor those on the two freedoms of the air shall be considered applicable to unmanned aircraft.

This implies a substantial difference in treatment between manned and unmanned aircraft: only for this latter the international legal system requires a State authorization for the simple fact of operating an aircraft without a pilot on board.

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of transit and of emergency landing. The agreement is also known as «two freedom agreement».

[7] COMENALE PINTO, M.M., "Ancora in tema di libertà dell'aria e di poteri dello stato di scalo nel sistema vigente di Chicago", *Diritto dei Trasporti* 2004, 501.

[8] Article 1, Section 1 states as follows: «[e]ach contracting State grants to the other contracting States the following freedoms of the air in respect of scheduled international air services: 1. The privilege to fly across its territory without landing; 2. The privilege to land for non-traffic purposes».

[9] The International Air Transport Agreement was also a multilateral agreement added to the Chicago Convention, but proved particularly unsuccessful, given the preference of the States to regulate bilaterally their commercial interests on their traffic rights, thus creating a network of bilateral agreements governing the commercial aviation worldwide. This Agreement only had 11 ratifications, against the 133 State Parties to the International Air Services Transit Agreement. See LEFEBVRE D'OVIDIO, A. – PESCATORE, G. – TULLIO, L., *supra* note 5, at 220.

[10] According to ABEYRATNE, R., "Remotely Piloted Aircraft Systems: Some Unexplored Issues", *Air & Space Law* 2016, 292, the special authorization which has to be granted for flying unmanned aircraft is indeed different from the one issued for commercial flights.

The State intervention in authorizing operations for manned aircraft only depends on the type of service provided by such aircraft, not on the mere fact of flying, as occurs in the case of unmanned aircraft. This may be due to the earliness of both the technological evolution and the consciousness of its use, for a presumably less reliable safety and security level. Yet this attitude is to be found even nowadays, considering the biased approaches to the liberalisation of the use of unmanned vehicles and therefore a general acceptance of a regime, internationally introduced, then domestically implemented, requiring a prior State control over the suitability of unmanned flights.

The need of an authorization provided under Article 8 reflects the principle of State sovereignty, [11] whereby each contracting State enjoys the right to authorize operations with unmanned aircraft over its territory. [12] Such operation shall be carried out in accordance with the terms of the authorization: thus, the State reserves as well the right to unilaterally establish the content of the authorization and the rules for flying such vehicles in its national airspace. For the sake of uniformity and a safe development of this aviation sector, however, it is suitable to establish principles and rules at an international level, as stated in the ICAO document Circular 328-AN/190. [13]

Moreover, it is necessary to remark the absence of any reference to unmanned operations of a transnational nature: Article 8 does not require an authorization for flying a pilotless aircraft exclusively over the territory of *another* contracting State. [14] We can infer the existence of a duty on each State to set up special authorizations regulating the use of unmanned aircraft for those vehicles registered with its nationality even flying exclusively within its own territory. This makes such provision even more weighty, considering its authority to affect not only

[11] Under Article 1 of the Convention, «[t]he contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory».

[12] GUERRERO LEBRÓN, M.J. - CUERNO REJADO, C. - MÁRQUEZ LOBILLO, P., "Aeronaves no tripuladas: estado de la legislación para realizar su integración en el espacio aéreo no segregado", *Revista de derecho del transporte* 2013, 80.

[13] For a detailed analysis of the Circular, see below.

[14] Unlike Article 5, which expressly refers to «all aircraft of the other contracting States» for granting the right to overfly its own territory and unlike the previously-in-force Article 15 of the 1919 Paris Convention as amended, which required the authorization to fly without a pilot over the territory of *another* contracting State (emphasis added). The latest amendments adopted by ICAO Council move back to the direction of regulating operations internationally relevant, as we will see below.

international operations with unmanned aircraft, but also their domestic use, thus becoming the pillar, the fundamental rule of all legislations, national or international, on the subject. This is why every discourse on unmanned aircraft must start from the provision of Article 8 of the Chicago Convention.

Moving the analysis to the last sentence of this Article, we can draw some observations from its wording. First of all, the use of unmanned aircraft in areas open to civil aviation shall not endanger the safety of other civil aircraft, therefore, of the general civil aviation. This entails a principle of equivalence for safety purposes, strongly proclaimed by all institutions currently involved in addressing the introduction of unmanned technology: aircraft without pilots on board should guarantee equivalent levels of safety as their manned counterpart. [15] Secondly, the reference to regions open to civil aircraft represents the starting point of the renowned discussion on the integration of unmanned aircraft into the civil aviation airspace. The modernity and importance of the provisions of the Chicago Convention on pilotless aircraft are to be found also in these words. The debate on the suitability and methods to integrate unmanned aircraft into the civil aviation airspace has started only in recent times and is still ongoing. But the drafters of Article 8 had contemplated the possibility of using such aircraft side by side with conventional air vehicles already in 1944, together with the consequent need of guaranteeing the adequate safety for the conventional aircraft affected.

Finally, some Authors locate right in this Article the assimilation of unmanned aircraft within the general concept of aircraft, with the consequent applicability of all aviation rules, presumably assuming it merely from the presence of rules concerning pilotless aircraft among the provisions of the Chicago Convention, thus making them an integral part of the aviation sector and of air law. [16]

To conclude the analysis of Article 8, it is interesting to take a look at the words used in the second part of the provision: «the flight of such aircraft […] *shall be so controlled*» (emphasis added). Does this expression casually contain the verb «to control», only to suggest any general form of operation? In that case, we could

[15] See, for instance, chapter 2.9 of ICAO Circular 328-AN/190.

[16] See, among others, KAISER, S. A., "UAVs and Their Integration into Non-segregated Airspace", *Air & Space Law* 2011, 162.

read the Article as «the flight of such aircraft without a pilot in regions open to civil aircraft shall be so *operated* as to obviate danger to civil aircraft» (emphasis added). Or was the use of such a verb intentionally made to require a particular form of unmanned aircraft which can be controlled for the whole duration of its flight? In this latter case we might think of a restriction of the categories of unmanned aircraft covered by the Convention, including only those which are remotely piloted, not fully automated. Or, through a broad interpretation of the verb «shall be so controlled», we might think of a simple requirement of constant monitoring, thus allowing the flight of automated aircraft but requiring a continuous control by human operators from a ground station.

The consequences of such interpretation following one or the other opinion might be very important: interpreting the verb as to only allow the flight of remotely piloted aircraft would determine the illegitimacy of the use of fully automated aircraft under international aviation law. This would entail the need for a legislative intervention to justify the advent of fully automated flights, in line with the opinion of ICAO as expressed in one of its documents, as we will see below.

2.2 Other provisions of the Chicago Convention

After this Article, we must wait for the twenty-first century to have more detailed rules in this field. However, apart from those definitional rules mentioned in the previous chapter, all such rules pertain to the regulatory level in the hierarchy of sources, thus maintaining a legislative gap into the legal system for the proper regulation of these new devices.

But before entering the details of some of such technical rules, it is useful to identify all other norms provided by the Chicago Convention, which, although not directly referring to unmanned aircraft, are to be considered fully applicable to them, for the simple reason that unmanned aircraft are aircraft to all effects.

The first of these provisions is undoubtedly the one of Article 3 of the Chicago Convention, limiting the scope of this international instrument to civil aircraft. This Article makes an express exclusion of state aircraft from its scope, including aircraft used in military, customs and police services in the definition of

state aircraft. [17]

For the purpose of outlining a legal framework for unmanned aircraft, this Article proves to be very important to draw a demarcation line between civil unmanned aircraft, covered by the Convention on International Civil Aviation and consequently this work, and military aircraft, [18] thus not considered part of air law in its pure meaning. [19]

We have previously observed that the rationale of Article 8 pursued the aim of placing unmanned activities under the authorization and control of the States, in order to avoid damages to persons and properties, bearing in mind the destruction perpetrated by unmanned bombs (more than proper aerial vehicles) during the Second World War. Nevertheless, such military aircraft have been kept out of the scope of the Convention, hence, of aviation law, which, at that time, was starting a new era of an unprecedented purely civil development.

The contracting States supposedly did not want to yield any space of sovereignty in the decisions concerning the use of aircraft for State purposes (such as military or police uses), keeping full control on how and when operating them. And this can undoubtedly be said with regard to unmanned technology, hence representing a great innovation at a time when unmanned aircraft were essentially all military. The drafters of the Convention showed such a foresight to introduce a regulation for a phenomenon, namely the civil use of pilotless aircraft, which was

[17] Article 3 states as follows: « (a) This Convention shall be applicable only to civil aircraft, and shall not be applicable to state aircraft. (b) Aircraft used in military, customs and police services shall be deemed to be state aircraft. (c) No state aircraft of a contracting State shall fly over the territory of another State or land thereon without authorization by special agreement or otherwise, and in accordance with the terms thereof. (d) The contracting States undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft». See HORNIK, J., "Article 3 of the Chicago Convention", *Air & Space Law* 2002, 161.

[18] As described in the previous chapter, unmanned aircraft for military purposes were the first to be implemented in the Twentieth century and still nowadays are undoubtedly the prevailing application of such a new technology. Their employment mainly rises issues from an international public law perspective, involving human rights, ethics, law of warfare and international humanitarian law. For an in-depth analysis on the military use of unmanned vehicles, see, among others ALTSON, P., "Lethal Robotic Technologies: The Implications for Human Rights and International Humanitarian Law", *Journal of Law, Information and Science* 2011, 35; HAGGER, M. – MCCORMACK, T., "Regulating the Use of Unmanned Combat Vehicles: Are General Principles of International Humanitarian Law Sufficient?", *Journal of Law, Information and Science* 2011,74; SHARKEY, N., "Automating Warfare: Lessons Learned from the Drones", *Journal of Law, Information and Science* 2011, 140.

[19] Or in the meaning of navigation law in the Italian legal system, which traditionally excludes the military sector from its scope.

far from being widely developed and so it remained for many decades. We can infer that, by regulating unmanned aircraft, the Chicago Convention paved the way for the use of a new technology just for peaceful interests, which, however, has been boosted only in the current Century.

It is unlikely that the drafters of the Convention intended to regulate state aircraft when addressing unmanned vehicles in Article 8, although being basically the only type of unmanned aircraft in use at that time: their inclusion within the scope of the Convention, which does not cover, under Article 3, state aircraft shows the opposite intention of regulating only civil aircraft, contrarily to what has been stated in the literature. [20]

Another Article extremely important for our purposes is Article 12, introducing the subject of the «Rules of the air». By reading the Article itself, we can define them as «rules and regulations relating to the flight and maneuver of aircraft», with which all aircraft flying over the territory of a contracting State, or carrying its nationality mark, must be compliant.

This may be considered one of the most important articles with regard to aviation safety, considering its goal of introducing a duty on the contracting States to adopt measures to ensure that all aircraft falling within the two categories (namely carrying its nationality mark or simply flying over or maneuvering within its territory) shall be compliant with the Rules of the air.

The Rules of the air represent the «rules of the road» of the aviation sector, establishing the technical organization of the circulation of aircraft both in national and international airspace. These Rules directly affect, indeed, the airspace pertaining to each individual contracting State, through the adoption of international Standards and Recommended Practices. [21] The uniformity in this respect derives from the provision of Article 12, which requires each contracting State to keep its own regulations, relating to the flight and maneuver of aircraft, in uniformity with those established by ICAO, to the greatest possible extent. The mechanism, which will be described in detail below, was introduced in order to guarantee the highest level of uniformity in a transport sector which is highly international in its nature.

[20] PETERSON, *supra* note 2, at 556.

[21] The analysis of Standards and Recommended practices will follow later in this work.

When it comes to unmanned aviation, we cannot help but observe the full applicability of these rules to devices built with unmanned technology, and this is mainly due to two reasons: first of all, the full inclusion of unmanned aircraft within the definition of aircraft, with all its legal consequences; [22] secondly, the rationale itself behind the establishment of such rules imposes a mandatory nature which cannot be derogated by any new technology, the exclusion of which would be detrimental to the rules themselves.

Moreover, the detailed description of the Rules of the air is contained in one of the annexes to the Chicago Convention, which will form part of a specific analysis in the following paragraph of this work.

Continuing our investigation, Article 17 of the Chicago Convention states that «[a]ircraft have the nationality of the State in which they are registered». This provision has established the requirement of nationality of aircraft, which is borrowed by the maritime tradition and creates a link between the State and the aircraft. The aim of such rule is to render all legislation laid out at the international level applicable to aircraft carrying the nationality of a State participant to the international conventions. Without such a principle of nationality of aircraft, the risk would be that of excluding a device from the scope of all legislations, to the detriment of safety for all the other users of the airspace. [23]

This is also an important provision with regard to unmanned aviation, since these new aircraft cannot be excluded from the requirement of carrying the nationality of the State in which they are registered. Surely this can be regarded as an important means for ensuring a safe integration of unmanned technology into the civil airspace, thanks to the open definition of aircraft, ready to accommodate vehicles built with such a new technology.

There are other relevant articles which find application to unmanned aircraft for the simple fact of their integration into the general definition of aircraft, but at the same time they may require either an extensive interpretation of their provisions or some adjustments for a complete adaptation to the new needs of unmanned

[22] As observed in the first chapter of this work. Cf ABEYRATNE, R., "Remotely Piloted Aircraft Systems: Some Unexplored Issues", *Air & Space Law* 2016, 318.

[23] For an interesting examination of the institution in the earliest times of aviation, see KINGSLEY, R., "Nationality of Aircraft", in *Journal of Air Law & Commerce* 1932, 50; for a more recent work, see FITZGERALD, P.P., "In Defense of Nationality of Aircraft", in *Annals Air & Space Law* 2011, 81.

technology.

Among such articles we can mention Article 29, providing the obligation for every aircraft engaged in international air navigation to carry certain documents. One of these documents is the certificate of airworthiness, which is, at the same time, required by Article 31, specifically stating the need for every aircraft of each contracting State to be provided with it. Moreover, the aircraft shall carry the appropriate licence for each member of the crew, completing what it is stated in Article 32, namely the duty, for every pilot and other members of the operating crew, to have certificates of competency and licenses, issued or rendered valid by the State in which the aircraft is registered.

Whereas Articles 31 and 32 introduce the documents concerning certificate of airworthiness and licensing of personnel, Article 29 complete such provisions stating a need to carry such documents on board the aircraft. We have mentioned these rules among those which need some revisions, or at least an investigation on their interpretation, for the following reason: the current rules concerning the certificate of airworthiness, contained in the relevant Annex to the Chicago Convention, have been designed bearing in mind the traditional manned aerial vehicles. Therefore, the issue on their direct applicability on unmanned aircraft should be addressed.

The same can be said for the licensing of personnel, which is, as well as the airworthiness certificate, specifically regulated in one of the annexes to the Convention. Given the absence of a crew on board, as we traditionally intend it, can the rules provided by the relevant Annex be directly applicable to the new kind of personnel involved in unmanned operations?

One insight may be found in the wording of Article 32 itself: the reference to the «pilot» of every aircraft can be easily adjusted to the new figure of remote pilot, who has essentially the same role, with the difference of not being on board the aircraft. Certainly, some intervention will be necessary in the detailed regulations, but at least the current provision of Article 32 seems flexible enough to accommodate the new needs of the aviation sector, contrary to what has been stated by ICAO. [24]

[24] As a matter of fact, in its Circular 328-AN/190, chapter 4.13, in relation to Article 32 of the Chicago Convention, ICAO states that «[r]emote pilots and other members of the remote crew are not subject to Article 32 which was drafted specifically for those individuals who conduct their

Some doubts may be raised, instead, on the feasibility and adequacy of the rule of Article 29 requiring every aircraft to carry certain documents. This provision was drafted bearing in mind an aircraft with a crew and a captain, who is made responsible of keeping the documents. With unmanned aircraft there will be no person in charge of this task, given the positioning of all personnel on the ground. This may be solved through the adaptation to the new technology with the use of digital documents, which may be carried on software on board the aircraft, thus respecting the standard set by the Chicago Convention. In addition to it, it may be added a specific duty for the personnel of the ground control station to keep the same documents in paper format.

There are of course many other relevant articles, not addressing the issue of unmanned operations but which have to be taken into account for the use of aircraft with no pilot on board according to the aspects concerned, such as landing at customs airport, [25] display of marks, [26] investigation of accidents, [27] air navigation facilities and standard systems, [28] aircraft radio equipment [29] and recognition of certificates and licences. [30]

Moreover, the whole Chapter VI of Part I of the Chicago Convention is of particular importance, since it deals with the International Standards and Recommended Practices (SARPs). Such SARPs are adopted by ICAO, through its Council, [31] on the subjects listed in Article 37 and other matters concerned with the safety, regularity and efficiency of air navigation.

Their goal is to promote a safe international aviation and the uniform standards to be reached by contracting States are laid out in order to achieve that aim. As a matter of fact, contracting States keep their sovereignty in drafting rules and regulations concerning all aspects of air navigation covered by ICAO SARPs; however, if their domestic regulations do not comply with the minimum standards

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duties while on board aircraft».

[25] Article 10 of the Chicago Convention.

[26] Article 20 of the Chicago Convention.

[27] Article 26 of the Chicago Convention.

[28] Article 28 of the Chicago Convention.

[29] Article 30 of the Chicago Convention.

[30] Article 33 of the Chicago Convention.

[31] Article 54(l) of the Chicago Convention.

established by the international community, this may result in a limitation of circulation of those aircraft carrying documents issued under such regulations into the airspace of the other contracting States. [32]

The SARPs are contained in the nineteen annexes to the Chicago Convention and provide detailed technical rules on all aspects concerning air navigation, making a clear distinction between required standards and recommended practices. [33]

In the following section we turn our attention right to these annexes, with a brief investigation of those SARPs which may affect, be affected or, as we will see, have already been affected by the introduction of unmanned technology.

2.3 The annexes to the Chicago Convention

Before analysing the annexes containing such SARPs, it is useful to mention the difference between the two categories of International Standards and Recommended Practices. [34] The distinction can be identified in the mandatory nature of the former for the contracting States, whereas Recommended Practices introduce rules with only a level of desirability. [35]

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[32] PETERSON, *supra* note 2, at 558.

[33] The ICAO annexes are the following: Annex 1, *Personnel Licensing*; Annex 2, *Rules of the Air*; Annex 3, *Meteorological Service for International Air Navigation;* Annex 4*, Aeronautical Charts*; Annex 5, *Units of Measurement to be Used in Air and Ground Operations*; Annex 6, *Operation of Aircraft*; Annex 7, *Aircraft Nationality and Registration Marks*; Annex 8, *Airworthiness of Aircraft*; Annex 9, *Facilitation*; Annex 10, *Aeronautical Telecommunications*; Annex 11, *Air Traffic Services*; Annex 12, *Search and Rescue*; Annex 13, *Aircraft Accident and Incident Investigation*; Annex 14, *Aerodromes*; Annex 15, *Aeronautical Information Services*; Annex 16, *Environmental Protection*; Annex 17, *Security; Safeguarding International Civil Aviation Against Acts of Unlawful Interference*; Annex 18, *The Safe Transport of Dangerous Goods by Air*; Annex 19, very recently adopted on *Safety Management.*

[34] The transposition of the Chicago Convention does not necessarily imply the automatic transposition of its Annexes: cf ROMANELLI, G.- COMENALE PINTO, M.M.*,* "Il recepimento degli annessi I.C.A.O. in Italia: un obiettivo raggiunto?", *Diritto dei Trasporti* 1994, 443.

[35] See, for example, the definition provided in the forward of Annex 1, where Standard is defined as «any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention», whereas a Recommended Practice is «[a]ny specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention». See ABEYRATNE, R., "The Legal Status of the Chicago Convention and its Annexes", *Air & Space Law* 1994, 113; BONORA, V., "L'introduzione nell'ordinamento interno dei principi generali contenuti negli allegati alla convenzione relativa all'aviazione civile internazionale stipulata

The first of such annexes requiring a particular examination is Annex 1 on Personnel Licensing. As is evident, when it comes to unmanned navigation, all discussions on the different figures of humans involved in operations always play an important role, given the main feature of unmanned aircraft: the absence of pilots and crew on board them.

This implies wondering whether all rules currently in force addressing the traditional pilots and crew members may find applicability with regard to the new roles emerging with the use of unmanned aerial vehicles. Among such rules, there are those relating to the licensing of personnel, provided with the aim of establishing some standards to be required to the people taking part in navigational operations. Once again, only achieving the maximum level of uniformity will guarantee the highest standards of safety between all contracting States, in both national and international airspace.

Together with the above-mentioned Article 32, Annex 1 to the Chicago Convention requires the pilot in command of an aeroplane or helicopter be licensed. [36]

An important feature of Annex 1 is the provision of some useful definitions for our interests: flight crew member is defined as «a licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period»; pilot-in-command is defined as «the pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight». [37] As we can notice, none of the two definitions represents, from the point of view of the wording used, a real obstacle to an extensive

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a Chicago il 7 dicembre 1944", *Le nuove leggi civili commentate* 1986, 1269; COSENTINI, M.C., "Sull'obbligo di recepimento degli annessi tecnici alla convenzione di Chicago", *Diritto dei Trasporti* 1999, 559. The nature of ICAO Standards as international soft law has been regarded as the reason of the success of ICAO: cf. KAISER, S.A., "Infrastructure, Airspace and Automation – Air Navigation Issues for the 21st Century", *Annals of Air and Space Law* 1995, 455. The nature of the mentioned annexes followed a different direction in comparison to the annexes of the previous Paris Convention 1919: cf. COMENALE PINTO, M.M., *L'assistenza al volo*, Padova, 1999, 14, note 31.

[36] The distinction between aeroplane and helicopter is contained in chapter 1.1 of Annex 1: the former is «[a] power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight»; the latter «[a] heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes».

[37] Chapter 1.1, in which it is also stated that the verb «to pilot» means «to manipulate the flight controls of an aircraft during flight time».

interpretation which might include remote pilot and remote crew within their scope. As a matter of fact, there is only a general reference to flight, but no requirement of the presence on board the aircraft during such flight.

However, note 2 of paragraph 1.2 on general rules concerning licences provides a detailed list of categories of personnel who are required to be licensed, making specific reference to the traditional roles conceived for manned navigation, such as multi-crew pilot, airline transport pilot, flight navigator.

We believe that when it comes to rules set forth for specific cases referring to traditional situations, assuming their configuration within conventional manned aviation, it is more difficult to adapt such rules to the new unmanned technology. [38]

This becomes evident when the International Standards and Recommended Practices of Annex 1 regulate, in Chapter 2, licenses and ratings for pilots according to the class and type of aircraft, such as single pilot licence, multi-crew pilot licence etc., up to personnel other than flight crew members.

One thing is clear and will require to be specifically addressed for unmanned aircraft: only a person in possess of a valid licence showing compliance with the specification of Annex 1 to the Chicago Convention and appropriate to the duties to be performed by that person can act as a flight crew member. [39] If under the definition provided by the Annex itself, a flight crew member does not necessarily need to be on board the aircraft to be considered as such, then a member of the crew of a remotely piloted aircraft system can be effectively deemed as a flight crew member. An intervention is therefore needed for setting up rules on licences for the new roles emerging with unmanned technology.

Annex 2 to the Chicago Convention is dedicated to the Rules of the air. Its importance is marked by its content of only required Standards, not Recommended Practices, given the necessity to comply with those standards for the ultimate goal of civil aviation safety. This is confirmed by the imposition of Article 12 of the Chicago Convention to adhere to the greatest possible extent to those standards. [40]

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[38] Although the requirement for unmanned aircraft to be compliant with ICAO standards, as they currently are, is widely recognised, waiting for appropriate amendments: see ABEYRATNE, R., "Remotely Piloted Aircraft Systems: Some Unexplored Issues", *Air & Space Law* 2016, 298.

[39] See chapter 1.2.1 of Annex 1.

[40] LA TORRE, U., "Aircraft pilotage", *Diritto Marittimo* 2015, 267.

Annex 2 defines the concept of pilot-in-command, placing upon him the responsibility for compliance with the rules of the air. [41] He shall also have final authority as to the disposition of the aircraft while in command. [42] In consequence of the adoption of Amendment 43 by ICAO Council on 7 March 2012, new terms related to unmanned aviation have been introduced in Chapter 1 of the Annex, opening a new era for civil aviation: among the others, [43] we can mention «remote pilote»[44], «remotely piloted aircraft»[45] and «remotely piloted aircraft system (RPAS)». [46]

The Annex then provides a set of rules on all technical aspects related to the activity of the aircraft navigation, moving from the right of way to navigating light, from a flight plan to air traffic control services, from unlawful interference to specific, detailed provisions on the two flight operating modes of Visual Flight Rules and Instrument Flight Rules, contained respectively in Chapter 4 and Chapter 5. The above-mentioned Amendment 43, introduced a new Section on remotely piloted aircraft, [47] stating that «[a] remotely piloted aircraft shall be operated in such a manner as to minimize hazards to persons, property or other aircraft and in accordance with the conditions specified in Appendix 4». [48]

The Appendix provides important general operating rules, implementing the

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[41] See chapter 2.3 of Annex 2, whereby «the pilot-in-command of an aircraft shall, whether manipulating the controls or not, be responsible for the operation of the aircraft in accordance with the rules of the air, except that the pilot-in-command may depart from these rules in circumstances that render such departure absolutely necessary in the interests of safety».

[42] See chapter 2.4 of Annex 2.

[43] The Annex, as amended, defines command and control link (C2), detect and avoid, operator, remote pilot station, RPA observer, visual line-of-sight (VLOS) operation. For a general description of the amendments: SIA, A.L.M., "Profili attuali della disciplina giuridica dei mezzi aerei a pilotaggio remoto e il regolamento dell'Ente nazionale dell'aviazione civile italiana (ENAC)", *Diritto dei Trasporti* 2014, 751.

[44] Defined as «[a] person charged by the operator with duties essential to the operation of a remotely piloted aircraft and who manipulates the flight controls, as appropriate, during flight time».

[45] Defined as «[a]n unmanned aircraft which is piloted from a remote pilot station».

[46] Defined as «[a] remotely piloted aircraft, its associated remote pilot station(s), the required command and control links and any other components as specified in the type design».

[47] Chapter 3.1.9 of Annex 2.

[48] It is interesting to remark that this new section is modelled on the previously existing section 3.1.9 (now 3.1.10) dedicated to unmanned free balloons, stating that «an unmanned free balloon shall be operated in such a manner as to minimize hazards to persons, property or other aircraft and in accordance with the conditions specified in Appendix 4 [now Appendix 5]». The requirement of operations performed in a way as to minimize hazards to persons, property or other aircraft shares with remotely piloted aircraft the principal objective of a safe integration into the civil aviation.

well-known provision of Article 8 of the Chicago Convention. Specifically it regulates the need for an authorization for operating a remotely piloted aircraft in three different cases: an appropriate authorization from the State from which the take-off is made; a special authorization from the State in which the flight is to be operated, when flown across the territory of another State; a coordination with the appropriate Air Traffic Service authority when operated over the high seas. [49]

It is interesting to remark a slight divergence with the principle emerging from Article 8 of the Chicago Convention. The first case, indeed, only requires the authorisation of the State from which the take-off is made for aircraft engaged in international air navigation. We can interpret this provision as an implicit decision not to interfere with State sovereignty by dealing with remotely piloted aircraft domestic flights, despite the requirement in force since 1944 which is irrespective of the international nature of the operations.

As of the second scenario, it is not clear what the world «another» effectively means: it may be interpreted as a State other than the State of Registry, or, more likely, given the position of the rule, as a State other than the one where the take-off is made. In this latter case, we can infer that the Appendix requires an authorization, for international flights, from the State of departure and from all other States overflown by the unmanned aircraft.

Article 2 explicitly introduces the requirement of the certificate of airworthiness for the remotely piloted aircraft, a certification for all associated components, a certificate of operator and a licence for the remote pilot.

Other noteworthy annexes for the consequences they might have with regard to unmanned aviation are Annex 7 and Annex 8, the former addressing Aircraft nationality and registration marks, the latter Airworthiness of aircraft. Annex 7, as the one previously commented, was modified through Amendment 6, adopted by the Council on 7 March 2012. The Amendment has merely introduced a classification as «unmanned» for aircraft intended to be operated with no pilot on board [50] and the requirement of the identification plate for remotely piloted aircraft.

[49] Article 3 of the Appendix provides detailed rules on the request for authorization and the content of the single elements of such request.

[50] Chapter 2.2. of Annex 7.

[51]

The importance of Annex 8, still unchanged when it comes to rules concerning unmanned aviation, is that it provides the certification requirements according to the type of aircraft, creating a classification in which it will not be easy to insert unmanned aircraft. The categorisation of vehicles into big groups of large aeroplanes, small aeroplanes and helicopters, although it is likely to find a corresponding classification for unmanned technology, establishes a set of technical rules on flight, structure, design and construction, powerplant, systems and equipment, operating limitation and information, system software, crashworthiness and cabin safety, operating environment and human factors, which were entirely conceived for traditional manned aviation, scarcely applicable to the new unmanned technology. This holds particularly true with regard to the rules on the operating environment and human factors: Annex 8 defines «human factor principles» as «[p]rinciples which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance», whereas «human performance» refers to «human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations». [52] All sectors of the aviation market have to take human factor principles into consideration and the different parts of the Annex contain a specific sub-part dedicated to operating environment and human factors. Helicopters and aeroplanes shall be designed to allow safe operations within the performance limitations of users, including crew, passengers, ground handling and maintenance staff and in such a way as to allow safe and efficient control by the flight crew. Moreover, the design of aircraft has to take into account ergonomics and operating environmental factors. [53] All these features obviously need to be reconsidered when addressing design, construction and equipment of unmanned aircraft, for which the requirements follow a different logic when it comes to human factors. [54]

[51] Chapter 9.2(b) of Annex 7.

[52] See Annex 8, Part 1, Definitions.

[53] For example, «[t]he design of the aeroplane shall take into consideration the flight crew operating environment including: a) effect of aeromedical factors such as level of oxygen, temperature, humidity, noise and vibration; b) effect of physical forces during normal flight; c) effect of prolonged operation at high altitude; and d) physical comfort».

[54] With regard to human factors, reference is often made to the ICAO document Doc 9683-AN/950,

Finally, also Annex 13 to the Chicago Convention [55] has witnessed some recent amendments in order to accommodate unmanned aircraft systems: [56] first of all, in its Chapter 1, the definition of «accident» has been changed as follows: «[a]n occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an *unmanned aircraft*, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down, in which: a) a person is fatally or seriously injured […]; b) the aircraft sustains damage or structural failure […]; the aircraft is missing or is completely inaccessible» (emphasis added).

Equal reference to unmanned aircraft is made in the definition of «serious incident». [57]

Finally, Chapter 5 of the Annex, dedicated to the responsibility for instituting and conducting the investigation in the territory of a contracting State, provides the obligation for the State of Occurrence [58] to institute an investigation into the circumstances of the accident and be responsible for the conduct of such investigation. Note 3 adds that in the case of investigation involving unmanned aircraft systems, only aircraft with a design and/or operational approval are to be considered. With this regard, despite the limitation introduced in the Annex, ICAO has stated its wish that, within contracting States, the investigation of unmanned aircraft accidents be undertaken regardless of the certification status of the aircraft.

Human factors training manual, which addresses the subject in all its aspects, such as fundamental human factors concept, management and organisation, human factors in air traffic management systems, in aircraft maintenance and inspection and training programmes for operational personnel.

[55] PELLEGRINO, F. "Sull'applicabilità dell'Annesso 13 ICAO nell'ordinamento italiano", *Diritto dei Trasporti* 2003, 805.

[56] GUERRERO LEBRÓN, M.J. - CUERNO REJADO, C. - MÁRQUEZ LOBILLO, P., *supra* note 12, 95.

[57] A serious incident is defined by the Annex as «[a]n incident involving circumstances indicating that there was a high probability of an accident and associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or *in the case of an unmanned aircraft*, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down» (emphasis added).

[58] The State of Occurrence is defined in Chapter 1 of the Annex as «the State in the territory of which an accident or incident occurs».

[59]

The presence of these first references to unmanned aircraft in ICAO Standards and Recommended Practices shows a first attempt of the international aviation community to address this emerging issue in its instruments. With specific regard to Annex 13, this might be due to the compelling need to include these new technological devices into the framework concerning accident and incident investigation, with a view to controlling this new aviation sector. The Amendments of the other aforementioned Annexes are also an evidence of the interest for integrating unmanned aircraft into the mechanisms of the Rules of the air and of nationality of aircraft: they have the merit of having started the process of direct intervention on the regulation of unmanned aviation, but they will certainly need to be followed by a further, more detailed regulatory framework.

2.4 International soft law

The examination of the instruments of soft law currently existing in the field of unmanned aviation [60] must necessarily go through the analysis of the Circular 328 AN/190, issued by ICAO in 2011, on Unmanned Aircraft Systems (UAS), developed by the Unmanned Aircraft Systems Study Group (UASSG). [61]

The Circular represents the first step in reaching the goal of providing the fundamental international regulatory framework through Standards & Recommended Practices, to underpin routine operations of unmanned aircraft systems throughout the world in a safe, harmonized and seamless manner comparable to that of manned operations.

One of the most important aspects of the said Circular is the presence of clear definitions for many terms and expressions used in the field of unmanned

[59] Chapter 5.41 of Circular 328.

[60] The intention of this section is to examine the non-binding documents adopted by ICAO on the subject of unmanned aviation other than the Annexes to the Chicago Convention. For their nature, indeed, also the Recommended Practices set forth in the Annexes are to be considered part of international soft law.

[61] The Unmanned Aircraft System Study Group (UASSG) was established by ICAO Air Navigation Commission (ANC) at the Second Meeting of its 175th Session on 19 April 2007. Also examined by MENDEZ, R. D., "Situación Internacional de las aeronaves pilotadas a distancia", *Revista Latino Americana de Derecho Aeronáutico,* 2018, IJ-DXXXIV-121.

navigation. These include the concepts of aircraft (corresponding to the one formally recognized by ICAO), autonomous aircraft, remotely-piloted aircraft (RPA) as subcategories of the general category of unmanned aircraft or unmanned aircraft system. [62] The Circular provides the explanation of other important terms, such as pilot-in-command, remote crew member, remote pilot station or RPA observer, which will be subject of a deeper analysis in this section.

Regarding the scope of the Circular, ICAO makes clear its intention not to address autonomous aircraft, because of the fundamental role that still has to be acknowledged to the pilot-in-command, responsible of the safe operations of the aircraft in its interaction with other civil aircraft and the air traffic management system, whereas autonomous aircraft cannot guarantee a real-time based management. The possibility of some individual States to accommodate autonomous aircraft in their legal systems, through the adoption of special provisions or only in segregated airspace, is not exactly coincident with the objective of ICAO in intervening on the subject, namely the full integration of unmanned aircraft into the civil aviation, therefore reserved only to remotely piloted aircraft. This is confirmed by the above-mentioned interpretation reserved by ICAO to the wording of Article 8 of the Chicago Convention, in particular the use of the verb «shall be so controlled», which expressly excludes all aircraft not even remotely piloted from the scope of all international legal framework on aviation law.

ICAO position on this matter is clear: there shall always be a pilot responsible for the operations with unmanned aircraft and «under no circumstance will the pilot responsibility be replaced by technologies in the foreseeable future». [63] This is why it is necessary to have a person with the capability of intervening at any moment in the management of the flight, equivalent to the capacity of a traditional pilot to take prompt control of the aircraft flown by its auto flight system. We believe that this may represent a strong limitation in developing fully automated vehicles, as will be seen when it comes to unmanned shipping.

Another important exclusion explicitly made by the document is that of

[62] The Circular defines autonomous aircraft as «[a]n unmanned aircraft that does not allow pilot intervention in the management of the flight» and remotely-piloted aircraft as «[a]n aircraft where the flying pilot is not on board the aircraft, expressly noted as a subcategory of unmanned aircraft».

[63] See chapter 3.1 of the Circular.

model aircraft, which fall outside the scope of the Chicago Convention, therefore not covered by air law not even in the case of unmanned model aircraft. [64]

ICAO, in the Circular under examination, remembers the first steps taken in the field of unmanned aerial vehicles, through the first meetings held in 2006 and 2007, where the need to harmonize notions, concepts and terms was identified. Afterwards, the purpose of the Circular was to inform States of ICAO perspective on the integration of unmanned aircraft into the civil airspace, to identify the relevant differences between manned and unmanned navigation and to encourage States to help the development of ICAO policy on this matter.

The current situation at the time of drafting the document, but still to be found today, was that of most unmanned flights operated in segregated airspace, in order to avoid critical situations with respect to other traditional aircraft, both for the inability of unmanned aircraft to comply with critical rules of the air and for the absence of International Standards and Recommended Practices specifically guiding unmanned aircraft operators. Their integration into the civil airspace means opening their flight into the non-segregated airspace, achieving and maintaining the highest possible uniform level of safety, as a goal for the general regulatory framework in international aviation. [65]

This is the reason why safety is regarded as the core element in addressing unmanned vehicles regulations. [66] The document itself defines the concept of safety as «[t]he state in which the possibility of harm to persons or of property damage is

[64] Model aircraft are devices used exclusively for recreational purposes and form a separate category of aviation, usually excluded by all legislations in the field of air law. With regard to unmanned aircraft, their characteristics and their new uses pose new points of contact with model aircraft; this is the reason why all law-makers and regulators usually address model aircraft in their documents concerning unmanned aviation and are currently starting to include them in their scope of application. Cf. Recital (34) of Regulation (EU) 2018/1139.

[65] Always bearing in mind the principle of equivalence as paramount standard: cf. MASUTTI, A., "Proposals for the Regulation of Unmanned Air Vehicle Use in Common Airspace", *Air & Space Law* 2009, 7 and CARDI, A. "La certificazione degli Unmanned Aerial Vehicles (UAV)", *Il diritto aeronautico a cent'anni dal primo volo*, Antonini, A. – Franchi, B. (eds.), Milano, 2005, 90. Other principles for the integration of unmanned aircraft into the non-segregated airspace are outlined by GUERRERO LEBRÓN, M.J. - CUERNO REJADO, C. - MÁRQUEZ LOBILLO, P., *supra* note 12, 75.

[66] In this context we introduce the distinction of the notion of safety with that of security, not easily distinguishable in languages such as Italian, where both terms translate to a single word, such as «*sicurezza*». Unlike safety, security refers to the state of being free from danger or threat, therefore considering unlawful acts by humans. See XERRI SALAMONE, A., "La sicurezza come valore nel diritto della navigazione e dei trasporti e nella formazione di un diritto comune europeo", *Sicurezza, navigazione e trasporti*, Tranquilli Leali, R. – Rosafio, E. G. (eds.), Milano, 2008, 161.

reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management». [67] Such process implies the two key concepts of State safety programme and safety management system. [68] This definition has been considered slightly different from the common meaning of the term safety, which would rather refer to a total absence of risks of harm to persons of damage to property. [69] This would be impossible to achieve in the aviation context, where a condition of safety is when such risks are reduced to an acceptable level: after all, it has been stressed that «the history of aviation is the history of improving safety». [70]

The Circular embraces the concept of unmanned aircraft system, as is evident by the title itself. Unlike conventional aircraft, one of the principal features of unmanned technology is the involvement of several components forming a whole system. This has to be taken into account by regulators when addressing the relevant legal issues. Unmanned aircraft systems, or more specifically remotely piloted aircraft systems, include not only the aircraft itself, but also its associated remote pilot station, the communication link and other equipment as may be required. This concept is made even more complicated if we consider that the different components can be located in different States; [71] that an aircraft can be piloted from many different stations or there may be a handover from one remote station to another; or that a single remote pilot station operates more aircraft.

ICAO recognizes the existence of these issues to be addressed and conducts a brief inspection of single aspects of the aviation regulatory framework, likely to be affected by the introduction of remotely piloted aircraft. These basically encompass all sectors regulated through the annexes to the Chicago Convention, from the central issue of collision avoidance, with a particular regard to detect and

[67] See chapter 2 of the Circular, on Safety Management.

[68] State safety programme refers to «an integrated set of regulations and activities aimed at improving safety», while the safety management system is «a systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures»

[69] PELLEGRINO, F., "La definizione di sicurezza aerea", *Aeroporti e Responsabilità*, Deiana, M. (ed.), Cagliari, 2005, 173. Also, HUANG, J., *Aviation Safety through the Rule of Law: ICAO's Mechanisms and Practices*, Alphen aan den Rijn, 2009, 6, reminds that the common meaning of the term is rather referring to a «freedom from danger or risk».

[70] HUANG, J., *supra* note 63, at 8.

[71] SIA, A.L.M., "Profili", *supra* note 43, at 761.

avoid solutions, to the integration of aerodrome operations, [72] from security, [73] to aeronautical communications, from nationality and registration marks to meteorological service.

But what poses major difficulties is the field of certification, with a special regard to airworthiness. [74] This is mainly due to the above mentioned concept of system, which is made by different components and may require a new approach to the certification of the single element or the system as a whole.

With regard to certification, ICAO has identified two possible approaches: one is based on the consideration of a remotely piloted aircraft system as a whole, entirely included in the Type Certificate [75] of the aircraft itself, under the responsibility of the unique Type Certificate holder. A second option determines a totally new approach, treating the aircraft and the remote pilot station separately and individually. [76] This may require a deeper regulatory intervention for a better adaptation to this new scenario. [77]

Moreover, one may take into consideration the introduction of a new «UAS operator certificate», referred to as «UOC», to authorize the operator to conduct navigational activities with an unmanned vehicle. Finally, ICAO considers the possibility of a remote pilot station operated as a commercial enterprise, therefore introducing a new actor in the aviation sector, who will be separate from the owner

[72] Which involves, among others, the applicability of aerodrome signs and marks to remotely piloted aircraft, their integration with manned aircraft on the manoeuvring area and their ability to follow Air Traffic Control instructions.

[73] With the potential vulnerability of the premises, not located in an isolated environment such as the cockpit of a traditional aircraft moving through the air, but on the ground, therefore more exposed to unlawful interference.

[74] For an overview on unmanned aircraft certification, see: CARDI, A. "La certificazione degli Unmanned Aerial Vehicles (UAV)", *Il diritto aeronautico a cent'anni dal primo volo*, Antonini, A. – Franchi, B. (eds.), Milano, 2005, 87.

[75] The Type Certificate is a document issued by the aeronautical authority of a country when the correspondence of an aeronautical product (aircraft, engine or propeller) to the airworthiness requisites provided for by the law in force for that specific type of product is demonstrated.

[76] Cf. MASUTTI, A., "Prospettive di regolamentazione dell'uso dei velivoli senza pilota (UAV) nello spazio aereo comune", *Diritto dei Trasporti* 2007, 788.

[77] Chapter 6.6. of the Circular. The new airworthiness certification for unmanned aircraft should be determined according to the risks to persons and property on the ground, hence on the operational environment overflown, and on the type of the aircraft: cf. CLOTHIER, R. – PALMER, J.F. – WALKER, R.A – FULTON, N., "Definition of an airworthiness certification framework for civil unmanned aircraft systems", *Safety Science* 2011, 874.

of the aircraft and bound with commercial contracts. [78]

When it comes to airworthiness, according to ICAO, many of the existing Standards and Recommended Practices are applicable to unmanned aircraft, while others may require innovative solutions, especially for the following reasons: SARPs are addressed to aircraft over 750 kg intended for carriage of passengers, cargo or mail; there are no specific SARPs for the remote control station; unmanned aircraft introduce new types of airframes and powerplants, with non-traditional construction methods; there will be new technologies involving several aspects such as detect and avoid, operational communications and data links. [79]

Last but not least, as already described in the previous section dedicated to the analysis of the annexes to the Chicago Convention, the subject of personnel licensing will be highly important and has been dealt with in the Circular under examination. The problems, according to ICAO, will arise from the absence of a direct personal contact between the authorities of the destination State and the remote pilot, who, in international flights, will be located in the territory of another country; there will be a need for new remote pilot skills, knowledge and training; the emergence of new figures will require adjustments to the existing regulations, for instance with the presence of a «remotely piloted aircraft observer». [80]

Most of these issues are emphasised by the consideration of non-applicability of the provisions of Article 32 of the Chicago Convention to the remote pilot and remote crew members, according to ICAO debatable interpretation. [81]

Based on what emerges in the Circular, the Manual on Remotely Piloted Aircraft System (RPAS), Doc 10019-AN/507, was elaborated by the UASSG and adopted by ICAO in 2015. The purpose of the Manual is to provide guidance on technical and operational issues applicable to the integration of remotely piloted aircraft in non-segregated airspace and at aerodromes. [82] It is regarded as the starting point of a process which will end with the definition of SARPs and

[78] Chapter 6.3 of the Circular.

[79] Chapters 6.16 and 6.17 of the Circular.

[80] Chapter 7.10 of the Circular.

[81] See PETERSON, *supra* note 2, at 593, who points out the universal acceptance of the concept of pilot in command, thus preferring the use of existing rules rather than inventing new concepts for the remote pilot.

[82] See Chapter 1, ICAO Regolatory Framework and Scope of the Manual, section 1.4.

Procedures for Air Navigation Services (PANS). [83]

3. The position of the European Union

After the first overview on the current status of the law concerning unmanned aviation at the international level, we will now proceed to investigate the position within the European Union, retracing the evolution that led to the current legislation still in progress, through the observation of the many policy documents and instruments of soft law.

The previous European legal framework, today recently repealed, started from the consideration of a separation of competences between the Union and the Members States. This was found in the so-called Basic Regulation, namely Regulation (CE) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/CEE, Regulation (EC) No 1592/2002 and Directive 2004/36/EC.

The scope of the Regulation was, among others, the design, production, maintenance and operation of aeronautical products, parts and appliances, as well as personnel and organisation involved in the design, production and maintenance of such products, parts and appliance; personnel and organisation involved in the operation of aircraft. [84] On the contrary, all services related to military, customs, police, search and rescue, firefighting, coastguard or similar activities, essentially every exercise of public authority, fell outside the scope of the Regulation. [85]

The principal objective of the instrument was to establish and maintain a high uniform level of civil aviation safety in Europe, and this was achieved through a set of rules concerning all aspects of aviation, from airworthiness to the essential requirements for pilots, from air operations to the establishment of a European Aviation Safety Agency for the purpose of implementing the Regulation. [86]

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[83] See MENDEZ, R. D., *supra* note 61.

[84] Article 1, paragraph 1(a)(b) of Regulation 216/2008.

[85] Article 1, paragraph 2 of Regulation 216/2008.

[86] Chapter III is dedicated to the establishment and organisation of EASA. In the meantime, the European framework on aviation has witness a growing involvement of EASA, to the point of achieving the current international dimension of the Agency thanks to the new Regulation (EU) 2018/1139. For an overview, see UVA, R. S., "The International Dimension of EASA Under the New

But the provision of our greatest interest was the one contained in Annex II, which lists the cases where Article 4, paragraphs 1, 2 and 3 did not apply. Article 4(1), (2) and (3) of Regulation 216/2008 established aircraft, personnel and operations which were bound to comply with the Regulation itself, namely aircraft designed or manufactured by an organisation for which the Agency or a Member State ensures safety oversight; registered in a Member State, unless their regulatory safety oversight has been delegated to a third country and they are not used by a Community operator; or registered in a third country and used by an operator for which any Member State ensures oversight of operations or used into, within or out of the Community by an operator established or residing in the Community; registered in a third country, or registered in a Member State which has delegated their regulatory safety oversight to a third country, and used by a third-country operator into, within or out of the Community; personnel involved in and operations concerning the use of the above mentioned aircraft.

Under Annex II, although falling within one or more of the above-mentioned categories, unmanned aircraft with an operating mass of no more than 150 kg were excluded from the application of the Regulation. [87]

Such provision perfectly reflected what had been formerly established under the previously in force Regulation (EC) 1592/2002 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, repealed by the following Regulation 216/2008. It was the first European binding instrument to mention unmanned aircraft, in the same way in which the following regulation subsequently did, thus creating a separation of competences between the European Union, for unmanned aircraft of an operating mass above 150 kg, and the Member States, for unmanned aircraft of an operating mass below 150 kg. [88]

It is interesting, however, to remark the presence of unmanned aircraft within European legislation even before the adoption of the Aviation Basic Regulation, although for totally different purposes. Council Regulation (EC) No 1334/2000 of 22 June 2000 setting up a Community regime for the control of exports of dual-use

Basic Regulation". *Air & Space Law* 2018, 411.

[87] See letter (i) of the Annex.

[88] For the sake of accuracy, Annex II of Regulation 1592/2002 excluded from its scope unmanned aircraft with an operating mass of less than 150 kg, thus showing a slight difference with the provision of Annex II of the Regulation 216/2008.

items and technology, [89] contains provisions dedicated to unmanned aircraft. [90] In establishing a regime of controls of the export of dual-use goods, namely items, including software and technology, which can be used for both civil and military purposes, the Regulation includes, in the list of dual-use items and technology, in category 9 – aerospace and propulsion –, unmanned aerial vehicles having an autonomous flight control and navigation capacity or capability of controlled-flight out of the direct vision range involving a human operator; associated systems, equipment and components, especially designed for remotely controlling the previously mentioned unmanned aerial vehicles. [91]

This Regulation is interesting also because it contains a definition of unmanned aerial vehicles, hence being the very first definition in European legislation, as follows: «any aircraft capable of initiating flight and sustaining controlled flight and navigating without any human presence on board». [92]

Besides these two cases of provisions concerning unmanned aviation, to be found in very different contexts and for very different purposes, all that has been said regarding unmanned aircraft was, until recent times, contained in studies, programmatic documents and instruments of soft law. This shows a great interest demonstrated by the European institutions on this field, an interest which, however, has found a concrete outcome resulting in legislation only in the second half of 2018.

The current new situation is the result of a European policy expressed through a set of programmatic documents which will be subject to analysis, before considering the latest Regulation.

The first document to be taken into account is the UAV Task-Force Final report, entitled «A concept for European Regulations for civil unmanned aerial vehicles (UAVs)», the outcome of a joint initiative of the Joint Aviation Authorities

[89] Later repealed by Council Regulation (EC) No 428/2009 of 5 May 2009 setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items.

[90] Following the modifications introduced by Council Regulation (EC) No. 394/2006 of 27 February 2006 amending and updating Regulation (EC) No 1334/200.

[91] Annex I, List of dual-use items and technology, of Regulation 1334/2000, category 9A012.

[92] See among the definitions of terms used in this Annex.

(JAA) [93] and Eurocontrol [94], issued on 11 May 2004.

The initiative was born as a reaction to the growing European unmanned vehicle industry, starting from the consideration that the non-existence of regulations for the civil use of unmanned aircraft was seen as an obstacle for a further development of that industry. The areas covered by this work are essentially all aspects related to civil aviation: safety and security, airworthiness, environment, operations, maintenance, licensing and air traffic management. It aimed at setting forth a concept for a regulation on civil unmanned aircraft that would allow, when implemented, their safe integration into the European airspace.

The drafters of the document believed that this goal had to pass through a principle of equivalence: the integration of unmanned aircraft should determine an equivalent level of risk with respect to that currently existing in the aviation sector. That would mean a retention, as far as applicable, of the existing rules, such as existing civil certification procedures for airworthiness, or at least staying as close to the existing norms as possible. [95]

In particular, the JAA and Eurocontrol recommended changes to Regulation 1592/2002 to facilitate the certification of unmanned aerial vehicles, through the introduction of an «UAV Type Certification». This latter recommendation was firstly not followed, given the adoption of Regulation 216/2008 repealing Regulation 1592/2002 but not providing anything new with regard to unmanned aircraft. [96]

Many other topics were addressed in that document, which identified, fifteen

[93] The Joint Aviation Authorities (JAA) was an association of civil aviation authorities of European States, agreeing to cooperate, on a purely voluntary basis, to the development and implementation of regulations and procedures in the field of aviation safety, with the aim of providing high and constant levels of security, as well as common conditions of competition at European level. In 2009 JAA was disbanded.

[94] The European Organisation for the Safety of Air Navigation, commonly known as Eurocontrol is an intergovernmental, civil and military organization involving 41 European countries and neighbouring countries, whose main aim is to develop and maintain an efficient air traffic control system at European level, supporting in this joint commitment of national civil aviation authorities, entities and providers of air traffic control services, users of civil and military airspace, the industrial sector, professional organizations and the relevant European institutions. In the last ten years, Eurocontrol has been involved in investigating issues related to unmanned aircraft, aiming at supporting the development of regulatory, operational and technical provisions, in order to accommodate and integrate civil and military remotely piloted aircraft systems into the European Air Traffic Management environment as a legitimate airspace user.

[95] See principle 5.2 of the Task Force.

[96] Now, instead, taken into consideration by the new Basic Regulation.

years ago, several issues which are still today under study by the competent authorities, in order to find a permanent legislative solution. [97]

After this work of 2004, the European institutions had basically been silent on unmanned aviation for the following decade, except for a sporadic intervention of the newly created EASA in the following year with two documents, an Advanced-Notice of Proposed Amendment No 16-2005 «Policy for Unmanned Aerial Vehicle certification» [98] and a Policy Statement – Airworthiness Certification. [99]

Afterwards, commencing from 2014, essentially all the institutions of the European Union started showing their interest in the field, issuing communications and resolutions and finally starting the procedures for the adoption of new regulations. The European Commission intervened with its Communication to the European Parliament and the Council, «A new era for aviation. Opening the aviation market to the civil use of remotely piloted aircraft systems in a safe and sustainable manner», issued on 8 April 2014. [100]

The Commission, considering safety as the paramount goal of the European aviation policy and regulations, showed its support for unmanned aircraft, here referred to in their subcategory of remotely piloted aircraft, to be able to fly «like normal air traffic» and be integrated into non-segregated civil airspace, among the «normally piloted» aircraft. It also stressed the need for a change in the

[97] Among these issues identified in the document, we can mention the applicability of flight rules; instruments of collision avoidance; the handover, as an evidence of the need to clarify the identity of the pilot at all times; the proposal for a classification of light UAVs, recognising their different needs, etc.

[98] Issued with the purpose of establishing a policy for the certification of unmanned aerial vehicles, as a first step towards a more comprehensive UAV regulation. The document contains an attachment with the guiding principles for UAV airworthiness regulation, still not followed in subsequent years.

[99] Doc. E. Y 013.01 issued on 25 August 2009. In the years to follow, some new works were published, such as the Commission Staff Working Document «Towards a European strategy for the development of civil applications of Remotely Piloted Aircraft Systems (RPAS)», SWD(2012) 259 final, published on 4 September 2012 and the «Roadmap for the integration of civil Remotely-Piloted Aircraft Systems into the European Aviation System», final report from the European RPAS Steering Group issued in 2013. This latter identifies some necessary technological development for the integration of unmanned aircraft into the European airspace, concerning, e.g., data communication links, security issues, surface operations including take-off and landing, detect and avoid systems, integration of unmanned vehicles into Air Traffic Management services. Moreover, this work is among the first to propose the transfer of national competence for remotely piloted aircraft systems below 150 kg of operating mass to the European Union, in a smooth and progressive way, proposal which has recently been met by the new European regulation, subject to a deep examination in this section of this work.

[100] Document COM (2014) 207 Final.

competences between the European Union and Member States, reconsidering the restricted scope of EASA competence to unmanned aircraft of an operating mass of more than 150 kg, deemed as an arbitrary cut off point.

The Commission, in its communication, identified several actions to be taken by the European regulators: to integrate remotely piloted aircraft systems into the European airspace, covering the necessary basic regulatory issues, a task assigned to the competent authority, namely EASA; to cover security aspects; to identify applications of unmanned aircraft compliant with data protection legislations; to create a clear liability regime and third-party insurance system and to take specific actions to foster the development of the market.

Subsequently, the document which can be considered the «manifesto» of the European policy on unmanned aviation, is the so-called «Riga Declaration», released on 6 March 2015. In this document, the European aviation community stressed the necessity for European Union regulators to ensure that all the conditions are met for the safe and sustainable emergence of innovative unmanned aircraft services, through the establishment of the following principles:

1. Drones [101] need to be treated as new types of aircraft with proportionate rules based on the risk of each operation; [102]
2. European Union rules for the safe provision of drone services need to be developed now; [103]
3. Technologies and standards need to be developed for the full integration of drones in the European airspace; [104]
4. Public acceptance is key to the growth of drone service; [105]

[101] It is interesting to notice the term used in the document, which is the one most commonly widespread in the society, outside the specialised environment. This may be an intentional choice of the drafters, made to address an open audience, as a programmatic document on behalf of all the European authorities to the civil society. Also EASA initially had used the term «drones», later abandoned: see below, note 109.

[102] Such rules should be simple, performance-based and should not reduce the level of safety currently achieved in civil aviation. More stringent rules should correspond to higher risks.

[103] Through this principle, the European Commission specifically mandates the EASA to revise the safety regulation by the end of the same year, 2015. The result, although not yet accomplished, has been at least the starting of the procedure for such revision.

[104] In this regard, the Commission recognises the need for specific and adequate investments for the development of such technologies and standards.

[105] Public acceptance implies the protection of civil fundamental rights, such as the right to privacy and security.

5. The operator of a drone is responsible for its use. [106]

After the Commission, the European Parliament intervened in the debate, through the approval of a resolution entitled «Safe use of remotely piloted aircraft systems (RPAS) in the field of civil aviation» on 29 October 2015. [107] In this programmatic document, the Parliament acknowledged the role of Europe as a leader in the civilian sector of remotely piloted aircraft, [108] therefore calling for a legal framework to ensure investment and development in the market.

Such a legal framework should cover all aspects of civil aviation, addressing airworthiness, certification specification, commercial and recreational use, the identity of owner and operator, the approval of training organisations for pilots, liability and insurance, data protection, privacy, geofencing and no-fly zones. The Parliament also favours the development of out-of-sight flights and the removal of the 150 kg threshold, at that time limiting the European competence in the field.

Particularly following the call of the Riga Declaration, the European Aviation Safety Agency started the procedure for the adoption of a new Regulation, aimed at creating that framework strongly supported by all the European institutions. That led to the issue of an Advanced – Notice of Proposed Amendment No 2015-10, with the relevant Technical Opinion in December 2015. Afterwards EASA issued a Prototype Commission Regulations on Unmanned Aircraft Operations in August 2016 [109] and later on, a second Advanced – Notice of Proposed Amendment No 2017-05 was released in May 2017.

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[106] The identification of the owner or operator is considered the first step to guarantee the enforcement of this principle, together with the adoption of sufficient and effective rules on insurance and reporting of incident with unmanned aircraft.

[107] Document P8-TA (2015) 0390.

[108] With 2,500 operators within its territory, against the 2,342 in the rest of the world.

[109] The Prototype Regulation is interesting since it shows what the future Regulation may look like, once it will be adopted. An important mention should be made to the definitions provided by Article 2, which even considers the term «automatic flight», meaning «a flight following preprogrammed instructions, loaded in the unmanned aircraft (UA) flight control system, that the UA executes» and gives the definition of «unmanned aircraft», often used with its acronym «UA», as «any aircraft operated or designed to be operated without a pilot on board». It is noteworthy, as well, the change in the use of wording by EASA, during the different phases of the procedure of adoption of this document: in its first Advanced – Notice of Proposed Amendment No 2015-10, the Agency made exclusively use of the term «drone». This is due, perhaps, to the different level of proximity to the final legislative act, thus regarding the latter as a programmatic document, aimed at starting the debate between institutions and stakeholders, whereas the Prototype Regulation is closer to the final binding document, where the term «unmanned aircraft», technically more appropriate, has been adopted.

The EU policy was then updated with the Opinion of a technical nature n. 01/2018, released in February 2018, dedicated to the «Introduction of a regulatory framework for the operation of unmanned aircraft systems in the 'open' and 'specific' categories», which represents one of the last documents in time issued for encouraging the participation to the debate of all the stakeholders of the sector. [110]

It is interesting to have a look at the proposed provisions, since they will constitute the future framework on the field of unmanned aviation. Some of them have already been achieved through Regulation 2018/1139; others will require the intervention of the implementing acts adopted pursuant to the said Regulation. The first noteworthy intervention is the extension of the EU competence to all unmanned aircraft, repealing the traditional limitation to vehicles with an operating mass of no more than 150 kg. [111] Such an amendment intervenes in accepting a proposal made by many of the involved actors in the previous documents, for the sake of an adequate harmonization in the legal framework, best suited to guarantee a high level of safety in the aviation sector. [112]

Regarding the content of such a future regulation, which will significantly change the current technical requirements in all Member States, the proposed framework identifies new categories of unmanned vehicles, this time classified not according to their operating mass, but to the operations themselves and the risks they pose on third parties (property and people). It is the acclaimed concept of a regulatory framework which is operation-centric, proportionate and risk-based, funded on the consideration that an aircraft, despite its light weight, can pose greater risks if operated in particular circumstances, such as urban areas, compared to desert regions. [113]

These categories are the following: «open», «specific» and «certified». [114]

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[110] MÁRQUEZ LOBILLO, P., "Análisis preliminar del futuro marco jurídico europeo para las operaciones con aeronaves pilotadas por control remoto: hacia la armonización plena", *Revista de Derecho del Transporte* 2018, 38.

[111] The EU Member States and the Parliament agreed for the revision of the Basic Regulation in this point; see https://ec.europa.eu/transport/modes/air/news/2017-12-22-aviation-strategy-eu-agrees-safer-skies-and-eu-wide-rules-drones_en (last accessed 18.01.2019).

[112] The high and uniform level of safety is among the objectives of the introduction of the new regulation. See the Opinion, section 2.2.

[113] Ivi.

[114] For a detailed analysis of the three categories, see MÁRQUEZ LOBILLO, P., *supra* note 110, at 31.

The «open» category concerns unmanned aircraft conceived to be operated in scenarios which will prove less risky than others. This low risk level will be guaranteed by the existence of specific limitations of their operations, such as a height limit of 150 metres, a weight limit of 25 kg, a minimum distance from persons of 5 m, operations allowed only in visual line of sight (referred to as VLOS), the establishment of "limited zones" or "prohibited zones", with the related equipment of geo-fencing systems, directly set in their software in order to avoid even accidental overflying over the limits established and a general prohibition of flying above crowds. It is also specified the possibility to carry dangerous goods, but only for the purpose of dropping them in connection with agricultural work, when the carriage of those goods is not in violation of any other applicable regulations.

The implementation of rules concerning the «open» category will be assigned to the law enforcement agencies of each Member State. Moreover, manufacturers and importers will be required to comply with the applicable rules on product safety and to issue information to respective customers on operational limitations applicable to the «open» category. [115] This latter proposal will, somehow, shift part of the responsibility to the initial stage of aircraft life, hence abandoning the traditional schemes conceived within aviation law and moving towards the concept of product liability. Finally, it is proposed, for this category, an internal division into three subcategories, according to the risks posed to persons. [116]

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[115] For an overview on unmanned aircraft manufacturing: SIARDI, C.A., "Tecniche di costruzione e sicurezza del volo degli Unmanned Aerial Vehicles (UAV)", *Il diritto aeronautico a cent'anni dal primo volo*, Antonini, A. – Franchi, B. (eds.), Milano, 2005, 153.

[116] A description of the subcategories is provided by Annex I, Subpart A, of the Prototype Regulation, dedicated to the «open» category, stating as follows: «Operation of UA in the 'open' category shall fall into one of the following subcategories: (a) subcategory A0: operation of UA posing a negligible risk of severe injury to people on the ground or damage to manned aircraft, and requiring neither specific remote pilot competence nor age limitations; (b) subcategory A1: operation of UA complying with requirements ensuring that they pose a negligible risk of severe injury to people on the ground or damage to manned aircraft, and requiring neither specific remote pilot competence nor strict operational limitations; (c) subcategory A2: operation of UA complying with requirements ensuring that they pose a limited risk of severe injury to people on the ground or damage to manned aircraft, operated by registered operators, and equipped with geofencing and electronic identification; (d) subcategory A3: operation of UA complying with requirements imposing technical mitigations like geofencing and electronic identification, posing a higher risk of severe injuries to people on the ground or damage to manned aircraft and operated by registered operators with higher competence». Subsequently, the Annex provides a detailed framework on the features and limits of operations in all four subcategories, establishing, for all of them, the ultimate responsibility of the operator.

The «specific» category concerns the use of unmanned aircraft in more critical operations and involves sharing the airspace with manned aviation. It is for vehicles falling within this category that we can discuss their integration into the civil, non-segregated, airspace. This is why for this class of aircraft the additional requirement of an intervention by the Member State Authorities is proposed, which will grant authorisation for conducting such operations. Before submitting a request for an authorisation, the operator will have to perform a safety risk assessment. [117] The conduct of operations will therefore be in line with the authorisation, containing all relevant elements for a safe performance, affecting both the device used and the personnel involved.

Furthermore, a measure to ensure the safety of the operations is the use of certified aviation equipment, parts and functionalities. These might be certified independently from the aircraft itself, raising the issue of adapting to new certification procedures for a phenomenon which has in the system, made out of several components, a key feature. With this regard, airworthiness plays a fundamental role, especially continuing airworthiness, which might be significantly affected by changes in the individual elements of the system.

Finally, when this risk-based approach shows a level of threat to safety which may be considered similar to the one posed by manned aviation, the operation will be included in the third category: the «certified» category. Its main characteristic is indeed its full assimilation to traditional aviation, in all sectors involved: for instance, the airworthiness of the aircraft and its compliance with environmental standards shall be ensured in the same way as is done today for manned aviation; the pilot shall be licensed and the operator shall hold a specific certificate, the so-called «remote operator certificate».

The last aspect of the proposed European Regulation that should be remarked is the idea, showed in the last document, the Opinion of a technical nature n. 01/2018, of splitting the original text of the Notice of Proposed Amendment into two different regulations: the first one, the delegated act, providing the framework

[117] The proposal also identifies the possible elements which should be taken into account by the operator in conducting the safety risk assessment, such as area of operation and population density; class of airspace, segregation, air traffic control procedures; design of the drone: functions provided, redundancy and safety features; type of drone operation and operational procedures; pilot competence; organisational factors of the operator.

on design, production, maintenance of the aircraft and their engines, propellers, parts and non-installed equipment, together with the equipment to control the aircraft; the second one, the implementing rule, dedicated to the operations and registration of unmanned aircraft.

The procedure for the introduction of a new legal framework on unmanned aircraft has reached the first achievement with the mentioned adoption of Regulation (EU) 2018/1139. The first remarkable innovation is the extension of the EU competence, strongly supported in all programmatic documents that I have examined. The new Regulation repeals Regulation (EC) 216/2008, no longer excluding unmanned aircraft below 150 kg MTOM from its scope. On the contrary, the Regulation applies not only generally to all aircraft (implicitly including unmanned aircraft) registered in a Member State, but expressly to «an unmanned aircraft, that is registered neither in a Member State nor in a third country and that is operated within the territory to which the Treaties apply by an aircraft operator established, residing or with a principal place of business within that territory». [118] The extension of the EU jurisdiction is made explicit by Recital 26, which reads as follows: «[s]ince unmanned aircraft also operate within the airspace alongside manned aircraft, this Regulation should cover unmanned aircraft, regardless of their operating mass». The new approach toward unmanned aircraft is evident also in the inclusion, within its scope, of «the design and production of products, parts and equipment to control aircraft remotely». [119]

Apart from the mentioned definitions provided by the Regulation, there are not many other provisions concerning unmanned aircraft. In particular, Section VII is dedicated to this new devices and Article 55 establishes a requirement of compliance with the rules of Annex IX, entirely dedicated to unmanned aircraft. Annex IX essentially contains general provisions, requiring, for instance, that «[t]he operator and the remote pilot must be able to ensure the safety of operation and safe separation of the unmanned aircraft from people on the ground and from other airspace users», [120] that «[u]nmanned aircraft must be safely controllable and manoeuvrable, as necessary under all anticipated operating conditions including

[118] Article 1(b)(iii) of Regulation 2018/1139.

[119] Article 1(a) of Regulation 2018/1139.

[120] Section 1.1 of Annex IX.

following the failure of one or, if appropriate, more systems», [121] and that «[t]he operator of an unmanned aircraft is responsible for the operation and must take any appropriate actions to ensure the safety of the operation». [122] Moreover, a registration will be required to operators using: «(a) unmanned aircraft which, in the case of impact, can transfer, to a human, kinetic energy above 80 Joules; (b) unmanned aircraft the operation of which presents risks to privacy, protection of personal data, security or the environment; (c) unmanned aircraft the design of which is subject to certification pursuant to Article 56(1)». [123]

All such programmatic provisions are intended to be more specifically defined by the following sources which will be adopted in the near future by the EU Institutions: in fact, the Regulation mandates the Commission to adopt implementing acts laying down detailed provisions, [124] and delegated acts on rules concerning the design, production and maintenance of unmanned aircraft and their engines, propellers, parts, non-installed equipment and equipment to control the aircraft remotely. [125]

Only when such implementing and delegated acts will be enacted, presumably in accordance with the above discussed proposals issued by EASA, the new European framework will be complete and the substitution of all the currently existing domestic regulations will be attained.

4. Italian navigation law

The last section of part I of this chapter will be dedicated to the existing provision of a domestic legal system, the Italian one, taking a brief look at the few legislative rules so far adopted, and at the technical regulation currently in force, bearing in mind the this latter will have a short life, considering the future adoption

[121] Section 2.1.3 of Annex IX.

[122] Section 2.4.1 of Annex IX.

[123] Section 4.2 of Annex IX. The mentioned Article 56(1) provides that «a certificate may be required for the design, production, maintenance and operation of unmanned aircraft and their engines, propellers, parts, non-installed equipment and equipment to control them remotely, as well as for the personnel, including remote pilots, and organisations involved in those activities».

[124] Article 57 of Regulation 2018/1139.

[125] Article 58 of Regulation 2018/1139.

of a European regulation covering unmanned aircraft of all weights and repealing all national frameworks on the subject. [126]

It should be added that, although having some unavoidable differences, the various domestic regulations have many commonalities, such as the main separation between unmanned aircraft below and above a 25 kg weight. The Italian Regulation will be therefore taken as an example of how the individual States have intervened in the field of unmanned aviation and what the current status of its framework is. [127]

As mentioned in the introduction of this work, the core of Italian navigation law is the Navigation Code (*Codice della Navigazione)*, adopted in 1942 as a Royal Decree. Here we find the fundamental norms of both maritime and air law, starting from the definitions themselves of ship and aircraft. Indeed, as mentioned in the chapter dedicated to the definition of unmanned aircraft, the Italian legislator has relatively recently intervened with an important reform of the aviation part of the Code, involving the concept of aircraft as well. [128] Under Article 743 of the Italian Navigation Code, remotely piloted aerial vehicles, as defined by the Italian Civil Aviation Authority, are considered to be aircraft. That implies the direct applicability of all legislation concerning aircraft, although some Authors argue for a differentiated applicability, to be identified case by case according to the subject

[126] For a general overview of the domestic regulation on unmanned aircraft in the United States of America, see STRAUB, J. - VACEK, J. - NORDLIE, J., "Considering Regulation of Small Unmanned Aerial Systems in the United States", *Air & Space Law* 2014, 275; TAKAHASHI, T.T., "Drones in the National Airspace", *Journal of Air Law & Commerce* 2012, 489; RAVICH, T.M., "The Integration of Unamnned Aerial Vehicles into the National Airspace", *North Dakota Law Review* 2009, 597.

[127] For instance, the threshold of 25 kg and 2 kg are taken into account by the recent Real Decreto 1036/2017, of 15 December 2017, regulating the use of unmanned civil aircraft in Spain, or by the French regulation, namely *Arrêté du 17 décembre 2015 relatif à la conception des aéronefs civils qui circulent sans personne à bord, aux conditions de leur emploi et aux capacités requises des personnes qui les utilisent*, of course with differences which make the introduction of a harmonized regulation a necessary step in the evolution of the European unmanned aircraft market.

[128] The intervention for the introduction of a framework on unmanned military aircraft occurred even prior to the reform of the Navigation Code. The Law n. 178/2004 authorizes the Italian armed forces, waiting for a legislation governing their use and their airworthiness, to use drones in operational and training activities for national security and defence. Following the amendment of Article 743 of the Navigation Code, with the inclusion of remotely piloted aircraft, the Minister of Defence adopted a Decree on 23 June 2006 for the identification of remotely piloted military aircraft (RPA), pursuant to the second paragraph of Article 743 of the Navigation Code. Finally, Articles from 246 to 248 of the Legislative Decree 66/2010 are dedicated to the use of military RPA. Cf. SEVERONI. C. "La disciplina normativa attuale degli aeromobili a pilotaggio remoto"*, Diritto dei Trasporti* 2016, 91.

concerned, given the different needs characterising remotely piloted aircraft. [129] As previously discussed, the expression used by the Italian legislator reflects its clear choice of excluding autonomous vehicles from its scope, perhaps in compliance with the requirement provided by the Chicago Convention of aircraft being «controlled». [130]

The Italian Civil Aviation Authority (Ente Nazionale per l'Aviazione Civile – ENAC) issued its Regulation on remotely piloted aircraft systems late in 2013, subsequently repealed by a second edition in 2015. [131] To sum up its main provisions, the Regulation makes a main distinction between remotely piloted aircraft systems (RPAS), subject to comply with the Regulation itself and falling within the general scope of air law, and model aircraft, excluded from this field of law. [132] Within the category of RPAS, two subcategories are identified according to the maximum take-off mass (MTOM), below or above 25 kg. The former category requires an authorisation by ENAC in case of critical operations, [133] whereas for non-critical operations a self-declaration is sufficient. [134] For aircraft lighter than 2 kg, operations are always considered non-critical, as long as it is proven that the device is harmless, and it is operated by a certified pilot; RPAS with a weight of less than 300 grams are, instead, always considered inoffensive and their operation is non-critical in all cases. All these categories of RPAS are required to carry an

[129] LA TORRE, U., "Gli UAV: mezzi aerei senza pilota", *Sicurezza, navigazione, trasporto,* Tranquilli-Leali, R - Rosafio, E., (eds.), Milano, 2007, 116.

[130] Although such a choice is considered contradicted by the ENAC Regulation according to SEVERONI, C., "Soccorso e mezzi di trasporto autonomi", *Diritto dei Trasporti* 2018, 29 note 3.

[131] For a thorough description of the Italian Civil Aviation Authority Regulation see SIA, A.L.M., "Profili", *supra* note 43, at 761; ROSAFIO, E., "Considerazioni sui mezzi aerei a pilotaggio remoto e sul regolamento ENAC", *Rivista del Diritto della Navigazione* 2014, 787; LOBIANCO, R., "Mezzi aerei a pilotaggio remoto: brevi osservazioni sul regolamento ENAC", *Responsabilità Civile e previdenza* 2017, 2065.

[132] Although the Regulation contains some provisions dedicated to model aircraft. For a critical comment of the standard for distinction between remotely piloted aircraft and model aircraft, see ANTONINI, A., "Le future sfide del diritto aeronautico: nuovi aeroporti, nuovi aeromobili", *Diritto dei Trasporti* 2015, 749.

[133] Critical operations are identified by exclusion, starting from the definition of non-critical operations, as those conducted in visual line of sight (VLOS) which do not overfly, even in case of malfunctions and/or failures, congested area, gathering of persons, urban areas or critical infrastructures.

[134] For some critical comments on this system based on the difference between authorisation and self-declaration, see RUIZ, M.M., "La necesaria ordenación jurídico-administrativa de los drones en el derecho español entre la libre competencia y la protección del interés general*", Revista de derecho del transporte* 2016, 81.

identification plate and flying over crowds is always prohibited. [135]

Above 25 kg, unmanned aircraft shall be registered and shall bear an airworthiness certificate. Some rules are provided on pilot licences, on the operator responsibilities [136] and on the mandatory insurance, through a reference to the Regulation (EC) 785/2004, with an important issue of coordination between the different norms, considering the error of translation in the Italian version of the said European Regulation, which will be discussed later in this work.

As previously mentioned, this Regulation is destined to be repealed by the new European framework, now that the EU Institutions have extended their competence to unmanned aircraft of all weights.

5. Concluding remarks

Following the investigation on technical rules concerning unmanned aircraft at all levels of legislation, herein conducted, the first question that comes to mind is still the following: what will the future regulatory framework of unmanned aircraft be like?

In the light of what has been observed in this chapter, the aspect which emerges with greater clarity is arguably the fact that everything is still in progress. This is the reason why we still wonder about the evolution that regulations on unmanned aircraft will experience in the years to come. At all levels we will surely witness new scenarios, starting from the adoption of technical rules specifically developed for remotely piloted aircraft systems within the framework of the annexes to the Chicago Convention, through International Standards and Recommended Practices.

But a significant change will soon become effective in the European legal system and, consequently, in that of all Member States: the recent adoption of Regulation (EU) 2018/1139, repealing the previous distribution of competences, has removed the jurisdiction of the Member States over unmanned aircraft also below 150 kg, with the aim of creating a harmonized framework.

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[135] Articles 10.7, 12.2, 12.5 of ENAC Regulation.

[136] The operator is identified through a factual concept, which differs from the one used for the aircraft operator (*esercente*) generally provided by the Navigation Code SEVERONI. C., "La disciplina", *supra* note 128, at 79.

Be that as it may, the level of technology achieved proves that what has been stated back in 2006 is no longer valid today: «most of the work left to fully integrate UAVs is unfinished business behind the chalk boards, computers, and labs of inventors, engineers, and scientists», rather than the regulators. [137] In the aviation sector, unlike the maritime world, law-makers have all instruments to intervene significantly and create an appropriate framework to finally achieve the desired integration of unmanned aircraft.

[137] PETERSON, *supra* note 2, at 593.

Part II – Maritime Law

SUMMARY - 1. Introduction - 2. The United Nations Convention on the Law of the Sea - 3. The International Convention for the Safety of Life at Sea - 4. The International Regulations for Preventing Collisions at Sea - 5. The International Convention on Standards of Training, Certification and Whatchkeeping for Seafarers 6. Concluding remarks.

1. Introduction

All that we have observed in the field of unmanned aircraft unfortunately finds no correspondence in the maritime sector. Whereas a legal framework on unmanned air navigation, although timidly, has already seen the light, even starting from an unsuspected era, unmanned shipping is still at an embryonic stage not only in technology but also in the legal context.

What may the content of a work of a legal nature be, then? Looking at all legislation requiring the presence of humans on board the ship is perhaps just what we can do, under the assumption that all that has been so far laid down has been established bearing in mind conventional vessels as they have always been up to these days: that is manned. In many contexts this is just taken for granted, with no explicit reference to an on-board crew or master, for the simple fact that all craft, in order to fulfil their tasks, naturally require a seafarer operating from the inside. [1]

After all, even before the advent of unmanned technology, safety has always been a major concern for all regulators in the maritime world, often seen in close connection with the human element. [2] For example, IMO adopted Resolution A.850(20) on 27 November 1997 on «Human element vision, principles and goals

[1] GOGARTY, B - HAGGER, M. C., "The Laws of Man Over Vehicles Unmanned: The Legal Response to Robotic Revolution on Sea, Land and Air", *Journal of Law, Information and Science* 2008, 114, observe that admiralty law «contains assumptions that seagoing vessels are human-operated».

[2] According to LORENZON, F., "Safety and Compliance", Baatz, Y (ed.) *Maritime Law*, forth ed., Abingdon, Oxon, 2018, 353, the commonality of the conventions to be analysed in this chapter lies in the circumstance that they «all focus on the human and technical element of shipping, aiming at preventing human error, enhancing the working and living conditions of seafarers and - in the broadest sense – preserving life at sea».

for the Organization». In order to grasp the importance of the human factor, one just needs to take a look at the wording used by IMO in the section of the Resolution dedicated to those principles: «[t]he human element is a complex multi-dimensional issue that affects maritime safety and marine environmental protection. It involves the entire spectrum of human activities performed by ships' crews, shore based management, regulatory bodies, recognized organizations, shipyards, legislators, and other relevant parties, all of whom need to cooperate to address human element issues effectively». [3]

The human element is thus a complex but fundamental factor of the shipping world, today questioned by the new technology: its interaction with the existing technical regulation conceiving its physical presence on board the vessel will be subject to analysis in this chapter, starting with the United Nations Convention on the Law of the Sea, then moving on to the Safety of Life at Sea Convention, the International Regulations for Preventing Collision at Sea and the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.

2. The United Nations Convention on the Law of the Sea

The first document to be analysed is the United Nation Convention on the Law of the Sea (UNCLOS). [4] The corresponding instrument in air law, the Chicago Convention, contains an article entirely dedicated to unmanned vehicles. On the contrary, in this fundamental convention on the law of the sea, there is no mention whatsoever to unmanned navigation.

However, it is still necessary to start with its provisions, as here we can find the first mention to the necessity of manning the vessels. [5] Most of the rules that may be of interest to us are located in Part VII of the Convention, dedicated to the High

[3] IMO Resolution A.850(20) of 27 November 1997, Principle (a).

[4] The mentioned Convention is often referred to with the acronym UNCLOS, although some authors prefer the acronym of Law of the Sea Convention (LOSC) to avoid confusion with UNCLOS III, referring to the Conference which gave birth to the Convention.

[5] For an overview on the issues related to the applicability of the existing international law to unmanned ships, see DAUM, O., - STELLPFLUG, T., "The implications of international law on unmanned merchant vessels", *Journal of International Maritime Law* 2017, 363.

Seas, particularly in Section 1, General Provisions. One of the greatest achievements of the Convention is the definitive establishment of the maritime zones, now recognised not only by all States parties to the Convention, but also by all other countries by means of its nature of provisions of customary law. [6]

The separation of the marine areas into different zones, with different regulations is a reflection of the compromise found between two historical principles of the law of the sea: the principle of freedom of navigation and the principle of State sovereignty. [7] This latter is reaffirmed in Article 2 of UNCLOS, whereby «[t]he sovereignty of a coastal State extends, beyond its land territory and internal waters and, in the case of an archipelagic State, its archipelagic waters, to an adjacent belt of sea, described as the territorial sea». This means that a coastal State enjoys its full sovereignty up to the limits of the territorial sea. Beyond that line, UNLCOS only grants sovereign rights, of a different nature depending on the distance from the coastline, largely of economic nature. [8]

Beyond these waters, the high seas are open to all States and they embody the historical principle of freedom of navigation, but this is also where the institution of nationality of ships comes into play, for a compelling need of balancing such freedoms with the public interests of all users of the international waters. With this respect, Article 91 states as follows:

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[6] LEE, M. L., "The Interrelation between the Law of the Sea Convention and Customary International Law", *San Diego International Law Journal* 2006, 409.

[7] NORDQUIST, M. H. - KOH, T. T. B. - MOORE, J. N. (eds*), Freedom of Seas, Passage Rights and the 1982 Law of the Sea Convention*, Leiden, 2009.

[8] To sum up, we can divide the marine zones into two main categories: marine spaces under national jurisdiction and spaces beyond national jurisdiction. The former category includes the internal waters, the territorial seas, the international straits, the archipelagic waters, the contiguous zone, the Exclusive Economic Zone (EEZ) and the continental shelf. The latter includes the high seas and the Area, namely the seabed and ocean floor and subsoil beyond the limits of national jurisdiction. With regard to the marine spaces under national jurisdiction, these can be divided into two other subcategories: marine spaces governed by territorial sovereignty (including internal waters, territorial seas, international straits and archipelagic waters), characterized by comprehensive and exclusive jurisdiction, which includes both legislative and enforcement jurisdiction; marine spaces beyond territorial sovereignty but under national jurisdiction of the coastal State (including the EEZ and the continental shelf). In these latter areas the jurisdiction embodies merely "sovereign rights" and is subjected to a limitation *ratione materiae*. This means that the coastal State is holder of numbered and strictly specified competences, or functional rights, acknowledged to one State in order to carry out a series of important functions for the international community as well, such as the management of fishery resources, the exploration of the subsoil and exploitation of some of its resources, the prevention of marine pollution. See generally NORDQUIST, M. H, (ed.), *United Nation Convention on the Law of the Sea 1982, a Commentary*, Vol I, Dordrecht, 1985.

> 1. Every State shall fix the conditions for the grant of its nationality to ships, for the registration of ships in its territory, and for the right to fly its flag. Ships have the nationality of the State whose flag they are entitled to fly. There must exist a genuine link between the State and the ship.
>
> 2. Every State shall issue to ships to which it has granted the right to fly its flag documents to that effect.

Where does the concept of nationality of a ship originate from? What is the rationale behind this institute and how may it affect or be affected by unmanned technology?

First and foremost, as stated in the Article, the nationality of a ship implies a certain, unspecified link between that ship and the State. At the same time, it represents the connection between the State and the community travelling on board the vessel and organised in a hierarchical manner. [9] If we look at the nationality of ships from this perspective, we may even question the need of its existence in the era of unmanned vessels. As a matter of fact, whereas the master is the representative of the flag State and embodies the link between such State and the rest of the people on board, there might be no need for such an institution with no human presence on board.

Nevertheless, the truth is that the provisions of UNCLOS on the nationality of the ship have certainly another rationale, which is to be found in the need of enforcing all legislation pertaining to maritime law, as evidence by Article 94. This interpretation is also a solution to all doubts raised by the term «genuine link», which should not be regarded as a precondition of the registration of the ship, but as «an obligation that arises as a consequence» [10] of such registration. It is through the registration mechanism that the State acquires control over that ship and the instruments for implementing all maritime law provisions to that ship, starting from the ones contained in Article 94 of the UNCLOS. [11] Here we can grasp the meaning

[9] LEFEBVRE D'OVIDIO, A. – PESCATORE, G. – TULLIO, L., *Manuale di diritto della navigazione*, XIV ed., Milano, 2016, 351.

[10] SERDY, A., "Public international law aspects of shipping regulation", Baatz, Y (ed.) *Maritime Law*, forth ed., Abingdon, Oxon, 2018, 331.

[11] MEYERS, H., *The Nationality of Ships*, The Hague, 1967, 251 observes that «"[g]enuine link" is a collective expression. An expression which designates that the state which maintains this link has at

of the balance between freedoms of the sea and the public community's interests, mentioned earlier. The existence of flag State jurisdictions has the function of making effective maritime law in a marine area which would otherwise not be covered by the traditional territorial competence of each State, for the international nature of the high seas. [12] Therefore, it would not be advisable to regard the flag State jurisdiction as an obsolete institution, no longer justified confronted with unmanned shipping, as long as it is our interest to retain the applicability of all the legal framework affecting vessels.

In this context, the first issues concerning unmanned vessels arise, given that there are requirements in Article 94 which seem inherently inconsistent with the concept itself of unmanned ship, for the mere circumstance that such new craft will not be furnished of a master and crew on board. [13] First of all, we can remark that the above reasoning is confirmed by the first paragraph of Article 94, stating as follows:

> Every State shall effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag.

Assuming that unmanned ships are ships, there is no reason why we should exclude the applicability of the quoted provision of UNCLOS. The consequence is that the States have the duty to control, also on technical aspects, all vessels flying their flag, even in their unmanned version. After that, the Article deals with listing in greater detail the forms in which such State jurisdiction and control is exercised, first of all over the ship, but also over its master, officers and crew in respect of administrative, technical and social matters concerning the ship. [14] This somehow brings back to the concept of nationality of ship as a connection between the flag

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its disposal various means which in combination enable it to establish and maintain its authority over its ship-users».

[12] It has been stated that «[f]lag State jurisdiction should instead be seen as a way of preventing a legal vacuum on the high seas, given that no State has the competence to regulate activities there on a special basis»: ibidem, at 329.

[13] VAN HOOYDONK, E., "The law of unmanned merchant shipping – an exploration", *Journal of International Maritime Law* 2014, 409.

[14] Article 94(2) UNCLOS.

State and the community of humans on board the ship, obviously not applicable in case of unmanned technology.

Two in particular are the provisions of Article 94 which appear *prima facie* inconsistent with the advent of unmanned shipping. The first one is contained in paragraph 3, stating as follows:

> Every State shall take such measures for ships flying its flag as are necessary to ensure safety at sea with regard, inter alia, to:
>
> (a) the construction, equipment and seaworthiness of ships;
>
> (b) *the manning of ships*, labour conditions and the training of crews, taking into account the applicable international instruments;
>
> (c) the use of signals, the maintenance of communications and the prevention of collisions. [15]

We believe that, given the paramount importance of the UNCLOS in its nature of «constitution of the Oceans», all discourse on the need of manning the vessels should take this Convention, hence the quoted provision, as a basis for developing any investigation on the subject. Is UNCLOS actually requiring every ship to be manned or, put differently, every State to ensure that all ships flying its flag are manned? A careful reading of the wording used shows that the primary requirement of UNCLOS is to ensure safety at sea and the elements listed in paragraph 3(b) are only some of the aspects which need to be addressed by States in order to achieve such safety. The reference to the "manning of ships" can be deemed as a natural component for the operation of vessels as they have always been functioning up to these days. To some extent this assumption may have a twofold meaning: on the one hand, since the ships have always been conceived as operated by an on-board crew, dealing with safety has necessarily to go through all the aspects related to the human factor, such as manning, labour conditions, training and licensing of personnel. But once proved that unmanned vessels can be as safe as traditional ones, we could infer that States will still be compliant with the requirement of UNCLOS in their duty to ensure safety, despite the exclusion of any attention to the manning of the vessel. This interpretation can obviously be regarded as the best and most

[15] Emphasis added.

flexible one for accommodating unmanned shipping and can be proposed every time the current legislation refers to manning activities only as a means to achieve the primary objective of safety in the maritime context.

On the other hand, one might frame that provision within the context of its adoption, pursuant to the principles of interpretation set forth by the Vienna Convention on the Law of Treaties 1969. [16] Particularly, the historical perspective should be taken into account and the practice and rules subsequently followed. All such elements inevitably lead to the concept of a manned ship, where the crew and the master are working on board the vessel and from that location are able to guarantee the safe operation of all navigational activities. Put simply, the drafters of UNCLOS did not even considered the possibility of operating the ship without an on-board crew, thus did not regulated it at all. This interpretation may lead to an opposite and less accommodating approach towards unmanned shipping: since these provisions were drafted with manned vessels in mind, the manning requirement may be deemed as an unambiguous obligation on the States for its natural traditional role in the maritime sector. In this way, the UNCLOS would, therefore, not seem particularly open to the introduction of unmanned technology in the shipping industry, as may appear through the previous reading.

Similar observations could be repeated for paragraph 4 of Article 94. This latter refers to the States measures for ensuring safety at sea, introduced in the precedent paragraph, stating as follows:

> Such measures shall include those necessary to ensure:
>
> (a) that each ship, before registration and thereafter at appropriate intervals, is surveyed by a qualified surveyor of ships, and has on board such charts, nautical publications and navigational equipment and instruments as are appropriate for the safe navigation of the ship;
>
> (b) that *each ship is in the charge of a master and officers* who possess appropriate

[16] Article 31 of the 1969 Vienna Convention states that a treaty must be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose. In addition, paragraph 3 of the same Article provides as follows: «[t]here shall be taken into account, together with the context: (a) any subsequent agreement between the parties regarding the interpretation of the treaty or the application of its provisions; (b) any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation; (c) any relevant rules of international law applicable in the relations between the parties».

qualifications, in particular in seamanship, navigation, communications and marine engineering, and that *the crew is appropriate in qualification and numbers for the type, size, machinery and equipment of the ship*;

(c) that the master, officers and, to the extent appropriate, the crew are fully conversant with and required to observe the applicable international regulations concerning 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. [17]

The reasoning proposed above can be repeated for the provisions of paragraph 4. However, through a careful reading of this latter paragraph, we might remark a lesser flexibility in the States' decision whether manning or not the ships flying their flag. If we think of these requirements merely as a reference to the measures to be taken by each State in order to ensure safety at sea, then we could repeat the first interpretation proposed for paragraph 3: safety is the ultimate goal of the provision and, therefore, giving evidence that unmanned operations are equally safe may be the means for allowing States to forego the manning component in ensuring that safety. After all, paragraph 4 merely contains a list of the "measures" referred to in paragraph 3.

However, we believe that there is here a much weightier content in this requirement, compared to the previous one, given its express mention to crew and master to be in charge of the vessel. This might give us a preference between the two interpretations for the second one, whereby the shipmaster and the other persons on board have always been considered essential components of the ship as an organisation, then UNCLOS provides the obligation for States to ensure that all ships flying their flag are manned with the appropriate master and personnel.

The only escape route from this path, too narrow for accommodating unmanned shipping, is, once again, recurring to a flexible interpretation of the wording used by the provisions of the Convention, which, after all, do explicitly mention the crew and the master, but not the need of their presence on board the vessel. One may, indeed, leverage the term "in the charge of" for stressing the consistency of unmanned technology with the law currently in force. «In charge of a master and

[17] Emphasis added.

crew» does not actually tells whether or not these master and crew must be on board the ship for a proper fulfilment of the requirement but can be possibly considered ambiguous enough to open interpretations of a personnel operating the ship from a shore-based control centre. Once again, we may be persuaded of the traditional interpretation of a vessel in charge of an on-board master and crew, only because this is the way in which ships have been operated from their creation up to now, but it does not necessarily show a legal, imperative requirement by international maritime law.

This is, to some extent, a recurring argument in the debate on unmanned shipping, given that essentially none of the relevant provisions currently in force refers to a need of human beings on board the vessel in an objective and unambiguous manner, so that there is no room for extensive interpretation and the only solution is a legislative intervention for amending the existing regulations. On the contrary, as we will see in the present work, the terms used by the conventions in force seem generally flexible enough to, at least, allow to open the debate on a possible new interpretation, with no necessary amendments.

After all, the provision whereby the crew must be appropriate in qualification and number for the type, size, equipment and machinery of the ship, is a requirement that is recurring in other contexts, which will be shortly analysed. Intending the term crew in the traditional manner would entail a need for an appropriate number of crew members working on board the vessel. Only the adjective "appropriate" may be subject to a flexible interpretation, for its connection to the characteristics of the ship. Therefore, whereas it is proven that a ship has the capability of being safely and regularly operated with no personnel on board, then the appropriate crew in number may even be zero, preserving its compliance with UNCLOS provision of Article 94(4)(b).

Such compliance may be granted otherwise, simply by re-interpreting the concept of crew and extending it to the shore-based personnel, which will be evidently appropriate for guaranteeing the perfect functioning of the remotely operated vessel. Certainly, the sector of our investigation which will encounter major obstacles for its implementation under the above described regulations will be that of fully automatic vessels, navigated autonomously by the software

composing their artificial intelligence, in accordance to a pre-programmed voyage and possibly with no human intervention whatsoever. Indeed, it is hard to see how such craft may prove compliant with the requirements of being in charge of a master and officers, of an appropriate crew in qualification and number and of a crew observing the applicable international regulations concerning the safety of life at sea and the prevention of collisions. [18] Not even the most extensive interpretations of those provisions may be helpful in accommodating fully autonomous ships, for which, we can anticipate, a legal intervention, not likely to happen in the near future, will prove necessary. One solution to this issue may derive from aviation law, where, as described in the first part of chapter one, the new Regulation (EU) 2018/1139 has provided some definitions relating to unmanned aircraft. In particular, it is interesting to remark that the concept of remote pilot includes the natural person operating an automatic unmanned aircraft, «by monitoring its course and remaining able to intervene and change the course at any time». [19] This means that the issue of the extensibility of the rules generally referring to the pilot to the new figure of remote pilot has been resolved by the EU Institutions by including, as well, the natural person responsible of merely monitoring the navigation into the general concept of pilot (and always with the possibility to intervene in the navigation, which is yet to be demonstrated by the shipping industry). The same direction may be discussed in the maritime context, in order to identify a natural person who will be always in charge of the ship, even if she is completely autonomous.

As for the other requirements of Article 94, such as having on board charts, nautical publications and navigational equipment and instruments as are appropriate for the safe navigation of the ship, or the observance by the crew of all applicable international regulations concerning 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, these are all provisions doubtless tailored to the operation of traditional manned ships, at most no longer resulting necessary in the era of unmanned technology.

[18] Article 94(4)(c) UNCLOS.

[19] Article 3(31) Regulation (EU) 2018/1139.

There are a few other articles in UNCLOS that may be of interest for our purposes, for their reference to master and crew, likely to represent a possible obstacle for the introduction of unmanned vessels.

One of them is Article 97, which mentions the penal or disciplinary responsibility of the master or of any other person in the service of the ship. [20] We have considered this Article worthy of being referred to in this context, because of the subject it involves, opening a Pandora's Box of master's criminal liability. Whereas from a civil law perspective, liabilities in the context of maritime law are already vicariously allocated to the legal persons primarily involved in conducting their commercial activities, merely relying on the shipmaster's work as part of their organisation, from a criminal law perspective, the principle of personality of responsibility generally applies. Therefore, the role of the master takes on particular importance for the identification of the responsible person in case of criminal offences committed in relation to the operation of the ship. In addition, the limited use that may be done of analogy in penal law, leaves no room for any extensive interpretation of the rules concerning the conventional concept of master, as to allow an applicability to the new shore-based operator. [21] Finally, the use of fully automated vessels will result in even more complicated discussions, not very different from those that have already started in the general context of law of robotics, on the consequences of crimes committed by an artificial intelligence, with no connection whatsoever to the human producer or programmer. A further debate in this context, mainly at domestic level, given the nature of this branch of the law, will prove necessary before any adoption of unmanned technology in the world of shipping, for better guaranteeing a prompt response of criminal law to new possible situations occurring in the foreseeable future.

Another article of particular importance is Article 98, establishing the master's duty to render assistance to persons in distress at sea. The Article, in its paragraph

[20] Article 97(1) UNCLOS precisely states as follows: «[i]n the event of a collision or any other incident of navigation concerning a ship on the high seas, involving the penal or disciplinary responsibility of the master or of any other person in the service of the ship, no penal or disciplinary proceedings may be instituted against such person except before the judicial or administrative authorities either of the flag State or of the State of which such person is a national».

[21] A brief section of this work, in part II of chapter 3, is dedicated to the questions concerning the role of the master.

1, states as follows:

> Every State shall *require the master of a ship* flying its flag, in so far as he can do so without serious danger to the ship, *the crew* or the passengers:
>
> (a) to render assistance to any person found at sea in danger of being lost;
>
> (b) to proceed with all possible speed to the rescue of persons in distress, if informed of their need of assistance, in so far as such action may reasonably be expected of him;
>
> (c) after a collision, to render assistance to the other ship, its crew and its passengers and, where possible, to inform the other ship of the name of his own ship, its port of registry and the nearest port at which it will call. [22]

This is not the only provision in force in international maritime law covering the obligation to render assistance: also the Safety of Life at Sea and the Salvage Conventions, in addition to domestic law rules, establish a personal obligation on the master to assist other vessels or persons in distress at sea. [23] As for the criminal law aspects, here too we could open a long debate on what will happen to this well-known rule, as well as principle of humanity, belonging to the tradition of the *lex maritima*. [24]

There are a number of practical issues that may arise from the use of unmanned vessels with respect to the duty to render assistance, already analysed by some Authors. [25] These include, first and foremost, the applicability of such duty to the

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[22] Emphasis added.

[23] Among the provisions concerning specific circumstances such as collision, we can mention Article 8 of the 1910 Collision Convention, establishing that «[a]fter a collision, the master of each of the vessels in collision is bound, so far as he can do so without serious danger to his vessel, her crew and her passengers, to render assistance to the other vessel, her crew and her passengers», which is verbatim translated into the Italian text of Article 485 of the Navigation Code. This latter, in fact, reads as follows: *«[a]vvenuto un urto fra navi, il comandante di ciascuna e tenuto a prestare soccorso alle altre, al loro equipaggio ed ai loro passeggeri, sempre che lo possa fare senza grave pericolo per la sua nave e per le persone che sono a bordo*».

[24] Also considering the strong connection of the duty to the criminal law, for the liabilities arising from cases of failure to comply with this duty.

[25] See CAREY, L., "All hands off deck? The legal barriers to autonomous ships", *Journal of International Maritime Law* 2017, 211; VEAL, R. - TSIMPLIS, M., "The integration of unmanned ships into the *lex maritima*", *Lloyd's Maritime and Commercial Law Quarterly* 2017, 330; CHWEDCZUK, M., "Analysis of the Legal Status of Unmanned Commercial Vessels in U.S. Admiralty and Maritime Law", *Journal of Maritime Law & Commerce* 2016, 147.

new type of vessels: [26] assuming that the shore-based operator will be regarded as the traditional master, with the consequent application of all relevant rules, is it reasonable to maintain such an obligation on him? The question arises given the different nature of unmanned vessels, which will not have any personnel materially endeavouring for salvaging other people. It is not clear what effectively the autonomous ship will be capable of doing with regard to this phenomenon. Surely, even if not directly charged of carrying out the salvage operations, the personnel at the shore-based control centre must be involved in, at least, signalling the existence of a situation of distress and activating all existing mechanisms for the rescue operations.

On the passive side of the events, will the unmanned vessel be subject to the assistance referred to in Article 98(1)(c) after a collision? According to the natural assimilation of autonomous vessels within the general concept of ship, there is no reason why it should be regarded differently when it comes to the duty of other ships to render assistance. These and other problems will need to be addressed in the context of the salvage obligation before any unmanned craft will set sail, given the paramount importance of clear rules for the protection of life at sea. [27]

Finally, Article 29 contains as well a reference to shipmaster and crew, but for other different purposes: the definition of warship. The article provides as follows:

> For the purposes of this Convention, "warship" means a ship belonging to the armed forces of a State bearing the external marks distinguishing such ships of its nationality*, under the command of an officer* duly commissioned by the government of the State and whose name appears in the appropriate 35 service list or its equivalent, and *manned by a crew which is under regular armed forces discipline*. [28]

In our opinion, it is an article of particular importance for its establishment of a demarcation line between military navigation and civil shipping. And in doing so, the presence of the manning element is, to some extent, stronger than in other

[26] SEVERONI, C., "Soccorso e mezzi di trasporto autonomi", *Diritto dei Trasporti* 2018, 42.

[27] For example, the identification of the ship which fails to render assistance may be another issue to be taken into consideration: see CAREY, L., *supra* note 25, at 212.

[28] Emphasis added.

locations. Perhaps the requirement of being under command of an officer may be subject to the same broad interpretation above proposed for the commercial context, therefore including an unmanned warship commanded by an armed force whose personnel is to be found in a remote, shore-based, location. But finding an accommodating interpretation for unmanned vessels to the second requirement, namely that the warship is manned by a crew which is under regular armed forces discipline, clearly appears impossible. [29] A ship, in order to be considered a warship under UNCLOS, has to be manned by a crew pertaining to a State's armed force. Does that mean that an unmanned vessel will never be able, under the existing legislation, to be regarded as a military craft? There might be, in the future, an interest by the Governments of many countries to eventually intervene on this topic, especially considering the strong concern for a clear and unequivocal legal framework, both for the purpose of upholding the introduction of unmanned technology in the naval sector and for that of preventing a military ship from circumventing international rules, not manifestly showing its quality. [30]

3. The International Convention for the Safety of Life at Sea

The International Convention for the Safety of Life at Sea (SOLAS) is always regarded as the centre of all "unmanned vessels troubles". The reason is simple: it is devoted to safety. SOLAS is the instrument where all efforts by the international community have been historically concentrated with the ultimate goal of achieving safety in the maritime world. It was, indeed, adopted for the first time in 1914, as a reaction to the disaster of Titanic. [31] The last and currently in force Convention was opened for signature on 1 November 1974 and entered into force on 30 June 1980.

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[29] VALLEJO, D., "Electric Currents: Programming Legal Status into Autonomous Unmanned Maritime Vehicles", *Case Western Reserve Journal of International Law* 2015, 413.

[30] Unmanned naval ships actually represent the first application of such technology in the marine context, already developed in some countries and likely to be the most widespread use in the near future. When it comes to military interests, States usually accompany the technological development with much more enthusiasm, for the existence of dedicated pathways, also from a legal standpoint. Cf. GOGARTY – HAGGER, *supra* note 1, at 92.

[31] The first Safety of Life at Sea Convention, however, has never entered into force, due to the immediately following outbreak of the First World War. Other versions were adopted throughout the rest of the Century, in 1929, 1948 and 1960.

[32]

Safety undoubtedly plays a peculiar role in the debate on unmanned shipping, for its twofold position: [33] on the one hand, it is the impulse from which the currently existing focus on autonomous navigation has started, as a search for a safer shipping industry, assuming that the human factor is the major cause of incidents; [34] on the other hand, it is the objective and the parameter to be followed in any discourse on unmanned vessels, considering that the introduction of such a revolutionary technology must be accompanied and justified by the absence of any impairment whatsoever to safety.

This is the reason why SOLAS contains many provisions that will prove of a particular interest for the advent of unmanned vessels, with a different level of interaction with the human factor and a consequent different action to be required whenever the maritime community will be ready for the implementation of the new technology. In this section of the present work, we will conduct an analysis of these provisions, as thoroughly as possible, particularly concentrated in the Annex to the Convention. Such Annex, under Article I (a) of SOLAS, constitutes an integral part of the Convention and must be enforced by all States Parties. [35] Therefore, this binding nature of the Annex may result in a major hurdle to the implementation of unmanned shipping, for the detailed content of technical rules, some of them particularly complicated for their reference to engineering aspects, involving all phases of the life of a ship, always devoted to the ultimate goal of safety.

One of the most interesting parts, for our purposes, is certainly Part C of Chapter

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[32] The Convention consists of thirteen Articles setting out general obligations and amendment procedure, a Protocol of 1988 relating to the International Convention for the Safety of Life at Sea, 1974, followed by an Annex divided into 14 Chapters. The number of State parties is, as of January 2019, 164, representing the 99% of world tonnage: http://www.imo.org/en/About/Conventions/StatusOfConventions/Documents/StatusOfTreaties.pdf (last accessed 18.01.2019).

[33] Safety has been regarded as the «*filo rosso*» of the entire field of the law: see VERMIGLIO, G., "Sicurezza: security, safety e sviluppo sostenibile", *Sicurezza, navigazione e trasporto*, Tranquilli Leali, R. – Rosafio, E.G. (eds.), Milano, 2008, 147.

[34] Unless we want to consider the economic argument as the main benefit deriving from this new technology, which might particularly interest the industry pushing for researches on the field. At least the interest of the public actors, such as IMO and EASA, is certainly moved by the goal of achieving the highest level of safety as possible in the maritime sector.

[35] Under Article II, the Convention generally applies to ships entitled to fly the flag of States the Governments of which are Contracting Governments.

II-1[36] of the Annex to SOLAS, dedicated to machinery installations. For instance, Regulation 29, paragraph 5 provides that «main and auxiliary steering gear power units shall be […] capable of being brought into operation from a position on the navigation bridge»; paragraph 7 states that «steering gear control shall be provided […] both on the navigation bridge and in the steering gear compartment»; paragraph 13 contains the requirement of steering gear compartments to be readily accessible. Regulation 30 provides additional requirements for electric hydraulic steering gear; [37] Regulation 31 describes the machinery controls [38] and Regulation

[36] Chapter II-1 generally regulates construction-structure, subdivision and stability, machinery and electrical installations.

[37] Paragraph 1 of Regulation 30 provides that «means for indicating that the motors of electric and electric hydraulic steering gear are running shall be installed on the navigation bridge and at a suitable main machinery control position».

[38] The Regulation, showing the evolution towards an unmanned engine room, provides as follows for ships constructed on or after 1 July 1998: «[m]ain and auxiliary machinery essential for the propulsion, control and safety of the ship shall be provided with effective means for its operation and control. All control systems essential for the propulsion, control and safety of the ship shall be independent or designed such that failure of one system does not degrade the performance of another system. 2. *Where remote control of propulsion machinery from the navigation bridge is provided*, the following shall apply: .1 the speed, direction of thrust and, if applicable, the pitch of the propeller *shall be fully controllable from the navigation bridge under all sailing conditions, including manoeuvring*; .2 the control shall be performed by a single control device for each independent propeller, with automatic performance of all associated services, including, where necessary, means of preventing overload of the propulsion machinery. Where multiple propellers are designed to operate simultaneously, they may be controlled by one control device; .3 the main propulsion machinery shall be provided with *an emergency stopping device on the navigation bridge which shall be independent of the navigation bridge control system*; .4 propulsion machinery orders from the navigation bridge shall be indicated in the main machinery control room and at the maneuvering platform; .5 *remote control of the propulsion machinery shall be possible only from one location at a time*; at such locations inter-connected control positions are permitted. At each location there shall be an indicator showing which location is in control of the propulsion machinery. The transfer of control between the navigation bridge and machinery spaces shall be possible only in the main machinery space or the main machinery control room. This, system shall include means to prevent the propelling thrust from altering significantly when transferring control from one location to another; .6 it shall be possible to control the propulsion machinery locally, even in the case of failure in any part of the remote control system. It shall also be possible to control the auxiliary machinery, essential for the propulsion and safety of the ship, at or near the machinery concerned; .7 *the design of the remote control system shall be such that in case of its failure an alarm will be given*. Unless the Administration considers it impracticable the preset speed and direction of thrust of the propellers shall be maintained until local control is in operation; .8 *indicators shall be fitted on the navigation bridge, the main machinery control room and at the maneuvering platform*, for: .8.1 propeller speed and direction of rotation in the case of fixed pitch propellers; and .8.2 propeller speed and pitch position in the case of controllable pitch propellers; .9 *an alarm shall be provided on the navigation bridge* and in the machinery space to indicate low starting air pressure which shall be set at a level to permit further main engine starting operations. If the remote control system of the propulsion machinery is designed for automatic starting, the number of automatic consecutive attempts which fail to produce a start shall be limited in order to safeguard sufficient starting air pressure for starting locally; .10 automation systems shall be designed in a manner which ensures that threshold warning of impending or imminent slowdown or shutdown of the propulsion system

37 deals with communication between navigation bridge and machinery space. [39] Part B-1 [40] contains as well provisions in apparent contrast with the design of unmanned vessels, such as Regulation 25-8, providing as follows in its paragraph 2:

> There shall be permanently exhibited, or readily available on the navigation bridge, for the guidance of the officer in charge of the ship, plans showing clearly for each deck and hold the boundaries of the watertight compartments, the openings therein with the means of closure and position of any controls thereof, and the arrangements for the correction of any list due to flooding. In addition, booklets containing the aforementioned information shall be made available to the officers of the ship.

Evidently, all such rules represent technical requirements for the design of ships, shipbuilding and operations, all tailored to traditional manned vessels, as we can remark by the presence of repeated reference to the navigation bridge, which would be removed from the unmanned ships' design. The main problem deriving from the mentioned provisions is their binding nature, confirmed by the use of the tense (e.g. «means for indicating that the motors of electric and electric hydraulic steering gear are running *shall be installed* on the navigation bridge», emphasis added). How can this obstacle be overcome for allowing the design of ships which will not include any of the previously mentioned installations? A partial solution could be identified in the context of Part A of Chapter II-1, regulating, among other general aspects, the scope of the Chapter and the exemptions which may be granted by States

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is given to the officer in charge of the navigational watch in time to assess navigational circumstances in an emergency. In particular, the systems shall control, monitor, report, alert and take safety action to slow down or stop propulsion *while providing the officer in charge of the navigational watch an opportunity to manually intervene*, except for those cases where manual intervention will result in total failure of the engine and/or propulsion equipment within a short time, for example in the case of overspeed» (emphasis added).

[39] «At *least two independent means shall be provided for communicating orders from the navigation bridge to the position in the machinery space or in the control room from which the speed and direction of thrust of the propellers are normally controlled*; one of these shall be an engine-room telegraph which provides visual indication of the orders and responses both in the machinery spaces and on the navigation bridge. Appropriate means of communication shall be provided from the navigation bridge and the engine-room to any other position from which the speed or direction of thrust of the propellers may be controlled».

[40] Part B-1 of Chapter II-I is dedicated to subdivision and damage stability of cargo ships.

Parties.

Regulation 1, paragraph 4, states as follows:

> The Administration of a State may, if it considers that the sheltered nature and conditions of the voyage are such as to render the application of any specific requirements of this chapter unreasonable or unnecessary, exempt from those requirements individual ships or classes of ships entitled to fly the flag of that State which, in the course of their voyage, do not proceed more than 20 miles from the nearest land.

The use of this regulation may evidently represent only a partial solution: the condition for exempting individual ships or a class of ships may be useful for our purposes, referring to unreasonableness and unnecessity of the existing requirements, as will occur in the case of unmanned vessels. Nevertheless, the scope of such exemption is limited to ships which do not proceed more than 20 miles from the coastline. That could certainly not represent the decisive gateway for the integration of unmanned ships into the world of shipping, for its limited operability, but it might be activated for a first launch of the new technology in sea routes closer to the land, where the remote control station is located. [41]

A second, temporary solution, may be the dual operability of vessels, designed both for accommodating seafarers who will navigate in a traditional manner and for being remotely operated. This scenario may probably be regarded as the most suitable for a safer introduction of autonomous vessels, at the same time preventing from a sudden revolution to unmanned navigation and allowing a compliance not only with all technical rules imposed by the international conventions, such as the ones hereto subject to our analysis, but also with the provisions on the manning component of every vessel. [42]

Part E of Chapter II-1 may also result of particular interest for our purposes, given its scope covering additional requirements for periodically unattended machinery spaces. This reflects the change of times which the marine engineering

[41] Which is essentially what is currently happening in those areas of the world where unmanned vessels are being tested: see, for instance, the case of Yara Birkeland, https://www.ship-technology.com/projects/yara-birkeland-autonomous-container-vessel/ (last accessed 18.01.2019).

[42] See the "CMI Position Paper On Unmanned Ships", at 11.

has gone through, with a general reduction of the human factor, even with the passage from a traditional manned situation to an unattended machinery. [43] Today we can infer that we are witnessing the final chapter of this story, from the lowest level of crew number achieved, up to the total elimination of seafarers from the vessel's deck.

Nevertheless, even in this part of SOLAS we can still remark the need of a structure which is conceived for a manned craft: the regulations contained hereto aim at defining the special situation of an unattended engine room, balancing the human absence with countermeasures to be taken in order to preserve the general safety of the vessels. This goal is, indeed, pointed out in Regulation 46, paragraph 1, whereby

> The arrangements provided shall be such as to ensure that the safety of the ship in all sailing conditions, including maneuvering, is equivalent to that of a ship having the machinery spaces manned.

Thus, we can infer that the transition from a traditional vessel to unmanned craft cannot be repeated as easily as for the unmanned engine room and by borrowing the provisions in force in the dedicated section. All such rules form a framework based on ensuring with certainty that the absence of crew members in the machinery spaces is duly counterbalanced with measures to guarantee a prompt response to emergency situations and a continuous monitoring of the engine. However, all such activities must be done from other locations on board the ship herself. Therefore, the argument of the existence of unmanned engine spaces proves of a little help for the purposes of encouraging a greater openness of the legal framework to totally unmanned craft.

An example of these rules may be found in Regulation 49, paragraph 1, whereby

> Under all sailing conditions, including maneuvering, the speed, direction of thrust and, if applicable, the pitch of the propeller *shall be fully controllable from the*

[43] See the COMMITTEE ON THE EFFECT OF SMALLER CREWS ON MARITIME SAFETY, NATIONAL RESEARCH COUNCIL, *Crew Size and Maritime Safety*, Washington, 1990, 55.

navigation bridge. [44]

And paragraph 4, stating that

> It shall be possible for all machinery essential for the safe operation of *the ship to be controlled from a local position*, even in the case of failure in any part of the automatic or remote control systems. [45]

This is the case for other provisions, hereto contained, on other aspects, such as communication, [46] alarm system [47] and so forth.

Moving on my investigation into SOLAS, I can simply mention other chapters for which issues of compliance for the new unmanned technology will *prima facie* arise with a certain degree of probability. Perhaps in many of these cases, the existing provisions will merely find no applicability and remain dead letter for autonomous vessels. These are Chapter II-2, on construction, fire protection, fire detection and fire extinction, particularly in its Part D on escape and Part E on operational requirements; [48] Chapter III on life-saving appliances and arrangements; [49] Chapter IV on radio communications, particularly its Part C on ship requirements. [50]

But the core of all doubts on the legal feasibility of unmanned vessels vis-à-vis the existing framework is undoubtedly to be found in Chapter V of the Annex to SOLAS, dedicated to safety of navigation. [51] Essentially all scholars who have come across unmanned shipping have mentioned one particular regulation of this Chapter of SOLAS, for it represents the main requirement with regard to the human

[44] Emphasis added.

[45] Emphasis added.

[46] Provided in Regulation 50 of Chapter II-1, Part E.

[47] Provided in Regulation 51 of Chapter II-1, Part E.

[48] See, for instance, Regulation 15 on instructions, on-board training and drills.

[49] See, for instance, Regulation 10 on manning of survival craft and supervision.

[50] For example Regulation 7 on general rules on radio equipment and Regulation 12 on watches.

[51] This Chapter, pursuant to its Regulation 1, applies to all ships on all voyages, except, among other circumstances of local interest, warships, naval auxiliaries and other ships owned or operated by a Contracting Government and used only on Government non-commercial service.

presence on board the vessel, just as Article 94 of UNCLOS in the context of the law of the sea. [52] That is Regulation 14, dealing with ships' manning and providing as follows:

> 1. Contracting Governments undertake, each for its national ships, to maintain, or, if it is necessary, to adopt, measures for the purpose of ensuring that, from the point of view of safety of life at sea, *all ships shall be sufficiently and efficiently manned*. [53]
> 2. Every ship to which chapter I applies shall be provided with an appropriate minimum safe manning document or equivalent issued by the Administration as evidence of the minimum safe manning considered necessary to comply with the provisions of paragraph 1.

This is where we can find the ultimate legal provision of the need to man the ships under the existing legal framework on international maritime law. The essential requirement established by Regulation 14 is that all ships are sufficiently and efficiently manned. Our analysis must, therefore, focus on these terms, with the aim of verifying whether they entail a total unlawfulness of unmanned vessels or, once again, a broad interpretation may be the instrument for legally accommodating their introduction.

Authors, with the support of case law, have pointed out the subjective nature of the requirement, for the absence of a prescriptive provision on the exact number of seafarer representing the sufficient level of manning. [54] However this subjectivity does not mean that all discretion is left to the shipping companies on the decision about what constitutes an appropriate number: on the contrary, there exist, of course, a set of rules that the single State Parties adopted with the purpose of defining in detail the meaning of SOLAS wording, generally by identifying the required number of crew members according to the role played in the navigational operations and to the type of vessel.

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[52] CAREY, L., *supra* note 25, at 205-206; VEAL, R. - TSIMPLIS, M, *supra* note 25, at 319; BOI, G.M., "«Navi-drone»: primi interrogativi in tema di disciplina giuridica", *Rivista del Diritto della Navigazione* 2016, 186.

[53] Emphasis added.

[54] CAREY, L., *supra* note 25, at 206.

The discretion is therefore left to each jurisdiction, none of which has so far adopted regulation "unmanned ships-friendly". Of course, such discretion is not an absolute arbitrariness: in order to guarantee a uniform level of conditions to be established by each State, IMO, pursuant to SOLAS Regulation V/14, lastly adopted, on 30 November 2011, Resolution A.1047(27) on the principles of minimum safe manning, revoking the previous Resolution A. 890(21) and Resolution A.955(23). This document consists of five annexes, divided as follows: guidelines for the application of principles of minimum safe manning; guidelines for determination of minimum safe manning; responsibilities in the application of principles of minimum safe manning; guidance on contents and model form of minimum safe manning document and framework for determining minimum safe manning.

The goals of the Resolution are many: «to ensure that a ship is sufficiently, effectively and efficiently manned to provide safety and security of the ship, safe navigation and operations at sea, safe operations in port, prevention of human injury or loss of life, the avoidance of damage to the marine environment and to property, and to ensure the welfare and health of seafarers through the avoidance of fatigue». [55] This shows the importance of the human factor in the maritime context generally speaking, not being limited to the employment of seafarers for the purposes of navigating the vessel, but playing a key role in many other aspects of maritime navigation.

Annex 2 includes the detailed list of criteria that should be taken into account when determining the minimum safe manning of a ship. These factors are: size and type of ship; number, size and type of main propulsion units and auxiliaries; level of ship automation; construction and equipment of the ship; method of maintenance used; cargo to be carried; frequency of port calls, length and nature of voyages to be undertaken; trading area(s), waters and operations in which the ship is involved; extent to which training activities are conducted on board; degree of shoreside support provided to the ship by the company; applicable work hour limits and/or rest requirements; and the provisions of the approved Ship's Security Plan. [56]

[55] Annex 1, Article 2 of Resolution A.1047(27).

[56] The Ship Security Plan, under the definition provided in Article 2.1.4 of Part A of the International

After these requirements, all functions of the crew on board the vessels are taken into account. Among these functions and their consequent responsibility, we can mention that of maintaining a safe navigational watch and safe engineering watch in accordance with the requirements of the STCW Code, a factor that seems *prima facie* inconsistent with the concept of unmanned shipping. [57]

But how is the minimum safe manning level effectively determined? This is provided by annexes 4 and 5 of the IMO Resolution, establishing the procedure for the submission of a proposal from the company operating the vessel and the issue of a document by the competent administration, specifying

> 2. a table showing *the number and grades/capacities of the personnel required to be carried*, together with any special conditions or other remarks;
>
> 3. a formal statement by the Administration that, in accordance with the principles and guidelines set out in Annexes 1 and 2, the ship named in the document is considered to be safely manned if, whenever it proceeds to sea, it carries *not less than the number and grades/capacities of personnel shown in the document*, subject to any special conditions stated therein; [58]

Therefore, it is in this document that the final and effective number of seafarers required on board the ship is determined. This document appears at the same time both the greatest hurdle to the introduction of unmanned vessels and the first gateway for unmanned vessels to find their lawful way into the existing legal framework. The ignition mechanism must be that of a company submitting a minimum safe manning proposal with all cells of the table showing the number 0 in all compartments of the vessel.

Pursuant to the Regulation here analysed, all countries have adopted their own domestic instruments containing the practical information on the procedure for

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Code for the Security of Ships and of Port Facilities (ISPS), is «a plan developed to ensure the application of measures on board the ship designed to protect persons on board, cargo, cargo transport units, ship's stores or the ship from the risks of a security incident». It is an instrument made mandatory by the ISPS Code itself.

[57] Annex 2, Paragraph 1.2.1.2 and 1.2.4.2 of Resolution A.1047(27).

[58] Emphasis added.

issuing the minimum safe manning document. [59] For instance, in Italy, [60] the Ministry of Infrastructures and Transport adopted a Circular n. 1 on 20 October 2010, reproducing the principles of the IMO Regulation [61] and containing the forms to be submitted by the operating company. [62] Accommodating unmanned technology must go through the acceptance by each single State of a safe manning number corresponding to zero, otherwise, in the absence of a minimum safe manning document duly issued by the State Administration, unmanned vessels will never be allowed to set sail. [63]

We may also wonder what might happen, from an international perspective, if a State regulation grants operability to unmanned vessels, hence considering them compliant with the principle of minimum safe manning, differently from the provisions in force in other States. [64] It has been stated that, despite the differences which might still exist between manning requirements of different States, when a vessel is properly manned in accordance with the law of the vessel's flag, it will not be held improperly manned by the courts of another State. [65] This might be due to mutual reliance between States in setting out the precise manning requirements, in line with the international principles. However, the same might not hold true for an unmanned vessel, where the consideration of an appropriate manning level amounting to zero might not be shared by other States, at least at this stage of the evolution.

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[59] For instance, in France, Article L.5522-2 of the Transport Code also uses a flexible term, requiring a number of crew member «*suffisant*» to ensure safety and security. The concrete number is then determined through an agreement between the Administration and the shipowner: PIETTE, G., "Les navires sans équipage", *Droit Maritime Français* 2017, 987.

[60] Where Article 164 of the Navigation Code, for the purpose of a seaworthy condition of the ship, requires that she is «*convenientemente […] equipaggiata*» (that is conveniently manned), using a flexible adverb, similarly to the ones used in the SOLAS Convention: cf. BOI, G.M., *supra* note 52, at 186.

[61] Although, dating to 2010, it refers to the previous resolution A.890(21).

[62] QUERCI, F.A., *Note in tema di equipaggio della nave e dell'aeromobile*, Padova, 1977, 75.

[63] See CARTNER, J.A.C. – FISKE, R.P. – LEITER, T.L., *The International Law of the Shipmaster*, London, 2009, 159, who observed that «port state control authorities check manning certificates as a part of their safety efforts».

[64] In the current framework, it might occur that the shipowner and the master are given an administrative sanction for failing to meet the minimum manning requirements: cf. Article 1221 of the Italian Navigation Code.

[65] HEALY, N. J – SWEENEY J. C., *The Law of Marine Collision*, Centreville, Maryland, 1998, 27.

Besides this main provision of Chapter V, there are other noteworthy rules contained in this chapter. For instance, Regulation 11 on ship reporting systems refers to the need for the shipmaster to be compliant with the adopted reporting system and report all information to the competent authority; Regulation 15 contains principles relating to bridge design, design and arrangement of navigational systems and equipment and bridge procedures, clearly bearing in mind, for the way in which they are drafted, ships carrying seafarers on board.

Moreover, Regulation 19 contains a reference to a requirement which will be later analysed in the context of the description of the COLREGs, often regarded as another of the main legal obstacles to the introduction of unmanned shipping. Paragraph 2.1.8 provides that all ships must have

> when the ship's bridge is totally enclosed and unless the Administration determines otherwise, a sound reception system, or other means, to enable the officer in charge of the navigational watch to hear sound signals and determine their direction. [66]

Other noteworthy provisions are contained in Regulation 22, dealing with navigation bridge visibility, Regulation 23, covering pilot transfer arrangements, [67] Regulation 24 on the use of heading and/or track control systems, Regulation 26 on steering gear and Regulation 33 on distress messages. In particular, paragraphs 1 and 2 of Regulation 24 establish rules which seem to be difficult to be met in the case of autonomous vessels, stating as follows:

> [i]n areas of high traffic density, in conditions of restricted visibility and in all other hazardous navigational situations where heading and/or track control systems are in use, *it shall be possible to establish manual control of the ship's steering immediately*.
>
> In circumstances as above, the officer in charge of the navigational watch shall have available without delay the services of a *qualified helmsperson who shall be*

[66] A requirement closely related to the Rule of COLREGs on look-out: see below, section 4.

[67] With interesting provisions, for the purposes of unmanned shipping, on access to the ship's deck and mechanical pilot hoists.

ready at all times to take over steering control. [68]

In conclusion of this focus on Chapter V of SOLAS, we can infer that, whatever approach lawmakers will take in addressing the legal issues of unmanned shipping, many of the rules of this chapter will need to be subject to a thorough scrutiny for the mere fact of covering safety and navigation, an aspect which will be necessarily strongly invested by the "unmanned revolution". Surely other chapters of SOLAS are worth mentioning, such as Chapter VI on carriage of cargoes and Chapter XI-2 [69] on special measures to enhance maritime security, which establish a master's discretion for ship safety and security. [70]Finally, Chapter IX is of particular importance for its reference to the International Safety Management Code (ISM Code). [71] Regulation 3 requires the company and the ship to be compliant with the provisions of the Code, which is treated as mandatory, hence forming another set of rules worth of a brief scrutiny for their binding nature and their consequences on autonomous ships. One of the main features of the Code is the establishment of a key figure for safety management: the designated person. [72] This latter has the responsibility of monitoring the safety and pollution-prevention aspects of the operation of each ship and ensuring that adequate resources and shore-based support are applied. He works as a link between the company[73] and the personnel

[68] Emphasis added.

[69] Chapter XI-2 also makes the above mentioned International Ship and Port Facility Security (ISPS) Code mandatory in its part A as adopted, on 12 December 2002, by Resolution 2 of the Conference of Contracting Governments to the International Convention for the Safety of Life at Sea.

[70] See Regulation 8, Chapter XI-2.

[71] BATALDEN, B. M. - SYDNES, A. K.,"Maritime safety and the ISM code: a study of investigated casualties and incidents", 13 *WMU Journal of Maritime Affairs* 2014, 3; MUKHERJEE, P. K., "The ISM Code and the ISPS Code: A Critical Legal Analysis of Two SOLAS Regimes", 6 *WMU Journal of Maritime Affairs* 2007 147, who points out the main difference of the two Codes, as the former essentially deals with maritime safety, whereas the latter with maritime security; RODRIGUEZ, A. J. - HUBBARD, M. C., "The International Safety Management (ISM) Code: A New Level of Uniformity", 73 *Tulane Law Review* 1998-1999, 1585.

[72] Article 4 of the ISM Code.

[73] Company, under paragraph 1.1.2 of Part A of the ISM Code, means «the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the shipowner and who, on assuming such responsibility, has agreed to take over all the duties and responsibility imposed by the Code».

on board. [74] Being a person ashore who has direct access to the highest level of management, this figure may not be affected by the advent of unmanned navigation. However, what will undoubtedly be missing is his role as a link with the on-board crew.

Besides the designated person, the main role is once again played by the ship-master, who, under Article 5 of ISM Code, «has the overriding authority and the responsibility to make decisions with respect to safety and pollution prevention and to request the Company's assistance as may be necessary». Moreover, Article 6 deals with resources and personnel and establishes a series of requirements for the master and crew, as follows:

> 6.1 The Company should ensure that the master is:
> .1 properly qualified for command;
> .2 fully conversant with the Company's SMS; and
> .3 given the necessary support so that the master's duties can be safely performed.
> 6.2 The Company should ensure that each ship is:
> .1 manned with qualified, certificated and medically fit seafarers in accordance with national and international requirements; and
> .2 appropriately manned in order to encompass all aspects of maintaining safe operation on board.

As we can notice, the quoted provisions constitute an additional legal obstacle to the implementation of unmanned navigation, often ignored when addressing the subject. It actually does not add much in terms of requirements, given the use of a wording similar to that of Regulation V/14 of SOLAS. Article 6.2.2, indeed, makes use of the adverb "appropriately", just as the previously analysed SOLAS Regulation introduces the *appropriate* minimum safe manning document. It is once again a subjective requirement, in this case closely related to the need of a safe operation on board the vessel, likely to be subject to the same kind of observations which we have remarked with respect to SOLAS provisions, depending on the different possible interpretations.

Article 6.2.1, instead, focuses on certification and qualification of the ship crew,

[74] LORENZON, F., *supra* note 2, at 356.

therefore, the verb "is manned" should be read in close relationship with the rest of the phrase. Nevertheless, one may observe that the provision merely requires each ship to be manned. In this case, this provision would constitute the paramount rule establishing the mandatory condition of a vessel to be manned, hence lacking the flexibility remarked in the previously analysed provisions. In the light of this requirement, there is no room for unmanned vessels, unless IMO intervenes by amending its content.

Finally, other noteworthy articles of the ISM Code are the following ones: Article 7 on shipboard operations, [75] Article 8 on emergency preparedness, with its paragraph 1 requiring the Company to identify potential emergence shipboard situations and Article 13 on document of compliance. [76]

We can conclude this section with the following remarks. The SOLAS Convention and its related instruments are undoubtedly of a great moment in the discussion on unmanned shipping. The fact that they deal with safe construction of ships, safety equipment and safety operational standards makes it clear that these provisions cannot be ignored by lawmakers dealing with unmanned technology. Therefore, even when there is no express mention to the seafarers' presence on board, or broad interpretations seem *prima facie* possible, caution should be used before jumping rapidly to conclusion on their applicability to unmanned vessels, making extensive use of analogy. We should always keep in mind that, after all, all these provisions were drafted around the traditional concept of manned ships, with master and crew on board. Removing them may have an impact also to those rules apparently not concerned, given the perception of the ship as a system composed of many elements, which must all be taken into account when modifying only one of them. [77] A solution with regard to the SOLAS Convention is necessary: one

[75] Which states that «[t]he Company should establish procedures, plans and instructions, including checklist as appropriate, for key shipboard operations concerning the safety of the personnel, ship and protection of the environment. The various tasks should be defined and assigned to qualified personnel».

[76] Defined, by Article 1.1.5, as «a document issued to a Company which complies with the requirements of this Code». See, in particular, Article 13.6, whereby «[a] copy of the Document of Compliance should be placed on board in order that the master of the ship, if so requested, may produce it for verification by the Administration or by an organization recognized by the Administration or for the purposes of the control referred to in regulation IX/6.2 of the Convention».

[77] Cf. the COMMITTEE ON THE EFFECT OF SMALLER CREWS ON MARITIME SAFETY, NATIONAL

direction might be that of introducing a dedicated Chapter to its Annex, with the aim of creating a technical regulatory framework tailored to the specific needs of unmanned vessels, from their construction requirements to the standards of operation, particularly considering their classification as one of the possible categories of ship navigating the oceans. [78]

4. The International Regulations for Preventing Collisions at Sea

The following international instrument to be investigated is the International Regulations for Preventing Collisions at Sea, the so-called COLREGs. [79]

First and foremost, it is useful to point out the importance of this instrument, for it establishes the "rules of the road" in the maritime context. This makes COLREGs a set of rules of a binding nature by which all ships have to abide. [80]

The first Rule to be commented here is Rule 2, which provides:

> (a). Nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.
>
> (b). In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.

Rule 2 is regarded as the provision establishing the principle of good

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RESEARCH COUNCIL, *supra* note 43, at 37.

[78] BOI, G.M., *supra* note 52, at 184. About the reasons for the conception of unmanned vessels as merely one of the future existing craft, see below, chapter three.

[79] The Regulations were adopted by IMO at a conference in 1972, as an evolution of the rules which had previously existed as international custom of seamen, later embodied in several versions of Collision Regulations, the last ones dating to 1960. See GAULT S. – HAZELWOOD S. J. – TETTENBORN A. (eds.), *Marsden on Collisions at Sea*, Thirteenth ed., London, 2003, 130.

[80] The universal applicability of the Rules is evidenced in Rule 1(a), whereby «[t]hese Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels».

seamanship, together with Rule 8 on action to avoid collision. [81] The good seamanship is a concept that goes beyond legal, prescriptive norms and has been described as bearing a twofold value: on the one hand it is the foundation of the COLREGs themselves, for inspiring all provisions governing the "rules of the maritime road", with the aim of preventing collisions; on the other hand, it forms an open, general norm adaptable to every situation which may not be expressly covered by the Regulations. [82] It can be defined as the skill in managing a ship or a boat, [83] or, more generally, the knowledge and skill pertaining to the operation, navigation, management, safety, and maintenance of a ship.

How this will be adapted to unmanned technology, it is hard to say, given the consideration of the concept as belonging to human nature, hardly applicable to an artificial intelligence, whose knowledge cannot be compared to human expertise. After all, pursuant to Rule 2(b), ironically enough, strictly complying with the provisions of COLREGs may, in some situations, determine a liability for not having avoided the danger encountered. The principle of good seamanship can, therefore, be considered superior in the hierarchy of sources to the Rules themselves, allowing derogation from the positive, written provisions. [84] Technology, however advanced may be, will always lack the consciousness in making decisions implying such a discretional assessment on which of the rules to follow, whether written or not.

Another Rule, which is often regarded as a major obstacle to the implementation of unmanned vessels, is Rule 5 on look-out, stating as follows:

> Every vessel shall at all times maintain *a proper look-out by sight and hearing* as well as by all available means appropriate in the prevailing circumstances and

[81] Rule 8 reads as follows: «[a]ny action to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship».

[82] VEAL, R. - TSIMPLIS, M., *supra* note 25, at 324.

[83] *The Concise Oxford Dictionary of Current English*, Oxford, 1995.

[84] See TSIMPLIS, M., "The liabilities of the vessel", Y. Baatz (ed.), *Maritime Law*, forth ed., Abingdon, Oxon, 2018, 236, who observes that failure to comply with Collision Regulations «does not necessarily lead to the imposition of civil liability. Firstly, if the action is dictated by the standard of good seamanship it is not against the Collision Regulations and it is not a negligent act».

conditions so as to make a full appraisal of the situation and of the risk of collision. [85]

Whereas in the previous Collision Regulations 1960, the look-out requirement was merely a component of the general principle of good seamanship, in the last version it is expressed positively in a substantive rule, in order to emphasise its importance. [86] Although dependent on the circumstances to be verified on a case by case basis, it is anyhow a weighty requirement which can give rise to liability in case of collision caused by failure to meet it. [87]

The reason for the concerns arising from this provision with respect to unmanned shipping is clear, given the wording used by the COLREGs when they require a proper «look-out by sight and hearing». Sight and hearing are both human senses, hence any effort to broaden its meaning by an extensive interpretation may be in vain. [88] Even the most advanced technology cannot reproduce the human visual and aural capabilities, merely for the circumstance that they are not the same. [89] Radars and sensor equipment may even be more reliable and accurate than human being, which is yet to be proven, but their functioning would still not meet the exact requirement of Rule 5 of the COLREGs, referring to a look-out by sight and hearing. After all, we cannot infer that the existing regulation totally opposes the use of technology; on the contrary, Rule 5 itself provides the use of all available means, but with the conjunction «as well as», preventing a full substitution of the look-out by sight and hearing with the said available means. [90]

One direction might be that of giving an extensive interpretation to the wording

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[85] Emphasis added.

[86] GAULT S. – HAZELWOOD S. J. – TETTENBORN A. (eds.), *supra* note 79, at 203.

[87] A poor look-out may indeed contribute or be the sole cause of a collision: cf. DOUGLAS, R.P.A. – GEEN, G.K., *The Law of Harbours and Pilotage*, London, 1993, 204. Many are the standards to be followed by the seamen in fulfilling it, such as maintaining «a position where he is by himself and does not have his attention distracted by hearing conversation between the master and the officer of the watch, or between the master and the helmsman, or between the officer of the watch and the helmsman», as stated by Willmer J. in *The British Confidence*, [1951] 2 Lloyd's Rep. 621.

[88] Indeed, described as «both eyes and ears of the ship»: PRITCHETT, P.W., "Ghost Ships: Why the Law Should Embrace Unmanned Vessel Technology", *Tulane Maritime Law Journal* 2015-2016, 205.

[89] After all, «[i]t is suggested that a master must use some power of deduction as well as his "senses"»: AIKENS, R. – LORD, R. – BOOLS, M.D., *Bills of Lading*, second ed., London, 2006, 61.

[90] VEAL, R. -TSIMPLIS, M., *supra* note 25, at 326.

referring to «sight and hearing», as intended also with the support of equipment such as radars, cameras and sound transmitters in general, being the tools which the master and crew will fully rely on. In this way, the human senses would be conceived as functioning indirectly, not with a direct perception of the facts. We believe that there is little room for such a reasoning and this is confirmed by a proper exegesis of the provision, as found in Healy-Sweeney: according to the Authors, who make reference to Rule 3(k) for interpreting the wording of Rule 5, it is «abundantly clear that the phrase "by sight" used in Rule 5 refers to visual observations and not to observations by radar or other electronic means». [91] Through this reading, the impossibility of an unmanned ship to be compliant with such requirement is evident. Accordingly, if there is one provision which must necessarily be amended to accommodate unmanned shipping, that is precisely Rule 5 of COLREGs, for its mandatory nature and the necessity of a look-out in strict observance of such Rule in its literal meaning.

Other provisions may effectively be affected by the introduction of autonomous ships, such as Rule 6 on safe speed [92] and Rule 7 on risk of collision. [93]

Moreover, some authors dealing with unmanned shipping have proposed the idea of leveraging Rule 18 of the COLREGs in order to find a channel for this new technology. The provision establishes a hierarchy in responsibility between vessels, introducing a right of way specifically for vessels "not under command". [94] A vessel not under command is defined as «a vessel which through some exceptional circumstance is unable to manoeuvre as required by these Rules and is therefore

[91] HEALY, N. J – SWEENEY J. C., *supra* note 65, at 92. Rule 3(k) of COLREGs indeed provides that «vessels shall be deemed to be in sight of one another only when one can be observed visually from the other».

[92] Rule 6 generally requires proceeding at a safe speed as to be always able to «take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions». Safe speed is a relative term, largely depending on the circumstances of the single case, see GAULT S. – HAZELWOOD S. J. – TETTENBORN A. (eds.), *supra* note 79, at 216ff.

[93] Rule 7 states that «[e]very vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt such risk shall be deemed to exist». For a comment on this Rule, see HEALY, N. J – SWEENEY J. C., *supra* note 65, at 125.

[94] Particularly in the case of many unmanned vessels operated by one single control station. Cf. GOGARTY – HAGGER, *supra* note 1, at 115.

unable to keep out of the way of another vessel». [95] From this definition, we can clearly infer that the proposed solution is based on a forced interpretation: in order to fall within that category, a vessel should be unable to manoeuvre in compliance with the COLREGs only in an exceptional situation. It is hence a temporary, emergency status, which cannot be granted to unmanned vessels for the simple fact that they do not carry personnel on board. An attempt to refer to the concept of vessel "not under command" for the purpose of guiding the integration of unmanned ships into a maritime reality would be highly contradictory, since their implementation is based on the assumption that their ability to navigate is not different from that of conventional ships, hence they should not have restrictions or difficulties in manoeuvring or visibility. [96]

For this latter concept, there are specific provisions for the case of restricted visibility, which is, however, perceived as an exceptional circumstance, therefore not suitable to form the basis for a dedicated set of rules. [97]

5. The International Convention on Standards of Training, Certification and Whatchkeeping for Seafarers

The International Convention on Standards of Training, Certification and Whatchkeeping for Seafarers (STCW Convention) was adopted on 7 July 1978 and entered into force on 28 April 1984. It was later amended in 1995 and, subsequently, a major revision was made through the Manila Amendments, adopted on 25 June 2010. [98]

The Convention is supported by a Code, containing detailed explanations and technical rules for all personnel involved in navigational operations. Only its Part A is mandatory, while Part B contains mere recommendations. [99]

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[95] Rule 3(f) of COLREGs.

[96] CAREY, L., *supra* note 25, at 209.

[97] See Rule 4 and Rule 19 of COLREGS.

[98] LORENZON, F, *supra* note 2, at 364.

[99] The STCW Conference, convened by the International Maritime Organization and met at the Headquarters of the Organization from 26 June to 7 July 1995, also adopted the Seafarers Training, Certification and Watchkeeping (STCW) Code.

The main purpose of the Convention is to promote safety of life and property at sea and the protection of the marine environment by establishing in common agreement international standards of training, certification and watchkeeping for seafarers. Article 1(2) requires all States Parties «to ensure that, from the point of view of safety of life and property at sea and the protection of the marine environment, *seafarers on board ships are qualified and fit for their duties*». [100]

This is why it is of particular importance for our work, for it addresses the human component of the shipping sector. However, it was obviously all tailored to this element in its traditional form, as the human beings involved in navigation have always been conceived. [101] Therefore, it is hard to figure out how this is going to be adapted to the new roles emerging from the use of unmanned technology in the maritime context.

This observation is confirmed by the general category covered by the Convention, which is that of «seafarers serving *on board* seagoing ships» (emphasis added). [102]

This creates a major difference with the other international instruments analysed above: whereas they all generally find applicability to unmanned shipping because they deal with wide aspects of the law of the sea and maritime law, assuming that unmanned vessels will fall within the category of ships, we may instead question the applicability of the STCW Convention, given that it addresses issues all specifically concerning seafarers. Precisely seafarers are the first victims of the unmanned revolutions, those who will supposedly disappear from the maritime scene when ships will be capable of being remotely operated or of navigating autonomously. Whereas for the other conventions we could discuss the interpretation of their rules for accommodating unmanned technology, in the case of the STCW Convention we should firstly discuss its relevance with regard to the subject of this work.

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[100] Emphasis added.

[101] The feature for an employee on a vessel to be classed as a "seaman" are: that the vessel be in navigation, that there be more or less permanent connection with the vessel and that the worker be aboard primarily to aid in navigation: cf. NORRIS, M.J., *The Law of Seamen*, Vol. I, third ed., Rochester, 1970, 49.

[102] Rule III of the STCW Convention.

The consequences of such non-applicability of the STCW to the new shore-based personnel bears, instead, a strong relevance: it would create a regulatory lacuna, given the absence of any regulation providing rules on all aspects covered by the STCW for the persons involved in unmanned operations. [103] The proposed criterion for extending its application by analogy to the shore-based personnel is by leveraging the general obligations of the Convention, aiming at protecting the safety of life and property and the marine environment. This means that the same standards as for the on-board crew should be used for the shore-based crew, for the purpose of achieving the objectives established by the STCW. However, the highest hurdle would be that of the emergence of new figures and new jobs, which do not find a homologous in the conventional ship organisation, therefore demanding necessary amendments or the adoption of a brand-new international instrument addressing training and certification of the new type of personnel. [104]

Further, the importance of the STCW with regard to unmanned vessels becomes evident when it comes to its section dedicated to the watchkeeping, set out in Chapter VIII of the mandatory provisions. These include provisions on certification, voyage planning, [105] keeping a navigational watch, [106] an engineering watch, a radio watch and so on. In particular, with regard to the navigational watch, Paragraph 12 of Part 3-1 provides that «[t]he officer in charge of the navigational watch is the master's representative and is primarily responsible at all times for the safe navigation of the ship and for complying with the International Regulations for Preventing Collisions at Sea, 1972»; Paragraph 13 adds some details to the look-

[103] VEAL, R. - TSIMPLIS, M., *supra* note 25, at 323.

[104] CAREY, L., *supra* note 25, at 206.

[105] For instance, requiring the master of every ship to plan the intended voyage in advance and to ensure that the intended route is planned using adequate and appropriate charts and other nautical publications necessary for the intended voyage.

[106] Part 3 on watchkeeping at sea sets forth the following principles: «8. Parties shall direct the attention of companies, masters, chief engineer officers and watchkeeping personnel to the following principles which shall be observed to ensure that safe watches are maintained at all times. 9. The master of every ship is bound to ensure that watchkeeping arrangements are adequate for maintaining a safe navigational watch. Under the master's general direction, the officers of the navigational watch are responsible for navigating the ship safely during their periods of duty, when they will be particularly concerned with avoiding collision and stranding. 10. The chief engineer officer of every ship is bound, in consultation with the master, to ensure that watchkeeping arrangements are adequate to maintain a safe engineering watch». See CARTNER, J.A.C. – FISKE, R.P. – LEITER, T.L., *supra* note 63, at 214.

out requirement of the COLREGs, stating as follows

> [a] proper look-out shall be maintained at all times in compliance with rule 5 of the International Regulations for Preventing Collisions at Sea, 1972 and shall serve the purpose of
>
> 1. Maintaining a continuous state of vigilance by sight and hearing as well as by all available means, with regard to any significant change in the operating environment;
> 2. Fully appraising the situation and the risk of collision, stranding and other dangers to navigation; and
> 3. Detecting ships or aircraft in distress, shipwrecked persons, wrecks, debris and other hazards to safe navigation.

Moreover, even though the use of navigational aids, automatic steering, unmanned machinery space controls, alarms and indicators provided on the bridge may affect the decision on the composition of the watch on the bridge, the first factor to be taken into account is that «at no time shall the bridge be left unattended». [107]

These norms are only some examples of how the issue is far more complicated than a mere question of non-applicability of the STCW Convention to unmanned vessels, for the simple fact that its scope covers only seafarers working on board the ships. On the contrary, some sections, such as the one concerning watchkeeping, although mainly drafted with the aim of regulating the seamen's conditions, are also strictly connected with the general interest of ensuring the safety of navigation, hence applicable to all types of vessels. This is why also the STCW should not be omitted from the examination of the existing rules affecting unmanned shipping and in the process of accommodating its legal introduction. In addition, as observed by Carey, there will always be cargo, hence property, on board the ship and there will always be a need of protection of the marine environment from accidents involving autonomous ships: therefore at least the general obligations set forth in the STCW Convention should be considered applicable to unmanned vessels, for the ultimate goal of promoting safety of life and property at sea and of protecting the marine

[107] Paragraph 17.1 of Part 3-1 of the STCW Convention.

environment. [108]

6. Concluding remarks

The importance of addressing all of the technical regulations herein described has now been acknowledge by IMO, which has started an inquiry into all of the mentioned conventions. After the constitution of an International Working Group (IWG) on Unmanned ships within the Comité Maritime International, [109] it was requested to continue with its work by the IMO Maritime Safety Committee (MSC) and to report to MSC 99. [110] To this end, the IWG first submitted a questionnaire to the national maritime law associations of several countries, focusing on how national laws will respond to unmanned shipping. Subsequently, it embarked on the next phase of its work which is to analyse in more depth each IMO legal instrument and identify those provisions which may need to be addressed in order to accommodate unmanned shipping in international waters. The outcome of this work was issued in documents containing the responses of the maritime law associations to the questionnaire and the regulatory scoping exercise for the use of maritime autonomous surface ships (MASS). The IWG selected eight conventions and identified all their provisions distinguishing between those which may need to be clarified or amended and those provisions where no action is necessary. [111] We can conclude that the discussion on a legal intervention for the purpose of introducing unmanned vessels has officially started.

Certainly, all these conventions might be considered less intriguing from the point of view of the legal debate in comparison to other private maritime law issues,

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[108] CAREY, L., *supra* note 25, at 206.

[109] All documents, together with the «CMI Position Paper On Unmanned Ships», can be found at http://comitemaritime.org/work/unmanned-ships/ (last accessed 18.01.2019).

[110] As I have mentioned in the first chapter of this work. For an overview of the outcome of the session, see http://www.imo.org/en/mediacentre/pressbriefings/pages/08-msc-99-mass-scoping.aspx (last accessed 18.01.2019).

[111] These conventions are SOLAS, COLREGs, STCW, MARPOL (International Convention for the Prevention of Pollution from Ships), FAL (Convention on Facilitation of Maritime Traffic), SAR (International Convention on Maritime Search and Rescue), SUA (Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation) and the International Convention on Salvage.

because of their mainly technical content. Nevertheless, they represent an inevitable hurdle to overcome before introducing unmanned vessels, if not even the central hurdle. [112] In this context, a paramount role will be played by classification societies, always key actors in maritime safety, [113] especially given that «[t]he world's leading classification societies play a critically important role in almost all commercial shipbuilding projects». [114]

As a matter of fact, as we will shortly see, these rules assume a rather great importance also in the context of private law, in circumstances such as liability for unseaworthiness, [115] which needs reference to the technical requirements of the ship and her manning level, or for non-compliance with the rules of the road established by COLREGs.

These issues will be the subject of the next chapter, indeed dedicated to the impact of unmanned shipping on the liability issues of maritime law.

[112] According to BOI, G.M., *supra* note 52, at 183, a new drafting of the provisions herein analysed will prove necessary.

[113] BOISSON, P., "Classification societies and safety at sea: Back to basics to prepare for the future", *Marine Policy* 1994, 363. In this regard, the company DNV GL has recently issued a position paper titled "Remote-controlled and Autonomous Ships", available at https://www.dnvgl.com/maritime/publications/remote-controlled-autonomous-ships-paper-download.html (last accessed 18.01.2019).

[114] CURTIS, S., *The Law of Shipbuilding Contracts*, third ed., London, 2002, 25.

[115] The relationship between the shipmaster and the concept of seaworthiness is indeed twofold: on the one hand the master has a duty to ensure that the characteristics of the ship make her seaworthy, on the other hand, the master can himself create unseaworthiness: cf. CARTNER, J.A.C. – FISKE, R.P. – LEITER, T.L., *supra* note 63, at 182.

Chapter Three

Liability issues

Part I - Air Law

SUMMARY - 1. Introduction - 2. Transportation - *2.1 - International framework of the contract of carriage - 2.2. Transport and unmanned aircraft* - 3. Tort liability - *3.1. The current international legal framework - 3.2. Damage to third parties caused by unmanned aircraft* - 4. Air Traffic Services - 5 Concluding remarks.

1. Introduction [1]

The main goal of the present Chapter is, firstly, to trace the current legal position towards the unmanned vehicles increasing demand, investigating whether aviation law is ready for the introduction of the use of unmanned aircraft for transport purposes. Secondly, we will turn our attention to the issues concerning tort-based liability arising from the use of unmanned aircraft. Finally, we will conclude this Chapter with some insight on the possible future development of air traffic services with the introduction of unmanned navigation in the aviation sector.

In order to introduce the subject, we should remark that none of the existing legislation at any level, international, European or domestic, has, to date, specifically provided rules on transport activities carried out through either fully automated or remotely piloted vehicles. This may be due to the earliness of such an issue, found to be not yet in the interests of lawmakers. Nevertheless, a growing interest on using unmanned aircraft for transport-related applications has been shown by several stakeholders around the world, from delivery purposes, [2] to urban

[1] The present chapter is an extended and revised version of a paper that was presented at the VII Congreso Internacional de Transporte "El transporte como motor del desarrollo socioeconomico", June 2018, Benicasim, Spain, entitled "Transportation and Unmanned Technology: Fiction or The Future? A First Glance on The Legal Issues Arising from The Use of Unmanned Vehicles for Transport Purposes", article in press.

[2] See also https://www.forbes.com/sites/ericmack/2018/02/13/delivery-drones-amazon-energy-efficient-reduce-climate-change-pollution/#3c6ce55a6a87 (last accessed 18.01.2019).

passenger transport, [3] to real cargo operations. [4] Remotely piloted aircraft for the carriage of cargo have already been tested in the military context, and many Authors agree on their possible translation to civil aviation. [5]

The first section of this Chapter aims at finding out whether the above-mentioned uses encounter any obstacle in the current legislations, or rather these latter are ready to embrace such a technological advancement.

It is noteworthy that, despite the lack of any specifically addressed instrument on transport with unmanned aircraft, there are cases where an unexplained mention to transport activities is made in legal sources dedicated to unmanned technology. It is the case of the Italian ENAC Regulation on remotely piloted aircraft systems: as a matter of fact, Article 7, entitled «Operation of RPAS», provides as follows in its paragraph 5: «[d]angerous goods transportation is subject to ENAC authorization». [6]

The provision may be deemed somehow bizarre, considering that it does not originate from any specific section of the Regulation dedicated to transport through remotely piloted aircraft systems. However, the wording used seem to imply the undisputed lawfulness of a possible application of remotely piloted aircraft for transport purposes. Whereas only transportation of dangerous goods is subject to authorization by the Civil aviation authority, interpreting *a contrario* shows evidence of a general acceptance of carriage of any other kind of cargo, with no need of ENAC intervention at all. Apart from this isolated case, we do not find rules on transportation with unmanned aircraft anywhere else. [7]

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[3] See also http://www.airbus.com/newsroom/news/en/2016/12/My-Kind-Of-Flyover.html (last accessed 18.01.2019).

[4] See also http://www.aircargonews.net/news/airlines/single-view/news/is-there-a-future-for-unmanned-air-cargo-operations.html (last accessed 18.01.2019).

[5] SIA, A.L.M., "Profili attuali della disciplina giuridica dei mezzi aerei a pilotaggio remoto e il regolamento dell'Ente nazionale dell'aviazione civile italiana (ENAC)", *Diritto dei Trasporti* 2014, 744, note 3; FRANCHI, B., "Aeromobili senza pilota (UAV): inquadramento giuridico e profili di responsabilità – seconda parte", *Responsabilità civile e previdenza* 2010, 1232; LA TORRE, U. - PETIT LAVALL, M. V., "Studio preparatorio alla modifica degli articoli 25 e 26 del nuovo Proyecto de Código aeronáutico latino americano", *Il Diritto Marittimo* 2017, 937.

[6] The English translation of the Regulation, a courtesy of ENAC, is available at the website page: https://www.enac.gov.it/sites/default/files/allegati/2018-Lug/Regulation_RPAS_Issue_2_Rev_4_eng.pdf (last accessed 18.01.2019).

[7] ICAO merely observes, in its Circular 328-AN/190 on Unmanned Aircraft Systems, chapter 5.38, that «[a]t such time as civil RPA are utilized for the transportation of goods internationally, the

As regards the state of the art of the technology, it is evident how the aviation sector, perhaps more than other sectors, has been affected by the automation technology. If we consider, for example, the flight operations of an aircraft nowadays, many phases are carried out by software mechanisms with little or no intervention of the human pilot. [8]

Moreover, «estimates in the literature indicate that somewhere between 70 and 80 percent of all aviation accidents can be attributed, at least in part, to human error». [9] This is surely one of the main reasons behind the need of human beings to push on researching new technical evolutions for increasing the automation to the detriment of the human factor. [10] For instance, «[i]t is generally acknowledged that human decision-making processes are subject to several flaws, among them a tendency to avoid algorithmic thought, a biased development of pros and cons based on the laws of logic, a partial view of the overall system and, often, the heavy influence of emotions». [11]

This demand has brought us to the current level of automation and stretching this line of the automation process may bring to the extreme point of a total lack of a need for a human pilot, hence leading us to the results represented by drone technology. [12]

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provisions of Annex 18 and Article 35 of the Chicago Convention will be applicable».

[8] See CHIALASTRI, A., "Automation in Aviation", *Automation* (ed. F. Kongoli), 79. Chapter 2.16 of ICAO Circular 328-AN/190 on Unmanned Aircraft Systems reads as follows: «[a]utomation plays an ever increasing role, particularly in transport category aircraft. Automation systems are already capable of operating the controls, keeping the aircraft on course, balancing fuel use, transmitting and receiving data from various ground facilities, identifying conflicting traffic and providing resolution advisories, plotting and executing optimum descent profiles and in some cases even taking-off or landing the aircraft. All of these activities are, of course, being monitored by the pilot».

[9] WIEGMANN, D.A. / SHAPPELL, S.A., *A human error approach to aviation accident analysis: the human factor analysis and classification systems*, Bodmin, UK, 2003, 2.

[10] And moving towards the elimination of the human factor as a source of errors: cf. SCHMID, R., "Pilot in Command or Computer in Command? Observations on the conflict between technological progress and pilot accountability", *Air & Space Law* 2000, 282.

[11] CHIALASTRI, *supra* note 8, at 80.

[12] See also ibidem, at 81 for a useful description of the possible evolution of the computer-human operator relationship, as follows: «1.The computer offers no assistance; the human operator must perform all the tasks; 2.The computer suggests alternative ways of performing the task; 3.The computer selects one way to perform the task and 4.Executes that suggestion if the human operator approves, or 5.Allows the human operator a limited time to veto before automatic execution, or 6.Executes the suggestion automatically then necessarily informs the human operator, or 7.Executes the suggestion automatically then informs the human operator only if asked. 8.The computer selects

Today we have the certainty that this scenario is not any more pertaining to science fiction, but a reality of the current state of the art of the technology: in April 2013, for the first time in history, a Jetstream 31 aircraft covered a 500-mile flight in the United Kingdom, remotely operated by pilots located on the ground and carrying two persons on board across British non-segregated airspace. [13] This event is the evidence that the evolution of the technical science has already reached the point of allowing the use of unmanned aircraft for transport purposes. [14] Is the law ready for it?

After a general overview of the international regulation of the contract of carriage, the present chapter will only take into consideration the carriage of cargo in addressing specifically its relationship with unmanned technology: [15] as a matter of fact, we consider this sub-category of the transport sector to be the first, if not the only, application of transportation performed through unmanned aircraft. Flying on a device which is not controlled by a human pilot on board, sharing a common interest in the good success of air navigation, still encounters some psychological obstacles making it unlikely to be implemented in the foreseeable future. [16] The carriage of cargo, instead, does not find such a socio-psychological limitation: this short investigation aims at defining some aspects of the existing international legal framework for the contract of carriage of goods in order to verify whether any limitation is to be found in the legal context.

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the method, executes the task and ignores the human operator».

[13] MICHAELIDES-MATEOU, S. / EROTOKRITOU, C. "Flying into the Future with UAVs: The Jetstream 31 Flight", *Air & Space Law* 2014, 111.

[14] Also considering the unchanged capability of traditional aircraft reconverted into unmanned aircraft to carry persons or goods on board: FRANCHI, B., "Gli aeromobili a pilotaggio remoto: profili normativi ed assicurativi", *Responsabilità Civile e Previdenza* 2014, 1772.

[15] For an examination of the characteristics of the goods carried by air, see COMENALE PINTO, M.M., "Il limite risarcitorio nel trasporto aereo di merci", *Il trasporto aereo tra normativa comunitaria ed uniforme* (eds. Tranquilli-Leali, R. – Rosafio, E.G.), Milano, 2011, 231.

[16] In the document issued by ICAO in 2011, Circular 328-AN/190, "Unmanned Aircraft Systems (UAS)", chapter 2.7, it is stated that unmanned aircraft «will not, for the foreseeable future, have passengers on board for remuneration». A little bit more optimistic is the vision of the SESAR Joint Undertaking in its document "European Drones Outlook Study - Unlocking the Value for Europe", page 4, issued in November 2016, whereby «[i]n the longer term, unmanned larger commercial vehicles are gradually expected with initial versions of optionally piloted systems estimated for sometime after 2030 – first impacting cargo transport and then moving slowly towards transport of passengers». It is nonetheless recognised a need for a «societal acceptance» before this change will take place.

2. Transportation

2.1 The international framework of the contract of carriage

International aviation law does not provide a definition of the contract of carriage, despite its centrality in this field of the law. This is clearly a task remitted to the single national legislations, where the domestic legal systems provide for definitional norms.

A contract of carriage can be defined as a contract whereby the carrier undertakes to transport persons or goods from one place to another, for remuneration. [17] This definition is to be found in Italian law in its Civil Code, Article 1678. It is therefore a very general definition, encompassing the contract of carriage performed with any means whatsoever. Some Authors, [18] in order to clearly establish the characteristics of transportation, have stressed the importance of the vehicle as paramount element of the contract of carriage, regardless of the physical space where the person or good is carried.

Though forming an autonomous system, navigation law in Italian law does not provide a specific definition of contract of carriage by sea or by air, thus borrowing the one provided by the Civil Code, the rules of which are applicable in case of regulatory gaps in the Navigation Code. [19]

According to the previous reconstruction focussing on the role of the vehicle, air transport is, therefore, characterized by the fact that the transfer must take place using an aerial vehicle. [20] Once again, we can notice that the aircraft itself becomes the centre of air law in its entirety.

Before addressing the specific issues related to the contract of carriage performed with an unmanned vehicle, it is useful to briefly delineate the main features

[17] The reference to the remuneration to be found in the definition of the contract of carriage of the Italian Civil Code has raised a debate on the possible configuration of a gratuitous carriage to be included within the general definition of the contract.

[18] BUSTI, S., *Contratto di trasporto aereo*, Milano, 2001, 1.

[19] Pursuant to Article 1680 of the Italian Civil Code.

[20] BUSTI, S., "Contratto", *supra* note 18, at 8.

of such a contract, common to all modes of transport, irrespective of the means which are used to perform it.

The first obligation characterizing the contract of carriage on the part of the carrier is that of transporting people or goods from one place to another. This implies an obligation of performing the carriage within a certain amount of time, having regard of the agreed distance and of the means with which the contract is to be performed.

The violation of such obligation may bring to carrier's liability for breaching the contract and/or for defective performance thereof (this latter in case of delay, namely when failing to perform the contract in the agreed period of time).

A second, particularly important obligation binding the carrier, which cannot be explicitly inferred from the definition above given, is the duty of care. [21]

It assumes different character whether we are discussing the contract of carriage of passengers or of goods, due to the different nature of the carried element. As a matter of fact, whereas the subject of transport is a person, the duty of care is addressed directly towards the contracting party; in case of carriage of goods, the contractor is not directly participating in the transport operations and the duty of care has to be addressed to the cargo.

The violation of such an obligation may occur in case of loss or damage to the cargo, whereas, with regard to transport of persons, injuries or death involving the passenger may represent the evidence of this violation.

Although without a precise definition, international air law has not failed to give some aspects related to the contract of carriage an effective legal framework, in order to provide uniform rules for a field which aims to find globally shared solutions, given its natural international vocation.[22]

This occurred at the very early stage of the history of aviation and its relevant law, with the signature of the Warsaw Convention. With the subsequent

[21] MCNAIR, A.D., *The Law of the Air*, Third Ed., Kerr, M.R.E. – Evans, A.H.R. (eds.), London, 1964, 138, observes that also at common law the liability of the carrier is twofold, provided the existence of the two mentioned obligations.

[22] ROMANELLI, G., "Principi comuni nelle convenzioni internazionali in materia di trasporto", *Il Diritto Marittimo*, 1992, 198, observes how international conventional law has in fact been particularly focussed on the carrier's responsibility.

amendments, it will be the fundamental instrument regulating the subject until the end of the Century.

Indeed, historically, the longest part of the Twentieth Century has been dominated by the Convention for the Unification of Certain Rules Relating to International Carriage by Air, signed in Warsaw in 1929. [23] This Convention witnessed important amendments during the second half of the Century, with the signature of the following instruments: the Protocol of The Hague of 1955, [24] the Convention of Guadalajara of 1961, [25] the Protocol of Guatemala City of 1971 [26] and the four Protocols adopted in Montreal in 1975. [27]

The evident complexity due to the existence of too many different instruments forming the Warsaw System has led the international actors of civil aviation to convening a new conference at the end of the Century, bringing with it the adoption of a brand-new Treaty: the Montreal Convention, signed on 28 May 1999 and entered into force in 2003. [28]

The Montreal Convention has shown a great success in the process of unification of rules on the carrier liability in air transportation, given the number of

[23] The convention was studied and drafted by the International Technical Committee of Legal Experts on Air Questions (*Comité International Technique d'Experts Juridiques Aériens*, CITEJA), formed in 1925, and discussed during the Warsaw Conference between 4 and 12 October 1929.

[24] The Protocol signed at The Hague on 28 September 1955 repealed the nautical fault as exemption for the carrier and added important provisions on the exclusion from the benefit of the limitation of liability in case of act or omission done with intent to cause damage or recklessly and with knowledge that damage would probably result.

[25] The Convention Supplementary to the Warsaw Convention, signed at Guadalajara on 18 September 1961, introduced the concept of actual carrier, meaning a person other than the contracting carrier actually performing the transfer.

[26] The Protocol of Guatemala City, signed on 8 March 1971, mainly contained amendments on the subject of the carrier's limitation of liability.

[27] On 25 September 1975, four Protocols were signed at Montreal. For an examination of the most important one, the fourth Protocol, see CERVELLI, V. R. / GIUSTIZIERI, F., "C'è qualcosa di nuovo oggi nell'aria, anzi d'antico: l'entrata in vigore del Protocollo n. 4 di Montreal 1975", *Diritto dei Trasporti* 1999, 35.

[28] The European Union had decided to intervene for improving the Warsaw System a few years before the adoption of the Montreal Convention, through its Regulation (CE) 2027/97: cf. COMENALE PINTO, M.M., "Riflessioni sulla nuova Convenzione di Montreal del 1999 sul trasporto aereo", *Il Diritto Marittimo* 2000, 803. The Convention was the result of the draft approved by the ICAO Legal Committee at its 30th Session in June 1997 and of the debate of the following years: cf. ZAMPONE, A., "Le nuove norme sulla responsabilità del vettore nel trasporto aereo internazionale di passeggeri", *Diritto dei Trasporti* 2000, 7 note 1.

ratifications reached. [29] And it is precisely to the provisions of this convention that we have to turn our attention, since it contains the most important binding rules for an international contract of carriage.

First of all, its scope should be made clear, namely that of all international transports according to the definition provided in the Convention. Under Article 1, international carriage means any carriage in which the place of departure and the place of destination, whether or not there be a break in the carriage or a transhipment, are situated either within the territories of two States Parties, or within the territory of a single State Party if there is an agreed stopping place within the territory of another State, even if that State is not a State party.

Chapter II of the Convention provides rules concerning the documentation and duties of the parties relating to the carriage of passengers, baggage and cargo, containing, in particular, detailed rules on the air waybill, the document to be issued in case of contract of carriage of cargo. Chapter III contains the legal framework on liability of the carrier.

The provisions on carriage of passengers are to be found in Article 17, in conjunction with Articles 20 and 21, together creating the well-known systems of «two-tier liability». As a matter of fact, whereas Article 17 paragraph 1 establishes the fact on which the carrier's liability lies, Article 21, introducing a precise threshold of money, ends up creating two different liability regimes, one below, the other above such threshold.

Under Article 17, the carrier is liable for damage sustained by a passenger or in case of a passenger's death, when the bodily injury or death were caused by an accident occurred during the period included from the operation of embarking to the operation of disembarking.

Whenever the damage is assessed below the threshold of 113.100 Special Drawing Rights for each passenger, the carrier may be wholly or partly exonerated from its liability only by proving that the damage was caused or contributed to by

[29] The 1999 Montreal Convention has currently 135 contracting States. See https://www.icao.int/secretariat/legal/lists/current%20lists%20of%20parties/allitems.aspx (last accessed 18.01.2019).

the negligence or other wrongful act or omission of the person claiming compensation (or in general if the damage was caused by the negligence or other wrongful act or omission of the passenger in case of his or her death). [30]

If the damage, instead, exceeds the threshold of 113.100 Special Drawing Rights, the carrier shall be exonerated from its liability simply by proving that the damage was not due to the negligence or other wrongful act or omission of the carrier or its servants or agents or it was solely due to the negligence or other wrongful act or omission of a third party.

This shows the great difference of the carrier's liability under the two different tiers: below the said threshold, we are dealing with a form of responsibility which is close to a strict liability regime, with the only exoneration element represented by the passenger's contributory negligence and irrespective of any regard to the carrier's diligence; above that threshold, the regime becomes a traditional form of contractual fault-based responsibility, granting the carrier the defence of proving the absence of negligence or wrongful act or omission on his part.

Moving to the liability framework provided in case of damage to cargo, [31] the regime shows a particular severity towards the carrier. This latter is indeed considered liable for damage sustained in the event of the destruction, loss of, or damage to, cargo upon condition only that the event which caused the damage took place during the carriage by air, including all the duration of the period in which the cargo is in the charge of the carrier. [32]

Article 18, paragraph 2, subsequently provides a list of events exonerating the carrier from its liability: an inherent defect, quality or vice of that cargo; a defective packing of the cargo performed by a person other than the carrier or its servants or agents; an act of war or an armed conflict; an act of public authority carried out in connection with the entry, exit or transit of the cargo. [33]

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[30] The limits of liability have been revised from the date of 30 December 2009, pursuant to the provision of Article 24 of the Convention.

[31] The Convention excludes, however, postal transport from its scope. See ROSAFIO, E. G., "Il trasporto aereo di cose", *I nuovi contratti nella prassi civile e commerciale*, Torino, 2004, 45.

[32] Article 18 of the 1999 Montreal Convention.

[33] To these exemptions we must add the generic provision of a contributory negligence of the damaged party, provided in Article 21 of the Montreal Convention.

The adoption of the 1999 Montreal Convention contributed to the process started within the Warsaw System, in particular with the signature of the forth Protocol of Montreal in 1975. [34] The process has brought the system of the carrier's liability from a fault-based liability regime to a strict liability regime, abandoning once and for all every reference to the concept of diligence shown by the carrier in avoiding the damage. [35]

This new regime aims at focussing on the activity of the air carrier, based on an intrinsic risk justifying the total allocation of the costs of damages on the professional carrier, creating a higher economic protection on the consignor, who enjoys an easier system of burden of proof. [36] As we will see later in this Chapter, strict liability is a recurring feature of liability regimes in aviation law.

Lastly, it should be noted that a fault-based liability regime remains in case of damages to passengers, baggage or cargo occasioned by delay. [37]

2.2 Transport and unmanned aircraft

The aim of this section is to analyse the current legal framework on the subject of carriage at the international level through the filter of unmanned navigation, in order to understand the endurance of the existing rules and their attitude towards such a technological innovation.

The investigation will be conducted from the angle of the crew and the pilot on board the aircraft, with the purpose of verifying their role under the current legislation and the consequent indispensability of their presence.

Moreover, the carrier's international liability regime, as above described, will be observed with regard to the possible changes that will prove necessary due

[34] KONING, I., "Liability in Air Carriage. Carriage of Cargo under the Warsaw and Montreal Conventions", *Air & Space Law* 2008, 321.

[35] BOI, G.,"La responsabilità del vettore aereo per danni ed ammanchi alle merci", *Il trasporto aereo tra normativa comunitaria ed uniforme* (eds. R. Tranquilli-Leali – E.G. Rosafio), Milano, 2011, 218.

[36] ROMANELLI, G., "Diritto uniforme dei trasporti e Convenzione di Montreal 1999", *Il nuovo diritto aeronautico in ricordo di Gabriele Silingardi*, Milano, 2002, 588.

[37] Article 19 of the 1999 Montreal Convention.

to the use of an unmanned aircraft. As above stated, the analysis will be limited to the contract of carriage of goods for the reason above described.

First of all, I would like to draw the attention on a particular feature emerging from a first, albeit superficial, examination of the legal framework: the absence of any reference to the need of a crew on board. Therefore, we can start our investigation with the following questions: does the current legislation on air law contain explicit provisions referring to the need of a crew on board as a carrier's obligation? Or can this only be derived implicitly from the aviation legal system as a whole?

In this section we will try to give answers to these questions and verify how ready air law is for eventually accommodating the use of unmanned aircraft for transportation purposes. The 1999 Montreal Convention, as the Hague-Visby Rules in maritime law, represents the fundamental source for the identification of the international carrier's liability legal framework.

Unlike the above mentioned maritime Treaty, which will be subject to analysis in the following part of this Chapter, the 1999 Montreal Convention does not expressly provide obligations on the carrier's part nor does it specifically mention the crew as a necessary component of the carrier's undertaking. This, of course, does not mean that the air carrier is totally free to operate a transport of goods with an unmanned aircraft under the current legislation, but at least shows the higher flexibility of air law towards such a new technology.

As a matter of fact, the framework on air carriage does not end within the provisions of the said Convention. On the contrary, many other aspects, characterized by a great influence of public interests, as is typical of this branch of law, need to be taken into account by the carrier whenever he decides to undertake such an economic activity.

The reference is made to all legislation related to safety and security, which is already the main concern of the institutions and law-makers dealing with unmanned technology. [38] All these concerns will obviously have their reflection on

[38] As we can remark, for instance, from the ICAO Circular 328-AN/190, Unmanned Aircraft Systems (UAS), point 2.8, «[t]he principal objective of the aviation regulatory framework is to achieve and maintain the highest possible uniform level of safety. In the case of UAS, this means ensuring the safety of any other airspace user as well as the safety of persons and property on the ground».

the future transport sector, as the fundamental background to guarantee the same level of safety as for the manned aviation industry.

Hence the pilot and the crew are not mentioned in the Montreal Convention, but behind the scenes of the contract of carriage there are of course several norms, mainly of a technical nature, regulating their role within the aviation activities. Here we refer, essentially, to all those provisions examined in the previous chapter, which become relevant also when dealing with private law issues. For instance, Annex 2 to the Chicago Convention, containing the Rules of the Air, establishes that the pilot-in-command of an aircraft shall be responsible for the operation of the aircraft in accordance with the rules of the air [39] and shall have final authority as to the disposition of the aircraft while in command. [40]

Furthermore, there are many other provisions contained in the various annexes to the Chicago Convention, for example the ones of Annex 1 on Personnel Licensing or of Annex 6, Chapter 9 on Aeroplane Flight Crew. [41] In any case, a process of interpreting these rules in a manner adapted to the new unmanned technology does not seem insurmountable. The provisions of the Italian Navigation Code, instead, appear to be more stringent in establishing duties of properly manning the aircraft. [42]

Nonetheless, the absence of any reference to the manning activity of the air carrier gives us the chance to evaluate the endurance of this legal framework for the introduction of unmanned aircraft. However, this is a somehow apparent and most evident help for a legal introduction of unmanned transportation; it is another, deeper consideration, with regard to the liability system set forth by the mentioned Convention which forms the basis of our reasoning. It is a system based on a strict

[39] Paragraph 2.3.1, Annex 2 to the Chicago Convention.

[40] Paragraph 2.4, Annex 2 to the Chicago Convention.

[41] Among these provisions, it is noteworthy to quote the one of paragraph 9.1.1, which reads as follows: «[t]he number and composition of the flight crew shall not be less than that specified in the operations manual. The flight crews shall include flight crew members in addition to the minimum numbers specified in the flight manual or other documents associated with the certificate of airworthiness, when necessitated by considerations related to the type of aeroplane used, the type of operation involved and the duration of flight between points where flight crews are changed».

[42] See Article 896 of the Italian Navigation Code on the composition of the crew and Article 889 on the duties of the pilot-in-command, who has to make sure of the airworthiness of the aircraft before the flight and of its proper manning level. With this regard, see also MASUTTI, A, *Il diritto aeronautico. Lezioni, casi e materiali*, Torino, 2004, 266.

liability regime, as previously described, albeit not absolute for the provision of the exemptions listed in Article 18, second paragraph. These exemptions do not change the nature of the regime as a strict liability one, since none of them refers to the subjective element of the carrier's behaviour, being, instead, totally dependent on aspects external to his control power. [43]

As above mentioned, it is the outcome of a tendency to turn fault-based liability systems into strict liability one. [44] The rationale is to be found in the intention of placing all costs on the commercial entity undertaking such activity, to be counted among its business costs, for a better protection of the contracting party.

Such a system abandoned any reference to the negligence of the carrier: in the original text of the Warsaw Convention, we could even find the exemption of «nautical fault»[45] traditional of maritime law. Under Article 20, paragraph 2, in the carriage of goods and luggage the carrier was not liable if he proved that the damage was occasioned «*by negligent pilotage or negligence in the handling of the aircraft or in navigation* and that, in all other respects, he and his agents have taken all necessary measures to avoid the damage» (emphasis added). [46]

The currently existing exemptions, instead, are totally irrespective of the carrier's activity and the reference to negligent pilotage has been removed from the text of the Convention. Any consideration to the pilotage, handling of the aircraft and navigation is now totally irrelevant.

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[43] BERLINGIERI, F., "Il trasporto di merci nella Convenzione di Montreal del 1999 sul trasporto aereo internazionale – Ambito territoriale di applicazione della normativa uniforme e disciplina della responsabilità del vettore", *Il nuovo diritto aeronautico in ricordo di Gabriele Silingardi*, Milano, 2002, 621.

[44] A trend opposite to the one existing in the earliest stages of the drafting phase of international conventions on transport field. See ROMANELLI, G., "Principi comuni nelle convenzioni internazionali in materia di trasporto", *Il Diritto Marittimo* 1992, 202.

[45] This well-known traditional institute of maritime law represents an exemption from the carrier's liability, based on the consideration that the carrier could never completely control the work of the shipmaster or the crew, creating a separation of the navigational operations with the transport activity itself. Such an exemption was included in the Hague-Visby Rules and defined by its Article 4, paragraph 2, which will be deeply examined later in this work.

[46] TINCANI, C., "La responsabilità nel trasporto aereo di cose", *Il nuovo diritto aeronautico in ricordo di Gabriele Silingardi*, Milano, 2002, 630-631.

It is in this context that any discussion on the field of unmanned transportation should start. And we believe that precisely this context represents a more favourable framework for the introduction of such innovation for the following reasoning.

What is the role of the law in addressing a new situation which is arising in the human experience if not that of creating a valid solution to the looming issues? In the context of the introduction of unmanned aircraft for transport purposes, the main concern is that of allocating the responsibilities on the appropriate party, considered to be the most suitable to bear the risks of such an activity. This translates to the need to find the person who will be held liable in case of loss or damage to the cargo due to the failure of the unmanned aircraft system, for instance an error in the remote pilotage of the aircraft.

Nevertheless, is such an error really relevant for the purpose of allocating the responsibilities between the contracting parties of the contract of carriage? In a system based on the carrier's strict liability, whereby his control over the navigational operations is irrelevant, the use of new technologies, to the point of moving the pilot outside the cockpit, does not seem to have any consequence on the contractual relationship between the carrier and the consignor.

In other words, the current liability legal framework seems ready to embrace unmanned air transportation, unlike the maritime legal system, whereby the shipmaster and the crew assume a more prominent role not only for the practical operation, but also for any consideration of a legal nature, particularly in relation to the position of the maritime carrier which may be considered less burdensome. [47]

The conclusion drawn in this section should, however, take many factors into consideration before being widely accepted: the private law regulation of the contract may well be ready to accommodate unmanned aircraft, but we should look at the aviation sector as a whole, where other interests play fundamental roles. Firstly, the public interest of safety, requiring compliance with a set of technical rules established by public authorities, usually at the international level. Secondly,

[47] BOI, G., "La responsabilità del vettore aereo per danni ed ammanchi alle merci", *Il trasporto aereo tra normativa comunitaria ed uniforme* (eds. R. Tranquilli-Leali – E.G. Rosafio), Milano, 2011, 226.

the interests of the other users of the airspace, who might be involved as third parties, triggering the mechanisms of liability in torts. The current legal framework of this latter and its relationship with unmanned navigation will be the subject of the following section of this Chapter.

3. Tort liability

3.1 The current international legal framework

One of the sectors in which unmanned aircraft may pose major problems of legal nature is tort liability. The use of unmanned vehicles determines a set of risks to persons with no contractual relationship with the operator, namely other users of the airspace and third parties on the ground, just as occurs to conventional aircraft. Although brief, the history of unmanned aircraft is certainly not short of incidents. [48]

With regard to tort liability, air law traditionally provides two different regimes depending on the persons or goods to which the damage is caused. One set of rules is dedicated to regulating collisions between aircraft; another one is devoted to damage to third parties on the surface. Whereas the former is completely remitted to domestic regulation, in the absence of any international instrument dealing with this subject, the latter was covered by an international convention many decades ago, which will be subject to analysis in this section. After a general overview of the mentioned regimes, I will discuss their applicability to unmanned aircraft.

The international law regulating collision between aircraft is characterised by the failure to conclude all projects of international convention succeeded one another over the decades. The first attempts date back to the early Thirties of the twentieth century, [49] followed by the 10th Session of ICAO Legal Committee in

[48] GUERRERO LEBRÓN, M.J. - CUERNO REJADO, C. - MÁRQUEZ LOBILLO, P., "Aeronaves no tripuladas: estado de la legislación para realizar su integración en el espacio aéreo no segregado", *Revista de derecho del transporte* 2013, 65, and RAPP, G.C., "Unmanned Aerial Exposure: Civil Liability Concerns Arising from Domestic Law Enforcement Employment of Unmanned Aerial Systems", *North Dakota Law Review* 2009, 627.

[49] Cf. SHAWCROSS AND BEAUMONT, *Air Law*, Fourth Edition, Vol. 1 General Text, P. Martin et al. (eds.), London, 1977, at 493, where it is stated that «much work was done under the auspices of CITEJA in the years following the signature of the first Rome Convention 1933, but no convention

1954 and the 15th Session convened in Montreal in 1964, which managed to draft an international agreement, later never submitted to an international conference. [50] Only with the adoption of the General Risks Convention, below described, we can infer the opening for an international regulation on collision between aircraft.

National legislation on collision between aircraft is somewhere governed by general principles of tort liability, [51] somewhere else strictly connected to the law of collision in the maritime sector. [52] The former is the case, for instance, of France, where Article L.6131-1 of the Transport Code [53] provides that «[i]n the event of damage caused by a manoeuvering aircraft to another manoeuvering aircraft in flight, the liability of the pilot and the operator of the aircraft is governed by the provisions of the Civil Code». [54] English law as well provides a right to recovery on the basis of negligence or breach of statutory duty in cases of mid-air collisions causing damage to the aircraft itself or to persons or property being carried therein. [55] The subject is governed by the general principles of torts at common law, since the various successive Civil Aviation Acts cannot apply to mid-air collisions for their express reference to damage to persons or property on land or water. [56]

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was ever concluded».

[50] ROMANELLI, G. - COMENALE PINTO, M.M., "Urto di aeromobili", *IV Digesto ital.*, *Sez. commerciale*, XVI, Torino, 1999, 321.

[51] The absence of any need for departing from the general principles of civil law has led many national legislators to make a mere reference to the general rules on the law of tort. See COMENALE PINTO, M.M., "La responsabilità per i danni da urto fra aeromobili", *Nuovi profili di responsabilità e di assicurazione nel diritto aeronautico*, Tullio L. (ed.), Napoli, 2009, 146.

[52] A third case is that of introducing an express and specific framework for aircraft collision, as occurred in Spain. However, even here regulations share many commonalities with other jurisdiction which have not provided specific aircraft collision rules, with some slight differences. Article 123 of the Ley sobre Navegacion Aerea states that «*[S]i la colisión ocurre por culpa de la tripulación de una de ellas serán de cargo del empresario los daños y pérdidas, y si la culpa fuese común o indeterminada, o por caso fortuito, cada uno de los empresarios responderá en proporción al peso de la aeronave»*. The Spanish term itself «*abordaje*» is borrowed from the maritime context: cf. PETIT LAVALL, M. V., "La reciente regulación internacional del abordaje aéreo en el Convenio sobre riesgos generales", *Diritto dei Trasporti* 2009, 710.

[53] Repealing the previously in force *Code de l'aviation civil*, of which Article L.141-1 contained the same wording.

[54] My translation of the original French text: «*[e]n cas de dommage causé par un aéronef en évolution à un autre aéronef en évolution, la responsabilité du pilote et de l'exploitant de l'appareil est régie par les dispositions du code civil*».

[55] SHAWCROSS AND BEAUMONT, *supra* note 49, at 505.

[56] See below. It has been stated that aviation cases should be dealt with similarly to maritime collision cases, where breach of regulations will usually be the strong evidence of negligence, but the usual

The second situation occurs in Italian law, where the unifying ambition of the Navigation Code is evident in subject matters such as collision. As a matter of fact, in the Italian jurisdiction, the shared rationale of rules on collision in the maritime and aviation sector is confirmed by the express reference, made by Article 966 of air navigation, to Articles from 482 to 487 to be found in Part I of the Code, regulating collision between vessels. [57] This framework is rendered applicable to collisions between aircraft, even in cases without material collision. [58] The main difference in terms of definition of the scope is the requirement that all vehicles involved are in movement. In case of collision between a moving aircraft and a stationary one, the applicable regime will be that of damage to third parties on the surface, assimilated to this case for practical reasons. [59]

The legal regime is very simple and based on general principles of fault liability, whereby the aircraft, to be read as "the operator of the aircraft", [60] is responsible for compensating any damage to other aircraft or ships if he is found at fault. [61] Whenever the collision is determined by case of force majeure, or it is not possible to establish the cause, damages are borne by those who suffered them.

Moving on to the legal regime of damage caused to third parties on the surface, the attention must be drawn to the existing international framework represented by the Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface, signed at Rome on 7 October 1952. The Convention, representing

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requirements of an action in negligence must be met in any case: see SHAWCROSS AND BEAUMONT, *supra* note 49, at 499.

[57] This regime, however, as observed in the dedicated section of this work, does not deviate from the general principles of tort liability, except for the presumption of equivalent fault where it is not possible to establish the proportion of fault of each aircraft and the joint and several liability in case of collision for common fault. See COMENALE PINTO, M.M., "La responsabilità", *supra* note 51, at 145.

[58] Pursuant to Article 967 of the Navigation Code, which extends the applicability of the mentioned rules when the damage is caused by the movement of the air or another similar cause.

[59] As observed by GRIGOLI, M., *L'esercizio dell'aeromobile*, Milano, 1988, 458, «*la situazione dell'aeromobile fermo non differisce in alcun modo, sul piano fenomenico, da quella relativa ad un oggetto che non sia un mobile della navigazione*».

[60] LEFEBVRE D'OVIDIO, A. – PESCATORE, G – TULLIO, L., *Manuale di diritto della navigazione*, XIV ed., Milano, 2016, 655.

[61] It is a kind of liability which can be derived from the general vicarious liability of aircraft operator for all facts committed by his pilot and crew, under Article 878 of the Navigation Code.

a second attempt of regulating the subject, [62] was not successful in terms of general acceptance by the international community, given the low number of ratifying States. [63] However, although ratified by only a small percentage of countries in the world, it is still the only international framework in force, covering the matter of damage to third parties caused by an aircraft in flight. As a matter of fact, the unsatisfactory achievement of such instrument, [64] together with the dramatic events of terrorism occurred at the dawn of the twenty-first century, [65] led to a long process for drafting two separate instruments, [66] the Convention on Compensation for Damage Caused by Aircraft to Third Parties, known as General Risks Convention, and the Convention on Compensation for Damage to Third Parties, Resulting from Acts of Unlawful Interference Involving Aircraft, both signed at Montreal on 2 May 2009. [67]

After almost ten years from their adoption, they are still not yet in force and there is not much enthusiasm on their possible future acceptance, given the concerns raised by many scholars. [68] Our examination will therefore be limited to the provisions of the Rome Convention 1952.

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[62] The Rome Convention 1952 was preceded by a previous Convention also signed at Rome in 1933. For an examination see: Gaspar Brown E., "The Rome Conventions of 1933 and 1952: Do They Point a Moral", *Journal of Air Law & Commerce* 1962, 418.

[63] For the reasons of such failure see GRIGOLI, M., *supra* note 59, at 465 and BUSTI, S., "I progetti di una nuova normativa internazionaluniforme sui danni cagionati a terzi dal volo di aeromobile: evoluzione o involuzione?", *Nuovi profili di responsabilità e di assicurazione nel diritto aeronautico*, Tullio L. (ed.), Napoli, 2009, 97. The number of States parties to the Rome Convention 1952 is currently 51: https://www.icao.int/secretariat/legal/lists/current%20lists%20of%20parties/allitems.aspx (last accessed 18.01.2019).

[64] Which had been previously amended by the Protocol to Amend the Convention on Damage by Foreign Aircraft to Third Parties on the Surface signed at Rome on 7 October 1952, signed at Montreal on 23 September 1978.

[65] MASUTTI, A., "Responsabilità per danni a terzi sulla superficie", *Diritto della Navigazione*, Deiana, M. (ed), Milano, 2010, 353.

[66] The drafters of the conventions made the decision of addressing the third-party liability in two separate instruments, one dealing with the ordinary risks of air navigation, the other with the act of voluntary unlawful interference, addressing the issue of security of civil aviation, particularly inspired by the attack of 9/11. The decision has been widely criticised by the doctrine: see, among others, BUSTI, S., "I progetti", *supra* note 63, at 101.

[67] CAPLAN, H., "Modernization of the 1952 Rome Convention and Protocol", *Air & Space Law* 2007, 19.

[68] Considered a step back, rather than a progress, by TULLIO, L., "La regressione del sistema di responsabilità per i danni a terzi sulla superficie", *Diritto dei Trasporti* 2008, 5. Moreover, the EU has even invited Member States to refrain from ratifying the Convention: LA TORRE, U., "La

The only aspect of the new General Risks Convention which is worth mentioning in this context is its innovation in its scope of application: as can be remarked from its official name, [69] and confirmed by the definition of "third party", [70] the new 2009 Convention innovates the preceding instrument by deleting the phrase "on the surface" referred to the third party. The new Montreal Convention covers damages caused by aircraft to third parties, where "third party" generically means «a person other than the operator, passenger or consignor or consignee of cargo». The consequence of this change is the inclusion of damages deriving from collision between aircraft within the scope of the convention, given that there will be no more need for the damaged party to be located on the ground, and that the operator, passengers and consignors or consignees of cargo of the other aircraft fall within the definition of third party pursuant to the Convention. [71] Besides the fact that it is unlikely that the General Risks Convention will soon enter into force and that there are no adequate provisions expressly regulating the event of collision, [72] the Convention would represent the first instrument of international law covering the law of collision between aircraft, after decades of unsuccessful attempts. [73]

Apart from the element of damage occurred on the surface, the other feature that must be pointed out of the scope of application of the Rome Convention 1952 is that the damage must occur in the territory of a Contracting State by an aircraft registered in the territory of another Contracting State. [74]

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navigazione degli UAV: un'occasione di riflessione sull'art. 965 c. nav. in tema di danni a terzi sulla superficie", *Rivista del Diritto Navigazione* 2012, 563.

[69] BUSTI, S., "I progetti", *supra* note 63, at 99.

[70] Article 1(i) of the General Risks Convention.

[71] Conversely, the Rome Convention 1952 expressly excludes the case of collision from its scope, since Article 24 reads as follows: «[t]his Convention shall not apply to damage caused to an aircraft in flight, or to persons or goods on board such aircraft».

[72] Except for Article 6 on events involving two or more operators, whereby «[w]here two or more aircraft have been involved in an event causing damage to which this Convention applies, the operators of those aircraft are jointly and severally liable for any damage suffered by a third party». Cf. LEFEBVRE D'OVIDIO, A. – PESCATORE, G – TULLIO, L., *supra* note 60, at 657.

[73] See, generally, PETIT LAVALL, M. V., *supra* note 52, at 707 and BUSTI, S., "La tormentata costruzione della nuova normativa internazionaluniforme sul danno a terzi dal volo di aeromobile: tanta fatica per nulla?", *Rivista del diritto della navigazione* 2010, 510.

[74] Article 23(1) of the Rome Convention 1952.

In some cases, such as the Italian Navigation Code, domestic laws have extended the applicability of the provisions to events which would not *per se* fall within the scope of the Convention: Article 965 of the Navigation Code [75] establishes the applicability of the international provisions in force to the liability for damage caused by the aircraft to persons or property on the surface, even to damage caused in the national territory by aircraft registered in Italy. [76] Hence, there is full correspondence of the legal framework of Italian law to that provided by the Rome Convention, thanks to the open cross reference, which will render applicable every convention to be ratified by the Italian Republic in the future. [77]

The liable person is identified in the operator, defined as «the person who was making use of the aircraft at the time the damage was caused». [78] The concept of operator is not corresponding to the general figure of *esercente* of Italian law: [79] this latter, indeed, looks at the teleological aspect of the concept, whereby only the organizational activity aimed at the implementation of the navigational operation assumes relevance, rather than the actual use of the aircraft, as required by the Convention. [80] Nevertheless, such a difference has no real practical effects, given the relevance assumed by the operating activity performed with consciousness and will by the operator: [81] as a matter of fact, if a person makes use of an aircraft without

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[75] As amended by the legislative decree n. 151/2006, mentioned in the first Chapter of this work.

[76] Paragraph 2 further extends the applicability of the international framework also to State aircraft.

[77] The reference to "international rules" is, however, not without drawbacks, given the wording used in the Article: for instance, doubts would arise regarding the scope of the General Risks Convention 2009, opened to damage to third parties wherever they are located, whereas Article 965 of the Navigation Code makes express reference only to damage to persons or property on the surface, hence virtually depriving the new Montreal Convention of the mentioned effect of extending its scope to aircraft collisions.

[78] Moreover, under Article 2(2)(3), «[a] person shall be considered to be making use of an aircraft when he is using it personally or when his servants or agents are using the aircraft in the course of their employment, whether or not within the scope of their authority. /The registered owner of the aircraft shall be presumed to be the operator and shall be liable as such unless, in the proceedings for the determination of his liability, he proves that some other person was the operator and, in so far as legal procedures permit, takes appropriate measures to make that other person a party in the proceedings».

[79] The *esercente* is, in the aviation sector, the counterpart of the maritime *armatore*.

[80] LEFEBVRE D'OVIDIO, A. – PESCATORE, G – TULLIO, L, *supra* note 60, at 646.

[81] ZAMPONE, A., "Riflessioni in materia di responsabilità nell'esercizio di remotely-piloted aircraft system (RPAS)", *Nuevos enfoques del derecho aeronáutico y espacial. XXXVIII Jornadas Latino Americanas de Derecho Aeronáutico y del Espacio*, Mayorga Toledano, M.C. (ed.), Madrid, 2015, 506.

the consent of the person entitled to its navigational control, this latter will be jointly and severally liable only if he fails to prove that he has exercised due care to prevent such use. [82]

With regard to the origin of the obligation to compensate damages, the mere fact of the flight is sufficient to attach liability to the operator, in derogation of the common principles of tort liability. At the dawn of its introduction, in fact, already from the first Convention of Rome 1933, the adoption of a strict liability for a regime on tort liability, at that time anchored to the condition of a culpable behaviour of the tortfeasor, was justified by the special protection need required for third parties outside the operation of the aircraft, not in the condition to take protective measures against the risks of such operation. [83] It was the beginning of liability for business risk and air law acted as a pioneer for the adoption of a strict liability regime. [84]

The obligation for compensation arises from the mere fact that the damage has occurred during the flight. [85] The Convention provides the definition of aircraft in flight, as «from the moment when power is applied for the purpose of actual take-off until the moment when the landing run ends». [86] Liability is excluded if the damage results from the mere fact of passage of the aircraft through the airspace in conformity with existing air traffic regulations. [87]

As regards the defences granted to the operator, liability is excluded if the person liable proves that the damage is the direct consequence of armed conflict or civil disturbance, or if such person has been deprived of the use of the aircraft by

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[82] Article 4 of the Rome Convention 1952.

[83] TURCO BULGHERINI, E., "Responsabilità per danni a terzi sulla superficie", *Dig. disc. priv. sez. comm.*, XII, Torino, 1996, 408.

[84] TULLIO, L., "La regressione del sistema di responsabilità per i danni a terzi sulla superficie", *Diritto dei Trasporti* 2008, 1.

[85] And that the flight itself, not necessarily the vehicles, has caused the damage. Therefore, the answerable person is found in the one who can foresee the risk and translate it into a cost, being in constant relationship with the cause of the damage. See ZAMPONE, A., "Riflessioni", *supra* note 81, at 507.

[86] Article 1(2) of the Rome Convention 1952.

[87] Article 1(1) of the Rome Convention 1952, which further provides that, following the general principle of causation, there is no right to compensation also where the damage is not a direct consequence of the incident giving rise to it. This Article was drafted bearing the issue of noise pollution in mind. LEFEBVRE D'OVIDIO, A. – PESCATORE, G – TULLIO, L, *supra* note 60, at 647.

act of public authority. [88] In addition, the compensation is not due or the amount is reduced when, respectively, the damage was caused solely through the negligence or other wrongful act or omission of the person who suffers the damage, or the damage was contributed by his/her wrongful act or omission (the so called "contributory negligence"). [89]

The Convention contemplates the case of two or more aircraft in collision with each other in flight, causing damage to a third party on the surface. In such circumstances, the operator of each aircraft is deemed to be liable according to the provisions of the Convention. [90]

Finally, other noteworthy rules introduced by the Rome Convention are the limitation of liability and the provisions concerning the insurance coverage. As regards the former, [91] Article 11 sets forth the limits to the liability, based on the weight of the aircraft, measured as the maximum take-off mass as authorized by the certificate of airworthiness. [92] The benefit of the limitation is excluded if the person who suffers damage proves that it was caused by the deliberate act or omission of the operator, his servants or agents, done with the intent to cause damage. [93] The Italian Navigation Code introduces a different criterion for the identification of the limits, in cases in which the Convention does not apply *per se*, anchoring the

[88] Article 5 of the Rome Convention 1952.

[89] Article 6 of the Rome Convention 1952, somehow reintroducing the element of negligence in the framework, although exclusively referred to the damaged person and not the operator.

[90] Article 7 of the Rome Convention 1952, whereby «[w]hen two or more aircraft have collided or interfered with each other in flight and damage for which a right to compensation as contemplated in Article 1 results, or when two or more aircraft have jointly caused such damage, each of the aircraft concerned shall be considered to have caused the damage and the operator of each aircraft shall be liable, each of them being bound under the provisions and within the limits of liability of this Convention».

[91] Which is often regarded as a typical provision accompanying a strict liability regime: see TURCO BULGHERINI, E., *supra* note 83, at 408.

[92] The limits set by Article 11 are provided as follows:« a) 500 000 francs for aircraft weighing 1000 kilogrammes or less; (b) 500 000 francs plus 400 francs per kilogramme over 1000 kilogrammes for aircraft weighing more than 1000 but not exceeding 6000 kilogrammes; (c) 2 500 000 francs plus 250 francs per kilogramme over 6000 kilogrammes for aircraft weighing more than 6000 but not exceeding 20 000 kilogrammes; (d) 6 000 000 francs plus 150 francs per kilogramme over 20 000 kilogrammes for aircraft weighing more than 20 000 but not exceeding 50 000 kilogrammes; (e) 10 500 000 francs plus 100 francs per kilogramme over 50 000 kilogrammes for aircraft weighing more than 50 000 kilogrammes. 2. The liability in respect of loss of life or personal injury shall not exceed 500 000 francs per person killed or injured».

[93] Article 12(1) of the Rome Convention 1952.

amounts to the compulsory insurance coverage introduced by Regulation (EC) n. 785/2004 of 21 April 2004. [94]

Concerning the provisions on insurance, the Convention opens the possibility for the contracting States to require that the operator of an aircraft registered in another contracting State be insured in respect of his liability for damage sustained in its territory for which a right to compensation exists under the provisions of the Convention. [95] In the EU system, the insurance is now covered by the mentioned Regulation (EC) 785/2004 of the European Parliament and of the Council of 21 April 2004 on insurance requirements for air carriers and aircraft operators, introducing a compulsory insurance for aircraft operators towards third parties. [96] In Italy this completes the already existing provision of Article 798 of the Navigation Code on compulsory insurance requirements. [97]

Although the Convention has received a limited number of ratifications, it has somehow inspired national legislations worldwide, also through the provisions of the first Rome Convention 1933. This is, for example, the case of English Law, where the Civil Aviation Act 1949 introduced a strict liability regime in some cases of surface damage. The said statute was later repealed by the Civil Aviation Act 1982, currently in force, of which Section 76(2) has repeated the same wording of the preceding instrument. The provision of such Section reads as follows:

> «[s]ubject to subsection (3) below, where material loss or damage is caused to any person or property on land or water by, or by a person in, or an article, animal or person falling from, an aircraft while in flight, taking off or landing, then unless the

[94] Regulation (EC) No. 785/2004 of the European Parliament and of the Council of 21 April 2004 on insurance requirements for air carriers and aircraft operators.

[95] Article 15 of the Rome Convention 1952.

[96] Cf. Article 4 of the Regulation, whereby air carriers and aircraft operators «shall be insured in accordance with this Regulation as regards their aviation-specific liability in respect of passengers, baggage, cargo and third parties».

[97] Cf. ROSAFIO, E., "L'assicurazione obbligatoria dei danni a terzi", *Diritto dei Trasporti* 1999, 405. After the reform of the aviation part of the Code, the Article expressly refers to the relevant EU regulation. Moreover, Article 971, integrating the provisions on the limitation of liability when the Convention does not apply *per se*, refers as well to the limits provided by the EU regulation, creating a full correspondence between insurance and liability for damage: see MASUTTI, A., "Responsabilità per danni a terzi sulla superficie", *Diritto della Navigazione*, Deiana, M. (ed), Milano, 2010, 352. For an overview of the compulsory insurance under the Spanish Air Navigation Law, see GUERRERO LEBRÓN, M.J. - CUERNO REJADO, C. - MÁRQUEZ LOBILLO, P., *supra* note 48, 94.

> loss or damage was caused or contributed to by the negligence of the person by whom it was suffered, damages in respect of the loss or damage shall be recoverable without proof of negligence or intention or other cause of action, as if the loss or damage had been caused by the wilful act, neglect, or default of the owner of the aircraft».

The features of the English Statute are essentially the same of the international system established under the Rome Convention, with the provision of physical loss or damage to persons or property on land or water, the causal link between the damage and the aircraft, the scope of application to aircraft in flight, taking off or landing and the defence of contributory negligence of the person who suffered the damage. [98] The only major difference is represented by the identification of the answerable person, not described as the «operator», as provided by the Rome Convention, but as the «owner» of the aircraft. It is true that the Rome Convention 1952 establishes a presumption whereby the registered owner of the aircraft is presumed to be the operator unless, in the proceedings for the determination of his liability, he proves that some other person was the operator and takes appropriate measures to make that other person a party in the proceeding. [99] However, the provisions in respect to the positions of other persons contractually involved in the use of the aircraft are slightly different: whereas pursuant to the international instrument the person from whom the right of use of the aircraft was derived is liable jointly and severally with the operator, [100] the English Civil Aviation Act 1982 attaches liability to the person to whom the aircraft has been demised, let or hired out, rather than to the owner, where the aircraft has been bona fide demised, let or hired out for any period exceeding fourteen days to any other person, and no pilot, navigator or operative member of the crew of the aircraft is in the employment of the owner. [101]

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[98] SHAWCROSS AND BEAUMONT, *supra* note 49, at 509.

[99] Article 2(3) of the Rome Convention 1952. According to SHAWCROSS AND BEAUMONT, *supra* note 49, at 484, the owner would maintain the quality of operator if the aircraft was chartered on a time and voyage charter, providing the crew; conversely, he would not be considered "operator" if he has chartered the aircraft on a bare hull basis.

[100] Article 3 of the Rome Convention 1952 provides that «[i]f the person who was the operator at the time the damage was caused had not the exclusive right to use the aircraft for a period of more than fourteen days, dating from the moment when the right to use commenced, the person from whom such right was derived shall be liable jointly and severally with the operator, each of them being bound under the provisions and within the limits of liability of this Convention».

[101] Section 76(4) of the Civil Aviation Act 1982.

3.2 Damage to third parties caused by unmanned aircraft

In conclusion of the description of the existing framework concerning collision between aircraft and damage to third parties on the surface, I can make my considerations related to the applicability of these rules to unmanned aircraft. We can infer a full applicability of the existing framework, being the baseline set of rules on aircraft operator's liability in torts. This holds true for those States which have adopted the Rome Convention 1952, the applicability of which has been already discussed in the literature. [102] For the others, where there is a different domestic regulation, the applicability of the provisions on damage to third parties on the surface to unmanned aircraft needs to be verified from time to time depending on the extensibility of such rules adopted within domestic law.

With regard to Italian law, the solution is to be found all inside the Navigation Code, thanks to the general assimilation of the notion of remotely piloted aircraft to the general definition of aircraft made by Article 743 of the Code. [103] As duly observed in the dedicated section of this work, the remotely piloted aircraft as defined by ENAC are considered to be aircraft in all respects. Under Article 965 the provisions of international law applicable in Italy are extended to damages caused by aircraft registered in Italy. The consequence is the applicability of the rules of the Rome Convention 1952 to damage to third parties on the surface occurred in Italy and resulting from the flight of an unmanned aircraft registered in Italy. [104]

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[102] See, for instance, MASUTTI, A., "Proposals for the Regulation of Unmanned Air Vehicle Use in Common Airspace", *Air & Space Law* 2009, 9; GUERRERO LEBRÓN, M.J. - CUERNO REJADO, C. - MÁRQUEZ LOBILLO, P., *supra* note 48, 88; MORSELLO, M.F, "Aspectos jurídicos principales de las aeronaves sin piloto", *Nuevos enfoques del derecho aeronáutico y espacial. XXXVIII Jornadas Latino Americanas de Derecho Aeronáutico y del Espacio*, Mayorga Toledano, M.C. (ed.), Madrid, 2015, 528.

[103] LA TORRE, U., "La navigazione degli UAV: un'occasione di riflessione sull'art. 965 c. nav. in tema di danni a terzi sulla superficie", *Rivista del Diritto Navigazione* 2012, 560.

[104] SEVERONI, C., "La disciplina normativa attuale degli aeromobili a pilotaggio remoto*", Diritto dei Trasporti* 2016, 83.

The initial uncertainty on the automatic applicability of the international aviation rules on tort liability to unmanned vehicles has been solved by the acknowledgment of a tacit assimilation of such aircraft into the general definition of aircraft, for their inclusion in the provisions of the Chicago Convention and the recent instruments of soft law by ICAO, confirming that unmanned aircraft should be treated as aircraft, with the due adjustments. [105]

However, as duly observed by Zampone, [106] the rules emerging from the Rome Convention 1952 are not totally corresponding to the new recommendations issued by ICAO when dealing with unmanned aircraft, especially when it comes to the definition of operator: the notion emerging from the Circular 328 of operator is that of a «a person, organization or enterprise engaged in or offering to engage in an aircraft operation». The divergence with the concept of operator adopted by the Rome Convention 1952 is evident, for in this latter the actual use of the aircraft at the moment of the damage is the only relevant element, whereas ICAO is now focusing rather on the organizational aspect of the navigational operations of an aircraft. [107]

Another issue arising from the use of unmanned aircraft systems is the possible inconsistency between the operator of the aircraft itself and the operator of the remote station, to be identified as the person or enterprise charged of operating the remote station. The two roles may not be necessarily coincident, bringing new doubts on the individuation of the responsible party under the provisions of the international convention. [108] This is where the complications mentioned in the previous chapters on the perception of unmanned aircraft as a system come into play. [109] When discussing liability issues, the configuration of the whole system and the

[105] ZAMPONE, A., "Riflessioni", *supra* note 81, at 504.

[106] Ibidem, at 508.

[107] Bringing the concept closer to the Italian notion of *esercente*, as noted above: cf. SIA, A.L.M, *supra* note 5, at 758.

[108] To which we must add the issue of transnational activities, regulated by different domestic provisions when the different entities involved in unmanned operations are not located in the same country, therefore are not certified by the same authority using the same standards. See ZAMPONE, A., "Riflessioni", *supra* note 81, at 508.

[109] It is noteworthy, in this context, that the relevance of the system has been remarked even for the general civil aviation, in its traditional design, where many factors and actors come into play in the definition of roles and responsibilities for air navigation: HUANG, J., *Aviation Safety through the*

apportionment of roles and duties of each component and their relevant operators will necessarily need to be addressed. Apart from the regulation of the internal relationships, the identification of a responsible person towards third parties is of a paramount importance.

In this context, we should remind that the technical regulations issued by each State Administration often contain provisions concerning the allocation of responsibilities between the different parties involved in unmanned aircraft operations. For instance, the Italian ENAC Regulation on remotely piloted aircraft systems, states as follows:

> «[in] case RPAS operations are carried out on behalf of third parties, a contract between the RPAS operator and the client shall be in force, where the sharing of responsibilities for such specific operations is defined with the relevant limitations and conditions, including provisions relevant to data protection as per Art. 34 of this Regulation». [110]

It is not clear how such provision should be interpreted, especially in the meaning of the phrase "the sharing of responsibilities", which seems to suggest that the operator may be entitled to contract out of his responsibility when he is acting on behalf of an unspecified "third party". For the way in which tort liability is designed, such an agreement may be effective only with regard to the contractual relationship between its parties, leaving the mechanisms of liability for damage to third parties on the surface unchanged. [111]

Another uncertainty arises in the Italian context, where some of the provisions of the ENAC Regulation are not consistent with the system as a whole: Article 32 prohibits unmanned operation unless the remotely piloted aircraft «has in place a third party insurance, adequate for the operations and not less than the minimum

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Rule of Law: ICAO's Mechanisms and Practices, Alphen aan den Rijn, 2009, 23.

[110] Article 7.3 ENAC Regulation, which, in its original Italian version, provides that «*[n]el caso di operazioni specializzate per conto terzi, deve essere stipulato un accordo tra l'operatore del SAPR e il committente nel quale le parti definiscono le rispettive responsabilità per la specifica operazione di volo e sulle eventuali limitazioni e condizioni connesse, anche con riguardo alle disposizioni in materia di protezione dati di cui all'Art. 34 del presente Regolamento*».

[111] SEVERONI, C., *supra* note 104, at 84 and LOBIANCO, R., "Mezzi aerei a pilotaggio remoto: brevi osservazioni sul regolamento ENAC", *Responsabilità Civile e previdenza* 2017, 2073.

insurance coverage of the table in Art. 7 of Regulation (CE) 785/2004 is in place for the operations». Regulation (CE) n. 785/2004 is the mentioned EU instrument providing rules on insurance coverage in the aviation sector; model aircraft weighting less than 20 kg fall outside its scope of application. [112] The major issue derives from the different translation present in the Italian version of the EU Regulation, whereby such an exclusion is not referred to model aircraft, but generally to aircraft weighting less than 20 kg. [113] The provision of the Italian Regulation introduces a mandatory insurance for third party liability of unmanned aircraft operators, but, in doing so, it makes reference to the amounts established by the EU Regulation, despite the exclusion of the smaller vehicles from the scope of this latter. Therefore, it is not clear whether the drafters of the ENAC Regulations had considered the existence of such inconsistency in the translation of the EU Regulation, given that it would reduce the effectiveness of the mandatory insurance for the exclusion of remotely piloted aircraft of less than 20 kg. [114] Perhaps these latter are, instead, the main target of ENAC when it adopted its Regulation: it is more likely that the Authority's need to regulate the market was essentially considering the sector which was the most developed at that moment, namely the case of smaller drones. We may resolve this inconsistency by excluding the applicability of the tables contained in Regulation 785/2004, without prejudice to the mandatory requirement of an insurance covering liability for damage caused to third parties on the surface. [115]

Finally, what may perhaps be considered the major issue in applying the existing framework on liability to third parties on the surface to unmanned aircraft, just at it currently is, is the inadequacy of the existing standards for the limits of the liability and for the insurance coverage. [116] For instance, the mentioned regulation

[112] Article 2(2)(b) of Regulation 785/2004.

[113] Article 2(2)(b) of the said Regulation, in its Italian version, refers to «*aeromobili con un MTOM inferiore a 20 kg*», rather than *aeromodelli*, as the literal translation from the English "model aircraft" should have been.

[114] FRANCHI, B., "Gli aeromobili a pilotaggio remoto: profili normativi ed assicurativi", *Responsabilità civile e previdenza* 2014, 1787.

[115] SEVERONI, C., *supra* note 104, at 86.

[116] Cf. SIA, A.L.M, *supra* note 5, at 769 and MORSELLO, M.F, *supra* note 102, at 530.

785/2004 requires, for the category of aircraft with MTOM of less than 500 kg, a minimum coverage of 750 000 SDR. On the one hand, the limitation may not be considered adequate for some remotely piloted aircraft which can anyway determine significant damage. [117] On the other hand, this provision would force small unmanned aircraft operators to expose themselves to liabilities and significant insurance costs, despite the local dimension of their business.

This is the evidence of one of the basic considerations which should be made to address the new issues deriving from unmanned vehicles. Despite the endurance of the legal systems, which might be virtually perfectly applicable to the aviation context characterised by the new unmanned technology, [118] in practice there is a number of practical aspects that should be taken into account, for the creation of new scenarios brought by unmanned aircraft, especially their diffusion and the consequent enlargement of the community of users of the airspace. [119]

The only certainty is that, for an effective functioning of the mechanisms of strict liability, the identification of the responsible person must be made clear by the existing legislation.

4. Air Traffic Services

Before concluding this chapter, I wanted to give some insight on new possible scenarios deriving from the innovative introduction of such technology in the civil aviation sector. This may involve a reconsideration of the role of Air Traffic Services (ATS).

The first initiative to provide external services of aid to air navigation was taken by some private companies in the United States, and the first experiment of air traffic control was inaugurated in New Jersey in 1935. [120] Only one decade later,

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[117] ZAMPONE, A., "Riflessioni", *supra* note 81, at 510.

[118] Indeed, according to COMENALE PINTO, M.M., "La responsabilità", *supra* note 51, at 131, the use of remotely piloted vehicles does not have particular consequences on the essence of the legal framework on third-party liability.

[119] For instance, deciding whether to distinguish the regulation on small unmanned aircraft from that on the large ones, criticised in the literature: cf. MACPHERSON, E., "Is the World Ready for Drones?", *Air & Space Law,* 2018, 175.

[120] See COMENALE PINTO, M.M., *L'assistenza al volo*, Padova, 1999, 8, who recalls the first stages

aids to air navigation were considered by the Chicago Convention in a few articles belonging to its Chapter IV on Measures to facilitate air navigation. For instance, Article 22 provides facilitation of formalities, [121] while Article 28 deals with air navigation facilities and standard services, stating that «each contracting State undertakes, so far as it may find practicable, to: a) provide, in its territory, airports, radio services, meteorological services and other air navigation facilities to facilitate international air navigation, in accordance with the standards and practices recommended or established from time to time, pursuant to this Convention».

Air traffic services were implemented pursuant to the provision of Article 37 of 1944 Chicago Convention, establishing the power of the ICAO to adopt international standards and recommended practices and procedures dealing with communications systems and air navigation aids; rules of the air and air traffic control practices with the aim of providing services of assistance and regulation of the air traffic, in order to ensure the safety of the operations. [122]

Annex 11 of the Convention represents the implementation of this provision, since it contains the International Standards and Recommended Practices on Air Traffic Services. [123] These must be read in conjunction with the technical provisions of Annex 2, mentioned in the previous chapter of this work, establishing the Rules of the Air. [124] Pursuant to Annex 11, Air Traffic Services represent a general category including the three sub-categories of air traffic control service, information service and alerting service. The first one is further subdivided into area control

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of these servicese when «*ci si limitò a segnalazioni con bandierine per l'atterraggio ed il decollo, a cui seguirono poi segnalazioni a mezzo di fasci di luce colorata, cui fecero infine seguito le comunicazioni via radio*». According to HAMALIAN, S.K., "Liability of the United States Government in Cases of Air Traffic Controller Negligence", *Annals of Air & Space Law* 1986, 56, prior to 1940 most airport control towers in the US were operated privately or by municipalities.

[121] Stating that «[e]ach contracting State agrees to adopt all practicable measures, through the issuance of special regulations or otherwise, to facilitate and expedite navigation by aircraft between the territories of contracting States, and to prevent unnecessary delays to aircraft, crews, passengers and cargo, especially in the administration of the laws relating to immigration, quarantine, customs and clearance».

[122] Article 37(a)(c) of the Chicago Convention.

[123] Now in its thirteenth edition since July 2001.

[124] The rules of Annex 2 were considered the elaboration of the existing objective rules of conduct, with which compliance was entirely remitted to the pilot, with no external influence by other entities: see COMENALE PINTO, M.M., "L'assistenza", *supra* note 120, at 7.

service, approach control service and aerodrome control service. [125] The more generic term "air traffic services" has replaced the formerly used "air traffic control", in order to embrace also information service and alerting service which both supplement the activity of the purely considered air traffic control. [126]

This latter specifically aims at preventing collisions between aircraft; preventing collisions between aircraft on the manoeuvring area and obstructions on that area; expediting and maintaining an orderly flow of air traffic; [127] whilst, generally speaking, the other functions of air traffic services are those of providing advice and information useful for the safe and efficient conduct of flights and notifying appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.

Chapter 2.1.1 of the Annex establishes the duty of the Contracting States to determine the portions of the airspace and the aerodromes where air traffic services will be provided by themselves and arrange for such services to be established and provided in accordance with the rules of the Annex.

Given the limited nature of the airspace, every use of which determines a limitation for every other possible user, the intervention of external entities in dealing with some aspects related to air navigation was considered necessary, for the superior interest of safety not only of the single aircraft, but of all users of the airspace at a given moment. This exigence, together with the need to manage the air traffic flow (ATFM - Air Traffic Flow Management), [128] in order to avoid a congestion of the routes, even through the identification of alternative routes, led to a new shape for air traffic services, no longer limited to be merely an aid to air navigation, but interfering in a much more stringent manner in the decision-making and in the programming of the traffic. [129]

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[125] Chapter 3.2 of Annex 11 to the Chicago Convention.

[126] SHAWCROSS AND BEAUMONT, *supra* note 49, at 272.

[127] Chapter 2.2 of Annex 11 to the Chicago Convention.

[128] The inclusion of Air traffic flow management makes the notion of Air Traffic Management more appropriate for its broader sense than Air Traffic Service according to KAISER, S.A., "Infrastructure, Airspace and Automation – Air Navigation Issues for the 21st Century", *Annals of Air and Space Law* 1995, 452.

[129] COMENALE PINTO, M.M., "Obblighi e responsabilità del controllore del traffico aereo", *Aeroporti e responsabilità*, Deiana, M. (ed.), Cagliari, 2005, 61.

Over the years, the role of the air traffic controller exceeded the dimension occupied at the time of conception of the traditional aeronautical legislation, becoming a new actor of aviation law, other than the classic legal figures. The flight controller, both for technological development and for the increase in traffic, tends to assume an increasingly important role, acquiring space between the competences of the pilot-in-command and other administrative tasks as navigation police. [130]

Nowadays, it is generally acknowledged that, particularly in carrying out services of Air Traffic Control, the competent authority is not limited to a work of mere surveillance of the space or dissemination of information, leaving to the pilot-in-command a space of discretion, but rather issues orders and authorizations leading to a level of compulsoriness. [131] And this relationship between the air traffic controller and the pilots commanding the aircraft is perhaps the most interesting legal issue, which has brought to the creation of some important case law where the interconnection between the two functions has been regarded as the cause of accidents and/or damage. The circumstance that such relationship may take new shapes with the use of unmanned aircraft is the reason why I am addressing this subject matter in this section of this work. Therefore, it is useful to take a look at the current status of the material legal framework.

In outline, courts have been called at national level to allocate obligations and liabilities following the general principles of the law of tort. [132] At the international level, attempts for a harmonised regulation of the subject were made in the early Sixties, to the point of achieving a draft convention which established a regime based on tort, anchored to the principle of fault liability and accompanied by the provision of a limitation of responsibility. [133] The occasion was exactly the same of drafting a comprehensive instrument addressing the liability for aircraft collision and for damage to third parties. [134] As we have observed above, the process has

[130] Ibidem, 81.

[131] LIBRANDI, R. / CAMILLETTI, R., "Rapporti tra controllore del traffico aereo e comandante dell'aeromobile", *Spunti di studio su L'attività di assistenza al volo*, Cagliari, 1994, 77.

[132] In actions where the defendant is the State, given the conception of such service as an exercise of public powers: SHAWCROSS AND BEAUMONT, *supra* note 49, at 273.

[133] COMENALE PINTO, M.M., "Obblighi", *supra* note 129, at 67.

[134] SHAWCROSS AND BEAUMONT, *supra* note 49, at 273.

never achieved its objectives and the debate on an international regulation of liability issues of air traffic services has slowly vanished, in conjunction with the abolition of the limits of liability provided for the air carrier's responsibility for damage to passengers. [135] As a matter of fact, in the preceding decades, it was not uncommon for lawyers to bring an action directly against the entities providing air traffic control, precisely to avoid the provisions of a limitation of liability and to find a deep pocket for their clients. [136]

The close interconnection with the legal framework concerning the carrier is evident, to the point that any departure from the flight assistance's instructions by the pilot has been considered an element for the loss of the carrier's benefit of the limitation of liability under the Warsaw system and, later, the Montreal Convention. [137] But the role of the air traffic controller may assume great relevance also in other sectors of the aircraft operator liability, such as the ones described in the previous section of this Chapter: tort liability for collision and for damage to third parties. This is, rather, a situation where the still existing limitation mechanism may lead the damaged party to have recourse to the air traffic controller in charge, not entitled to the benefit of the limits. [138]

In fact, there is no shortage of cases in which air traffic controllers have been recognised to have played a role in the accident. [139] A renowned mid-air collision case is, for example, the one occurred between a Tupolev TU 154M of Bashkirian Airlines and a DHL aircraft (Boeing 757-200) in the airspace near Überlingen (Lake Constance), Germany, on 1 July 2002. On 27 July 2006, the Konstanz Landgericht

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[135] With the problems arising from the absence of an international framework: cf. VRBASKI, L., "Liability for Air Navigation Service Providers: Towards an International Solution", *Air & Space Law* 2013, 34.

[136] COMENALE PINTO, M.M., "La responsabilità", *supra* note 51, at 147.

[137] See, for instance, the ruling by the U.S. Court of Appeal, 11th Cir., 15 June 1999, *Doris Cristina Piamba Cortes v. American Airlines, Inc*, 177 F.3d 1272.

[138] COMENALE PINTO, M.M., "Obblighi", *supra* note 129, at 70.

[139] In particular, CHATZIPANAGIOTIS, M., "Liability Aspect of Air Traffic Services Provision", *Air & Space Law* 2007, 329, observes that «[f]or IFR flight, courts are more likely to accept the responsibility of the ATCO: the pilot is presumed to be unable to see & avoid», a condition which will be the normality in the context of unmanned aviation. According to HAMALIAN, S.K., *supra* note 120, at 62, «in such a situation [flight under IFR], the pilot is at the mercy of the controllers' instructions and his own instruments. Thus, different conditions of flight place different sorts of duties and responsibilities on pilots and controllers».

(Konstanz Regional Court) has ruled on the issue of liability, holding the Federal Republic of Germany responsible to indemnify the plaintiff (Bashkirian Airlines) for all losses resulting from the accident and to hold the defendant harmless from any claims of third parties that result from the accident. [140] The ruling was based on the conclusion that the air traffic controllers' instruction was the exclusive cause of the accident, in breach of the governmental duties concerning ATC services: and that other contributory causes were not enough to form the basis for a contributory negligence defence. [141] In this and other occasions, the public nature of the ATS providers did not prevent the courts from holding the States liable for compensation, [142] through mechanisms of the principle of general tort law. [143] The extension of the level of interference by air traffic controllers and of their relevant responsibilities has naturally brought to an evolution also in the criminal jurisprudence. [144]

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[140] The passenger aircraft and the cargo aircraft were both flying at flight level 360 (36,000 feet, 10,973 m) on a collision course. The airspace was controlled from Zürich, Switzerland, by the private Swiss airspace control company Skyguide. As emerged from the German investigation, the only air traffic controller handling the airspace at that time did not realise the problem in time and thus failed to keep the aircraft at a safe distance from each other. Less than a minute before the accident he instructed the pilot of the Bashkirian Airlines flight to descend by a thousand feet to avoid collision with crossing traffic, while at about the same time the traffic collision avoidance system (TCAS) on the DHL aircraft instructed the pilots to descend. After the passenger flight had started the descent, their TCAS instructed them to climb, against the Swiss air traffic controller's instruction. Had both aircraft followed those automated instructions, the collision would not have occurred, deriving essentially from the shortcoming of the controller who mistakenly had kept on instructing the Tupolev to descend. The collision resulted in the death of all 69 passengers and crew of the Tupolev and the two crew members of the DHL Boeing.

[141] EHLERS, P. N., "Lake Constance Mid-Air Collision: Bashkirian Airlines v. Federal Republic of Germany", *Air & Space Law* 2007, 78.

[142] Since the case of *Eastern Airlines, Inc. v Union Trust Co*., the US Supreme Court has always excluded the possibility for the Federal Government to rely on the exercise of sovereign rights to avoid liability. COMENALE PINTO, M.M., "Obblighi", *supra* note 129, at 72. Courts have often been criticised for creating a too broad warranty position on the air traffic controllers: SODI, G., "Spunti dal volo Germanwings 9525: il difficile tema della safety culture. Due modelli a confronto", *Diritto dei Trasporti* 2017, 215. Such a creative interpretation by case law is risking overturning the role of the pilot-in-command under the principle on which aviation safety is based worldwide: FRANCHI, B., "Controllori del traffico aereo: un'altra sentenza che ne amplia le competenze", *Responsabilità civile e previdenza* 2011, 2289.

[143] VRBASKI, L., *supra* note 135, at 36.

[144] See, among others, for the Italian case law: Cass. Pen. 6820/2011 with critical comments by FRANCHI, B., "Controllori del traffico aereo: un'altra sentenza che ne amplia le competenze", *Responsabilità civile e previdenza* 2011, 2284, and by TROVÒ, L., "La posizione di garanzia dei controllori del traffico aereo", *Diritto dei Trasporti* 2011, 911. For an overview of American criminal cases, see FRANCHI, B., "Profili di responsabilità degli esercenti i servizi di assistenza al volo negli Stati Uniti", *Responsabilità civile e previdenza* 1991, 783.

It is an unstable legal framework, where air traffic controllers are exposed unlimitedly to the claims of any damaged person of the aviation sector, to the point that the dependence of the pilot to the instructions of the ATC has created a situation of joint decision-making mechanism on the operation of the aircraft. [145] The proposed developments of the legal framework have considered the introduction of a strict liability regime for the air traffic services provider, accompanying the process of privatisation of the organisation charged of the management of the aids to air navigation. [146] Against this background, it is clear that a legislative intervention at all levels is desirable, [147] and we believe that the advent of unmanned air navigation may represent the occasion for innovating the legal framework: in a future aviation market where we imagine the existence of aircraft being remotely piloted, the conception of such systems may witness a significant change due to the changes in the design of the piloting structure, with the introduction of unmanned aircraft systems.[148]

This change may be firstly of a physical nature, given the existence of remote control stations located far from the aircraft but perhaps closer to the ATS provider: we may start considering a work side by side, with the relevant roles and responsibilities kept distinguished.

But if we take this scenario to the extremes, we could consider a redistribution of responsibilities and a new, more meaningful role reserved to the ATS providers. This hypothetical scenario would entail a necessary exit of these services from the current state of activity of a public-administrative nature, being absorbed by the commercial organisations within the rank of their servants or agents, position

[145] SCHMID, R., "Pilot in Command or Computer in Command? Observations on the conflict between technological progress and pilot accountability", *Air & Space Law* 2000, 281.

[146] COMENALE PINTO, M.M., "Obblighi", *supra* note 129, at 70.

[147] For the beginning of a reform process in the EU, see VAN DAM, R., "The Long and Winding Road: Air Traffic Management Reform in Europe", *Air & Space Law* 2015, 47.

[148] KAISER, S.A., "Infrastructure, Airspace and Automation – Air Navigation Issues for the 21st Century", *Annals of Air and Space Law* 1995, 453, stated that «the question may arise whether a reallocation of responsibilities between pilot in command and air traffic control will become necessary to legally reflect the changed working environment and interface between participants».

currently absolutely excluded. [149] After all, the idea of including the air traffic controllers' duties and responsibilities into the mechanism of contractual liability is not totally new, [150] but it would naturally require a modification of all the relevant legal framework, at least bringing much more clarity to the system. [151] Apart from these conjectures, the first issue to be addressed is the integration of unmanned aircraft into the current system of air traffic services, which is fundamental for achieving their desired full integration into the non-segregated airspace. [152]

To sum up, all these considerations obviously presuppose a new configuration of air traffic services as will be effectively implemented with the intervention of unmanned technology, hence requiring a future debate within the legal science under the urges of the demands of all stakeholders of the aviation sector. [153]

5. Concluding remarks

After the analysis of the law related to some of the main liability issues that might be affected by the employment of unmanned vehicles in the aviation context, we can draw some conclusions on the direction that air law should take in the near future, or, merely, on the longevity of this branch of the law faced with the advent of unmanned technology.

It has been remarked how aviation law is particularly familiar with one regime characterising different sectors, namely strict liability. This is, with some adjustments, the regime governing the contract of carriage of goods internationally

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[149] BUSTI, S., "Contratto", *supra* note 18, at 512.

[150] COMENALE PINTO, M.M., "Obblighi", *supra* note 129, at 76. The nature of the ATS provider as a contractual responsibility has been categorically excluded, for the lack of a valid consent by the user: VIDELA ESCALADA, F., "The international regulation of liability in the field of air traffic control services", *Air Worthy. Liber Amicorum honouring Professor Dr I. H. Ph. Diederiks-Verschoor*, Storm van 's Gravesande, J.W.E., - van der Veen Vonk, A. (eds.), Deventer, 1985, 206.

[151] One of the proposals in the literature is to impose strict liability on the ATS providers, considering the increasing use of automatic systems: CHATZIPANAGIOTIS, M., "Liability Aspect of Air Traffic Services Provision", *Air & Space Law* 2007, 356.

[152] Pursuant to a principle of transparency: see MASUTTI, A., "Proposals for the Regulation of Unmanned Air Vehicle Use in Common Airspace", *Air & Space Law* 2009, 7.

[153] Also taking into account the impact of automation on the organisation of air traffic services themselves: cf. LA TORRE, U. - PETIT LAVALL, M. V., *supra* note 5, at 939, where it is stated that «*gli air traffic controllers saranno gradualmente sostituiti da sistemi di comunicazione bordo/terra/bordo totalmente automatizzati*».

and this is also the regime which regulates the liability for damage to third party on the surface, both internationally and at a domestic level. The law of the aviation sector has been even regarded as the branch of the law where the institute of strict liability originated, for the inherent hazard represented by the activity of flying an aircraft from the early stage of the aviation history. [154]

Perhaps, with a significant implementation of unmanned aviation, this feature of the sector may represent a great advantage for an easier acceptance of this innovation into the legal framework. In any case, this does not mean that intervening with the appropriate adjustments is not a desirable choice, in order to guarantee the greatest clarity of the different legal positions in the era of unmanned navigation.

[154] Position not universally shared: SHAWCROSS AND BEAUMONT, *supra* note 49, at 502, observed that, at common law in the UK, «it is now clear that an aircraft itself will not be regarded as so inherently dangerous, and flying is not such an ultrahazardous activity that a special rule of strict liability should apply».

Part II – Maritime Law

SUMMARY - 1. Introduction - 2. The contract of carriage of goods - *2.1 Introduction to the carriage of goods - 2.2. Main provisions of the Hague/Hague-Visby Rules concerning the human component - 2.3. Seaworthiness - 2.4. Charterparties - 2.5. The carrier's exemptions - 2.6. Contract of carriage and unmanned shipping* - 3. Collision - *3.1. The law of collision - 3.2. Collision and unmanned ships - 3.3. The master* - 4. Pilotage and Vessel Traffic Services - 5 Concluding remarks.

1. Introduction

After the examination of public law aspects which will necessarily affect the use of unmanned ships, I will now turn my attention to the private law components of this field of the law, where the relations between the private actors of the shipping industry are regulated, for the contractual allocation of duties and rights of the parties to the various contracts and their relevant responsibilities. In addition, outside the contractual context, collision is one of the most important topics of maritime law, therefore, its relevant law and its contacts with autonomous navigation will be subject to this analysis.

From the perspective of the law of contracts, the investigation will focus entirely on the rules governing the most important relationships which form the basis of the international trade, namely the contract of carriage of goods in all its legal configurations. The maritime carriage of passengers is deliberately excluded from the scope of this work, for it will hardly be involved in the unmanned revolution: both as a matter of socio-psychological acceptance and for the technical needs deriving from the presence of passengers on board the vessel, none of the stakeholders involved in this new research field are considering its applicability to the carriage of passengers. [1] Moreover, a question on the limits of our technological advancements should be raised right in this context: is it really necessary and

[1] The carriage of passengers on unmanned vessels has been indeed considered not possible nor suitable: cf. BOI, G.M., "«Navi-drone»: primi interrogativi in tema di disciplina giuridica", *Rivista del Diritto della Navigazione* 2017, 189 and PIETTE, G., "Les navires sans équipage", *Droit Maritime Français* 2017, 989.

beneficial to all users of the sea having an unmanned cruise ship where thousands of tourists are left at the mercy of a shore-based crew? The same goes for the general category of pleasure craft, where sailing itself represents the interest of human beings. Only the contract of carriage of goods will therefore be examined in this chapter, likely to be the only appliance of unmanned technology in this field.

Against this background, one particular aspect has to be taken into account for the future implementation of unmanned navigation: when unmanned ships will come to light, they will always have to reckon with the coexistence of conventional craft in the same waters. This significantly affects the way in which we deal with the subject, given that we always have to bear in mind the presence of other manned vessels at sea. [2]

Moreover, this chapter has to deal with another major limitation, represented by the principle of freedom of contract. As a matter of fact, the use of spaces left to free contractual negotiation by the non-overriding rules might have significant consequences on the configuration which manned shipping will be given. To some extent, it might even constitute one possible solution, but much will depend on the directions which the industry will be eager to take.

2. The contract of carriage of goods

2.1 Introduction to the carriage of goods by sea

The international trade of goods has always been one of the main leading sectors of maritime navigation, from the earliest days of its history up to the third millennium. [3] Today, around 90% of goods are transported by sea and this sector has become largely predominant over the carriage of passengers, for the important replacement witnessed by this latter in favour of the faster and more comfortable

[2] According to TSIMPLIS, M., "The liabilities of the vessel', Baatz, Y (ed.) *Maritime Law*, fourth ed., Abingdon, Oxon, 2018, 313, «the major safety risk is in the mix of manned with unmanned ships rather than in any inherent risk in autonomy».

[3] International trade has been defined «unquestionably» the lifeblood of commercial shipping: LORENZON, F., "Shipbuilding, sale, finance and registration", Baatz, Y (ed.) *Maritime Law*, fourth ed., Abingdon, Oxon, 2018, 76.

air transportation. [4]

As described in the first chapter, the researches on unmanned navigation in the maritime context are mainly designed around the concept of an unmanned carrier, in which the major benefits of unmanned technology are considered to be found. [5]

Here again a similar consideration to the one conducted on passenger ships has to be observed: some categories of vessels are likely to be excluded from any discourse related to unmanned shipping, namely those employed for the carriage of dangerous goods. This is essentially due to the high risks of this kind of navigation, which is subject to much more stringent sets of rules concerning safety and security. It would be much more difficult to design a concept of unmanned operation for dangerous goods and perhaps not desirable at all. This adds a new element to the conclusion pointed out above of an unavoidable coexistence of unmanned vessels with conventional ones.

Oil tankers, for instance, represent today the 28 % of share of the world fleet in terms of tonnage. [6] If we consider them to be unlikely to ever witness the unmanned revolution, accordingly a large part of the shipping industry will remain unaffected by this new technology, hence raising an issue of coexistence of manned and unmanned vessels which needs to be taken into account not only during the transitional phase of the development.

The purpose of this section is to verify the legal feasibility of the use of unmanned vessels for the carriage of goods by sea under the existing legal framework, particularly through the analysis of the international maritime law, which bears a considerable high level of uniformity.

The legislative history of the contract of carriage of goods has witnessed

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[4] «Maritime transport is essential to the world's economy as over 90% of the world's trade is carried by sea and it is, by far, the most cost-effective way to move en masse goods and raw materials around the world»: https://business.un.org/en/entities/13. (last accessed 18.01.2019). For an interesting description of the business of carriage of goods by sea, see GIRVIN, S., *Carriage of good by sea*, 2011, 3. For updated statistics on the world fleet, refer to the UNCTAD Review of Maritime Transport 2017, 21.

[5] To the point of becoming, according to an Author, the «primary method of transporting goods»: cf. PRITCHETT, P.W., "Ghost Ships: Why the Law Should Embrace Unmanned Vessel Technology", *Tulane Maritime Law Journal* 2015-2016, 198.

[6] UNCTAD Review of Maritime Transport 2017, 21.

several changes from its earlies stage up to the present. However, the set of rules which seems to show a better resistance to the changing times is, surprisingly, the oldest one, given the poor success of the latest international instruments. Such a history dates back to the nineteenth century, when the Conference of Liverpool was held to establish common rules on bills of lading. [7]

However, a successful convention did not see the light until 1924, when the International Convention for the Unification of Certain Rules of Law relating to Bills of Lading was signed in Brussels. [8] It was the birth of the so-called Hague Rules, which, despite their almost century-old age, still play a fundamental role in governing the current contracts of carriage. In the majority of the maritime countries, this happens by way of the set of rules resulting from the adoption of the Protocol to Amend the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading of 1968, which amended the previous instrument, forming the so-called Hague-Visby Rules. For those States which are parties to both conventions, the contract of carriage will be governed by the Hague-Visby Rules, when applicable; for those States which did not signed or ratified the latter, the Hague Rules are still in force.

Beside these mentioned instrument, a couple of subsequent attempts were made by the international community in order to modernise the existing rules, even by concluding brand new conventions. The first of such attempts was the United Nations International Convention on the Carriage of Goods by Sea, so called Hamburg Rules, adopted at Hamburg on 31 March 1978. The second one was the United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea, commonly known as the Rotterdam Rules. The poor success of the two conventions, which is due to different practical reasons, is evidenced by the insignificant number of accessions, having the latter been ratified

[7] It was the Association for the Reform and Codification of the Law of Nations, later the International Law Association, which first promoted the convening of a conference for regulating internationally the relations between carriers and shippers. The outcome of the Liverpool Convention was the draft model of bill of lading, with the aim to be adopted in practice by the actors of the shipping industry. A few years later the approach changed from the model bill of lading to a set of rules which could be voluntarily incorporated by reference in the bill of lading.

[8] The novelty of the Convention is the abandonment of the approach of voluntary application, in favor of a set of rules introducing mandatory standards which could not be contracted out. This was done through the adoption of an international instrument binding the States Parties to the convention.

by only four States, hence not yet into force, whereas the former has been ratified by none of the important maritime countries. [9]

In my examination of the consequences and obstacles of the introduction of unmanned vessels with regard to the carriage of goods, I will primarily focus on the relevant provisions of the Hague/Hague-Visby Rules, defining the carrier's obligations and liabilities. [10]

2.2 Main provisions of the Hague/Hague-Visby Rules concerning the human component

The present section will be dedicated to the analysis of the obligations and liability of the carrier. In this context, the concept of seaworthiness plays a particularly important role: for this reason, it will be separately described in a dedicated section.

The contract of carriage is not defined in the Hague-Visby Rules. For this purpose we will refer to the Italian definition, which is to be found in the Civil Code and covers the contract performed with any means whatsoever, as pointed out in the air law part of the present chapter. The general rules on the contract of carriage provided by the Civil Code, indeed, find application in Italy also to transport by sea, when they are not derogated by the Navigation Code. [11] Article 1678 of the Italian Civil Code defines the contract of carriage as follows:

> With the contract of carriage the carrier undertakes to transfer persons or goods

[9] The Rotterdam Rules, which so far count of only four State Parties, require at least 20 ratifications for entering into force; the Hamburg Rules are, instead, effectively in force, but ratified by only 34 States, none of which can be considered as a major maritime country. For an updated status of the conventions, see: http://www.uncitral.org/uncitral/en/uncitral_texts/transport_goods/Hamburg_status.html (last accessed 18.01.2019) and http://www.uncitral.org/uncitral/en/uncitral_texts/transport_goods/rotterdam_status.html (last accessed 18.01.2019).

[10] In the context of this work, we will refer to the Hague Rules and the Hague-Visby Rules interchangeably, given their identical content with regard to the provisions below analysed.

[11] Article 1680 of the Italian Civil Code reads as follows: *«[l]e disposizioni di questo capo si applicano anche ai trasporti per via d'acqua o per via d'aria e a quelli ferroviari e postali, in quanto non siano derogate dal codice della navigazione e dalle leggi speciali».*

from one place to another, for remuneration. [12]

The quoted definition expressly shows only one of the carrier's obligations, perhaps the most evident, which forms the basis of the rationale of the contract, namely the transfer of passengers or goods from one place to another. [13] However, this is not the only obligation deriving from the conclusion of the contract, given the existence of another fundamental obligation, the duty of care. [14] This represents the condition for ensuring the safe and sound arrival of the passenger at the place of destination and the delivery of the cargo in the conditions in which it was received. It is an obligation implied by the existence of an action for compensation caused by death or injury to the passenger or damage or loss to cargo. Some legal sources even include express provisions with regard to the duty of care: the Hague-Visby Rules, for instance, establish a duty resting with the carrier to «properly and carefully load, handle, stow, carry, keep, care for, and discharge the goods carried». [15]

Besides these two main obligations, there is a number of other ancillary obligations of particular importance for our purposes, since they refer to the human component of the carrier's organisation. But before entering the details, we should verify the scope of application of the Hague-Visby Rules, for it constitute the instrument from whose angle we will address the issue of unmanned vessel, in order

[12] My translation of the Italian text «*[c]ol contratto di trasporto il vettore si obbliga, verso corrispettivo, a trasferire persone o cose da un luogo a un altro*».

[13] Such a duty has been made explicit by the Rotterdam Rules. See GIRVIN, S., "Carriage", *supra* note 4, at 445.

[14] Further, the obligation to transfer passengers or goods is accompanied by an additional element, constituting an important feature of the exact fulfilment of the carrier's main obligation: That is the time of transfer. It is calculated depending on all characteristics of the voyage and is of particular relevance for the interests of passengers and shippers, especially when it is violated by the carrier and depending on the importance of such violation. Charterparties sometimes have express terms concerning the time within which the obligation must be performed, otherwise they provide that the owner must exercise reasonable despatch, all convenient despatch, utmost despatch or due despatch. At common law it is implied that the obligation must be performed within a reasonable time: see BAATZ, Y, "Charterparties", Baatz, Y (ed.) *Maritime Law*, fourth ed., Abingdon, Oxon, 2018, 143. In respect to the Hague-Visby Rules, there is no mention to the time within which the transfer must be carried out or to the carrier's responsibility for delay in delivering the goods. The gap is usually filled by national legislation, such as Article 422 of the Italian Navigation Code, which extends the same liability regime borrowed from the Hague Rules to the damages caused by delay in the delivery.

[15] Article 3, Rule 2 Hague-Visby Rules.

to assess whether this might be applicable to a contract of carriage of goods performed by means of an unmanned ship. The answer to this question is to be easily found in Article 2 of the Hague-Visby Rules, providing the definitions of the terms used. As mentioned in the chapter dedicated to the definition of ship, the word is here intended to mean «any vessel used for the carriage of goods by sea». [16] This definition is very broad, specially tailored to cover all vessels employed in the transportation of goods by sea, irrespective of their type. This means that, once assumed the inclusion of the concept of unmanned ship into the general one, there is no reason for excluding the applicability of the Rules to unmanned vessels used for the carriage of goods by sea, provided that the other conditions of applicability are met. [17] Furthermore, the importance of the Rules is strengthened by the imposition of a minimum standard of obligations and liability which the carrier cannot contract out of. [18] The consequence is that a carrier using an unmanned vessel will be anyway bound to comply with such standards, which, however, include an inevitable reference to the human presence on board. It is therefore questionable how unmanned shipping will cope with these requirements, which will be now described in detail.

Finally, Article 2 itself defines the carrier simply as «the owner or charterer who enters into a contract of carriage with a shipper».

Whereas seaworthiness can be considered as the cornerstone of the carrier's obligations and liability, even with regard to the presence of a master and crew on board the vessel, the Hague-Visby Rules provide also an express requirement of manning the ship resting on the carrier. Indeed, Article 3, Rule 3, provides as

[16] Article 1(d) Hague-Visby Rules.

[17] These other conditions are outlined by the Article 1 itself, whereby the term contract of carriage applies only to «contracts of carriage covered by a bill of lading or any similar document of title, in so far as such document relates to the carriage of goods by sea, including any bill of lading or any similar document as aforesaid issued under or pursuant to a charter party from which such bill of lading or similar document of title regulates the relations between a carrier and a holder of the same»; the term goods bears the following meaning «goods, wares, merchandise, and articles of every kind whatsoever except live animals and cargo which by the contract of carriage is stated as being carried on deck and is so carried».

[18] See Article 3, Rule 8 Hague-Visby Rules, whereby «any clause, covenant, or agreement in a contract of carriage relieving the carrier or the ship from a liability for loss or damage to, or in connection with, goods arising from negligence, fault, or failure in the duties and obligations provided in this article or lessening such liability otherwise than as provided in these Rules, shall be null and void and of no effect».

follows:

> The carrier shall be bound before and at the beginning of the voyage to exercise due diligence to:
>
> a) Make the ship seaworthy;
> b) Properly man, equip and supply the ship;
> c) Make the holds, refrigerating and cool chambers, and all other parts of the ship in which goods are carried, fit and safe for their reception, carriage and preservation.

In the quoted Article, we may essentially identify all of the main issues concerning the introduction of unmanned shipping, together with the provisions on the carrier's liability. With regard to this latter, indeed, Article 4, Rule 1 of the Hague-Visby Rules precisely reflects the wording of Article 3, Rule 1, but on the vantage point of a subsequent and eventual stage of the contract performance, namely that of the carrier's responsibility. Article 4, Rule 1 reads as follows:

> Neither the carrier nor the ship shall be liable for loss or damage arising or resulting from unseaworthiness unless caused by want of due diligence on the part of the carrier *to make the ship seaworthy*, and *to secure that the ship is properly manned, equipped and supplied*, and *to make the holds, refrigerating and cool chambers and all other parts of the ship in which goods are carried fit and safe for their reception, carriage and preservation* in accordance with the provisions of paragraph 1 of article 3. [19]

We will focus, in this section, on the obligation to properly man the ship. It is evidently the first major issue which has to be addressed in the context of unmanned navigation. The existence of an obligation to man the vessel lying upon the carrier automatically makes the carrier who performs his carriage by means of an unmanned vessel in breach of one of the obligations established by law. The only workaround might be represented by the adverb «properly», accompanying the verb. Of course, we cannot infer that an unmanned vessel is ever properly manned, for she will always lack a master and a crew on board, however, we may interpret the flexibility of the «proper» manning requirement in a sense as to consider the

[19] Emphasis added.

unmanned craft as furnished with the number of crew members appropriate for a vessel of her kind: that is zero. It is evidently a somewhat unnatural interpretation, for it renders the verb used by the Rules to describe the carrier's obligation totally meaningless.

However, in order to establish the effective level of proper manning, one should refer to the relevant legislation adopted with regard to minimum safe manning levels. As described in the previous chapter, such reference has to be made, first of all, to the deeply analysed SOLAS Convention, which provides that all ships must be sufficiently and efficiently manned. [20] As duly observed in the previous chapter, there is no specific provision at international level defining the meaning of the adverbs «sufficiently» and «efficiently», just as there is no specific definition of what «properly» means in the context of the contract of carriage of goods. The solution is to be found in each single State regulation, by which the Maritime Administration defines the effective manning levels, by distinguishing type of vessel and role of crew members and taking into account the IMO Resolution 1047(27) on principles of minimum safe manning.

There is no case law to help us in our purpose of analysing the manning obligation on the part of the carrier, merely because the presence of the required number of crewmembers is a prerequisite to obtain the safe manning document by the national administration. [21] Therefore, carriers are always compliant with the obligation of properly manning the ship, given the importance of such a condition from the standpoint of administrative acceptance and safety concerns. All ships have so far been manned with the required number of personnel, for the obvious reason that shipowners (and/or carriers) need all of them to operate their vessels. [22]

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[20] Reference is made to Chapter V, Regulation 14 of the SOLAS Convention, deeply analysed in the previous chapter.

[21] GIRVIN, S., "Carriage", *supra* note 4, at 387.

[22] While the manning obligation can be considered also one of the criteria used by shipowners in the selection of the flag, the respect of minimum standards is also a significantly important factor for the master who will operate the vessel. Indeed, «[t]he manning requirement regime and its enforcement of the flag state is interrelated with the cost of labour. Even at lowest cost, fewer people to do the job reduces costs even further. There is usually a minimum number any master is comfortable with to operate a ship. Even with that minimum number, the operation has little room for error. If any errors occur because of under-manning, no matter what the flag state statute says, it will cause great difficulties for the master»: CARTNER, J.A.C. – FISKE, R.P. – LEITER, T.L., *The International Law of the Shipmaster*, London, 2009, 96 note 113.

The only requirement which the carriers have in some cases failed to meet is the personnel level of competence or the insufficiency of compartment staff, which are deemed to be components of the concept of seaworthiness, therefore analysed in detail in the next section.

The novelty brought by unmanned shipping is represented by the idea of demonstrating the equal level of safety of a ship which is not furnished with personnel on board, for she can be safely operated by a crew located on the ground thanks to her technological equipment. Therefore, the change for the acceptance of unmanned vessels has to go through amendments to such technical rules, allowing the issue of safe manning certificates in case of total absence of personnel on board the ship. Only at that time we might start thinking of a full compliance with the obligation of properly manning by carriers operating unmanned vessels. However, on a literal reading of the wording of the Hague-Visby Rules, an intervention on Articles 3 and 4 should be considered, in order to avoid a *prima facie* inconsistency of these provisions with unmanned shipping.

Even taking into account the latest international instrument adopted on the subject, although not yet in force and with limited chances to enter into force in the near future, [23] namely the Rotterdam Rules, is still of a little help for our purposes: the only change concerning the analysed obligation to be found in the Rotterdam Rules is the use of a new term «to crew» in Article 14, instead of «to man». The rationale is the elimination of the verb bearing a masculine reference, in favour of a more gender-neutral term, but keeps the same kind of issues as observed with regard to the Hague-Visby Rules. [24]

[23] For an interesting debate against and in favour of the adoption of the Rotterdam Rules, see, respectively: DIAMOND, A., "The Rotterdam Rules'', *Lloyd's Maritime and Commercial Law Quarterly* 2009, 445 and BERLINGIERI, F., "Revisiting the Rotterdam Rules", *Lloyd's Maritime and Commercial Law Quarterly* 2010, 583.

[24] Cf. page 12, note 56 of the working document A/CN.9/WG.III/WP.36 "Transport Law: Preparation of a draft instrument on the carriage of goods [wholly or partly] [by sea] - Provisional redraft of the articles of the draft instrument considered in the Report of Working Group III on the work of its twelfth session (A/CN.9/544)" available at http://www.uncitral.org/uncitral/en/commission/working_groups/3Transport.html (last accessed 18.01.2019).

2.3 Seaworthiness

«A vessel on the high seas without a master on board is an unseaworthy vessel». [25] This was one of the conclusions of an American case of vessel unseaworthiness, [26] which shows how inconsistent with such a statement unmanned ships may be. In this section we will focus on the doctrine of seaworthiness and its importance in the current legal framework.

When it comes to the concept of seaworthiness, all existing legal sources merely refer to seaworthiness, unseaworthiness, seaworthy or unseaworthy vessel without any specification of what all these terms effectively mean. For filling the concept of seaworthiness and seaworthy vessel with a substantial content, we have to turn our attention to case law, where the meaning and features of the terms derive from.

The Cambridge Dictionary defines the term seaworthiness as «the state when a ship is in a good enough condition to travel safely on the sea». [27] But in the legal background it features specific characteristics emerging from the work of maritime courts and scholars.

The origin of the doctrine of seaworthiness is to be located in the common law systems of the nineteenth century, precisely in the context of marine insurance, where the first cases developed the concept of implied warranty of seaworthy ship. In *Dixon v Sadler* the court stated that:

> There is an implied warranty that the vessel shall be seaworthy, by which it is meant that she shall in a fit state as to repairs, equipment, and crew and in all other respect, to encounter the ordinary perils of the voyage insured, at the time of sailing upon it. [28]

[25] NORRIS, M.J., *The Law of Seamen*, Vol. I, third ed., Rochester, 1970, 624.

[26] *Farmer v The O/S Fluffy D*, 220 F Supp 917 [DC Tex 1963].

[27] https://dictionary.cambridge.org/.

[28] Dixon v. Sadler, as quoted by ZHANG, P. – PHILLIPS, E., "Safety first: Reconstructing the concept of seaworthiness under the maritime labour convention 2006", 67 *Marine Policy* 67 2016, 55.

However, way before the use of the term seaworthiness, common law courts and charterparties used to refer to the status of the ship as to be «tight staunch and strong» for the intended voyage, and fitted with «good and able maryners». [29] The shipowner used to ensure that the ship was tight, staunch and strong and that the «ship, and her furniture, be sufficient for the voyage… [and] also be furnished with a sufficient number of persons of competent skill and ability to navigate her». [30]

We can infer that from the earliest stage, the doctrine of seaworthiness was built upon its main different components, which are still considered today. The reference to the «intended voyage» somehow shows the relativity of the concept, which is to be meant in consideration of different varying factors dependent on the different circumstances concerning the ship and the adventure, briefly described below. [31]

With regard to the legal nature of the doctrine, there has been an evolution from the original consideration of seaworthiness as an unconditional obligation, still existing at common law, to the new nature of due diligence obligation, adopted by some domestic statutes and later introduced to the international regulation. As a matter of fact, at common law the carrier has an absolute obligation, even considered, through a technically inaccurate term, as a warranty, of ensuring that the ship is seaworthy. [32] He will be absolutely liable, regardless of any negligence in making the ship seaworthy, since his duty is not merely doing his best «to make the ship fit, but that the ship should really be fit». [33] The evidence of the vessel's unseaworthiness is enough to identify the carrier's liability at common law, given the absence of exonerating circumstances.

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[29] See GIRVIN, S., "The Obligation of Seaworthiness: Shipowner and Charterer", NUS Law Working Paper 2017/019, 3, citing the earliest English cases, available at https://law.nus.edu.sg/cml/wps.html (last accessed 18.01.2019).

[30] Ibidem, at 5.

[31] BAATZ, Y., *supra* note 14, at 133, observes that "the test of unseaworthiness is subjective and not objective; i.e. this ship must be fit to encounter the perils of the sea for the contractual voyage and not any other voyage". The warranty of seaworthiness varies also depending on the place: a vessel considered seaworthy for a voyage in one place may not be so considered in another: see KASSEM, A. H, *Carriage of Goods by Sea: The Legal Aspects of Seaworthiness current law and development*, Lambert Academic Publishing, 2010, 26.

[32] GIRVIN, S., "Carriage", *supra* note 4, at 390.

[33] *Steel v State Line Steamship Co.* (1877) 3 App Cas 72, 86.

On the contrary, in other legal systems, the obligation to furnish a seaworthy vessel was soon replaced by an obligation to exercise due diligence to furnish a seaworthy vessel, with a view to protecting the carriers' interests. The first attempt came out of the Liverpool Conference in 1882, [34] considered to be the first step towards the establishment of a uniform international regime on bills of lading. However, the first legal source to effectively introduce the obligation of due diligence was the Harter Act, enacted in the United States in 1893. [35]

This was the position embraced by the international community when the Hague Rules were incorporated into the Convention signed at Brussels in 1924, still in force today also through the Hague-Visby Rules. This creates a significant difference of regimes between bills of lading regulated at common law and those governed by the international legislation, since, for this latter, «[t]he carrier shall be bound before and at the beginning of the voyage to exercise due diligence to: a) make the ship seaworthy» and he will be held liable only whether loss or damage arsing or resulting from unseaworthiness is caused by want of due diligence on his part to make the ship seaworthy. [36] When unseaworthiness as the cause of damage or loss to cargo is proven, the carrier can still rely on the proof of his exercise of due diligence to make the ship seaworthy, the burden of which rests with him under Article 4 of the Hague-Visby Rules. [37]

The concept of due diligence has been defined as a «genuine, competent and reasonable effort of the carrier to fulfil the obligations set out in subparagraphs (a), (b), & (c) of the art. 3(1) of the Hague or Hague-Visby Rules». [38] One of these obligations is, indeed, that of providing a seaworthy ship, meaning a ship which is fit to encounter the ordinary perils of the sea, according to many factors below described.

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[34] GIRVIN, S., "Carriage", *supra* note 4, at 215.

[35] STURLEY, M. F., *The Legislative History of the Carriage of Goods by Sea Act and the Travaux Preparatoires of the Hague Rules*, Volume 1, Littleton, 1990, 7.

[36] Article 4, Rule 1 Hague-Visby Rules.

[37] The last phrase of Article 4, Rule 1 reads as follows: «[w]henever loss or damage has resulted from unseaworthiness the burden of proving the exercise of due diligence shall be on the carrier or other person claiming exemption under this article».

[38] TETLEY, W., *Marine Cargo Claims*, 3rd ed., 1988, 369-370.

The first of these features is, naturally, the physical condition of the ship, namely her readiness to encounter the ordinary perils of the sea that she might face during the voyage, particularly depending on the ship characteristics, such as type of vessel, her age, her equipment, the existing state of knowledge, the time of the year of the intended voyage and the type of navigational waters.

Besides her physical fitness with regard to all such circumstances, the ship has to be seaworthy from the standpoint of her human component as well, also defined as «human worthiness». [39] It has been said that the human element of seaworthiness has been too little taken into account in comparison to the attention paid to the «iron and steel factors», referring to the ship's physical structure. [40] This can be due to the regular compliance with, at least, the requirement of the ship furnished with the sufficient number of seafarers, pursuant to the obligation of properly manning the ship. Nevertheless, the human element is assessed not only from the point of view of its numerical presence, but also by its competence and skill. This is essentially what the notion of seaworthiness according to the courts decisions encompasses.

The leading case in this subject matter is the *Hongkong Fir Shipping Co Ltd v Kawasaki Kisen Kaisha Ltd*, in which Salmon J stated that «the engine room staff of this vessel was incompetent and insufficient in numbers. Accordingly, the owners were in breach of their obligation» to make the ship seaworthy, pursuant to the clauses of the charterparty governing the contract. [41] With regard to the test for verifying whether the shipowner met his duty, the question is, continues Salmon J, «[w]ould a reasonably prudent owner, knowing the relevant facts, have allowed this vessel to put to sea with this engine room staff? […] I have no doubt that the true answer to this question is 'No'. It is obvious from the owners' associated company's letter […] to the owners' […] agents that the owners were informed that as the engines were very old it was necessary to engage an engine room staff 'of

[39] CHACÓN, V. H., *The Due Diligence in Maritime Transportation in the Technological Era*, Springer 2017, 132.

[40] ZHANG, P. – PHILLIPS, E, *supra* note 28, at 56.

[41] *Hongkong Fir Shipping Company, Ltd. v. Kawasaki Kisen Kaisha, Ltd., The "Hongkong Fir",* 1 Lloyd's List Law Report 1961, 171.

exceptional ability, experience and dependability'». [42]

The Court, through this decision, introduced a new component within the doctrine of seaworthiness, to be assessed in seaworthiness claims, concerning the human element of the ship's organisation. We can, however, remark that the requirement of a sufficient and competent crew was obviously not new to the contracts regulating the carrier's obligations and responsibilities: even centuries before, the charterparties used to require the ship to be furnished with 'good and able maryners' and other crewmembers according to their expertise. [43]

Perhaps the novelty of the *Hongkong Fir* case is related to the new approach of the judge of framing those aspects of the human component into the doctrine of seaworthiness, including the presence of a sufficient crew. It is not clear why the sufficiency of seafarers does not amount to the obligation of properly manning the vessels, rather as a case of seaworthiness. This renders the former obligation generally met in any circumstance, whereas what is subject to Courts assessment is once again the seaworthiness requirement, which bears a pivotal nature in allocating contractual responsibilities. After all, a rigid distinction of the two requirements as two different obligations is of a little practical consequence, given the same regime characterising both duties. In addition, the greater significance of seaworthiness in comparison to the mere manning obligation is due to the formulation of Article 4, Rule 1 of the Hague-Visby Rules: «[n]either the carrier nor the ship shall be liable for loss or damage arising or resulting from unseaworthiness unless caused by want of due diligence on the part of the carrier to make the ship seaworthy, and to secure that the ship is properly manned». In other words, what determines the carrier's liability is damage or loss to cargo resulting from unseaworthiness deriving from a lack of due diligence in properly manning the vessel. This is why, ultimately, failing to meet the manning requirement will always count as a case of unseaworthiness.

Many are the ways in which a ship may be rendered unseaworthy in her human component, always relative to the circumstances of the concrete case, depending on the single individual, on his connection to the specific vessel or on the single voyage, thus to be established on a case-by-case basis: these factors are

[42] Ibidem, at 168.

[43] GIRVIN, S., "The Obligation", *supra* note 29, at 3.

the lack of ability or training of the seafarer, for instance in fire-fighting, the lack of knowledge in relation to a particular vessel or her equipment, the lack of will or inclination, his habits and/or characteristics which render a seaman not suitable for his role on board the vessel or a temporary incapacity, due, for example, to illness or tiredness. [44] Therefore, in the mentioned cases, notwithstanding her physically fit structure or the presence of a sufficient number of seafarers, the vessel might still be considered not adequately manned, hence unseaworthy. [45]

Against this background, one should pay considerable attention in identifying the cause of the seafarer's action that resulted in damage or loss to cargo, for this might open two irreconcilable directions concerning the carrier's liability. Indeed, it is not easy to identify whether the origin of crew actions is to be found in the incompetence or in the negligence of some of the members. The consequence is, respectively, holding the carrier liable for damage or loss or, on the contrary, relieve him of his liability for compensation. [46] As a matter of fact, an incompetent crew is destined to be counted as unseaworthiness, hence falling within the scope or Article 4 Rule 1 of the Hague-Visby Rules, whenever such unseaworthiness was caused by want of due diligence on the part of the carrier to make the ship seaworthy. [47] Conversely, a negligent crew in navigating or managing the ship is the ultimate case of the so called "nautical fault", the well-known and much discussed exemption provided by Article 4, Rule 2(a) of the Hague-Visby Rules, which renders both the ship and the carrier not responsible for loss or damage. [48]

The exemptions provided to the carrier will be subject to a further discussion below. Here in the analysis of seaworthiness in its crew competence aspect, it is important just to remark the subtle difference existing with the crew negligence, giving rise to important practical consequences, as evidenced. This is, in outline, the current legal regime concerning the doctrine of seaworthiness, on which every

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[44] WHITE, R., "The human factor in unseaworthiness claims", *Lloyd's Maritime and Commercial Law Quarterly* 1995, 226.

[45] ZHANG, P. – PHILLIPS, E, *supra* note 28, at 56.

[46] WHITE, *supra* note 44, at 223.

[47] CHWEDCZUK, M., "Analysis of the Legal Status of Unmanned Commercial Vessels in U.S. Admiralty and Maritime Law", *Journal of Maritime Law & Commerce* 2016, 142.

[48] See below, section 2.5.

discourse relating to unmanned shipping should be built, as we will soon try to delineate.

However, for a complete description of the concept, although of a little relevance for our purposes, we should remark the existence of other factors pertaining to the theory of seaworthiness: a documentary factor, which refers to the duty to carry certain documents on board the vessel, such as all documentation concerning the navigational aspects or the ship's plan, the lack of which may render the vessel unseaworthy. [49] Finally, with particular regard to the performance of the contract of carriage, another important feature is the so called cargoworthiness, defined as the ability of the vessel to receive the cargo and deliver it to its final destination safely. [50]

2.4 Charterparties

It is noteworthy to briefly verify the position assumed by charterparties in relation to seaworthiness, as it might be insightful for the inspection of the issues related to unmanned shipping.

As is well known, the term «charterparty» refers originally to the document, consequently to the agreement therein contained, whereby a shipowner, for remuneration, leases his vessel, or the whole or part of the carrying capacity of his vessel, to a lessee (called a charterer) principally for the purpose of transportation of goods. This is why such kind of contracts are studied in the context of maritime transportation, because they constitute the most common means of regulating the relationships between parties deriving from the carriage of goods, along with the bill of lading, which differs for its legal nature. Charterparties are the main instrument in the hands of shipowners to make profit out of their property. [51]

However, not all charterparties can be framed into the category of contract of carriage: through a demise charter, possession, management, navigation, and control of the vessel are fully transferred to the charterer, who has, usually for a

[49] KASSEM, *supra* note 31, at 45.

[50] Ibidem, at 52.

[51] BAATZ, Y., *supra* note 14, at 123.

long period of time, decision upon the employment of the vessel and full control over the manning, equipping and insuring activities. [52] This type of charterparty cannot be classified among the contracts of affreightment, rather within the category of bailment or lease contract. The investigation, when discussing contracts of affreightment, is therefore generally limited to those, more widespread, charterparties typically used for transporting goods: the time charter and the voyage charter. [53]

With a time charter and a voyage charter, the shipowner retains possession, management and control of the vessel, which is leased to the charterer respectively for a fixed period of time or for a specified voyage. Traditionally the practice is to use standard forms drafted by particular bodies renowned in the shipping world, with a part following a printed model and another part to be filled by the parties to the agreement in accordance with their interests.

One of the most discussed aspects with regard to charterparties is their relationship with bills of lading, implying their relationship with the rules governing the bills of lading, such as the international regulation of the Hague or Hague-Visby Rules.

Technically speaking, there is no full coincidence of the actors parties to the two different instruments: whereas the charterparty is stipulated between shipowner and charterer, the bill of lading regulates the relationship between carrier and shipper. [54] However, in practice, bills of lading and charterparties are often closely related to each other, given the interest generally arising on the charterer to enter into contracts of carriage with shippers, therefore generating the issue of bills of

[52] ZOCK, A. N., "Charter Parties in relation to cargo", *Tulane Law Review* 1970-1971, 734.

[53] However, it should be remarked that the classification of these two kinds of charterparty is not unquestionable in all jurisdictions, mainly due to the existence of different legal frameworks on contracts for the use of the ship: for instance, in Italy, a long debate has been going on regarding the nature of the time charter, which has traditionally been framed within the category of *contratto di noleggio*, which can translate to the English "contract of hire", despite the recent change of orientation: cf. LEFEBVRE D'OVIDIO, A. – PESCATORE, G – TULLIO, L., *Manuale di diritto della navigazione*, XIV ed., Milano, 2016, 437. ZOCK, *supra* note 52, at 736 describes the time charter as not technically a contract of affreightment, but as a kind of contract of service. However, the term contract of affreightment is also used as a generic term to include all contracts of carriage by sea in return for the payment of freight or hire: see GIRVIN, S., "Carriage", *supra* note 4, at 20.

[54] See, for instance, the definition of carrier as the person «who enters into a contract of carriage with a shipper», provided by Article 1(a) of the Hague-Visby Rules, covering indeed the regulation of the bill of lading.

lading. This creates a complex network of single agreements with several different parties entering into them, usually having underlying contracts of sales of goods. Although it is often difficult to reconstruct its legal tangles and piece together the different positions arising, this network is essentially the lifeblood of the shipping industry.

An accurate description of this topic does not fall within the scope of this work. It will only be briefly outlined, for a better understanding of the repercussions on the concept of seaworthiness and, consequently, on the human factor in maritime navigation and its possible future absence in the context of unmanned vessels.

Essentially the main difference with regard to the nature of the bill of lading is dependent on the person who assumes the position of the holder; it shifts from a mere receipt not evidencing a contract of carriage, or a contract of carriage personally binding upon the shipowner alone, or a contract of carriage personally binding upon the charterer alone. [55] The bill of lading will be a receipt, if it is issued to the charterer who keeps it in his possession, or if it is issued or transferred to a third party who thereafter transfers it to the charterer. Where, however, the bill of lading is issued or transferred to a third party, it will always constitute a contract of carriage independent from the terms of the charter party, except for the provisions of the charterparty expressly incorporated in the bill, given the absence of privity on the part of the third party holder.

The rules governing the bill of lading are not, in themselves, applicable to the charterparty, making the reconstruction of the whole legal framework more difficult. In order to avoid such a difficulty, the charterparties often contain a paramount clause for the incorporation of the Hague-Visby Rules. Such a clause aims at making the Rules applicable to the contract between owner and charterer and, sometimes, it requires a paramount clause to be inserted in all bills of lading issued under that charterparty. Complications may arise from the absence of express reference to the specific set of Rules to be incorporated, or for the compulsory applicability of that set of Rules as enacted in a national legislation. [56]

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[55] Or, in the US system, a contract of carriage binding upon the vessel *in rem*.

[56] BAATZ, Y., *supra* note 14, at 129 reporting the *Yemgas FZCO v Superior Pescadores SA Panama (The Superior Pescadores)*.

With regard to seaworthiness, such incorporation, where made in a charterparty which provides an absolute obligation of seaworthiness, determines a reduction of this duty to a due diligence obligation under the international regulation. This occurs also whenever there is no express provision in the charterparty concerning seaworthiness, since the implied obligation will be found at common law (hence, an unconditional obligation, as previously described).

Nevertheless, this absence of express provisions regarding seaworthiness has become rarer in the latest contracts, since «nowadays one would expect a standard form charterparty to contain express provisions as to seaworthiness, although the word "seaworthiness" may well not be present». [57] Indeed, all standard forms today contain a clause using the terms which have traditionally constituted the concept of seaworthiness. For instance, the NYPE 1946 [58] provides in its Preamble:

> Vessel on her delivery to be ready to receive cargo with clean-swept holds and *tight, staunch, strong and in every way fitted for the service*, having water ballast, winches and donkey boiler with sufficient steam, or if not equipped with donkey boiler, then other power sufficient to run all the winches at one and the same time (and with full complement of officers, seamen, engineers and firemen for a vessel of her tonnage) [59]

The recent updated version, NYPE 2015, provides, instead, an obligation of seaworthiness with the express use of the term and adds an express reference to the master of the vessels and to the STCW Convention:

> The vessel on delivery shall be seaworthy and in every way fit to be employed for the intended service, having water ballast and with sufficient power to operate all cargo handling gear simultaneously, and, with full complement of Master, officers and ratings who meet the Standards for Training, Certification and Watchkeeping for Seafarers (STCW) requirements for a vessel of her

[57] Ibidem, at 132.

[58] The New York Produce Exchange (NYPE) is a standard time charter party developed by the renowned international shipping association representing shipowners, BIMCO (Baltic and International Maritime Council). Its 1946 edition is arguably still the most commonly used version of the NYPE in the dry cargo sector of the industry.

[59] Emphasis added.

tonnage.[60]

The Gencon 94 contains an obligation of due diligence to make the ship seaworthy, in line with the Hague-Visby Rules. [61]

We can remark how, just as occurs with regard to the obligation of seaworthiness, generally the standard forms do not utilise the word "man" in relation to the shipowner's duty to furnish the vessel with the appropriate number of seafarers. As we could see from the NYPE forms, the wording used directly mentions the specific role of the crew member, such as officer, engineer or fireman. The lack of reference to the master in NYPE 1946 can be due to the obviousness of the necessity of his role, at least for the way in which ships have been navigated up to the present days.

The example of these standard forms is useful to verify the approach of charterparties towards the manning factor of navigation, both in the form of the pure obligation to man and as a component of seaworthiness. As we can see, all of them address the issue, for it is a fundamental aspect of shipping activities, hence it cannot be overlooked even in the context of contractual freedom. This holds true for maritime navigation as has been up to the present time, but the challenge of unmanned shipping is precisely that of reducing the importance of such manning factor, to the point of totally eliminating it from the list of activities and obligations on the part of the carriers. We will try to draw some conclusion of this overview of the contract of carriage regime later in this work, but we can here anticipate that the flexibility and faster adaptation of the charterparties, in comparison to legislative interventions, may be one of the ways to slowly accommodate unmanned vessels, if possible. [62]

[60] Cl 2(b), lines 40-44.

[61] GIRVIN, S., "Carriage", *supra* note 4, at 395.

[62] For instance, the recent standard form Sheltime 4 is an example of the adaptation to technological advancements required in the operations of the vessel, for its provision expressly referring to "hull stress calculator, radar, computers and computer systems". See GIRVIN, S., "The Obligation", *supra* note 29, at 33.

2.5 The carrier's exemptions

In order to conclude the overview of the liability regime governing the contract of carriage internationally, however brief and incomplete it may be, this section is dedicated to the well-known exemptions provided in favour of the carrier by the Hague and Hague-Visby Rules. One in particular will be subject to examination for it is the one mostly discussed by scholars because of its peculiar nature and for its possible future evolution in the context of unmanned shipping.

Article 4, Rule 2 reads as follows:

> Neither the carrier nor the ship shall be responsible for loss or damage arising or resulting from:
>
> a. Act, neglect, or default of the master, mariner, pilot, or the servants of the carrier in the navigation or in the management of the ship;
>
> b. Fire, unless caused by the actual fault or privity of the carrier;
>
> c. Perils, dangers and accidents of the sea or other navigable waters;
>
> d. Act of God;
>
> e. Act of war;
>
> f. Act of public enemies;
>
> g. Arrest or restraint of princes, rulers or people, or seizure under legal process;
>
> h. Quarantine restrictions;
>
> i. Act or omission of the shipper or owner of the goods, his agent or representative;
>
> j. Strikes or lockouts or stoppage or restraint of labour from whatever cause, whether partial or general;
>
> k. Riots and civil commotions;
>
> l. Saving or attempting to safe life or property at sea;
>
> m. Wastage in bulk or weight or any other loss or damage arising from inherent defect, quality or vice of the goods;
>
> n. Insufficiency of packing;
>
> o. Insufficiency or inadequacy of marks;
>
> p. Latent defects not discoverable by due diligence;
>
> q. Any other cause arising without the actual fault or privity of the carrier, or without the actual fault or neglect of the agents or servants of the carrier, but the burden of proof shall be on the person claiming the benefit of this exception to show that neither the actual fault or privity of the carrier nor the fault or neglect of the agents or servants of the carrier contributed to the loss or damage.

Whereas the majority of the items refers to circumstances out of the carrier's control, hence constituting typical exceptions in a fault-based liability regime, made explicit by the quoted provision, [63] we will draw our attention to the one provided by Article 4, Rule 2(a), «[a]ct, neglect, or default of the master, mariner, pilot, or the servants of the carrier in the navigation or in the management of the ship», the so called «nautical fault».

This immunity implies that the carrier will not be held liable whenever the damage or loss to cargo is a direct consequence of the crew's activity both in purely navigating the ship and in her administration with regard to her nautical use, distinguished from her commercial use. The rationale behind such a peculiar provision is to be found in the circumstance that the master acts on his own judgement in making technical decisions concerning the navigational operation of the vessel; moreover, his employer, the shipowner, has no way to exercise control over the navigation and the master's decisions because of his distant location. [64]

Its introduction in the list of exemptions occurred at a time in which shipowners were attempting to overcome the traditional conception of the carrier as an "insurer" of the goods, hence liable for damages irrespective of his fault. It was part of the compromise between the interests of shippers and that of carriers, reached already at the Liverpool Conference of 1882. [65] After a debate raised by those delegates wishing to delete the exception and even the whole list, admittedly considered «a little long and at times archaic in its form», [66] the exemption was retained because of its customary value within the shipping industry, accepted by all stakeholders. Thus, an innovation in this respect would have been too dangerous, [67] especially with a view to creating a uniform and express protection of the

[63] Mr. Alten, representative of the Norwegian delegation at the Conference of Brussels 1922 observed how redundant the list of exception sounded for Continental lawyers, for the existence of a principle of *ex culpa* liability of the carrier in civil law jurisdictions. See STURLEY, M. F., "The legislative", *supra* note 35, at 376.

[64] GIRVIN, S., "Carriage", *supra* note 4, at 469.

[65] STURLEY, M. F., "The History of COGSA and the Hague Rules", 22 *Maritime Law & Commerce* 1991, 7.

[66] STURLEY, M. F., "The legislative", *supra* note 35, at 396.

[67] Ivi.

shipowner's interests. [68]

Yet such a rejection to innovation, emerged as far as 1924, seems to be still prevailing in the maritime world. Although the nautical fault has witnessed some attempts to be deleted from the existing international regulation, even to the point of including such deletion into the last two Conventions, the Hamburg and the Rotterdam Rules, [69] the poor success proven by these latter is perhaps a sign of resistance of the shipping industry to innovative rules, especially when it comes to the loss of privileges by one category. [70] Even more than a century after the birth of such exemption, in a totally different technological context which would no longer justify the rationale of the lack of means of communication between the carrier and his master and crew, the shipowners' interest of retaining the outcome of what has been defined a «one-sided» compromise seem to get the upper hand. [71]

It will be interesting to verify whether the future confrontation between the law and unmanned technology will represent the inevitable end of such «unprincipled anachronism on the verge of extinction». [72] This and other issues will be discussed in the next section.

2.6 Contract of carriage and unmanned shipping

We may now wonder what all this matter has to do with unmanned shipping. First and foremost, being the first sector in terms of impact to the maritime industry overall, the influence of the advent of unmanned vessels may be more significant in the context of carriage of goods. Secondly, such an impact will occur faced with the current legal context, which has to be properly reconstructed in order to verify

[68] Ibidem, at 452.

[69] GIRVIN, S., "Exclusions and limitation of liability", *Journal of International Maritime Law* 2008, 525.

[70] FORCE, R., "Comparison of the Hague, Hague-Visby, and Hamburg Rules: Much Ado About (?)", 70 *Tulane Law Review* 1995-1996, at 2070, observes that it is difficult to say how effective the impact of such deletion may be on the carrier's immunities: even the existing exemption can be easily turned by the court into failure to properly care for the cargo or incompetence of the crew, causing unseaworthiness of the vessel.

[71] MYBURGH, P., "Charting the Limits of the Nautical Fault Exemption", *Lloyd's Maritime and Commercial Law Quarterly* 2009, 294.

[72] Ivi.

where it might become an irreconcilable clash.

The first incompatibility may occur every time the legal sources require the carrier to man the ship, an obligation which, by definition, the operator of an unmanned vessel is not able to properly meet. Whereas the provisions analysed in the previous chapter deal with public law aspects, originating from the public interest in ensuring the highest level of safety of navigation, the other side of the coin may be represented by an exposure to contractual liability. It is the case of the framework established by the Hague and Hague-Visby Rules, whereby the carrier has an obligation to exercise due diligence to «properly man, equip and supply the ship» and is consequently held liable for loss or damage resulting from unseaworthiness caused by want of due diligence to secure that the ship is properly manned.

As observed earlier, the route to be followed in order to give a content to such a generic and open obligation of «properly manning» leads to the technical regulation on safety and minimum safe manning, deriving from the principles of the SOLAS Convention and then detailed by the single State Administrations. The great obstacle of such an obligation may be hard to surmount without a legislative intervention, but the wording with which it is formulated, as mentioned above, may represent a useful workaround. The flexibility of the adverb «properly» may still guarantee a certain degree of discretion as to the identification of the required number of seafarers on board the vessel. Essentially, despite the oxymoron inherent to the name itself, unmanned ships will be properly manned with a number of crewmembers equal to zero.

Given the obvious uncertainty of such a solution, we believe that, with regard to the mentioned provisions concerning the contract of carriage, a modification will prove necessary, since the accommodation of unmanned ships cannot be fully achieved so long as the carrier will be required by law to properly man his ship.

Moreover, due to the formulation of Article 4 of the Hague-Visby Rules and its interpretation witnessed by case law, the manning obligation is generally considered under the broader obligation of seaworthiness. As described above, the doctrine of seaworthiness bears a pivotal role within the framework of the carrier’s obligations and responsibilities. Within its borders, the human component has

played a fundamental role to give substance to the concept and failure by the carrier to meet his obligation of manning the vessel with a sufficient and competent crew has been taken into account for a consideration of the unseaworthiness of that vessel.

This is why seaworthiness in often regarded as the gateway to the legal introduction of unmanned shipping. Substantially, the new challenge will be that of demonstrating the effective seaworthiness of a vessel which is totally different from the ones so far existed with regard to the human component. In addition, this new kind of ship may also differ in other aspects such as ship design and construction, for the alleged presence of new technical features in the general design and the necessary presence of all new required software and hardware to allow navigational operations under the new mechanisms.

Hence, the introduction of unmanned ships to maritime law may effectively go through the evidence of their required level of seaworthiness, meaning that they will be fit to encounter the ordinary perils of the sea for the intended voyage and to carry out the transportation of the intended cargo for that particular voyage. However, we believe that the main feature of the concept is also a somewhat limitation to our room for manoeuvre from the legal perspective: that is its relativity. As a matter of fact, seaworthiness is an open and flexible concept, «relative to the nature of the ship, the particular voyage, the time of the year, the stages of that voyage, the cargoes which the shipowner has contracted to carry, and the relevant standards for the carrying of cargoes at the applicable time». [73] It is therefore an ever-changing doctrine, to be assessed on a case by case basis by the interpreter of the contract, evolving with the evolution of times and technical knowledge, in accordance with the scientific development. [74]

One may wonder how this might ever represent a limitation for the legal intervention. The answer to that question is to be found in the absence and non-necessity of an abstract definition of seaworthiness applicable once and for all. Seaworthiness has to be determined in concrete, as an evaluation of a prudent shipowner before and at the beginning of the voyage and, subsequently, by the court

[73] GIRVIN, S., "The Obligation", *supra* note 29, 18.

[74] CHACÓN, *supra* note 39, at 163.

in case of contestation over the possession of such quality of the ship. The ball is still in the hands of the industry, more precisely of researchers and engineers, who need to give evidence of the seaworthiness of unmanned ships as a category, to allow shipowners to make their unmanned vessels seaworthy in concrete. But when it comes to law-makers' intervention, their possibilities to be heard with regard to seaworthiness are restricted by the evolutionary nature of the concept: after all, «the fact that making the ship seaworthy involves more factual issues than legal ones limit the enactment and application of positive rules to strictly determine what the extension of this obligation is». [75]

Of course the determination of seaworthiness in concrete is not totally devoid of objective criteria on which the interpreter can count when assessing such quality of the ship: these are to be found in all technical legislation analysed in the previous chapter, particularly in the SOLAS and all other instruments establishing the standards of a safe navigation. [76] The more recent of these instruments, affecting the requirements of the ship as to seaworthiness, are the ISM Code [77] and the 2006 Maritime Labour Convention. [78]

This is where all the room for manoeuvre is left at this stage to regulators. Once again, the target of the legal discourse on unmanned shipping has to be the technical international regulation, aimed at ensuring the safety of maritime navigation in its broadest sense, hence destined to be of relevance even for the private law framework. Given the above described relative nature of seaworthiness, the only direct intervention possible for accelerating, or even forcing, the introduction of unmanned vessels is, for the moment, precisely to be found in these regulations.

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[75] Ibidem, at 171.

[76] In particular, with regard to the manning problem, the mentioned IMO Resolution A.1047(27) on the principles of minimum safe manning and the ISM Code.

[77] Cf. GIRVIN, S., "Carriage" *supra* note 4, at 388, about the new requirement of being ISM compliant as a seaworthiness standard.

[78] The Maritime Labour Convention, signed on 23 February 2006, is one of the pillars of international maritime law and is the outcome of the work of the International Labour Organization. It has become a mandatory element of the maritime legal system, and the compliance of the vessel with its standards is considered a requirement for her seaworthiness, not without problem of consistency with other instruments such as the Hague-Visby Rules. See ZHANG, P. – PHILLIPS, E, *supra* note 28, at 58.

As of the carrier's liability regime as a whole, with a particular look at the nautical fault, we may wonder what kind of consequences unmanned shipping may bring to the existing framework. The existence of a fault-based liability regime entails the relevance of the carrier's behaviour, particularly for the identification of his culpable act or omission which has determined or has contributed to determine the damage or loss to cargo. This holds true not only in respect to the obligation of due diligence as to seaworthiness, but in general terms for the overall construction of the liability regime, taking into account, for instance, the well discussed item (q) of Article 4(2) of the Hague-Visby Rules. [79] In the unmanned shipping context, the reconstruction of the chain of the causal link may require new reflections given by the nature of the new equipment used for operating the vessel, even taking too far from the actual employment by the carrier's organisation (for instance, in case of "functional breakdowns" with more sophisticated machinery). [80]

Also the exemption of nautical fault arguably calls for a deep look into the navigational behaviours of master and crewmembers, playing a fundamental role in shifting the burden of proof between carrier and plaintiff. The issue of what constitutes an act, omission or default in the navigation or in the management of the ship needs to be addressed in the new scenario of unmanned navigation: one may wonder to what extent the use of a navigational software effectively counts as navigation or management of the unmanned vessel. Against this background, the dividing line between the negligence for nautical fault and the incompetence of the crew, leading to unseaworthiness, risks to be even thinner. [81] The opposite outcome of the two directions has been described above.

All these issues become more evident when referring to errors committed by

[79] Article 4, Rule 2(q) states establish as a carrier's exemption «[a]ny other cause arising without the actual fault or privity of the carrier, or without the actual fault or neglect of the agents or servants of the carrier, but the burden of proof shall be on the person claiming the benefit of this exception to show that neither the actual fault or privity of the carrier nor the fault or neglect of the agents or servants of the carrier contributed to the loss or damage». This formulation has become the base of the liability under the new formulation of the Rotterdam Rules. Also in the Italian Navigation Code, evidence of the cause of the damages without the fault or privity of the carrier or of his servants or agents is made as general rule by Article 422, paragraph 1.

[80] See CHACÓN, *supra* note 39, at 150, with regard to seaworthiness.

[81] It has been duly observed how the shipowner must inform the master and crew of all technologies and any special attention they require, in order to verify that the personnel employed has the technical knowledge to operate such equipment: see CHACÓN, *supra* note 39, at 173.

the shore-based "master" or "crew": for some Authors there is no doubt that their activity will fall within the existing regime, for being to all extents acts of the carrier's servants related to the navigation of the vessel. [82]

Moreover, as mentioned earlier, reflecting upon the rationale of the nautical fault immunity rises many doubts on its significance in the twenty-first century: the distance of the carrier from the ship and her master, no longer effectively consistent with the equipment available today, will undoubtedly not justify the retention of such a controversial exemption anymore. Indeed, as observed in the literature, «technology has finally removed the basis for the provision completely». [83] The only circumstance which the carrier might, in an unmanned shipping future, not be in control of, may be represented by the complex network of electronic and computerized systems, which will be the core of the navigational operations. Nevertheless, we may wonder whether exempting the carrier's liability for faults caused by such systems will be favourable and can still amount to the concept of «nautical» fault.

Finally, to conclude this section, it is worth spending a few words with regard to the impact of unmanned shipping on charterparties. Generally speaking, it has been held that «there is nothing to stop the various types of charter party continuing to play a role. The fact that ships will in future perform their tasks without anybody on board does not appear to have an essential impact on these contracts». [84] This holds true in respect to the general functioning of the charterparties' negotiation and conclusion. Nevertheless, when it comes to some of the provisions analysed above, such as the ones requiring the complement of master, officers, seamen, engineers and firemen on board the ship, together with her seaworthiness, we cannot do without addressing and amending the relevant clauses of the standard forms in order to adapt them to the new needs and circumstances of unmanned vessels.

The same comments observed with regard to the obligations of manning and the obligation of seaworthiness as provided by the relevant international regulation

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[82] VAN HOOYDONK, "The law of Unmanned Merchant Shipping – An Exploration", *Journal of International Maritime Law* 2014, 419.

[83] PRITCHETT, P.W., *supra* note 5, at 217.

[84] VAN HOOYDONK, *supra* note 82, at 418.

can be repeated in parallel to the obligations of the same kind inserted in the standard forms of charterparties. However, despite the widespread use of standard forms, the conclusion of charterparties is based on a different balance of bargaining powers between parties, in comparison to the relationship between carrier and shipper, for which the necessity of enacting a set of mandatory rules was indulged through the Hague Rules. Charterparties are, instead, governed by freedom of contract, whereby the parties have the power of negotiating the clauses of the agreement.

In the present situation, it is hard to imagine the deletion of all clauses related to the presence of a crew on board for accommodating the charter of unmanned vessels. But in a near future, courageous shipowners, eager to sustain the «unmanned revolution», may think of inserting clauses tailored to the charter of unmanned ships, hence referring to the full complement of employees at a shore-based control centre and the ship's fitness with particular regard to the equipment necessary to navigate her from a distant position. [85] This must include the equipment which will prove necessary to replace the work of seafarers in all their previous tasks, from cameras, radars and instruments to perform a proper look-out, equivalent to that performed by sight and hearing, to all other appliances to be used for handling, stowing, keeping and caring for the goods carried. [86]

Although not easy to imagine, the freedom of contract existing in charterparties may constitute the gateway to the introduction of unmanned shipping, at least the fastest way, with less need to wait for the time for a draft of new international conventions or amendments to the existing ones. However, there will still be some aspects to be addressed, which the modification of the relevant clauses of charterparties will not resolve once and for all, namely compliance to the standards of safety provided by the international and domestic framework in the interests of all users of the sea. This is the evidence that, once again, the introduction

[85] Together with the introduction of possible future changes in the organisation of the carrier's activity, for instance conceiving the shore-control centre as an independent contractor, therefore bound with the carrier through a new, specific agreement.

[86] Considering that, «in the absence of express provision, the obligation to load, stow, trim and discharge the cargo is at common law on the owners»: cf. WILFORD, M. – COGHLIN, T. – KIMBALL, J.D., *Time Charters*, third ed., London, 1989, 245.

of unmanned vessels, even through the freedom of contract, cannot ignore the existence of a mandatory set of rules not related to private interests, which can be shaped unconditionally in their contractual positions, but to the public needs of a marine environment which must be safe for all.

3. Collision

3.1 The law of collision

Collision is the second subject referred to liability, which has to be perused in this chapter, with the aim to retrace the legal framework governing this issue and apply it to the new exigencies of unmanned ships. [87]

Collisions between vessels are the most common accidents at sea, together with groundings. [88] The concept is used to refer not only to collisions with material contact between ships, but also when damages have been determined by the movement of the water caused by another vessel, just as occurs in the case of aircraft collision. [89]

Although mostly regulated at a national level, some uniform principles internationally shared can be identified, especially thanks to the existence of an international convention on the subject. The Convention for the Unification of Certain Rules of Law with respect to Collisions between Vessels was signed at Brussels in 1910, as the achievement of the first Diplomatic Conference on Maritime Law promoted by the Comité Maritime International. [90] The Convention contains provisions which are basically repeated in all state legislations, for they do not depart from the general principles of tort law based on negligence. [91] The

[87] For an overview on the subject, see also VAN HOOYDONK, *supra* note 82, at 421.

[88] TSIMPLIS, M., *supra* note 2, at 234.

[89] This is explicitly confirmed by Article 488 of the Italian Navigation Code, whereby the provisions on collisions are applicable even with no matieral contact: «*[l]e disposizioni che precedono si applicano ai danni prodotti per spostamento di acqua od altra causa analoga, da una nave ad un'altra e alle persone o alle cose che sono a bordo di questa, anche se non vi è stata collisione materiale*».

[90] STURLEY, M. F., "The legislative", *supra* note 35, at 5.

[91] GAULT S. – HAZELWOOD S. J. – TETTENBORN A. (eds.), *Marsden on Collisions at Sea*, Thirteenth

premise is the existence of a general principle of *neminem laedere*, which translates to the maritime context to a duty of care imposed on every ship against all other users of the sea. [92]

This is reflected in the provision of Article 3 of the 1910 Convention, which states as follows:

> If the collision is caused by the fault of one of the vessels, liability to make good the damages attaches to the one which has committed the fault. [93]

This provision is completed by Article 2, which covers the cases where a fault cannot be established. It reads as follows:

> If the collision is accidental, if it is caused by force majeure, or if the cause of the collision is left in doubt, the damages are borne by those who have suffered them. [94]

Generally speaking, it is one of the typical cases amounting to the shipowner's vicarious liability, [95] with no personal fault on the employer but

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ed., London, 2003, 67.

[92] TSIMPLIS, M., *supra* note 2, at 234.

[93] That the principle of liability in case of vessels collision is nowadays universally governed by fault-based liability is recognised by IMO in its recent scoping exercise on Maritime Autonomous Surface Ships.

[94] In addition, Article 4 of the 1910 Collision Convention provides as follows: «1. If two or more vessels are in fault the liability of each vessel is in proportion to the degree of the faults respectively committed. Provided that if, having regard to the circumstances, it is not possible to establish the degree of the respective faults, or if it appears that the faults are equal, the liability is apportioned equally. 2. The damages caused, either to the vessels or to their cargoes or to the effects or other property of the crews, passengers, or other persons on board, are borne by the vessels in fault in the above proportions, and even to third parties a vessel is not liable for more than such proportion of such damages. 3. In respect of damages caused by death or personal injuries, the vessels in fault are jointly as well as severally liable to third parties, without prejudice however to the right of the vessel which has paid a larger part than that which, in accordance with the provisions of the first paragraph of this Article, she ought ultimately to bear, to obtain a contribution from the other vessel or vessels in fault. 4. It is left to the law of each country to determine, as regards such right to obtain contribution, the meaning and effect of any contract or provision of law which limits the liability of the owners of a vessel towards persons on board».

[95] In the Italian legal system, the *armatore* is liable for all acts and facts of the ship, meaning all obligations arising from contracts entered into for the needs of the vessels and all actions committed by his crew: cf. Article 274 providing that «*[l]'armatore e responsabile dei fatti dell'equipaggio e delle obbligazioni contratte dal comandante della nave, per quanto riguarda la nave a la*

considered as a negligent management of the ship in its broadest sense. As a matter of fact, when collision is regarded as a consequence of the shipowner's failure to fulfil one of his duties, the causative link with the shipowner's corporate entity may be clearer: for instance it may be due to his failure to properly man or equip a vessel, to maintain the vessel in a seaworthy condition, to instruct or supervise the crew on the operational procedures on board the ship, to carry out the required inspections and to make every other decision as a prudent shipowner to make the ship's operation safe. [96] But as an employer, for his paramount role recognised by maritime law, he can be answerable also for the actions taken by the master or crew, as part of his organisation, in the navigation, *stricto sensu* intended, of the ship.

This latter inevitably involves the concept of "good seamanship", mentioned in the previous chapter of this work. The breach of the duty of good seamanship will amount to negligence when evidence is given of a failure to exercise the skills, care and nerve required ordinarily to a competent seaman. [97] The term "good seamanship" indeed means the skill, care and nerve of each seafarer, in accordance to his rank, including observance of local and international rules and collection of the relevant information related to the intended voyage. [98]

Article 2 of the 1910 Convention triggers the functioning of the regular causation doctrine, whereby the burden of proof in these cases lies on the claimant who suffered damages. He has to prove that the damage was caused by the negligence of the defendant or of some persons whose act he is responsible. [99] Failing to give such an evidence means leaving the cause of the loss in doubt. The existing law assimilates the doubt of the cause to accidental cause or force majeure. This means that where the defendant can prove the intervening cause breaking the chain of causation or, in general, when none of the colliding parties is in negligence, each party has to suffer its own losses. [100]

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spedizione».

[96] GAULT S. – HAZELWOOD S. J. – TETTENBORN A. (eds.), *supra* note 91, at 69.

[97] Ibidem, at 70.

[98] TSIMPLIS, M., *supra* note 2, at 235.

[99] GAULT S. – HAZELWOOD S. J. – TETTENBORN A. (eds.), *supra* note 91, 120.

[100] TSIMPLIS, M., *supra* note 2, at 237.

All these general principles governing the responsibilities in collision cases have to be put in practice when the interpreter needs to effectively verify the existence of a fault on one of the vessels. This has to be judged objectively and when it comes to the identification of a negligent conduct in the navigation, it is assessed with the help of standards internationally shared and forming the basis of the prudent conduct of a reasonable seafarer. Such standards are to be found in the technical regulation establishing the rules of the road of the sea, namely the COLREGs, listing in detail all measures to be taken by the personnel involved in navigation in order to safely operate the vessel, along with the STCW Code.

But as evidenced above, the paramount standard to be followed as a reference for the assessment of the crew's conduct is the principle of "good seamanship", conceived as a general criterion for the investigation on the use of the required diligence by the seafarer involved in the collision. This has to be interpreted in conjunction with the detailed technical rules laid down in the COLREGs and in the STCW Convention, or with any other rule governing the crew and master's conduct on the navigation of the ship. The violation of any statutory rule established for the purpose of avoiding collision between vessel plays, indeed, a fundamental role, also with regard to procedural matters. [101]

3.2 Collision and unmanned ships

After this description in outline of the liability regime for collision cases, we can conduct a reflection on how it might be affected by the introduction of

[101] It is the case of the United State system, characterised by the so-called Pennsylvania Rule, named after a 1874 decision by the U. S. Supreme Court, whereby «when, as in this case, a ship at the time of a collision is in actual violation of a statutory rule intended to prevent collisions, it is no more than a reasonable presumption that the fault, if not the sole cause, was at least a contributory cause of the disaster. In such a case the burden rests upon the ship of showing not merely that her fault might not have been one of the causes, or that it probably was not, but that it could not have been». It is the most frequently invoked rule in American collision cases, establishing a presumption not of fault, but of causation, considered one of the principal reasons for the refusal of the United States to ratify the 1910 Collision Convention, which abolished all legal presumption of fault under Article 6. Although not precisely a substantive presumption, rather a procedural device, American courts have regarded the rule as to be covered by the phrase "all legal presumption" of the Convention, thus at risk of abrogation should the United States have ratified the instrument. For a detailed description of the Rule and the consequent debate, see HEALY, N. J – SWEENEY J. C., *The Law of Marine Collision*, Centreville, Maryland, 1998, 45ff.

unmanned technology in the maritime context. The first consideration may be related to the suitability of the current framework for allocating the responsibility in case of vessels without a crew on board. Once again, we can draw some conclusions only at a hypothetical level, given the absence of certain answers to the question of how effectively the implementation of unmanned vessels will be put into practice.

One direction might be that of leaving things as they are, at least in terms of general principles governing the law of collision. The overall navigational activity is ascribed to the shipowner, who is hence generally liable for the damages arising from such activity. [102] Therefore, the use of unmanned vessels may, in outline, not affect the allocation of responsibilities in this respect, since the shipowner will be considered answerable however the ship is operated. Nevertheless, uncertainty may derive from the effective shape that the shipping industry will take in the unmanned shipping context: if it will be characterised by navigational operations carried out by the shore-control centre as an independent contractor, therefore outside the organisation referred to the shipowner, a new legal entity will come into play in the relationships deriving from a collision. [103]

Certainly, the general principle of tort law may come to the rescue, but a specific regulation addressing the specificities of maritime law would be more suitable. What is generally difficult is the circumstance that the fault-based liability regime requires an investigation on the subjective conduct of the shipowner organisation, both of his personal behaviour in the management of the ship and of his servants in the navigation on the ship. In the case of unmanned vessels, this implies an assessment of the flaws occurred in the overall mechanisms governing the navigation of an autonomous vessel, especially concerning equipment and software, being the tools which the master fully relies on. Such an assessment cannot be totally discretional but has to be funded on objective standards just as happens today. If these standards are found in the COLREGs, it means that they have to be somehow adjusted to help not only the operators to navigate the ship,

[102] VEAL, R.- RINGBOM, H., "Unmanned ships and the international regulatory framework", *Journal of International Maritime Law* 2017, 113.

[103] For example, by specially created companies: cf. BOI, G.M., *supra* note 1, at 187.

but also the interpreters to verify any culpable behaviour and allocate the responsibilities accordingly. As we can see, the conversation always comes back to the technical regulations, even when addressing the liability issues deriving from the use of autonomous ships. This means that we cannot neglect the importance of the technical regulations in all contexts, for it will be the ground on which also the private law questions will find an answer.

A possible way to avoid the need of investigating the conduct of the actors involved is an introduction of the opposite regime of strict liability. Such a regime represents the imposition of liability from the consequences of an activity irrespective of the negligence of the actor and is often adopted by the law on a person who carries out an activity considered to be intrinsically dangerous. The existence of such a regime for whoever decides to undertake himself in such an enterprise is taken into account as part of the business risk, hence translated into a business cost. This has been the option chosen by the international community in the aviation sector for damages to third parties on the surface: the activity of flying an aircraft has been deemed to be inherently dangerous and any damage deriving therein must be compensated by the operator of the aircraft, irrespective of his fault in causing that damage, for the simple fact that the damage occurred as a direct result of his activity.

As we have seen, a strict liability regime has not been embraced by maritime law, which has conversely found a system *ex culpa* more suitable for allocating liabilities in marine collisions. [104] Is, on the contrary, a strict liability a useful way to apportion all costs of venturing in an unmanned navigation? It might be considered as a solution to avoid the issues deriving from the investigation of fault and negligence regarding new kinds of activities closely dependent on technology. [105] After all, if we consider the employment of an unmanned vessel as a type of activity inherently dangerous, this would justify the adoption of a strict liability regime, for a protection of the other users of the sea from the natural risks deriving

[104] The same goes, as we have seen in the first part of this chapter, for the regulation of aircraft collisions.

[105] Particularly with regard to the case of fully autonomous vessels: cf. SEVERONI, C., "Prime osservazioni in tema di responsabilità derivante da urto con navi senza equipaggio", *Diritto dei Trasporti,* 2018, 77.

from unmanned shipping and transferring the costs into a business cost, just as occurred in other sectors of shipping considered inherently hazardous. [106]

3.3 The master

We take this opportunity of investigating the law of collision for briefly introducing one of the hot topics when it comes to unmanned shipping: the shipmaster's status.

According to Van Hooydonk, the advent of unmanned vessels will represent the final stage of the downgrade which this figure has witnessed over the past hundred years. [107] Such a reduction of his functions is directly proportional to the evolution of technology, especially in the field of communication, which has particularly undermined the master's role in representing the shipowner in several factual and legal situations. [108] Nevertheless, however reduced may his functions be, there is still one task which fully remains on the master's hands: that is the conduct of the ship. [109]

The master has been defined as «a natural person hired by contract who lives on a vessel and manages it and its related matters while the vessel is navigating and carrying goods or performing services for freights or hire. Thus, he is the appointed and retained commander of a vessel in commercial service and is the person who is responsible for a vessel in navigation and licensed by competent national authority». [110] Likewise, he has been defined bearing four characteristics as «(1) a

[106] The most relevant case is certainly that of the International Convention on Civil Liability for Oil Pollution Damage (CLC), signed at Brussels in 1969. The Convention covers the compensation to persons who suffer oil pollution damage, placing a strict liability for such damage on the owner of the ship from which the polluting oil escaped.

[107] VAN HOOYDONK, *supra* note 82, at 412.

[108] CARTNER, J. – FISKE, R. – LEITER, T., *supra* note 22, at 158.

[109] The master is, in fact, charged of personally overseeing in the navigation: ibidem, at 133. Regulation 8 of Chapter XI-2 of the SOLAS Convention generally grants the master a certain discretion with regard to safety and security of the ship. Historically «the owners rarely navigate[d] a trading ship by themselves; the conduct and management of it [were] almost always entrusted to the master, whether he ha[d] or ha[d] not a partial property in it»: ABBOTT, C. (BARON TENTERDEN), *A Treatise of the Law Relative to Merchant Ships & Seamen*, Cole Aspinall B. - Perronet Aspinall J. - Stuart Moore, H. (eds.), London, fourteenth ed., 1984, 155.

[110] CARTNER, J. – FISKE, R. – LEITER, T., *supra* note 22, at 3.

natural person who (2) is responsible for a vessel (3) and all things and persons in it and is (4) responsible for enforcing the maritime laws of the flag state». [111]

His authority to command the vessel is certainly the first of his duties which comes to mind when thinking of the shipmaster's role, [112] although it does not necessarily mean that he is always on the bridge. [113] Such an authority has, of course, its corresponding responsibility, particularly with regard to collision. [114] This is when the unmanned shipping issue comes into play: it is uncertain what will happen with unmanned vessels, which will bring the disappearance of the master's role as we currently know it, always bearing in mind that this will not affect all and every kind of ship, thus not causing all masters of the planet to vanish. [115] But, at least «[t]he legal powers exercised by the master on board ship will cease to have any object. No longer is there anybody on board who is responsible for the nautical command of the ship, or who may in case of emergency perform legal acts on behalf of the owners, exercise the employer's authority over a community of workers temporarily isolated from society, and who in certain circumstances represents authority (e.g. when recording and investigating crimes, recording births, marriages and deaths)». [116]

The main question arising at this stage is the following: will the corresponding figure located on shore be subject to all regulations currently related to the master? Can we simply apply analogical extension of all such framework to the shore-based

[111] CARTNER, J. – FISKE, R. – LEITER, T., *supra* note 22, at 86.

[112] NORRIS, M.J, *supra* note 25, at 634. Together with his duties concerning the voyage planning: cf. LA TORRE, U. "Equipaggio, commando e determinazione della rotta nella navigazione marittima", *Rivista del Diritto della Navigazione* 2013, 111.

[113] VEAL, R. - TSIMPLIS, M., "The integration of unmanned ships into the *lex maritima*", *LMCLQ* 2017, 317. See the interesting passage of GIRVIN, S., "Carriage", *supra* note 4, at 19: «[h]is principal responsibility is the safety and welfare of everybody who sails on the vessel, the vessel itself and its cargo. Other tasks for which he is commonly responsible include: planning of the ship's route; ensuring that maritime laws, rules, and regulations are followed; ensuring that the speed, position, and course of the ship are correct; ensuring that a log is kept of events, weather conditions, and the ship's position; ensuring that repairs, fuel, and supplies for the ship are arranged; ensuring that the vessel is maintained; ensuring that the loading, unloading, and stowing of cargo is supervised; overseeing any harbor pilot when entering and leaving ports».

[114] Article 97 of UNCLOS.

[115] Cf. the provocation raised by VAN HOOYDONK, *supra* note 82, at 411.

[116] Ibidem, at 412. Under Article 186 of the Italian Navigation Code, all the people who are on board the ship are subject to the authority of the shipmaster.

operator? There will undoubtedly always be a need for placing liability on a specific actor of the shipping industry. [117] Nonetheless, we believe that it is unlikely that an affirmative answer to this question will be upheld in the future, for the many complications which might derive from such an extensive interpretation, despite its usefulness for resolving many issues. [118] Particularly with regard to the master's criminal liability, given the limited use of analogy and extensive interpretation in this sector. [119]

The conclusion, as evidenced when dealing with the STCW Convention, is that we will anyway need to intervene, whether domestically or internationally, on the sets of rules concerning the master and adapting them to the new needs of unmanned ships, addressing the new roles which will emerge in the future.

4 Pilotage and Vessel Traffic Services

Pilotage is another interesting sector which might be affected by unmanned shipping, with many consequences from the contractual standpoint.

There is no definition of the contract of pilotage, but, for instance within the Italian doctrine, it has been defined as the contract whereby the pilot undertakes to suggest the route and to assist the shipmaster in determining the manoeuvres necessary to perform it. [120] A definition of pilot can, instead, be drawn from the UK Pilotage Act 1987, as «any person not belonging to a ship which has the conduct thereof». [121]

Drawing an international framework of pilotage is not easy because of the absence of any international regulation whatsoever and because of the differences

[117] SEVERONI, C., *supra* note 105, at 76.

[118] BOI, G.M., *supra* note 1, at 187. This is particularly true when the analogy should be made with the new figure of the voyage programmer in case of fully autonomous vessels: PIETTE, G., *supra* note 1, at 986.

[119] VEAL, R. - TSIMPLIS, M., *supra* note 113, at 318. For the master's criminal liability for failing to meet the requirements of the COLREGs, see CAREY, L., "All hands off deck? The legal barriers to autonomous ships", *Journal of International Maritime Law* 2017, 208.

[120] LEFEBVRE D'OVIDIO, A. – PESCATORE, G – TULLIO, L., *supra* note 53, at 623.

[121] Pilotage Act 1987 (UK), chapter 21, section 31, which refers to the definition provided by the Merchant Shipping Act 1894, c 60.

from jurisdiction to jurisdiction. Nonetheless, there are some principles which are shared internationally. These principles have important consequences in the apportionment of relevant liabilities.

First and foremost, the command remains with the master: the determination of the route and execution of the manoeuvres always remain purview of the master, whilst the pilot assumes a mere role of "adviser". [122] In this respect, the Italian Navigation Code makes it clear, through its Article 298, that «the shipmaster, even when he is obliged to avail himself of the pilot, must personally direct the manoeuvre of the ship at the entrance and exit of ports, canals, rivers and in all circumstances in which navigation presents particular difficulties». [123] This principle is based on a necessary distinction between the concept of "conduct of a ship" and that of "command of the ship", respectively resting with the pilot and the master. [124] Moreover, it is reflected in the liability regime for damage caused by errors in manoeuvring: responsibility lays upon the master, unless he proves that the error has derived from incorrect indications or information provided by the pilot. [125] After all, it has been stated that «irrespective of the legal position, masters are generally resigned to the fact that they will be held to blame by their owners for damage occasioned while under pilotage». [126]

This situation translates to a specific allocation of the burden of proof concerning the relationships between the contracting parties of the contract of pilotage. The master, as a servant of the owner, will be held *prima facie* liable unless proof of misleading indications by the pilot is given. Such a proof of error in the information breaks the causal link between the master's manoeuvre and the damage.

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[122] Often considered by pilots as underrating their actual skills and positions: cf. DOUGLAS, R.P.A. – GEEN, G.K., *The Law of Harbours and Pilotage*, London, 1993, 201.

[123] My translation of the Italian: *«[i]l comandante, anche quando sia obbligato ad avvalersi del pilota, deve dirigere personalmente la manovra della nave all'entrata e all'uscita dei porti, dei canali, dei fiumi e in ogni circostanza in cui la navigazione presenti particolari difficoltà*». The Article also refers to the cases of compulsory pilotage, that is where the responsible Authorities establish that the shipmasters are obliged to require the assistance of a pilot in a specific marine area.

[124] DOUGLAS, R.P.A. – GEEN, G.K., *supra* note 122, at 206.

[125] A principle which is further confirmed by the provision of Article 313 of the Navigation Code, whereby «*[i]n caso di pilotaggio, il comandante è responsabile dei danni causati alla nave da errata manovra, se non provi che l'errore è derivato da inesatte indicazioni o informazioni fornite dal pilota*».

[126] DOUGLAS, R.P.A. – GEEN, G.K., *supra* note 122, at 201.

Afterwards, the only defence left to the pilot will be that of events excluding the causal link between his behaviour and the damage, such as force majeure, accidental cause or negligence of a third party or of the damaged person. [127] According to a more authoritative doctrine, once the inaccuracy of indications and information by the pilot has been proven, the pilot's liability is absolute since no defence is granted to him. [128]

A second, internationally shared principle of the law of pilotage concerns the relationship with third parties: the pilot is deemed to be a servant of the shipowner while acting within his authority. For instance, Article 316, paragraph 2, of the Italian Navigation Code provides that during the time in which he serves on board the vessel, the pilot is part of the crew. [129] Such a principle is reflected as well in the provision concerning liability for damage to third parties: the shipowner will be answerable for vicarious responsibility, since, against third parties, the act or omission will always amount as an act of the shipmaster, hence legally referred to the shipowner. [130]

After all, this principle was internationally set forth already in 1910, when the Brussels Collision Convention established that «[t]he liability imposed by the preceding Articles attaches in cases where the collision is caused by the fault of a pilot, even when the pilot is carried by compulsion of law». [131] This means that the liability remains with the shipowner, through the use of the metonymic expression referring to the "fault of the vessel". [132]

In this context, the question is now how the advent of unmanned shipping can

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[127] COTTIGNOLA, G., "Pilotaggio (contratto di)", *Diritto della Navigazione*, Deiana, M. (ed), Milano, 2010, 299.

[128] LEFEBVRE D'OVIDIO, A. – PESCATORE, G – TULLIO, L., *supra* note 53, at 625.

[129] My translation of the original Italian text «*[f]a inoltre parte dell'equipaggio il pilota durante il period in cui presta servizio a bordo*».

[130] LEFEBVRE D'OVIDIO, A. – PESCATORE, G – TULLIO, L., *supra* note 53, at 625. This principle has been recently questioned in Italian navigation law by the amendment of Article 93 of the Navigation Code through law 230/2016: the new provision has extended the liability of the pilot not only towards the vessel, but also for damages occurred to persons or goods derived from his culpable conduct, thus establishing the possibility of a direct liability to third parties, excluding any vicarious responsibility of the shipowner. For an overview of the new Italian regime on pilotage, see ANCIS, L., "Il nuovo sistema di responsabilità civile dei piloti marittimi", *Diritto dei Trasporti* 2017, 823.

[131] Article 5 of the 1910 Collision Convention.

[132] Cf. page 160, in Part I of the present chapter.

affect the legal framework of pilotage. Generally speaking, we could easily think that no modification might be required by the introduction of autonomous or remotely operated ships. The construction of mutual relationships can still stand and work no matter how the ship is operated, but the circumstance that the work of the new personnel on shore will not be physically following the ship through the oceans may create some points of contact with the institute of pilotage.

The era which we are currently entering may, in fact, represent the occasion for wider considerations on the new role which might be taken by the institute of pilotage. The construction envisaged by some of the recent projects on unmanned shipping [133] makes reference to port operations conducted by an embarking crew, whilst the rest of the ocean voyage would be autonomously operated. Apart from the practical functioning of such a mechanism, one may point out the similarity of such a structure with the concept of pilotage, where the pilot takes over the conduct of the ship for the navigation in congested areas such as ports, canals and so forth. We may suppose that in such a context, the pilot corporation can replace the crew embarking for port operations. [134] However, as stressed above, conduct of the vessel does not mean command; therefore, such a scenario would bring a significant innovation in the configuration of pilotage and the apportionment of liabilities, whereby the master would no longer be personally in charge of manoeuvring the ship.

Likewise, in a context where operations are remotely conducted at all times, one may think of a work side by side between pilots and shore-based crew, with no need for embarking the vessel, effectively implementing the timidly introduced remote pilotage. [135] In such a scenario, one may question the principle above described of the placement of the pilot within the organisation of the shipowner: without him getting on board the vessel, the vicarious liability of the shipowner would no longer be justified, unless somehow integrated within the organisation of

[133] Cf., among others, MUNIN project.

[134] Opening up to possibilities of a self-handling of the service: cf. COTTIGNOLA, G., *supra* note 127, at 302.

[135] For an overview, see HADLEY, M. – POURZANJANI, M., "How Remote is Remote Pilotage?", *WMU Journal of Maritime Affairs* 2003, 181.

the shore-control centre. [136] Nevertheless, the opposite situation might occur with much more frequency, where the shore-based station is located in a place far from the port where the pilot operates, since the shore-based crew no longer follows the ship. How this scenario would be regulated remains to be seen, considering that the cooperation between pilot and master currently occurring on board through their physical presence would no longer take place. [137]

In the short run, one of the proposed solutions is that of exempting unmanned ships from pilotage, taking advantage of the existing rules of exemption from pilotage either to the vessel or to the shipmaster. [138]

All these scenarios are pure speculations, entirely dependent on many factors which remain all to be seen according to the future developments of the industry and the technology. With particular regard to pilotage, a greatest role will be played by the pilots' interests, often regarded as reluctant to innovations.

Beyond pilotage, given the «conceptual proximity», [139] we may repeat similar observations on a new role for those mechanisms of aid to navigation, bearing the name of Vessel Traffic Services (VTS). These services were introduced with the aim of assisting the ships during particular stages of navigation in particular areas, as well as organising the traffic for preventing collision and avoiding congestion. [140]

The international legal framework first met VTS in 1985 through a soft law instrument, IMO Resolution A.578(14), containing guidelines for Vessel Traffic Services, revoked by the subsequent Resolution A.875(20) adopted on 27 November 1997. [141] This latter was accompanied by an amendment of the SOLAS

[136] CAREY, L., *supra* note 119, at 218.

[137] PIETTE, G., *supra* note 1, at 991.

[138] CAREY, L., *supra* note 119, at 216.

[139] COMENALE PINTO, M.M., "Obblighi e responsabilità del controllore del traffico aereo", *Aeroporti e responsabilità*, Deiana, M. (ed.), Cagliari, 2005, 60.

[140] MESSERE, G. – ROSSI, D., "La natura giuridica dell'attività espletata dal VTS", *Il controllo del traffico marittimo (VTS)*, Romanelli, G., - Tullio, L., (eds.), Cagliari, 2001, 56.

[141] Where VTS was defined, in section 1.1.1., as «a service implemented by a Competent Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area».

Convention of the same year, later revised and currently contained in Regulation 12 of Chapter V. [142]

In outline, the goals of VTS are to improve the safety and efficiency of navigation, safety of life at sea and the protection of the marine environment and/or the adjacent shore area, [143] through the arrangement of information service, navigational assistance service and traffic organisation service. [144] The exigence of providing this kind of services also in the maritime sector was clearly inspired by the successful experience of the civil aviation. [145]

The aspect of major interest for our purposes is the VTS operator's relationship with the shipmaster, destined to assume a growing importance with the evolving technology. Aiming at providing the master with all the relevant data and information useful to reconstruct the reality surrounding the vessel, the synergic interconnection between the master on board and the VTS provider is set to bring an improvement in the conduct of the navigation, thanks to the enhancement of the collection of relevant information. [146] However, just as occurs in the context of Air Traffic Services, the collaboration is not always fruitful, hence the identification of the person who retains the final decision is of a paramount importance.

The interference of such aids to navigation based on shore, although it represents a great innovation in the traditional role of the master, has not totally

[142] The mentioned Regulation states as follows: «1 Vessel traffic services (VTS) contribute to safety of life at sea, safety and efficiency of navigation and protection of the marine environment, adjacent shore areas, work sites and offshore installations from possible adverse effects of maritime traffic. 2 Contracting Governments undertake to arrange for the establishment of VTS where, in their opinion, the volume of traffic or the degree of risk justifies such services. Contracting Governments planning and implementing VTS shall, wherever possible, follow the guidelines developed by the Organization.* The use of VTS may only be made mandatory in sea areas within the territorial seas of a coastal State. 4 Contracting Governments shall endeavour to secure the participation in, and compliance with, the provisions of vessel traffic services by ships entitled to fly their flag. 5 Nothing in this regulation or the guidelines adopted by the Organization shall prejudice the rights and duties of Governments under international law or the legal regimes of straits used for international navigation and archipelagic sea lanes».

[143] Section 2.1.1 of the Guidelines.

[144] MESSERE, G. – ROSSI, D., *supra* note 140, at 58 note 20.

[145] MONTANARO, R., "Rapporto fra autorità STM e comandante", *Il controllo del traffico marittimo (VTS)*, Romanelli, G., - Tullio, L., (eds.), Cagliari, 2001, 116. See also COMENALE PINTO, M.M., *L'assistenza al volo*, Padova, 1999, 8.

[146] MONTANARO, R., *supra* note 145, at 130.

undermined his position as *seul maitre à bord après Dieu*. [147] A significant guidance in this sense comes from the mentioned IMO Guidelines, in which it is stated that «[w]hen the VTS is authorized to issue instructions to vessels, these instructions should be *result-oriented only*, leaving the details of execution, such as course to be steered or engine manoeuvres to be executed, to the master or pilot on board the vessel. Care should be taken that VTS operations do not encroach upon the *master's responsibility* for safe navigation, or disturb the traditional relationship between master and pilot» (emphasis added). [148] Therefore, the Guidelines make it clear that the instructions must be result-oriented only and the responsibility for the conduct of the ship remains with her master, [149] who still retains the power to assess the correctness of the instructions received and depart from them, for the ultimate goal of the safety of navigation. [150]

Another noteworthy element emerges from the mentioned provision of the Guidelines: the relationship with the institute of pilotage. The analogy of contents between VTS and pilotage has been remarked by some Authors, [151] in particular the common duty of providing the vessel with the necessary information for safely proceeding in specific areas of the sea. As pointed out above, both services do not compromise the master's duties and responsibilities on the command of the vessel.

For the purpose of our work, we believe that also Vessel Traffic Services may play a key role in the "unmanned revolution": if we consider their total reliability to high technology, thanks to which they were born, and their location on shore, the similarity with unmanned navigation, especially in its form of remote controlled operation, is evident. The introduction of unmanned vessels may be the occasion

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[147] Or the "Master under God" in early admiralty cases: cf. CARTNER, J. – FISKE, R. – LEITER, T., *supra* note 22, at 12.

[148] Section 2.3.4 of the Guidelines.

[149] ROMANELLI, G, "L'assistenza VTS: un primo parziale inventario dei connessi problemi giuridici", *Il controllo del traffico marittimo (VTS)*, Romanelli, G., - Tullio, L., (eds.), Cagliari, 2001, 23. This principle is confirmed also in the UK: MARCHIAFAVA, G., "L'esperienza inglese in materia di VTS", *Il controllo del traffico marittimo (VTS)*, Romanelli, G., - Tullio, L., (eds.), Cagliari, 2001, 45.

[150] MONTANARO, R, *supra* note 145, at 139.

[151] COMENALE PINTO, M.M., "VTS: aspetti dell'organizzazione e della responsabilità", *La marittimità in Sicilia*, città, 1997, 216.

for further implementing Vessel Traffic Services, [152] beyond the mere role of control and monitoring, [153] with the consequent need of reshaping all this sector of the industry and its legal configuration, particularly with regard to the duties and responsibilities. [154]

5. Concluding remarks

The conclusions that we can draw from the analysis conducted in the present chapter is that unmanned shipping will undoubtedly bring necessary reconfigurations in the private law layout of the maritime sector: it has been observed in the literature that, with the advent of unmanned vessels «new liability players are introduced and even those retained arguably assume very different responsibilities». [155] However, much of the innovation largely depends on different variables which cannot be predicted by the law at this stage, since they will basically be dictated by the different needs of the industry and how this latter will decide to shape itself.

While waiting for such configuration to take shape, maritime law should start considering those aspects of its framework which will necessarily need an intervention, mainly pertaining to the public law interests of the sector. [156] This is the necessary precondition for paving the way to an efficient legal framework concerning also obligations and liabilities of the different stakeholders, in order to safely accommodate the introduction of unmanned ships.

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[152] Cf. BOI, G.M., *supra* note 1, at 192.

[153] XERRI SALAMONE, A., "La sicurezza come valore nel diritto della navigazione e dei trasporti e nella formazione di un diritto comune europeo", *Sicurezza, navigazione e trasporti*, Tranquilli Leali, R. – Rosafio, E. G. (eds.), Milano, 2008, 158.

[154] After all, an influence in the liability regime was taken into consideration by the international community through the adoption of some international conventions, for instance, in the CLC, when it includes, among the exemptions of the shipowner's liability, «*negligence and other wrongful act of any Government or other authority*»: COMENALE PINTO, M.M., "Assistenza", *supra* note 145. at 11.

[155] VEAL, R.- RINGBOM, H., *supra* note 102, at 112.

[156] Cf. HAMSHER, M., "Seaworthiness and the *Hongkong Fir* Decision", *Legal Issues Relating to Time Charterparties*, Thomas, R. (ed.), London, 2008, 88.

Conclusion

The main goal of the present thesis was to reconstruct the current status of the law facing the emerging issues of the civil use of unmanned vehicles, without any pretence of covering all questions possibly involved. Topics such as privacy issues, [1] security, [2] insurance [3] have been deliberately omitted, for the too many implications or for their irrelevance in this context. [4]

The structure of this work had the intention of highlighting, through a parallel look at the two sectors, the different situations characterising the two relevant legal systems. The different achievements resulted in the law are the reflection of the different state of the art of the technology and the correspondent use for civil purposes.

As pointed out in the first chapter, the definition, classification and inclusion in the existing categories are far ahead for unmanned aircraft, by comparison with unmanned ships. Secondly, the second chapter has shown a different degree of development also in the technical regulatory framework: for instance, we have noticed how the European Union has already taken the first steps to regulate the subject and domestic jurisdictions have all enacted regulations governing the operation with unmanned aircraft. Conversely, in the maritime context, the International Maritime Organization has only just started its inquiry on unmanned vessels.

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[1] For an overview, see GUERRERO LEBRÓN, M.J. - CUERNO REJADO, C. - MÁRQUEZ LOBILLO, P., "Aeronaves no tripuladas: estado de la legislación para realizar su integración en el espacio aéreo no segregado", *Revista de derecho del transporte* 2013, 97.

[2] On security issues in aviaton law, see: MARCHIAFAVA, G., "Profili giuridici della sicurezza informatica nel trasporto aereo", *Diritto dei Trasporti* 2018, 369; ABEYRATNE, R., "Aviation Cyber Security: A Constructive Look at the Work of ICAO", *Air & Space Law* 2016, 25. For the risks of cyber attacks to unmanned ships, see BOI, G.M., "«Navi-drone»: primi interrogativi in tema di disciplina giuridica", *Rivista del Diritto della Navigazione* 2016, 191. On the future issues relating to piracy, see PRITCHETT, P.W., "Ghost Ships: Why the Law Should Embrace Unmanned Vessel Technology", *Tulane Maritime Law Journal* 2015-2016, 210.

[3] AZZANO, A. "Profili assicurativi degli Unmanned Aerial Vehicles (UAV)", *Il diritto aeronautico a cent'anni dal primo volo*, Antonini, A. – Franchi, B. (eds.), Milano, 2005, 27. In the maritime context, P&I clubs will play a significant role in the accommodation of unmanned vessels.

[4] For instance, the institute of the limitation of liability, peculiar to this field of the law, should not be affected by the advent of unmanned shipping.

The only points of convergence are located in the third chapter: in the sector of private law, as I have duly remarked, many things may change depending on the configurations of the industries. This is where the commonalities pointed out in the introduction of this work, which formed the basis of the Italian navigation law conceived in its unitary design, can be raised again in the era of automation: indeed, both sectors might witness significant interventions of systems for monitoring and controlling the navigation, in a much weightier manner than the current influence of such systems. The strong reliance on technologies and the ultimate goal of safety of air and maritime navigation can be the two factors encouraging the rise of the role of Air Traffic Services and Vessel Traffic Services, moving to new dimensions not known today. Such an innovation may occur within the existing public conception of the said services, or rather, through a new private business which would require enormous changes in the arrangement of the legal positions. In this context, the unity of the two branches of the law may go through the perception of aviation law as a guide for a further implementation of such mechanisms in the maritime sector. [5]

We cannot hide that there will still be significant differences between the two systems, mainly due to the natural diversities characterising some of the aspects of the two kinds of navigation: among such differences, one which plays a meaningful role for the purpose of the use of unmanned vehicles is certainly the figure of the shipmaster/pilot-in-command. The terms used speak for themselves: whereas the term «master», deriving from the Latin *magister*, [6] implies the assumption of duties and responsibilities far more relevant than the sole conduct of the ship, the pilot navigating the aircraft is indeed considered a mere «pilot», as a person who operates

[5] It has been observed that the implementation of ATS and VTS are reshaping the concept of «*trasporto autarchico*», which would lose its centrality in the unification of navigation law. However, the unitary approach is further confirmed by the common needs of the two sectors with regard to aids to navigation, particularly highlighted in the era of unmanned vehicles technology: *«[p]uò anzi condividersi il rilievo che, anche rispetto ai sistemi di assistenza a terra, sis ta assistendo ad una tendenza verso l'adozione, nella navigazione marittima, di soluzioni con notevoli punti di corrispondenza a quelle adottate o prefigurate per la navigazione aerea»*: COMENALE PINTO, M.M., *L'assistenza al volo*, Padova, 1999, 12.

[6] In its original configuration in Roman law, the master, *magister navis*, responsible for the commercial operations, was kept distinguished from the *gubernator navis*, charged with the navigational operation *strictu sensu* of the vessel: MOSCHETTI, C.M., "Nave (diritto romano)", *Enciclopedia del Diritto, XXVII*, Milano, 1977, 571.

the flying controls of an aircraft. [7] Therefore, we can easily understand how different the evolution towards the deletion of the two figures, or just their relocation on shore, might prove.

However, the unitary design of navigation law as described in the introduction of this work has been found in other aspects, such as the public interest to protecting human life and the environment [8] and the concept of ship and aircraft management and operation. [9] Both elements will be recurring and shared by the aviation and the maritime sectors also in the era of automation.

One thing is certainly common to air and shipping law facing unmanned vehicles technology: both are questioning the indispensability of the commander and his crew for the conduct respectively of the aircraft and the vessel. [10] This holds

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[7] LA TORRE, U., "Riflessioni sulla condotta del «pilot in command» nel volo di aeromobile*", Rivista del Diritto della Navigazione* 2013, 610. An interesting summary of the differences between the two industries is contained in COMMITTEE ON THE EFFECT OF SMALLER CREWS ON MARITIME SAFETY, NATIONAL RESEARCH COUNCIL, *Crew Size and Maritime Safety*, Washington, 1990, 75: «navigation of airliners is directed by a mandatory traffic control system, which diminishes the human element in navigation decisions. Automated flight control systems further reduce the risk of human error. Ships, on the other hand, depend entirely on the attentiveness and skills of their crew members. / Maintenance standards for airliners are higher than those for ships, and more strictly enforced. Federal aviation regulators oversee precisely specified and highly disciplined certification and maintenance procedures. In the maritime world, on the other hand, maintenance standards are highly variable, and federal regulation focuses on vessel performance rather than specified maintenance procedures. / Working conditions and hours of work aboard aircraft are strictly limited by federal regulations and union work rules. Aircraft do not fly if the available crews have not had the specified opportunity to rest. Aboard merchant ships, current manning statutes as interpreted by federal courts set no upper limit on the hours a crew member may work. / Requirements for training and qualification of airline flight crews are far more strict and standardized than those applied to ship's officers. Airlines benefit, for example, from the military training that most of their pilots have received, and from their own strictly certified and extremely rigorous training programs. Flight crews are certified for the specific aircraft type they fly, and are given rigorous physical examinations semiannually. Maritime licenses are renewed every five years, and permit the operation of nearly any type of vessel, without distinction. Aside from a color-blindness test, given with license-renewal examinations, no physical qualifications are imposed. / The aircraft industry and its federal regulators spend generously on research and development to improve safety. The ship building and shipping industries, the Maritime Administration, and the Coast Guard have extremely small budgets for such research—particularly the human factors research that must undergird attempts to automate vessels».

[8] XERRI SALAMONE, A., "La sicurezza come valore nel diritto della navigazione e dei trasporti e nella formazione di un diritto comune europeo", *Sicurezza, navigazione e trasporti*, Tranquilli Leali, R. – Rosafio, E. G. (eds.), Milano, 2008, 156.

[9] Conceived in the Italian literature as «*esercizio*», a central aspect of the whole system: ROMANELLI, G. "Diritto aereo, diritto della navigazione e diritto dei trasporti", *Rivista Trimestrale di Diritto e Procedura Civile* 1975, 1341.

[10] Their unavoidable presence on board is pointed out by QUERCI, F.A., *Note in tema di equipaggio della nave e dell'aeromobile*, Padova, 1977, 46.

particularly true when we are dealing with fully autonomous vehicles, a field where major problems will arise: whereas in the case of remotely controlled vehicles analogy might be used with the due adjustments, for vehicles controlled by Artificial Intelligence, we will need to address totally new issues. Damage caused by the failure of the system governing the aircraft or the ship will need to find a responsible party. It is not yet clear whether this latter will still be the aircraft operator and the shipowner, or rather liability will attach to the manufacturer, [11] the software provider or, for instance, the programmer of the voyage, [12] as a new figure arising in the context of autonomous navigation. [13] We might also take the first steps from an insightful conclusion observed in the literature, regardless of unmanned navigation: whereas the subjective role of the commander is perfectly replaceable, it is the command, as an objective factor, to be essential, to the point of becoming inherently part of the concept of ship and aircraft themselves. [14] The irreplaceable nature of the command might help, in the era of unmanned technology, to maintain the necessary references for the apportionment of liability.

Furthermore, we believe that some of the issues posed by the operation of vehicles through Artificial Intelligence are common to the general legal controversies arising from the robotization of many human activities, [15] including

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[11] Only a tort liability would potentially attach to the aircraft manufacturer in the current legal framework: see RINALDI BACCELLI, G., *La responsabilità extracontrattuale del costruttore di aeromobile,* Padova, 1987, 145. On the possible liability of the shipbuilder or the manufacturer of an individual component of an unmanned ship, see VEAL, R.- RINGBOM, H., "Unmanned ships and the international regulatory framework", *Journal of International Maritime Law* 2017, 113.

[12] SEVERONI, C., "Prime osservazioni in tema di responsabilità derivante da urto con navi senza equipaggio", *Diritto dei Trasporti* 2018, 78.

[13] In some cases, especially for unmanned aircraft of a small size, a different approach, closer to the legal framework of consumer products, has been advocated by PERRITT, H.H. – SPRAGUE, E.O., "Law abiding drones", *The Columbia Science & Technology Law Review* 2015, 390.

[14] LA TORRE, *Comandante di nave e aeromobile*, in *Diritto della Navigazione* (a cura di M. Deiana), Milano, 2010, 95.

[15] PARISI, D., "Quali problemi porranno i *robot* futuri?", *Informatica e Diritto* 2010, 49; PERLINGIERI, C., "L'incidenza dell'utilizzazione della tecnologia robotica nei rapporti civilistici", *Rassegna di Diritto Civile* 2015, 1235. Strictly connected with the emerging issues and proposed solutions for a civil law regulation of Artificial Intelligence is the American doctrine of personification, which has been proposed as the solution for a safe introduction of unmanned ships, rather not suitable for all kinds of robots: cf. CHWEDCZUK, M., "Analysis of the Legal Status of Unmanned Commercial Vessels in U.S. Admiralty and Maritime Law", *Journal of Maritime Law & Commerce* 2016, 163. For an interesting reading on the doctrine of personification: DAVIES, M., "In Defense of Unpopular Virtues: Personification and Ratification", *Tulane Law Review* 2000-2001, 337.

the same phenomenon occurring to other means of transportation. [16] This assertion is confirmed by the recent Resolution of the European Parliament on robots, whereby unmanned vehicles are addressed together with other forms of robotic devices. [17]

Moreover, the reference to the distinction between the two subcategories of remotely piloted and fully autonomous vehicles is the occasion for pointing out one of the limitations of this work: as repeatedly stressed, the law is faced with questions, the answers of which largely depend on the effective configuration of the new technology. As pointed out in the relevant part of this thesis, the legal response might be extremely different whether a ship is going to be navigated autonomously by a computer or rather continuously conducted by a human operator, although no longer located on board. And again, things might be addressed and resolved differently whether the application of the new technology will be considered only for navigation in certain waters or for certain kinds of transportation. Against this background, the work of the jurists is restricted, also considering their limitation in judging the goodness of the technical rules. [18]

Nevertheless, it has duly been pointed out that the law can impose the technique. [19] And this can be done by intervening at the earliest stages of the evolution, just as is happening today with the first interventions by the international regulatory bodies through the proactive approach so far demonstrated. [20] This might

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[16] For an overview on autonomous cars, see SEVERONI, C., "Prime considerazioni su un possibile inquadramento giuridico e sul regime di responsabilità nella conduzione dei veicoli a guida autonoma", *Diritto dei Trasporti* 2018, 331; GAETA, M.C., "Automazione e responsabilità civile automobilistica", *Responsabilità civile e previdenza*, 2016, 1728.

[17] It is the document P8_TA(2017)0051, European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)). In particular, section 24 provides that «autonomous transport covers all forms of remotely piloted, automated, connected and autonomous ways of road, rail, waterborne and air transport, including vehicles, trains, vessels, ferries, aircrafts, drones, as well as all future forms of developments and innovations in this sector».

[18] HUANG, J., *Aviation Safety through the Rule of Law: ICAO's Mechanisms and Practices*, Alphen aan den Rijn, 2009, 45.

[19] PIETTE., G., "Les navires sans équipage", *Droit Maritime Français* 2017, 989.

[20] Cf. PRITCHETT, P.W., *supra* note 2, at 225. It has been stated that «*[l]a safety culture aeronautica non potrà mai essere effettivamente implementata se non si compie quel passaggio necessario da un approccio reattivo ad un approccio proattivo della stessa, come complessivamente intesa*»: SODI, G., "Spunti dal volo Germanwings 9525: il difficile tema della safety culture. Due modelli a confronto", *Diritto dei Trasporti* 2017, 223.

be a solution, anticipating the needs of the industry in order to decide in advance the direction which the new technology should take, for the sake of safety and the growth of the market. The best way to conduct this approach is certainly avoiding prescriptive rules, in favour of the promotion of goal-based standards, a policy recently advocated by the international regulatory bodies. [21]

One thing is certain: a long-term solution of the legal issues arising from the use of unmanned aircraft and vessels should start from a reconsideration of the two sectors in their entirety. For instance, should the maritime and aviation infrastructure remain unchanged, there would be no chances to effectively accommodate the new technology. [22] The same is valid for the human factor of the sector, which will need an unavoidable reorganisation. [23] The broadest vision possible is the key, to prevent us from leaving behind any of the components forming these two complex industries. [24]

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[21] HOPPE, H., "Goal-based Standards – A New Approach to the International Regulation of Ship Construction", *WMU Journal of Maritime Affairs* 2005, 169. This approach may take advantage of some of the techniques of international maritime legislation, such as the tacit acceptance procedure characterising the adoption of amendments to certain conventions. Tacit acceptance procedure is viewed favorably for its capacity of keeping abreast of evolving technology: SHI, L., "Successful Use of the Tacit Acceptance Procedure to Effectuate Progress in International Maritime Law", *University of San Francisco Maritime Law Journal* 1998-99, 331.

[22] For instance, port and airport infrastructure will be the first needing substantial changes: Cf. OKORIE, I., "Are current port liability provisions in international maritime law adequate in an era of automation?", *Australian Journal of Maritime & Ocean Affairs* 2016, 147. Moreover, «a new generation of naval architects, technicians and engineers» will be required, according to HOGG, T. – GHOSH, S., "Autonomous merchant vessels: examination of factors that impact the effective implementation of unmanned ships", *Australian Journal of Maritime and Ocean Affairs* 2016, 217.

[23] The future organization of the shore-based personnel, together with the alarm management system, has been regarded as the major technical problem in the experiment conducted by MAN, Y. - LUNDH, M. - PORATHE, T. – MACKINNON, S., "From desk to field – Human factor issues in remote monitoring and controlling of autonomous unmanned vessels", *Procedia Manufacturing* 2015, 2674.

[24] According to PELLEGRINO, F., "La definizione di sicurezza aerea", *Aeroporti e Responsabilità*, Deiana, M. (ed.), Cagliari, 2005, 177, «*[d]evono essere adottate le misure di natura tecnica più idonee, sotto il profile della prevenzione di incidenti, con riferimento a tutte e tre le component (uomo-macchina-ambiente) in quanto elementi intercorrelate, interagenti e interdipendenti*». Further, «[s]hips are complex sociotechnical systems, consisting of (1) technologies, (2) people, (3) organizational structures, and (4) an external environment. As the literature on sociotechnical systems shows, the four dimensions are interdependent; when one changes, it affects the other three. Because of this fundamental interdependence, the introduction of technological change cannot be viewed in isolation, or even at a subsystem level; it must be viewed from a true systems perspective. Thus, whether the introduction of new technology will permit safe reduction in manning will depend on whether appropriate changes can be made in the other three sociotechnical system dimensions. If inappropriate changes are made, or if the macrosystem in which the ship system is enmeshed constrains appropriate changes, then simply reducing crew size is likely to have unintended or undesirable effects that result in a reduction in safety»: COMMITTEE ON THE EFFECT OF SMALLER

As aviation law has already demonstrated, legal improvements will prove necessary for accommodating unmanned vessels, [25] whether or not revolutionising the whole system. [26] Undoubtedly, as I have personally found out during the conduction of the present research, year after year the framework is rapidly changing, especially in air law, whereas in maritime law, such fast changes will soon occur in the next future. This is perhaps what makes this topic such a fascinating subject, in which all the actors of the law are called to participate in the debate, where still «*tout est à construire…*». [27]

CREWS ON MARITIME SAFETY, NATIONAL RESEARCH COUNCIL, *supra* note 7, at 37.

[25] BOI, G.M., *supra* note 2, at 180.

[26] According to LORENZON, F., "From sails to drones: time to reconsider a uniform liability regime for multimodal transport?", *Journal of International Maritime Law* 2015, 334, «[I]n a very near future of drones and computer software managing most if not all stages of multimodal transport, the current system and its complexities can no longer be justified». See also VAN HOOYDONK, E., "Towards a Worldwide Restatement of the General Principles of Maritime Law", *Journal of International Maritime Law* 2014, 170.

[27] PIETTE., G., *supra* note 19, at 992.

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