



WORKING PAPER

THIRTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 9 to 19 October 2018

COMMITTEE A

Agenda Item 5: Emerging issues

5.2: Operations below 1000 feet

VERY LOW ALTITUDE OPERATIONS

(Presented by the Secretariat)

EXECUTIVE SUMMARY

This paper addresses the opportunities and challenges linked to the emergence of a range of aviation activities in very low altitude airspace, typically at 1 000 feet above ground level (AGL) and below, particularly in urban or suburban environments. These activities include the operation of small unmanned aircraft (UA), commonly referred to as “drones”, as well as new developments referred to as “flying taxis”. In light of the expected benefits and to ensure safe, efficient, and interoperable worldwide operational and regulatory frameworks that include existing airspace users, ICAO should continue serving as the global facilitator and forum for the coordinated development of national regulations and supporting efforts towards the conceptualization and implementation of an unmanned aircraft systems (UAS) traffic management (UTM) system.

Action: The Conference is invited to agree to Recommendation 5.2/xx — Very low altitude operations, in paragraph 3.

<i>Strategic Objectives:</i>	This working paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives.
<i>Financial implications:</i>	<i>Impact for the aviation community:</i> Significant investments will be required, possibly through public-private partnerships (PPPs), for the conceptualization and implementation of a UTM system, and to ensure safe, efficient, and interoperable worldwide frameworks, both operational and regulatory. <i>Impact for ICAO (relative to the current Regular Programme Budget resource levels):</i> Since the 39th Session of ICAO’s Assembly (A39) extended the Organization’s work programme to encompass UAS operations that remain outside of the international instrument flight rules (IFR) framework, additional resources are required, both financial and human, to support ICAO’s efforts in the highly specialized areas associated with unmanned aviation operations.
<i>References:</i>	AN-Conf/13-WP/6 A39-WP/474 Doc 10019, <i>Manual on Remotely Piloted Aircraft Systems (RPAS)</i> Doc 10007, <i>Report of the Twelfth Air Navigation Conference (AN-Conf/12)</i> Doc 10075, <i>Assembly Resolutions in Force as of 6 October 2016</i> Doc 7300, <i>Convention on International Civil Aviation</i>

1. INTRODUCTION

1.1 This paper addresses the emergence of a range of new aviation activities in very low altitude airspace, typically at 1 000 feet above ground level (AGL) and below, in urban or suburban environments. Such activities include the operation of small unmanned aircraft (UA), commonly referred to as “drones”, as well as new developments such as “flying taxis”, operating along with existing airspace users such as manned helicopters, paragliders and other users. UA include a broad spectrum from meteorological balloons that fly freely to highly complex aircraft piloted from remote locations by licensed aviation professionals. The latter are covered in AN-Conf/13-WP/6.

2. DISCUSSION

Opportunities

2.1 Drones are expected to support the development of goods delivery business models, in particular, online sale of products such as pharmaceuticals, food, electronics and clothing as well as inspection, monitoring and even recreational activities. The competitive advantage of drones over traditional ground transportation modes is particularly strong in densely populated urban areas.

2.2 Furthermore, a network of small, electric powered-lift aircraft that take off and land vertically may enable rapid and reliable transportation between suburbs and cities and within cities. The use of such aircraft can generate significant savings in commute time and therefore positively contribute to urban mobility. From an economic perspective, urban powered-lift networks are expected to have significant cost advantages over traditional ground and air transportation which usually require heavy infrastructure such as roads, rail, bridges, tunnels or airports.

2.3 With these new technologies, tops of parking garages, existing airports and heliports, and even unused land surrounding highway interchanges could form the basis of an extensive, distributed network of dedicated operational sites. The lower cost and increased flexibility provided by these innovative approaches may substantiate strong business cases for cities and States around the world.

Challenges

2.4 **Aircraft certification** — Ongoing “flying taxi” projects are aimed at the development and introduction within five years of highly automated unmanned aircraft systems (UAS) available for use as taxis by the general public. Such new types of aircraft expected to carry passengers will require a blend of certification requirements from both manned and unmanned aircraft categories. While airworthiness certification SARPs are under development for remotely piloted aircraft (RPA), they do not allow for people being on board at this time. Advances are being made in this field, including flight demonstrations, in the United Arab Emirates, the United States and the European Union.

2.5 **Air traffic management** — The increasing numbers of aircraft, whether manned or unmanned, operating simultaneously within metropolitan areas will require new approaches to air traffic management (ATM). The UAS traffic management (UTM) concept can be defined as a system that provides traffic management through the integration of humans, information, technology, facilities and services, supported by air and ground and/or space-based communications, navigation and surveillance. A key aspect of UTM is precisely the need for it to serve in areas with high-density aircraft operations, including package delivery. It should be noted that airspace from ground-level to upwards of 1 000 feet AGL is already the operational environment of low-flying helicopters and other manned aircraft which will also need to be identified by the UTM system. At this early stage, it would be premature to define the

dimensions of the UTM, including its lower and upper limits. The primary means of communication and coordination between the air navigation services providers (ANSPs), operators and other stakeholders may be through a distributed network of highly automated systems via application programming interfaces (API), rather than the traditional voice/data exchange between pilots and air traffic controllers.

2.6 **Infrastructure development** — Identifying the infrastructure requirements, followed by development and deployment, will require the proactive cooperation of States and stakeholders with the involvement of local authorities as necessary, possibly through public-private partnerships (PPPs).

Work in Progress

2.7 Given the rapid development of aviation technology planned to operate in low level airspace, the 39th Session of the ICAO Assembly, from 27 September to 6 October 2016, expressed broad support for ICAO taking a leadership role in the development of Standards and guidance material (A39-WP/474 refers) for the proper harmonization of regulations on UAS that remain outside of the international instrument flight rules (IFR) framework. In order to facilitate this expansion of ICAO's work programme, an innovative and flexible approach was recognized as being necessary, taking into account ongoing developments at national, regional and international levels.

2.8 Currently, UTM technology is advancing rapidly in a number of States and regions. For example, in Europe, the high-level conference on UAS, held in Helsinki in November 2017, called for “strengthened international regulatory cooperation with ICAO, JARUS and Non-EU States” and invited “European authorities to come forward, as a matter of urgency, with indications of future regulatory plans which [...] reflect the probable roles and responsibilities of the actors involved in drone operations and U-space provision...”. U-Space, in Europe, is a set of new services and specific procedures (e.g., registration, electronic identification, geofencing, flight approval, and tracking) designed to support safe, efficient and secure access to airspace for large numbers of UA. Ongoing work on UTM also includes NASA's work in the United States, as well as other projects in China, Japan, the Russian Federation and Singapore.

2.9 In this context, the DRONE ENABLE Symposium was held in Montréal from 22 to 23 September 2017. The Symposium emphasized the need for regulators to take a different, quicker path from the traditional approach of developing regulations and guidance in order to accommodate and ultimately integrate UTM solutions.

2.10 Any framework for UTM will have to include several components, three of which are fundamental and will therefore be addressed as a matter of priority as follows: i) *registration system* from which data is accessible in real time to allow remote identification and tracking of each UA, its operator/owner and location of the remote pilot/control station; ii) *communications systems* for control of the UA and for tracking all UA within the UTM area; and iii) *geofencing-like systems* that will support automatic updates by national authorities on the 28-day aeronautical information regulation and control (AIRAC) cycle to prevent UA operation in sensitive security areas and restricted or danger areas such as near aerodromes.

2.11 To further support State and industry efforts towards harmonization of the regulatory framework applicable to UAS, ICAO has developed an online toolkit (<https://www.icao.int/safety/UA/UASToolkit/Pages/default.aspx>) which includes guidance material to support regulators in developing and implementing UAS national regulations, best practices and examples from States that have regulations in place. The UTM framework will be added to the UAS toolkit as it is developed by ICAO.

The Way Forward

2.12 ICAO must continue supporting States and industry stakeholders to allow more complex low-altitude operations; maintain close contact with industry innovators; identify ways to balance local and international interests; improve communications with enforcement authorities; address security risks; and accelerate the approval of special authorizations that can be recognized by multiple States.

2.13 ICAO's activities to support the development of the UTM are essential to ensure compatibility and interoperability of systems and associated regulations. The Organization must therefore continue to serve as the global facilitator and forum for States, industry, academia and other interested stakeholders to collaborate on developing the UTM system.

2.14 ICAO must expedite the development and deployment of the global aircraft registry network (ARN) which will facilitate the connectivity between national aircraft registries. The ARN will apply to manned aircraft, as well as RPA and other UA. As a global network, the ARN will support ICAO in the areas of operational safety and universal safety oversight while helping States in day-to-day operations and enabling them to fulfil their obligations under Article 21 of the Chicago Convention.

2.15 States should support the development of UTM systems by ensuring the identification and availability of sufficient and adequate infrastructure, including giving consideration to and implementing financing arrangements such as PPPs.

3. CONCLUSION

3.1 In light of the above, the Conference is invited to agree to the following recommendation:

Recommendation 5.2/xx — Very low altitude operations

That the Conference:

- a) urge States to collect and share information regarding very low altitude operations;
- b) request ICAO to contribute to the development of operational solutions and guidance to support the safe and coordinated development of aviation activities at low altitude particularly in urban and suburban environments, including in the vicinity of, and into, airports;
- c) request ICAO to continue serving as the global facilitator and forum for States, industry, academia and other interested stakeholders in the development of the UTM system, including by developing guidance for the identification, structuring and implementation of necessary financing mechanisms such as public-private partnerships (PPPs);
- d) request ICAO to expedite development of a global aircraft registry network (ARN);
- e) request ICAO to continue developing provisions for the proper harmonization and implementation of regulations on UAS;
- f) urge States to provide ICAO with dedicated financial and personnel support to undertake the expanded work programme associated with UAS operations that remain outside of the international instrument flight rules (IFR) framework, with the development of the UTM system, and with other low altitude operations; and
- g) request ICAO to continue conducting awareness and educational activities amongst users, and to facilitate the exchange of information amongst States regarding their UAS regulations.

— END —