



WORKING PAPER

ASSEMBLY — 41ST SESSION

TECHNICAL COMMISSION

Agenda Item 31: Aviation Safety and Air Navigation Standardization

TO ADDRESS THE SUITABILITY OF FLIGHT RULES TO ENABLE SAFE OPERATIONS OF UNMANNED AIRCRAFT SYSTEMS IN THE AIRSPACE

(Presented by Presented by Czechia on behalf of the European Union and its Member States¹, the other Member States of the European Civil Aviation Conference², the Member States of the African Civil Aviation Commission³, and EUROCONTROL, and co-sponsored by Singapore)

EXECUTIVE SUMMARY

Member States and ICAO have long recognised the importance of safe and efficient integration of unmanned aircraft, whether remotely piloted, fully autonomous or combinations thereof, in non-segregated airspace and at aerodromes. The integration of remotely piloted aircraft systems (RPAS) operating in accordance with instrument flight rules (IFR) in controlled airspace and at controlled aerodromes was historically viewed to be a higher priority and ICAO's global provisions are therefore focused to facilitate such operation⁴. Other unmanned aircraft systems (UAS) operations, including visual and beyond visual line-of-sight (BVLOS) operations, were mainly excluded from those considerations. The lack of sufficient guidance in this area makes it difficult for Member States to keep their own regulations in this respect aligned with those established by ICAO. Keeping national regulations aligned with ICAO is the basis for international harmonisation and interoperability, which is essential for manned and unmanned operations to be conducted safely. This working paper invites ICAO to expand its priorities regarding UAS and develop more comprehensive guidance enabling safe integration of UAS other than RPAS operating IFR.

¹ Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

² Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Iceland, Republic of Moldova, Monaco, Montenegro, North Macedonia, Norway, San Marino, Serbia, Switzerland, Türkiye, Ukraine and the United Kingdom.

³ Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cabo Verde, Central African Republic, Chad, Comoros, Congo, Cote d'Ivoire, Democratic Republic of the Congo, Djibouti, Egypt, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Togo, Tunisia, Uganda, United Republic of Tanzania, Zambia and Zimbabwe.

⁴ Such IFR RPAS operations are outside the scope of this paper

Action: The Assembly is invited to:	
<p>a) acknowledge that Member States are adopting differing approaches to the operational introduction of UAS, and that different methods are being employed to manage the various risks. Request ICAO to develop, in addition to the existing work ongoing on UAS and unmanned aircraft systems traffic management (UTM), guidance for Member States on how to apply the main objectives and principles within flight rules Standards and Recommended Practices (SARPs) in Annexes 2 — <i>Rules of the Air</i>, Annex 11 — <i>Air Traffic Services</i> and PANS-ATM (Doc 4444), <i>Procedures for Air Navigation Services — Air Traffic Management</i> in order to support today's typical UAS operations;</p> <p>b) request ICAO to consider whether additional material relating to Flight Rules needs to be developed to enable safe integration of UAS operations, achieving common understanding; and</p> <p>c) encourage Member States, regional safety oversight and international organisations and industry to share best practices related to UAS/UTM regulations to support this work.</p>	
<i>Strategic Objectives:</i>	This working paper relates to the Safety and Economic Development of Air Transport Strategic Objectives.
<i>Financial implications:</i>	The activities referred to in the attached assembly Paper should be undertaken subject to the resources available in the 2022 – 2024 Regular Programme Budget and/or from extra budgetary contributions.
<i>References:</i>	Annex 11 — <i>Air Traffic Services</i> Annex 2 — <i>Rules of the Air</i> Doc 9854, <i>Global Air Traffic Management Operational Concept</i> Doc 4444, <i>Procedures for Air Navigation Services — Air Traffic Management</i>

1. INTRODUCTION

1.1 The introduction of inexpensive, small unmanned aircraft systems (UAS) on the market about ten years ago led to their quick adoption for both recreational activities and professional use. It led to an increasing pressure on the Civil Aviation Authorities to enable these operations, despite their non-compliance with ICAO Standards and Recommended Practices (SARPs), in particular those regulating the flight rules.

1.2 For instance, due to the nature of their operations, most UAS tend to fly below the minimum height authorised for manned traffic, whether in visual flight rules (VFR) or instrument flight rules (IFR). UAS can take off and land outside of dedicated aerodromes⁵. Moreover, it is often expected that they do so, to avoid conflict with manned traffic. Furthermore, UAS are not able to satisfy the ‘See and Avoid’ requirements for VFR flights. Instead, the safety of operation is often ensured by the remote pilot on the ground, ensuring that the unmanned aircraft (UA) is in visual line-of-sight (VLOS), or with the support of visual airspace observers. Furthermore, small UA are hard to detect by the crews of manned aircraft.

1.3 This complexity is also exacerbated by the wide variety of types of UA, in terms of mass, dimensions or means of propulsion (fixed wings, rotorcraft, etc.). A prerequisite for an amendment to the SARPs would be the development of a mature policy and a validated concept of operations (CONOPS) for UAS operations. Attempts have already been made by several Member States to build a common approach, the most notable one being the work performed by the Joint Authorities for Rulemaking on Unmanned Systems (JARUS). This led to the publication of recommendations and guidance material for operators and

⁵ In accordance with ICAO Annex 14

Civil Aviation Authorities. However, these attempts were not focused on the definition of a common set of flight rules.

1.4 The different initiatives led ICAO to develop the UAS model regulation, which is helping Member States to develop their own regulations. In Europe, following the work done by JARUS, comprehensive regulatory frameworks have been adopted for States to support UAS operations other than UAS operations in the certified category⁶.

2. ANALYSIS

2.1 Flight rules are fundamental to enable safe, non-segregated operations and are one of the important elements of the rules of the air regulations. A key element of safe airspace operations is that all airspace users must comply with a recognised ruleset (known as rules of the air) and the ruleset used by a pilot is determined, in the first instance, by the classification of airspace that they are intending to operate in and by their choice of flight rules. Currently, that is either IFR or VFR. These rulesets ensure that all airspace users can integrate with one another safely, and they place certain responsibilities and requirements upon the pilots and air traffic management service providers.

2.2 Annex 2 — *Rules of the Air* contains the Standards for VFR and IFR flight. However, the Standards contain requirements that do not cater for the specifics of UAS operations. This has an impact on the safe integration of UAS and the operational requirements of UAS operators. From an international perspective, it is important to harmonise the application of extant objectives and principles relating to flight rules.

2.3 Currently, the responsibility to ensure collision avoidance between unmanned aircraft and manned traffic rests with the UAS remote pilot/system, irrespective of whether the UAS is operated VLOS or Beyond Visual Line-of-Sight (BVLOS). The lack of mature Detect and Avoid systems and the relatively small size of many UA means that manned aircraft are unable to visually acquire such aircraft rendering the see and avoid principle, essential for flight in VFR, ineffective.

2.4 One of the first pieces of work that will be valuable to undertake, is to identify where UAS are unable to comply with the requirements of the existing Rules of the Air. Once this is understood, work can be undertaken to address those areas.

2.5 The following areas are identified as requiring additional guidance to existing flight rules:

- a) right of way rules and collision avoidance considering UAS type of operations (BVLOS, VLOS or extended visual line -of -sight (EVLOS)) and hierarchy⁷;
- b) visual meteorological conditions (VMC) minima applicability to UAS considering their performance compared to manned aeroplanes, helicopters or others;
- c) minimum heights and their applicability to UAS operations and
- d) common altitude reference system.

2.6 This list is not exhaustive but indicates some of the areas where further guidance on flight rules and their applicability to UAS might be required and should be identified by ICAO.

⁶ JARUS and Europe as well as ICAO model UAS regulations divide the UAS operations following an operation centric, risk-based and performance-based approach into what is named open, specific and certified. [ICAO Model UAS Regulations](#)

⁷ In relation to aircraft types (e.g. aeroplanes, helicopters, sailplanes, balloons, etc.)

3. CONCLUSION

3.1 In today's situation, the lack of a mature concept, technical solutions and common regulatory approaches do not allow States and ICAO to propose significant amendments to the flight rules (IFR, VFR) within SARPs that could be accepted by all Member States. The UAS industry is still growing and the pace of innovation is very high, so developing new SARPs for these types of operations is not considered to be the right approach at this time.

3.2 Therefore, this working Paper is requesting ICAO to develop guidance for Member States on how to apply the main objectives/principles within flight rules SARPs in Annex 2, Annex 11 and PANS-ATM in order to support today's typical UAS operations. This work should not be considered in isolation and its further impact on other *Rules of the Air* should be investigated.

3.3 The ultimate goal of all stakeholders is to achieve safe, efficient and seamless operations and full integration between manned and UAS traffic. Based on what is set in this working paper, ICAO should promote guidelines to achieve this objective.

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