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TECHNICAL COMMISSION

Agenda Item 31: Aviation Safety and Air Navigation Standardization

NEW ENTRANTS AND LOW-LEVEL FLYING OPERATIONS

(Presented by Saudi Arabia)

EXECUTIVE SUMMARY

The operation of unmanned aircraft (UA) at low altitude airspace is evolving rapidly and are increasingly used in variety of applications such as agriculture activities, traffic monitoring, critical infrastructure surveillance and inspection, rapid response for emergencies and fires, and deliveries, etc. Moreover, there is also ongoing development of commercial and business platforms (e.g., delivery systems) which may greatly increase the scale of UA operations and demand on low altitude operations and airspace usage. While the restriction of airspace access for UA and segregation of different types of airspace users for low-level flying operations is feasible with the current traffic density and can ensure safe aircraft operations, these arrangements will not cope with the increasing number of UA operating in low altitude airspace that might conflict with manned aviation and the ultimate goal should be, as specified in ICAO global unmanned aircraft system traffic management (UTM) framework, an integration and equitable access to all airspace users considering the safety and efficiency objectives.

Action: The Assembly is invited to:

a) note the information provided in this paper; and
b) request ICAO to develop strategy related to new entrants considering mature concepts and rapid pace of development for the adoption of new entrants' operations in low altitude airspace.

Strategic Objectives:	This working paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives.
Financial implications:	The ICAO activities referred to in this paper can be undertaken within the resources available in the 2023-2025 Regular Programme Budget and/or from extra budgetary contributions.
References:	Doc 10140, *Assembly Resolutions in Force (as of 4 October 2019)* Doc 10115, *Thirteenth Air Navigation Conference. Montréal, 9-19 October 2018. Report*. Unmanned Aircraft Systems Traffic Management - A Common Framework with Core Boundaries for Global Harmonization - Edition 3[1]

[1] https://www.icao.int/safety/UA/Documents/UTM%20Framework%20Edition%203.pdf

1. INTRODUCTION

1.1 In October 2018, the Thirteenth Air Navigation Conference (AN-Conf/13) discussed the opportunities and challenges related to the emergence of a range of aviation activities in very low altitude airspace, typically at and below 1000 feet above ground level (AGL), in particular in urban or suburban environments. These activities include the operation of unmanned aircraft (UA), with rapid increase and traffic density that vary depending on the region and States.

1.2 The conference adopted Recommendation 5.2/1, *Very low altitude operations* which invited ICAO to contribute to the development of operational solutions and guidance, including on unmanned aircraft systems traffic management (UTM) systems, autonomous operations and tactical risk assessment models, to support the safe and coordinated implementation of aviation activities at very low altitude, particularly in urban and suburban environments, including in the vicinity of, and into, aerodromes.

1.3 To achieve this, ICAO, in collaboration, with States, unmanned aircraft systems (UAS) industry leaders, academic institutions, and aviation professionals developed a common global framework for (UTM, a framework that is kept up to date through a series of requests for information (RFIs) and the outcome of ICAO DRONE ENABLE events. Edition 3 of the UTM Framework is available on the ICAO Unmanned Aviation public website[2] and Edition 4 is expected to be published during 2022.

1.4 The ICAO global UTM framework is providing guidance to States on core capabilities of a "typical" UTM system that must be able to interact with the air traffic management (ATM) system in the short term and integrate with the ATM system in the long term. The core capabilities cover registration and identification systems; communications systems; detect and avoid (DAA) capabilities; geofencing-like systems; interoperability (with other systems and other States); UTM-ATM boundaries and information exchange; infrastructure performance requirements (including reliance on existing infrastructure); frequency spectrum (availability, suitability, security, etc.); cybersecurity considerations; structure and approval processes for UTM service providers; UTM risk assessment; separation; strategic deconflict; and contingency procedures; etc. It is expected that ICAO global UTM framework will be extended to include requirements on certification, integration into aerodromes, and emerging advanced air mobility (AAM) traffic in the low altitude environment.

1.5 To support setting of proper framework for new entrants, the Assembly, at its 40th Session adopted Resolution A40-7, *New entrants*, which "directs ICAO to review Standards and Recommended Practices (SARPs) relating to, inter alia, the rules of the air, air traffic services, certification, licensing, liability and the environment, for amendment or expansion as necessary, to facilitate the operation of New Entrants within a global, harmonized framework, taking into account regional frameworks and practices".

2. DISCUSSION

2.1 The operation of UA at low altitude airspace is evolving rapidly and are increasingly used in variety of applications such as agriculture activities, traffic monitoring, critical infrastructure surveillance and inspection, rapid response for emergencies and fires, and deliveries, etc. Moreover, there is also ongoing development of commercial and business platforms (e.g., delivery systems) which may greatly increase the scale of UA operations and demand on low altitude operations and airspace usage.

2.2 To manage the increasing number of applications for access to low-level controlled or uncontrolled airspace, States apply, in general, restrictions and segregation based on conditions and

[2] https://www.icao.int/safety/UA/Pages/ICAO-Model-UAS-Regulations.aspx

measures coordinated with the air navigation services providers (ANSPs). While the restriction of airspace access for UA and segregation of different types of airspace users for low-level flying operations is feasible with the current traffic density and can ensure safe aircraft operations, these arrangements will not cope with the increasing number of UA operating in low altitude airspace that might conflict with manned aviation and the ultimate goal should be, as specified in ICAO global UTM framework, an integration and equitable access to all airspace users considering the safety and efficiency objectives.

2.3 Under the current ATM environment, the aircraft operating at low altitude are mainly general aviation aircraft, and helicopters used for government and private activities. The current ICAO Annex 2 — *Rules of the Air* provisions do not allow flying over congested areas of cities, towns or settlements or over an open-air assembly of persons at a height less than 1000 ft above the highest obstacle to permit, in the event of an emergency arising, a landing to be made without undue hazard to persons or property on the surface.

2.4 The on-going research and rapid pace of development for the adoption of new entrants' (e.g., electric and hybrid aircraft with new airborne technology and capabilities) operations in urban, suburban, and rural environments is supported by an evolving technologies and business opportunities that may affect the whole State's economy. The new entrants' projects and concept of operations are being pursued by companies with significant investments from private industry creating new types of aircraft that have automation flying capabilities in low altitude airspace changing the current modes of air transportation. With this respect, the new electric vertical take-off/lift and landing aircraft (eVTOL) capabilities, the required supporting ground infrastructure, and air traffic management systems will impact the current airspace monitoring systems, working arrangements, practices, and regulatory framework. Some States have already begun flight-testing and initiated certification processes with the expectation of making, gradually, these operations significant part of the aviation industry.

2.5 The automation on the ground and on-board aircraft, and digital data sharing network are the foundation for the new entrant operators to facilitate their flights in low altitude airspace, promote safety, and provide efficient traffic management, strategic deconflict and separation without using different supporting infrastructures which may impact the level of new entrant equipage i.e., multiple sensors and capabilities affecting their performance, size, weight, reliability, and overall cost.

2.6 The orderly growth and integration of new entrants in low altitude airspace should be based on strategic evolution plan using phased and iterative approach covering the development, testing, validation, and introduction of new capabilities with the involvement of all stakeholders. The use cases with lower risk operations can serve as opportunities to have better understanding, build experience, and refine requirements to expand the traffic of new entrants in low altitude airspace allowing the establishment of a full set of requirements covering advanced capabilities required for urban environments, where increased population, obstruction and traffic density are more complex. The delivery, surveillance, and inspection, and transport operations in remote and less populated areas may be considered as starting point for the gradual integration of new entrants in low altitude airspace.

2.7 The implementation of air traffic management systems for the new entrants requires significant collaboration, coordination, education, and agreement between all stakeholders including government entities as it brings major changes to the current aviation sector as new concepts and technologies are used for flights management and integration. The following factors may impact the growth and integration of new entrants:

a) development of regulatory framework as new requirements should be set to ensure safety and efficiency for all new entrant operations;

b) high Safety standards must be demonstrated with no impact on the public and property on the ground with proper interaction with or other aircraft;

c) ground infrastructure which may include vertiports, hangar and maintenance areas, and associated recharging/power facilities;

d) management of communication capabilities, data exchange including cybersecurity risks, and threats.

e) compliance with the security requirements and no-flying zones/areas;

f) robust resilience and contingency arrangements to recover from unexpected failure or weather condition changes and continue a flight operation despite loss or corruption of one or more datalinks or connections;

g) reduction of environment impact with respect to noise and visual pollution;

h) flexibility and scalability to meet operators and users' needs; and

i) public acceptance of the services provided through the new entrants.

2.8 Considering the similarities between the current low-level flying operations (e.g., helicopter and certain UAS flights) and the proposed concepts for new entrants i.e., urban air mobility (UAM)/advanced air mobility (AAM), the technical and operational regulatory requirements related to aircraft equipage, airspace, infrastructure, licensing, training may be advanced using other regulatory framework and developments related to ICAO UAS guidance, global UTM framework and ATM operations.

2.9 The ICAO's role is to provide global policies and develop the provisions that will support gradual and safe integration of new entrants' operations in low altitude airspace. To enable the standardization, global harmonization, interoperability, safe and efficient new entrants' low-level flying operations, there is a need to

a) update the existing provisions based on operational concept, identification of services, and interactions between the different stakeholders;

b) identify communication, navigation and surveillance (CNS) performance requirements including frequency spectrum needs and protection, performance-based navigation, and use of international mobile telecommunication (IMT) networks as means of providing surveillance capabilities;

c) establish new airworthiness, certification, and licensing requirements covering single piloted, remotely piloted and/or highly automated operations;

d) develop new requirements for the design, certification, and development of ground infrastructure such as vertiports;

e) develop new requirements on traffic management automation and data exchange standards considering the need for real-time information updates between ATM and UTM systems (the concept is already covered under ICAO UTM global framework); and

f) establish new requirements for the new competencies, roles and responsibilities of personnel involved in the operations of the new entrants.

3. CONCLUSION

3.1 ICAO has a key role as a forum and facilitator for the development of frameworks and knowledge sharing on the operations of new entrants at low altitude airspace. ICAO is bringing together States, and industry stakeholders, at both the global and regional levels to update SARPs, develop guidance material, share best practices on the concept of operations and requirements for safe and efficient integration of new entrants in the aviation ecosystem. Even for new entrant standards that are developed by States and specialized organizations, such as Standards Developing Organizations (SDOs), ICAO would serve as a unifying body to support harmonization and ensure global consistency, and interoperability.

3.2 The integration of new entrants in low altitude airspace with multiple applications and users is a complex, and multidisciplinary challenge. With the contribution of States, stakeholders, and the industry, ICAO has the capabilities, and a strong leadership and knowledgeable regulatory establishment allowing the organization to lead the development of framework, standards, and guidance supporting the gradual evolution of new entrants' operations.

3.3 The similarities between the current low-level flying operations and the new entrant flights and the approach used for the development of ICAO UTM global framework may be considered to support adequate identification of requirements covering all aspects related to safe and efficient operations.

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