

THE COMMERCIAL OPERATIONS OF UAS WITHIN THE FRAMEWORK OF THE EXISTING INTERNATIONAL REGIME APPLICABLE TO AIR CARRIERS

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ABSTRACT

This study explores the legal framework governing cross-border operations of Unmanned Aircraft Systems (UAS), highlighting the pressing need for a unified regulatory environment to match the rapid advancements in UAS technology. As UAS operations increasingly align with international air services, this study draws parallels between UAS governance and the regulation of airlines, which are currently authorized to provide international air services under air transport agreements. The analysis focuses on the applicability of both international law and EU regulations to UAS operations, particularly in the context of scheduled, non-scheduled, and cabotage services. It examines certification and licensing requirements under EU regulations, identifying their potential to serve as models for future international standards. Overall, this study contributes to the understanding of regulatory challenges and opportunities, emphasizing the importance of harmonized global standards for the effective integration of UAS into international aviation.

Keywords

UAS, UAV, commercial operations of UAS, legal regime of UAS.

1. INTRODUCTION

Within the European Union (EU), the legal regime governing cross-border operations of Unmanned Aircraft Systems (UAS) involves the interaction of both international and EU law. International law, notably the Chicago Convention on International Civil Aviation, establishes broad principles regarding airspace sovereignty, safety standards, and operator requirements [1]. However, within the EU, Member States operate under a unified legal framework provided by Regulation (EU) 2019/947 and other related EU laws [2]. The present study aims to clarify how these two frameworks apply. Distinguishing between these systems is essential, as legal requirements for UAS operations can differ significantly for EU Member States as compared to other countries.

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Article 13 of Regulation (EU) 2019/947 deals with the obligations of remote pilot operators of UAS within the European Union. This regulation, part of the European Union's broader framework for drone operations, establishes specific requirements for those who operate drones, so as to ensure airspace safety, security, and efficiency. Under Article 13, remote pilot operators must adhere to various rules, including making sure that their operations do not pose risks to people, property, or other aircraft. The article emphasizes that operators must maintain a valid authorization or certificate from the relevant aviation authority, comply with operational limitations and conditions set forth by the authority, and ensure that all necessary safety measures are in place. Furthermore, Article 13 requires that UAS operators keep detailed records of their operations, including flight and equipment maintenance logs, to support safety and accountability. More broadly, Article 13 is part of a comprehensive regulatory framework aimed at integrating drones into the airspace in a safe and controlled manner while promoting innovation and operational standards within the EU.

The Chicago Convention, on the other hand, is a cornerstone of international aviation law. This treaty – formally known as the Convention on International Civil Aviation, signed in Chicago on 7 December 1944 – grants each country jurisdiction over its own airspace, requiring UAS operators to comply with the regulatory frameworks of each state they enter. For international UAS operations, the International Civil Aviation Organization (ICAO) provides non-binding guidelines on safety standards, such as airworthiness, operational limits, and maintenance. However, these are only recommendations, and actual regulations vary by country [3].

In contrast, within the EU, safety standards are more harmonized. Regulation 2019/947 establishes binding rules that Member States must follow, including detailed provisions on UAS airworthiness, safety, and operator obligations. Therefore, while international law provides general safety guidelines, EU Member States adhere to stricter, uniform safety standards, reducing the legal complexity of cross-border operations within the Union [2].

One of the key differences between international law and EU law relates to operator qualifications. While it is generally true for the international context that operator qualifications for UAS vary significantly between countries, this does not apply to EU Member States. In the EU, operator certification is standardized under Regulation 2019/947, ensuring that operators across Member States meet consistent qualification standards. This includes mandatory certification processes for UAS operators depending on the category of operation (open, specific, or certified), minimizing discrepancies between national requirements within the EU [4]. Meanwhile, internationally, operator qualifications can indeed vary significantly [5]. Some countries require specific certifications, while others have more lenient requirements. Cross-border UAS operations outside the EU must account for these variations, ensuring compliance with the regulatory standards of each jurisdiction [2].

Another reason it is crucial to distinguish between international and EU law is that these frameworks govern UAS operations in different capacities. The Chicago Convention establishes basic principles of airspace sovereignty, safety, and international air transport, while the International Civil Aviation Organization (ICAO) sets non-binding standards that apply globally. However, EU Member States operate within the legally binding framework of the EU, particularly Regulation (EU) 2019/947 and its accompanying Regulation (EU) 2019/945 [6], which govern UAS operations within the European Union. While international law provides general principles applicable to UAS, within the EU, Regulation 2019/947 is the primary legal source for cross-border UAS operations. This regulation outlines the categories of UAS operations, operator requirements, and procedures for cross-border operations. Failing to distinguish between these legal frameworks can lead to confusion, particularly when dealing with issues such as operator qualifications and safety standards, which vary significantly between international and EU contexts.

The Chicago Convention, while comprehensive for traditional manned aviation, has limited direct applicability to UAS operations, especially those involving cross-border activities. Article 8 of the Convention is the only provision that directly addresses pilotless aircraft, stating that no aircraft capable of being flown without a pilot shall fly over a contracting State without that State's special permission [7]. The applicability of the Chicago Convention to UAS is further complicated by the definition of "airline" in Article 96, which refers to any entity involved in or providing international air transport services. Given that UAS operations are often conducted by entities that may not fit the traditional definition of an airline, there is ambiguity in how the Convention's provisions apply to UAS. For cross-border UAS operations within the EU, the regulatory framework provided by Regulation 2019/947 offers clearer guidance [8].

Data protection is one more area where EU law provides a more robust framework. The General Data Protection Regulation (GDPR) governs UAS data collection and usage within the EU, ensuring a high level of protection across Member States. Internationally, privacy laws vary considerably, and operators conducting cross-border operations must be mindful of these differences, particularly when operating in jurisdictions with less stringent privacy protections [9],[10]. Other important considerations for UAS cross-border operations include insurance, liability, customs, and frequency spectrum management. Internationally, liability laws and insurance requirements are not uniform, which can complicate operations involving multiple countries. Operators need to ensure adequate insurance coverage that is valid across all relevant jurisdictions. In the EU, insurance and liability standards are more consistent, providing greater legal certainty for operators [11]. Similarly, customs and import regulations, while complex internationally, are streamlined within the EU's single market, reducing barriers to cross-border UAS operations within Member States [12].

As UAS technology continues to develop and is increasingly integrated into commercial aviation, the need for a unified regulatory framework becomes more urgent. The EU has already recognized this need through Regulation 2019/947, but the international community is still working towards a cohesive legal structure. Airlines are also rethinking their business models, integrating UAS into cargo and last-mile delivery services, further highlighting the necessity for harmonized international rules [13].

It is important to clarify the distinction between the terms “Unmanned Aircraft” (UA) and “Unmanned Aircraft System” (UAS), as they have different scopes within aviation regulations. UA refers solely to the aircraft itself, intended to operate without a pilot on board, whereas UAS encompasses both the aircraft and its associated elements, such as control systems and communication links [14]. This distinction is particularly significant in the context of international and EU regulations, where various components of a UAS may fall under different jurisdictions. For example, while the UA operates in one country’s airspace, the control systems or data links may be based in another. If the definition of UA is confined to the aircraft as an object and excludes essential operational elements, this could lead to fragmented legal obligations. Therefore, legal and regulatory frameworks must address the UAS concept as a whole to ensure comprehensive governance of cross-border operations [15]. Drawing a clear distinction between UA and UAS helps avoid confusion and ensures that all elements of UAS operations are adequately regulated to reflect this complexity.

Drones are expected to become part of everyday life and with the race on for commercialisation, it is only a matter of time before they overtake traditional airline traffic. Airlines therefore are also re-thinking their business models and fleet configuration in order to implement the most advanced and efficient technology. United Airlines was the first major airline to invest in two eVTOL companies and just recently has announced plans to launch the first electric commuter flights with Eve Air Mobility [16]. Some other airlines already use unmanned aircraft systems (UAS) for warehouse sorting and last mile delivery to complement cargo services. The need for a unified regulatory environment therefore needs to be rapidly recognized by the international community as technology is usually a step ahead of regulation.

More importantly, since certain freedoms of the air are still not fully recognized by States or governed by air transport agreements, a study of existing regulations governing the principles of international carriage from the perspective of drone operations is more than necessary.

Within the EU, aside from large scale operations, smaller UAS operations are also gaining importance, particularly in sectors such as medical logistics, where UAS are used to transport blood, vaccines, and other critical supplies across borders. It is important to recognize that these smaller operations are subject to the same regulatory framework, and their inclusion in the analysis offers a more comprehensive view of UAS operations in the EU [17].

2. FUNDAMENTAL PRINCIPLES OF CIVIL AVIATION

Freedom of the air has not been recognized in terms of economic governance, and drones are no exception in this regard. Most flights conducted by UAS have taken place in segregated airspace. This is due to the fact that current unmanned aircraft (UA) are unable to integrate safely and seamlessly with other operators in an airspace and therefore they are only limited to flights operated within one State or within the territory of European Union – subject to the rules established by the aforementioned Regulation (EU) 2019/947 of 24 May 2019 [2].

Article 13 of this Regulation establishes rules regarding the remote identification of unmanned aircraft systems (UAS). It mandates that operators of UAS must ensure their aircraft are equipped with remote identification capabilities. This means that, in addition to the physical operation of the drone, it must be able to transmit information about its identity and location to relevant authorities and other entities. This requirement aims to enhance safety and security by enabling better tracking and identification of drones, thereby supporting effective management of airspace and compliance with regulations [18].

If cross-border (international) operations are possible, the core elements of international law must be recognized in terms of UAS operations. Among these principles are territorial sovereignty, national air space, freedom of the high seas, the nationality of aircraft attributed to the state of registration and the non-use of weapons against civil aircraft in flight. This clause applies to both domestic and international flights involving civil aircraft in flight. All of these principles have also been repeated in the Chicago Convention [1]. This treaty also determines also the standards to maintain international civil aviation in a safe and orderly manner while ensuring equal opportunities and economic efficiency. Although most of the principles contained in the Chicago Convention can be applied to UA, the complexity of their operation, particularly in international (commercial) air transport, may raise some concerns that should be addressed by more specific standards and practices. From the perspective of future international UA flights, these recommendations are significant and should be considered far beyond the conflict-zone aspect. This is due to the fact that these flights are aimed to be conducted in non-segregated airspace. Consequently, UAS will need to be integrated into non-segregated airspaces to act and respond as manned aircraft do.

Current national (European) regulations impose obligations on both UA and UAS that should also be considered together from the perspective of international air transport. The latter have been recognized as a new component of aviation systems that still need to be understood to properly distribute responsibility. This is compounded by the dispatcher (operator), who will ultimately decide on the purpose and scope of the operation performed by a UA and remote pilot. Furthermore, the Chicago Convention addresses obligations to both airlines and aircraft, but it is not yet certain that the air services provided by UA in future will only be operated by

airlines. If operations are extended to other entities, then new regulations governing commercial operations of UAS will have to be developed. The aim of this paper is to reconcile the exploitation of UAS in international (commercial) transport with the existing regulatory regime applicable in general to airlines [19].

In the context of Unmanned Aircraft System (UAS) operations, the fundamental principles of civil aviation adapt traditional aviation standards to address the unique aspects of UAS. By integrating UAS into existing frameworks, these standards ensure that key areas such as safety, airworthiness, and airspace management are extended to unmanned operations. This includes establishing protocols for unmanned traffic management, operator certification, and compliance with airspace regulations, thereby ensuring that UAS can safely coexist with manned aircraft while maintaining the safety and efficiency of airspace. Linking traditional aviation standards with UAS operations highlights how the regulatory framework evolves to accommodate the specific needs and challenges posed by unmanned systems. Safety remains paramount, with specific focus on reliable UAV design, robust control systems, and safe integration into existing airspace. This includes creating protocols for unmanned traffic management and ensuring UAVs do not pose hazards to manned aircraft, people, or property on the ground. Compliance with regulations is crucial, encompassing UAV-specific laws and guidelines on operator certification, flight permissions, and airspace usage. Efficient airspace management also applies, necessitating coordinated efforts to prevent airspace congestion and interference with traditional aviation routes.

Environmental considerations, such as noise and emissions, are increasingly relevant for UAS operations. Ethical and privacy concerns, particularly in surveillance and data collection, are partially addressed within civil aviation principles. However, many of these concerns are governed by their own legal frameworks. For example, privacy regulations such as the General Data Protection Regulation (GDPR) [20] and EU Regulations 2019/945 and 2019/947 require UAS operators to be aware of and comply with privacy laws. While civil aviation principles provide general guidance on operational standards, the broader legal frameworks like GDPR play a more central role in regulating data protection and privacy issues specific to UAS operations, highlighting the need for operators to navigate both civil aviation and specialized privacy regulations. Lastly, international cooperation, facilitated by bodies like the ICAO, is key to developing and harmonizing global UAV standards, ensuring safe and equitable use of airspace by unmanned systems alongside manned aviation.

3. PILOTLESS AIRCRAFT WITHIN THE MEANING OF ARTICLE 8 OF THE CHICAGO CONVENTION

The only provision within the Chicago Convention that is undoubtedly designed to regulate UA can be found in its Article 8. This Article stipulates that no aircraft capable of being flown without a pilot shall fly over the territory of a contracting State

without a special permit granted by that State and in accordance with the terms of such permit. It also states that the flight of such aircraft in areas open to civil aircraft should be controlled to prevent any danger to civil aircraft. In the Global Air Traffic Management Operational Concept an “unmanned aerial vehicle” has been described as a pilotless aircraft, in the sense of Article 8, 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 [21].

Such requirements for obtaining special authorization in Annex 2 on Rules of the Air refer to safety rules following the conditions of the State of Registry, the State of the Operator (if different) and the States in which the flight is to operate. And therefore, a special permit from a host country to enter its airspace is reasonably justified. This requirement also seems to be compatible with other provisions of the Chicago Convention that are applicable to air transport services, as discussed below.

It should be emphasized, however, that although most of the provisions of Chicago Convention can be applied to the UA, it is not so obvious whether the same rules pertain to the UAS, as its definition goes beyond the UA as an object. While the term UA (unmanned aircraft) refers solely to the aircraft itself, it is less clear whether the same rules apply to the term UAS (unmanned aircraft systems), which encompasses not only the aircraft but also its control systems, data links, and other associated components. There is a potential to interpret “aircraft” in legal frameworks as including the UAS in its entirety, recognizing the integrated nature of these systems. This interpretation would bring the entire UAS, including its communication and control systems, under existing aviation rules. However, there is also the possibility of interpreting “aircraft” more narrowly, applying regulations only to the UA as a physical object, thereby excluding the broader system from certain legal requirements.

This distinction has significant legal consequences. If the UAS is treated as an “aircraft,” operators may be subject to more comprehensive safety, certification, and liability rules, covering both the physical aircraft and the supporting systems. Conversely, interpreting “aircraft” as applying only to the UA may leave gaps in regulatory oversight, particularly concerning data security, remote control operations, and cross-border use of communication systems. Therefore, a clear and consistent legal approach is needed to define how UA and UAS are treated within international and domestic aviation law, ensuring that all components of UAS operations are properly regulated.

The Chicago Convention governs standards and rules relating to the technical and operational aspects of air navigation and is not designed to deal with the commercial aspects of international air transport. Despite the efforts of some States to establish the freedom of establishment for international air services, the Chicago Convention does not explicitly express support for this concept. The Convention focuses primarily on regulating safety, security, and airspace sovereignty, leaving the establishment of air services to be governed largely by bilateral agreements between states rather than through a universal framework. Providing a source or reference to

specific articles within the Convention, or relevant commentary, would further support this argument and highlight the Convention's limitations regarding the freedom of establishment in international air services.

Additionally, there may be some ambiguity in clarifying to whom some provisions of the Chicago Convention relating to air services are addressed as some of them apply to aircraft and some to airlines. As stated in ICAO Circular 328, all UA, whether remotely-piloted, fully autonomous or a combination thereof, are subject to the provisions of Article 8. It has been also emphasized that only a remotely-piloted aircraft will be able to integrate into the international civil aviation system in the upcoming time. It was further explained that whether the aircraft is manned or unmanned does not change its status as an aircraft [14].

4. RESULTS FOR THE OPERATION OF AIR SERVICES

Examination of the Convention's text reveals that certain clauses specifically pertain to aircraft, while others target airlines. When rights are designated to aircraft, it's easier to apply these to Unmanned Aircraft (UA) by analogy. However, applying specific requirements and rights to Unmanned Aircraft Systems (UAS) is more challenging. As noted above, Article 96 defines an "airline" as any entity engaged in, or offering, international air transport services. The specifics of these services are usually outlined in bilateral agreements between states, detailing the criteria for eligible airlines. The Chicago Convention does not explicitly specify which entities are authorized to conduct international air services, except in instances where a particular article refers to airlines. This lack of clarity presents challenges when categorizing entities like UAS operators, as the Convention was primarily designed with traditional manned aviation in mind. While it defines 'aircraft' and addresses the responsibilities of airlines, it does not fully account for the complexities of unmanned systems. UAS operators, who manage not only the aircraft but also the broader control systems and remote operations, do not fit neatly into the traditional categories established by the Convention. This creates legal ambiguities, particularly concerning the application of air service agreements and traffic rights to UAS operations. As UAS continue to evolve and play a more significant role in international air services, these gaps in the Convention's framework highlight the need for updated regulations to specifically address the unique nature of UAS operations.

Each State exercises complete and exclusive sovereignty not just over safety and security but also in protecting its economic interests, particularly in deciding which foreign aircraft operations are permissible within its territory. Article 6 of the Chicago Convention plays a pivotal role in the economic regulation of international air transport, stipulating that no scheduled international air service may operate within a contracting State's territory without specific permission or authorization. Article 96 complements this by defining "air services" and "international air service,"

with the former being any scheduled service by aircraft for public transport of passengers, mail, or cargo, and the latter referring to services crossing the airspace of multiple states. Article 6, while addressing the need for special permission in case of international scheduled air service, does not specifically indicate to whom it applies. It broadly applies to aircraft, including drones, and suggests that traffic rights commonly associated with route rights in air transport agreements might not necessarily apply in the same manner to UAS. This aspect will need to be further analysed if no airline operates services with UAS.

The traffic rights set forth in traditional air transport agreements, such as those governed by the Chicago Convention, are designed primarily for manned aircraft operated by airlines. These rights typically include:

- **Freedom of the Air:** Various “freedoms” (e.g., rights of overflight, technical stop, and commercial rights such as the right to carry passengers and cargo between two countries) are negotiated and granted through bilateral or multilateral air service agreements (ASAs).
- **Scheduled and Non-Scheduled Services:** Defined under Articles 5 and 6 of the Chicago Convention, scheduled international air services require specific permissions and are often governed by these ASAs, which determine who can operate on which routes and under what conditions.

As noted above, UAS operators often do not fit the traditional definition of an “airline” as per Article 96 of the Chicago Convention. Moreover, UAS, particularly those not transporting passengers or cargo in a conventional manner, may not align with the terms under which traffic rights are typically negotiated. For instance, UAS used for surveillance, agricultural purposes, or drone delivery services do not fall under the standard definition of air transport services.

- **Potential for Special Agreements or Modifications:** As indicated by the ICAO guidelines and evolving EU regulations (e.g., Regulation (EU) 2019/947 and Regulation (EU) 2019/945), UAS operations may require distinct regulatory frameworks that consider their unique technical and operational characteristics. Current agreements may need amendment or new provisions specifically tailored to UAS operations, so as to address traffic rights, safety standards, and cross-border operations.

Generally, flights not meeting the criteria for scheduled air services fall under Article 5, which applies to aircraft not engaged in scheduled international air services, especially for non-traffic purposes like emergency landings. The ICAO Council has indicated that while states have the right to impose restrictions, they should not hinder operations. This article, though addressing a smaller segment of flights, is increasingly relevant to international air transport involving UAS and – in the present authors’ opinion – the most appropriate for UAS operations, as it does not determine the status of the operator.

Non-scheduled flights, while not governed by international agreements, are subject to the laws of the concerned contracting state. National policies vary, with some states imposing strict limitations and others allowing more freedom. Carriers must typically be licensed by their home country for international non-scheduled air transport, and some states require foreign carriers to provide proof of such licensing. The ICAO has been requested to develop regulatory frameworks for UAS, but these are not yet tailored for drones used in international air transport, indicating a need for more specific national regulations.

National policies for international non-scheduled air transport vary significantly. Some countries impose stringent regulatory requirements to ensure safety and control, while others adopt a more flexible approach. For example, in the United States, foreign carriers must obtain a foreign air carrier permit from the Department of Transportation (DOT) to conduct non-scheduled flights, as mandated under Title 14 of the Code of Federal Regulations (CFR), Part 375. This regulation requires foreign carriers to demonstrate proof of insurance, compliance with safety standards, and a financial fitness review. In contrast, European Union member states adhere to Regulation (EC) No 1008/2008 [22], which establishes common rules for the operation of air services within the EU. Under this regulation, non-scheduled air transport by foreign carriers is permitted if the carrier holds a valid Air Operator Certificate (AOC) issued by its national aviation authority and complies with additional requirements set forth by the destination state. For instance, the United Kingdom's Civil Aviation Authority (CAA) requires non-EU carriers to apply for a Foreign Carrier Permit, demonstrating compliance with both EU and UK safety regulations and providing proof of an AOC from their home country. Additionally, some states, such as China, have adopted restrictive policies, requiring foreign carriers to obtain approval from the Civil Aviation Administration of China (CAAC) for each non-scheduled flight. This approval process includes submitting detailed information on the flight purpose, route, and safety measures, and ensuring compliance with national aviation regulations.

These examples illustrate the diversity in national policies regarding licensing and operational requirements for international non-scheduled air transport, reflecting varying priorities concerning safety, economic protection, and regulatory oversight. Carriers must typically be licensed by their home country, and some states, such as Japan, require foreign carriers to provide proof of such licensing before granting operational permissions.

The authors of some studies examining various legal perspectives on cross-border UAS operations have focused mostly on airlines that may benefit from rights granted by air transport agreements. It is not so obvious, however, that international UAS operations will be performed only by airlines [23]. Although the Convention does not exclude non-air carrier entities from providing air services, the complexity of UAS operations complicates the categorization of such entities as airlines. Different scenarios under Articles 5, 6, and 7 should be explored, as well as the commercial

opportunities arising from scheduled air services and their governance through air service agreements (ASAs). Whether ASAs will regulate UAS operations remains a question for further analysis [24].

All articles of the Chicago Convention referencing aircraft could apply to UA, but the approach to UAS remains unclear. Identifying the principal entity to which traffic rights are assigned is crucial. If a UA and its remote pilot station operate in different states or the remote pilot station is used in a different state than the UA, a special authorization should consider all these factors. States involved in any UAS operation should adhere to comparable standards of certification and licensing, especially for transportation for remuneration.

5. BILATERAL AGREEMENT ON INTERNATIONAL AIR SERVICES APPLICABLE TO AIRLINES

The Chicago Convention delegates the management of international air transport to individual States and does not specifically identify the entities responsible for executing international air services. Instead, these details are usually outlined in air transport agreements. The intricate web of bilateral agreements in place complicates standardizing regulations for UAS operations, as agreements must be mutually established. A bilateral international air services agreement model, established at the 1944 Chicago Diplomatic Conference, has been widely adopted in international engagements. These agreements, primarily covering scheduled international air services and to a lesser extent non-scheduled services, form an extensive legal framework.

Only airlines are recognized as beneficiaries of the commercial rights in these agreements, and no other operators are entitled to exercise traffic rights in international transport. While a State determines the foundational conditions for establishing an air carrier, key aspects of an airline's designation are dictated by air transport agreements. Central to these conditions is the nationality clause, a core principle in the economic regulation of international air transport. Traditional bilateral air transport agreements often include clauses about substantive ownership or effective control of designated airlines. Assessing substantial ownership involves evaluating the extent of ownership, with more than 50% equity often deemed significant. Determining effective control is more complex, as control can be exerted in various ways by diverse entities.

In the context of UAS operations, assessing eligibility for commercial rights is more challenging, as operations might involve multiple States, different from those establishing commercial rights. If the assumption remains that only airlines can utilize these rights, then no modification is needed. However, this overlooks the intricacies of UAS operations. Under the Chicago Convention, rights are primarily assigned to States and their aircraft, so the dualism between UA and UAS entities presents a significant challenge to overcome before initiating the first international commercial UAS flight. This distinction between UA and UAS, already outlined

above, is crucial because current international aviation law, including the Chicago Convention, primarily governs the aircraft (UA) without accounting for the broader operational framework that a UAS represents. The Chicago Convention, for example, addresses the aircraft's rights and obligations but does not clearly extend these provisions to the associated systems and infrastructure required for UAS operations, such as remote pilot stations or data communication networks located in different jurisdictions.

The challenge is further compounded by the fact that, in a UAS, the different components may be subject to the laws of multiple states. For instance, the UA may be registered in one country, while its remote pilot station and communication systems could be located in another. This creates potential conflicts of law and jurisdictional issues regarding certification, airworthiness, operator licensing, and liability, which are not straightforward under the current international framework. Moreover, existing bilateral and multilateral air service agreements do not explicitly cover these scenarios, adding further uncertainty to the legal status of UAS operations across borders.

Therefore, before the first international commercial UAS flight can be initiated, there is a need to reconcile these differences through new regulatory frameworks or amendments to existing ones. These frameworks must comprehensively address the unique operational, safety, and legal challenges presented by the dualism between UA and UAS entities, ensuring that all components are regulated consistently and coherently on an international scale. Several scenarios are conceivable, including one where all States involved in a UAS operation must be parties to an international air services agreement. This approach would demand a revolutionary shift in the regulation of international transport by UAS.

A simpler approach is to designate an airline responsible for meeting additional international standards in UAS operations, thereby centralizing responsibility. Airlines are identifiable entities recognized by their commercial rights in international air services, which are granted based on mutual agreements and encompass route, operational, and traffic rights. Introducing UAS operations could impact this market access rights, especially in defining routes and operational specifics. The integration of UAS with traditional aircraft operations could significantly alter the scope of agreed operating rights, potentially expanding services by incorporating additional aircraft for specific tasks.

While the established freedoms of the air may remain applicable to UAS operations, addressing UAs as part of an airline's fleet in bilateral agreements is necessary. Operational and technical aspects, particularly the advanced communication systems required for drone operations, add complexity to assigning sole responsibility for international air transport. These communication systems often involve multiple entities across different jurisdictions, such as remote pilot stations, satellite networks, and ground control centres, complicating the assignment of clear legal and operational responsibility to a single entity. However, designating an airline for this role seems efficient from both a commercial and consumer perspective.

Developing a complete regulatory framework for UAS will be an ongoing process, evolving with technological advancements. While current air transport agreements recognize only airlines for providing international air services, future regulations may expand this to include specific UAS operation categories.

6. THE ICAO MODEL UAS REGULATION

The most pressing issue is the standardisation of UAS certification for cross-border operations. As with aircraft, the authorization of unmanned aircraft for commercial operations with passengers on board will require an agreed common regulatory framework for UAS. Not every holder of an air operator's certificate will be able to provide international air services for the public transport of passengers, mail, or cargo. Air transport provided by an airline generally requires an operating license, which can only be granted to an entity holding a valid AOC.

The ICAO has taken a first step towards this harmonisation. It has been requested by States to develop a regulatory framework for UAS. Although this proposal is limited to UAS that operate outside of the IFR International areas, it may serve as a guideline for further standardisation in the international commercial operation of UAS. As the industry develops rapidly and the race to commercial operations is likely to be like commercial spaceflight, the need for a regulatory regime will soon become urgent.

The ICAO Model UAS Regulations and associated Advisory Circulars are intended to assist States in the implementation of national UAS regulations [25]. Part 101 is dedicated to UA weighing 25 kg or less, which do not require additional operational review and are beyond the scope of the present analysis. Part 102 governs UA operations using UA weighing more than 25 kg and rules regarding these UAs are likely to apply to cross-border operations. It should be emphasized that Part 102 is not yet dedicated to UAS operations engaged in international carriage. This part establishes standards regarding Unmanned Aircraft System Authorization or Unmanned Aircraft System Operator Certification (UOC) and most probably will be commonly recognized as a requirement for future transportation in cross-border operations. This part also establishes the obligation to obtain a UAS authorization or UOC before commencing UAS operations. It also specifies what data should be submitted to the competent CAA in order to obtain the UAS Authorization or UOC. The UOC should include the following ICAO recommendations: 1) details of the location of the certificate holder's principal base of operations, 2) the certificate holder's address for service in the country concerned, 3) a list of any business names under which the certificate holder is approved to operate; 4) the privileges and operations that the operator is authorized to perform, including details of each UA that is authorized for use, identification of the geographical areas of operations approved by the competent CAA and any exemption issued from any requirement of this or any other Part. Where an airline remains the only entity authorized to

perform international air services, it will therefore be more than beneficial to locate the UAS Authorization or UOC in a company that takes full responsibility for the conduct of the operation from a commercial and safety perspective.

While the ICAO Model UAS Regulation remains only a template for Member States, future international standards should recognize common requirements in terms of UAS authorization or UOC and should also specify additional conditions that need to be met in terms of financial standing and commercial capability to provide reliable services to customers, particularly towards passengers. More detailed requirements are formulated based on the ICAO Model UAS Regulation by the EU and a special category has been already established for the operations with the highest level of risk.

Regulation 2019/947 applies to all UAS operations, including those involving smaller drones, which are increasingly used in commercial activities. The regulation's "open category" applies to UAS under 25 kg, which do not require prior operational authorization due to their low risk. However, cross-border operations involving such UAS must still comply with the regulation's requirements, particularly regarding operator registration and technical standards.

By excluding this segment, the article ignores the growing market for smaller UAS in areas such as last-mile delivery and logistics, which play a significant role in the development of the UAS industry within the EU.

7. EU COMMON RULES AND PROCEDURES FOR OPERATION UAS OPERATION

It seems almost certain that only one category of UAS will be allowed to operate cross-border flights. EU Regulation 2019/947 classifies UAS operations into three categories: *open*, *specific* and *certified*.

The *open* category is not subject to any prior operational authorization and mitigates a low level of risk. It applies, much like ICAO Part 101, to unmanned aircraft with a maximum take-off mass of less than 25 kg. The open category is not subject to any prior operational authorization and is intended for operations that present a low level of risk. It applies to unmanned aircraft with a maximum take-off mass of less than 25 kg and meets additional criteria distinguishing it from specific category operations, such as staying within visual line of sight, not flying over people, and not carrying dangerous goods.

The *specific* category applies to a UAS that does not fall within any of the definitions of the open category and where the operation is not considered to be sufficiently safe. In this category, an operational authorization is required. The competent authority should specify whether the operational authorization concerns the approval of a single operation, or a number of operations specified in time or locations or both and the approval of a light UAS operator certificate (LUC). An operational authorization is not required for UAS operators holding an LUC with appropriate privileges. An LUC (Light UAS Operator Certificate) with

appropriate privileges allows the holder to self-authorize certain types of UAS operations without needing to apply for individual operational authorizations. These privileges may include conducting specific or repetitive operations, operating in certain airspace categories, or performing operations beyond visual line of sight (BVLOS), depending on the holder's safety performance, operational history, and compliance with regulatory standards. In this case, the competent authority should specify the terms and conditions of the privilege granted to the UAS operator in the LUC and should grant the privilege to an LUC holder to authorize its own operations without the need to apply for an operational authorization. Depending on the UAS operator's past safety performance and safety record over a defined period of time, the competent authority may apply a gradual approach for the purpose of granting privileges to LUC applicants [#36].

When a UAS operator intends to conduct an operation within the specific category for which an operational authorization has already been granted, and which is intended to take place partially or entirely in the airspace of a Member State other than the Member State of registration, then additional requirements regarding UAS are expected to be met in accordance with Delegated Regulation (EU) 2019/945 [#3]. This process also applies when the UAS operator intends to conduct an operation only in a Member State other than the State of registration.

An operation falls into the *certified* category, in turn, if it is conducted over gatherings of people, involves the transport of people or involves the carriage of dangerous goods that may result in high risk for third parties in case of accident. In addition, UAS operations have been classified as certified, where the competent authority, following the risk assessment provided for in Article 11 of Regulation 2019/947 considers that the risk of the operation cannot be adequately mitigated without the certification of the UAS and of the UAS operator and, where applicable, also without the licencing of the remote pilot.

Based on Article 10, in addition to the conditions defined for UAS on the basis of the above delegated regulation, additional technical requirements and rules and procedures for airworthiness, as defined in other delegated acts adopted pursuant to Article 58 of the Regulation (EU) 2018/1139 are required [26]. Regulation 2019/947 also obliges Member States to establish and maintain accurate registration systems for UAS whose design is subject to certification and for UAS operators whose operation may present a risk to the safety, security, privacy, and protection of personal data or the environment. UAS operators within the specific and certified categories must be registered, and the owner of a UA whose design is subject to certification must also register the unmanned aircraft. Certified equipment is understood as any equipment for which the relevant design organization has demonstrated compliance with the applicable certification specifications and received a form of recognition from EASA that attests such compliance. This process is independent from the CE marking process conducted based on the general principles set out in Article 30 of Regulation (EC) No 765/2008 [27].

Part C of Regulation 2019/947 sets out the general requirements for the Light UAS Operator Certificate (LUC). Only a legal person can apply for a LUC. An application for a LUC should contain the following necessary information: 1) a description of the UAS operator's management system, including its organizational structure and safety management system, 2) the name(s) of the responsible UAS operator's personnel and 3) a statement that all the documentation submitted to the competent authority has been verified by the applicant and found to comply with the applicable requirements. Like an air operator, the LUC holder should follow specific requirements that should be met for the formal application including the development of an Operational Manual and safety management manual (SMM), list of UAS to be operated, documents of purchase, leases, contracts or letters of intent, arrangements for crew and ground personnel training and qualification, etc. An LUC holder is considered to be a UAS operator; consequently, they must be registered according to Article 14 and this can be achieved in parallel to the LUC application [28].

Irrespective of the above-mentioned rules and conditions, Regulation 2019/945 specifies the requirements for the design and manufacture of UAS intended to be operated under the rules and conditions defined in Regulation 2019/947 and of remote identification add-ons. Article 40 establishes requirements for UAS operated in the certified and specific categories. It provides that a UAS subject to certification should comply with the applicable requirements set out in Regulation (EU) 748/2012 [29], Regulation 2015/640 [30] and Regulation 1321/2014 [31]. Paragraph 1 states that the design, production and maintenance of UAS needs to be certified if 1) it has a characteristic dimension of 3m or more, and is designed to be operated over assemblies of people; 2) it is designed for transporting people; 3) it is designed for the purpose of transporting dangerous goods and requiring a high level of robustness to mitigate the risk for third parties in case of accident and 4) it is intended to be used in the specific category of operations defined in Article 5 of Regulation 2019/947 and in the operational authorization to be issued by the competent authority, following a risk assessment provided for in Article 11 of Regulation 2019/947, considers that the risk of the operation cannot be adequately mitigated without the certification of the UAS [29].

The overall scope of requirements for UAS operators seems to follow the technical and administrative pattern adopted in a more advanced form for air operators. It is therefore expected that more advanced technology capable of transporting people will require even stricter compliance with rules similar to those required for air operators.

8. LICENSING OF UAS OPERATORS

The aspect of licensing will also require further consideration if UAS are certified for the carriage of passengers. Existing EU standards for the internal aviation market impose requirements by recognising the potential link between the financial health

of an airline and safety. As the risk of UAS operations is comparable to that of air carriers for the transport of persons, the requirements for obtaining and maintaining a valid operating licence should be similar, if not identical. An entity applying for commercial operations involving the use of UAS may become an airline for the purposes of licensing. Regulation 1008/2008, which establishes common rules for the operation of air services in the EU, defines an operating licence as an authorization granted by the competent licensing authority to an undertaking, permitting it to provide air services as specified in the operating licence [22].

An entity applying for an operating licence should meet the following requirements listed in regulation: 1) its principal place of business should be located in a Member State responsible for granting an operating licence, 2) holds a valid AOC issued by the same Member State, 3) it has at least one aircraft at its disposal through ownership or dry lease agreement, 4) its main activity regards air service operations, 5) its company structures allows the competent licensing authority to implement provisions relevant to licensing requirements, 6) Member States and/or their nationals own more than 50% of the undertaking and effectively control it, whether directly or indirectly through one or more intermediate undertakings, 7) financial conditions defined by Article 5 of the Regulation and provisions on good repute from Article 7 are fulfilled and 8) insurance requirements established in Article 11 and Regulation 785/2004 are also met [11].

The financial conditions should be carefully checked by the competent authority before the operating licence is granted. A company applying for the first time should demonstrate that it will be able to meet its actual and potential obligations for a period of 24 months from the start of its operations and that it will be able to cover its fixed and operating costs for a period of three months from the start of operations without using any income from its operations. When applying for the operating licence, the entity should submit a business plan for at least the first three years of operation. Less stringent requirements apply to a company applying for an operating licence to cover operations with aircraft of less than 10 tonnes maximum take-off mass (MTOM) and/or less than 20 seats. Such a company should demonstrate that their net capital is at least EUR 100 000 or provide, when so required by the competent licensing authority, additional information in order to assess its financial standing. However, the competent licensing authority may still require more stringent conditions to be met by an undertaking with the intent to operate scheduled air services whose turnover exceeds EUR 3 million per year.

An operating licence is valid as long as the company complies with the requirements demonstrated during the process of licensing. At least the same requirements should be met by UAS willing to operate as a company with an EU operating licence. In the opinion of the present authors, less stringent conditions are not justified for providing scheduled air services, as the risk of UAS operations is almost identical to that of airline services in terms of potential liability and the need to provide adequate compensation in the event of accidents or incidents. Given this

comparable risk profile, UAS operators should be required to meet similar insurance standards to ensure sufficient coverage for passengers, third parties, and property. It also appears that the operations of UAS will require more in-depth analysis, depending on the technical conditions under which they are intended to be used for the transport of people.

Licensing of Unmanned Aircraft Systems (UAS) operators is a critical aspect of ensuring safe and responsible use of airspace. This process typically involves rigorous training and assessment, focusing on both practical flying skills and theoretical knowledge of aviation regulations, safety practices, and airspace rules. Licensing criteria can vary significantly between countries, reflecting their specific regulatory environments and airspace challenges. The process often includes exams, flight demonstrations, and continuous education requirements. Effective licensing ensures that UAS operators are competent, aware of their legal obligations, and equipped to handle the complexities of operating drones in diverse and potentially challenging environments.

According to the European Union Aviation Safety Agency (EASA), certified UAS operations involving the transport of passengers and high-risk goods are expected to be fully regulated by 2030. This timeline is critical, as it suggests that cross-border operations in the certified category will become increasingly common in the coming decade. The regulation of UAS in the certified category, which involves higher-risk operations, such as flights over gatherings of people or the transport of dangerous goods, will require rigorous operator certification and compliance with airworthiness standards. Understanding this timeline is crucial for anticipating the future regulatory landscape of UAS operations.

9. FINAL REMARKS

While UAS operations have the potential to significantly impact the transport services market, including international scheduled air services, their current dominance is constrained by technological limitations such as limited battery capacity, lifecycle, and range. Overcoming these challenges will be critical for UAS to achieve a more prominent role in this sector. However, as technology advances and solutions to these limitations are developed, UAS could eventually play a larger role in international air transport. It is only a matter of time before UAS operations come to dominate the transport services market, including international scheduled air services. Nevertheless, while UAS services offer unique advantages for certain applications, such as short-distance deliveries or accessing remote areas, current literature suggests that they are not likely to replace traditional aircraft or other modes of ground transportation on a large scale. Moreover, given their highly integrated nature and the need for compliance with aviation standards, UAS are more likely to complement existing transport modes rather than replace them entirely.

The main obstacles to proper regulation relate to the technical aspects that need to be considered in order to adopt a uniform certification and licensing process for UAS. International scheduled air services are provided only by airlines designated on the basis of air transport agreements. This does not mean that only existing air carriers can operate on international routes, but that such an airline has been recognised as a reliable entity in international relations. However, from the point of view of passengers, more advanced technology enables us to implement more advanced forms of services. The most convenient means of communication would involve designating a single entity responsible for the whole process of operation. To date, generally accepted standards have placed all responsibility for the provision of services, including liability, towards airlines. This can remain unchanged if at least the same licensing requirements are applied to entities willing to provide passenger transport. This also means that these companies may effectively become airlines after being authorized by the competent authority.

International standards for cross-border operations of Unmanned Aircraft Systems (UAS) are pivotal for ensuring global airspace safety and regulatory consistency. These standards, shaped by bodies like the International Civil Aviation Organization (ICAO), focus on harmonizing airspace management, safety protocols, and communication systems across borders. They encompass operator training and certification, adherence to varying national aviation laws, and coordination between countries' aviation authorities. Key challenges include aligning diverse national regulations and managing risks unique to UAS technology. These standards are crucial for balancing the innovative potential of UAS with the safety, security, and privacy concerns inherent in international airspace operations as there are also technical standards, it would be beneficial to use regulations or rules to provide terminological precision [#34].

The commercial operations of UAS are set to revolutionize the aviation industry, and their integration into cross-border operations is inevitable. However, the regulatory frameworks governing these operations must be clearly understood, particularly in distinguishing between international and EU law. The EU's Regulation (EU) 2019/947 provides a comprehensive framework for cross-border UAS operations, and its focus on certification, safety, and operator qualifications offers a mature regulatory environment for the future of UAS.

By addressing smaller-scale commercial operations, the growing market of UAS under 25 kg, and the timeline for certified UAS operations, the present study has provided a more complete analysis of the legal challenges and opportunities for UAS cross-border operations. Furthermore, the inclusion of Article 13 of Regulation 2019/947 is critical for understanding how UAS operators can navigate the complexities of cross-border activities within the EU.

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