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WORKING PAPER

ASSEMBLY — 40TH SESSION

TECHNICAL COMMISSION

Agenda Item 30: Other issues to be considered by the Technical Commission

UNMANNED AIRCRAFT SYSTEMS (UAS) TRAFFIC MANAGEMENT (UTM)

(Presented by Saudi Arabia)

EXECUTIVE SUMMARY

Article 28 of the *Convention on International Civil Aviation*, (Doc 7300) requires that Contracting States must provide airports and air navigation services (ANS) in their territory according to the Standards set by the Convention and the Annexes.

The operations of unmanned aircraft (UA) provide opportunities and challenges related to a range of aviation activities in very low altitude airspace, typically at 1 000 feet above ground level (AGL) and below, in particular in urban or suburban environments.

As the technology evolves, the current ground infrastructure to support UAs operations is limited and should be expanded to accommodate the expected level of traffic in near future.

To ensure orderly development of UA operations, ICAO should develop a regulatory framework for unmanned aircraft systems traffic management (UTM) considering integration and data sharing with existing air traffic management (ATM) systems.

Action: The Assembly is invited to:

a) re-iterate the fundamental role of ICAO as the unique international forum for the orderly development of international civil aviation;
b) urge States to share their experience and expertise on the development of unmanned aircraft systems traffic management (UTM);
c) request ICAO to develop a UTM regulatory framework to ensure orderly development of UTM operations and activities; and
d) urge ICAO to review and amend all existing provisions, SARPs and guidance to consider the UTM development and operations;

Strategic Objectives:	This working paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives.
Financial implications:	The activities referred to in this paper will be undertaken subject to the resources available in the 2020-2022 Regular Programme Budget and/or from extra budgetary contributions.
References:	*Report of the Thirteenth Air Navigation Conference (AN-Conf/13)* (Doc 10115)

1. INTRODUCTION

1.1 Article 28 of the *Convention on International Civil Aviation*, (Doc 7300) requires that Contracting States must provide airports and air navigation services (ANS) in their territory according to the Standards set by the Convention and the Annexes.

1.2 The AN-Conf/13 held in October 2018 recognized the opportunities and challenges related 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, in particular in urban or suburban environments. These activities include the operation of medium and small unmanned aircraft (UA) and the operation of remotely piloted aircraft systems (RPAS).

1.3 Although, ICAO has defined activities in the development of the regulatory framework to support the integration of remotely piloted aircraft (RPA) into non-segregated airspace and aerodromes, this framework is not covering UA operations.

1.4 The number of UA that can fly within visual line of sight (VLOS) and beyond visual line of sight (BVLOS) is increasing in drastic way. This increase in UA fleets will lead to a considerable growth of flying operations in the airspace.

1.5 With the expected commercial uses of UA, significant daily flights will be conducted to support business needs, such as deliveries. The number of daily operations could impact the airspace use beyond the current service requirements.

1.6 The low-altitude UA operations will encompass flights in uncontrolled airspace, transit between controlled and uncontrolled airspace, and flights within controlled airspace. Considering the number and type of UA operations projected, it is obvious that the existing air traffic management (ATM) system used mainly for manned aircraft operations cannot deliver services for UA. Further, the nature of UA operations does not require direct interaction with the ATM system as per existing practices.

1.7 To enable safe management of the expected rapid increase of UA operations in airspace, ICAO should take the lead to define solutions and guidance that scale beyond the current ATM infrastructure and air traffic control (ATC) services. This may include establishing a technical and operational framework, developing operating rules to ensure accountability of operators and stakeholders, and promoting efficient and equitable airspace access rules for manned and unmanned aircraft operations.

1.8 ICAO should develop a concept for unmanned traffic management (UTM) considering integration or data sharing with existing ATM systems, and provide guidance to support the management of UA operations in uncontrolled airspace; where no air traffic separation services are provided.

2. UTM REQUIREMENTS AND GUIDANCE

2.1 UTM is a concept around which ICAO and Contracting States will provide requirements and guidance to support safe operations for UA operating in low altitude airspace. UTM will be a collaborative-based traffic management system, where the service providers and operators are responsible for the coordination, execution, and management of multiple UA operations, with well-established flying requirements and rules. UTM should be designed to support the demand and expectations for a broad range of operations with high level of complexity and risk.

2.2 UTM should support the provision of safe services that are complementary to those provided by the ATM system, and are based primarily on the sharing of information between service providers and operators on flight intent and airspace constraints.

2.3 UTM should offer services for unmanned aircraft registration, flight planning and authorizations, communications, separation, tracking, limitations, weather awareness and mapping. UTM should be based on information sharing and exchange - from operator to Civil Aviation Authority, service provider to operators, operator to operator, between unmanned aircraft to achieve safe operations.

2.4 UTM should mandate sharing of flight intent between operators and coordination of de-conflict and safely separation of UA trajectories. The UTM should include requirements for on-demand access to UTM operational information when needed.

2.5 Under UTM, ICAO should define the requirements for the type of UA operation and associated airspace volume/route in which they are operating including the ability to contain operations within a specified airspace volume or remain clear of a specified volume.

2.6 ICAO should define the primary means of communication and coordination between the Civil Aviation Authority, service provider, operators, and other stakeholders. The use of a distributed network of highly automated systems should be considered.

2.7 UTM requirements and guidance should include:

a) airspace integration requirements for enabling safe, efficient low-altitude operations;

b) UTM services such as airspace design, corridors, dynamic geofencing, severe weather and wind avoidance, congestion management, terrain avoidance, route planning and re-routing, separation management, sequencing and spacing, and contingency management;

c) type of UTM systems that may include persistent or portable UTM system, which would move between geographical areas and support operations such as precision agriculture and disaster relief. The persistent UTM system, which would support low-altitude operations and provide continuous coverage for a geographical area. This system would require persistent communication, navigation, and surveillance (CNS) coverage to track and monitor conformance;

d) communication link solutions to have reliable, scalable, and flexible communications;

e) requirements on access to real-time airspace constraints available to service provider and UA operators and responsibilities for managing their own operations safely within these constraints without receiving ATC services;

f) level of equipage and automation characteristics that include self-configuration, self-optimization and self-protection. The self-configuration aspect could determine whether the operations should continue given the current and/or predicted wind/weather conditions;

g) classification of UA capabilities; a categorization of the UA having performance-based navigation (PBN) capabilities, including the vertical performance can be a pre-requisite to authorize operations in congested urban airspace;

h) altitude band for very low level (VLL) urban airspace operations;

i) established minimum separation and alerting requirements based on severity of risk for multiple UA operations;

j) deconfliction of UA operations and strategic separation which can be achieved by planning and airspace segregation;

k) use of geofencing techniques for traffic management and deconflict;

l) safety consideration and data to make strategic decisions related to initiation, continuation, and termination of airspace operations;

m) obligations on UA owners and operators to choose a service provider and a list of UTM services to ensure adequate planning, safe operations and proper integration between UA;

n) all infrastructure (ground control stations and ground stations…etc.), policies, and procedures required to support low altitude UAs operations;

o) recommendations on establishment of regulatory framework, development of operating rules and performance requirements commensurate with type of operation, and data exchange and information architecture that provides shared situational awareness among UA operators;

p) safety oversight and monitoring activities over service provider and UA operators with enforcement measures;

q) recommendations to adopt different regulations in different airspaces (including restrictions for UAs with limited capabilities from flying through congested urban spaces) and to establish restrictions (cruising, lanes, corridors, altitude separation) only when and where necessary; and

r) anti-UA systems and how service provider and stakeholders can identify unauthorized UA flights and apply the required anti-UA systems and techniques to ground the UA.

2.8 The obligations on service providers should be well-defined with clear UTM services to support the UA operations, to connect operators and other stakeholders to enable information flow across the service provider network, and to promote shared situational awareness among UTM operators.

3. CONCLUSION

3.1 As a global forum for Civil aviation activities, ICAO needs to set a UTM framework which considers the rapid evolvement of UTM's technology and operations and ensure the orderly and safe development of UTM activities. The framework should cover the core concerns of UTM operations and the maturity of the industry and UTM infrastructure that will evolve to support initiation of planned commercial operations.

3.2 The ICAO regulatory framework should:

a) consider the operational use of UTM capabilities considering the geographical areas, density of traffic, evolvement of commercial use and all external factors that may impact the flying activities;

b) bring the right requirements and guidance to support safe UTM operations; and

c) consider evolvement of technology and innovation and development of solutions to assist in the management of the gradually increase of the numbers of UAs operations.

3.3 ICAO should play its key role as a forum and facilitator for the definition and development of the UAS traffic management (UTM) framework, bringing together States and industry stakeholders, at both global and regional levels. There is a need for ICAO, States, regional organizations and industry stakeholders to proactively cooperate for the deployment of necessary UTM core components and infrastructure.

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