In the *Convention on International Civil Aviation* (Doc 7300) (Chicago Convention), signed at Chicago on 7 December 1944, any aircraft intended to be flown without a pilot on board is referred to as a "pilotless aircraft". Today, these aircraft are called "unmanned" rather than "pilotless". Unmanned aircraft (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 part of a category referred to as remotely piloted aircraft (RPA) and operate as part of remotely piloted aircraft system (RPAS). RPAS, which offer a vast range of capabilities and sophistication, constitute a growing industry with considerable operational opportunities and economic potential. In addition to RPA, a range of new aviation activities have been gaining momentum recently. These include small UA commonly referred to as "drones" as well as new developments such as "flying taxis", operating along with existing airspace users like manned helicopters, paragliders and other aircraft.

However, since their associated technologies, designs and operating concepts are evolving rapidly, States are being challenged with the safe and efficient integration of RPAS and UAS into environments shared by a highly regulated and well established manned aircraft. As such, unmanned aircraft systems (UAS) and RPAS represent a new and challenging component of the work programme of the International Civil Aviation Organization (ICAO).

ICAO is actively involved in facilitating the development of a regulatory framework for unmanned aviation and in leading the discussion on RPAS and UAS through the organization of global symposia.

REMOTELY PILOTED AIRCRAFT SYSTEMS PANEL (RPASP)

To assist its efforts, ICAO established the Unmanned Aircraft Systems Study Group (UASSG) in 2007 to support the development of Standards and Recommended Practices (SARPs) and guidance material for civil UAS. In 2014, the RPAS Panel (RPASP) was established to progress the work of the UASSG with the following objectives and scope:

a) serve as the focal point and coordinator of all ICAO RPAS related work, with the aim of ensuring global interoperability and harmonization;

b) develop SARPs, procedures and guidance to facilitate safe, secure and efficient integration of RPA into non-segregated airspace and aerodromes;

c) review ICAO SARPs, propose amendments and coordinate the development of RPAS related SARPs with other ICAO expert groups;

d) assess impacts of proposed provisions on existing manned aviation; and

e) coordinate, as needed, to support development of a common position on bandwidth and frequency spectrum requirements for command and control of RPAS for the International Telecommunications Union (ITU) World Radio Conference (WRC) negotiations.

ICAO published the first edition of the *Manual on Remotely Piloted Aircraft Systems* (Doc 10019) in March 2015. The purpose of the Manual is to provide guidance on technical and operational issues applicable to the integration of RPA in non-segregated airspace and at aerodromes.

Annexes to the Chicago Convention

In order to develop a regulatory framework for unmanned aviation, one must first be familiar with the existing framework that was built piece by piece as aviation grew. To this end, the RPASP is thoroughly involved in a detailed study of the Chicago Convention and its 19 Annexes.

It is anticipated that all but one of the 19 Annexes will be amended to accommodate RPAS requirements. Annex 5 — *Units of Measurement to be Used in Air and Ground Operations* will not be affected. Thus far, the Panel's work has led to the following amendments. Annex 2 — *Rules of the Air*, now contains high level Standards regarding certification, licensing, operating rules and special authorizations as required under Article 8 of the Chicago Convention, which provides that: "*No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization*". Annex 7 — *Aircraft Nationality and Registration Marks*, defines RPA as unmanned aircraft, and ensures nationality and registration marks can be applied regardless of size or configuration of aircraft. Annex 13 — *Aircraft Accident and Incident Investigation*, extends the definition of "accident" to include unmanned aircraft.

More recently, the RPAS Panel has developed new provisions for the remote pilot licence (RPL) for remote pilots, student remote pilots and instructor ratings, medical assessments, as well as licences and ratings for personnel other than remote flight crew members. After a thorough analysis of the role and functions of the RPL and the broad range of RPAS, the Panel recommended that only one licence, with appropriate endorsements (class, category and type rating of RPA and associated Remote Pilot Stations (RPS), operational limitations, etc.), would best accommodate the diversity of current and future requirements. This licence has been created on the same basis as that of a commercial pilot for manned aviation.

Accordingly, ICAO adopted in March 2018 an amendment to Annex 1 – *Personnel Licensing*, which introduced a regulatory structure for the issuance of RPL and the provision of a global framework for the regulation of RPAS licensing to support international flights operating under instrument flight rules (IFR). To assist States with the implementation of these new provisions, ICAO is assembling a multidisciplinary group of global experts to review and make consequential updates to related ICAO guidance material. Given the critical role that competent personnel play in ensuring operational safety, the guidance material developed by this group of experts will help to ensure that States can properly approve and oversee their service providers' training programmes in advance of the amendment applicability date of 2 November 2022.

The RPAS Panel is actively progressing work on amendments to the remaining Annexes. In particular, Annex 6 – *Operation of Aircraft*, will contain a brand new Part IV — *International Operations — Remotely Piloted Aircraft Systems* covering all types of RPA, with no distinction between commercial and general aviation, as well as requirements for the RPAS operator certificate. Annex 8 — *Airworthiness of Aircraft* will be expanded to cover RPS and C2 Link for control and management. Annex 10 — *Aeronautical Telecommunications* will contain provisions for C2 Link, frequency spectrum, as well as detect and avoid capability. Future amendments to Annex 11 — *Air Traffic Services* will relate to the integration of RPAS into the air traffic management (ATM) system. Annex 17 — *Security* will include measures to prevent unlawful interference, particularly related to physical security of RPA and RPS. Provisions in Annex 18 — *The Safe Transport of Dangerous Goods by Air* will be extended to address RPA employed to carry dangerous goods. The scope of Annex 19 — *Safety Management* will be extended to actors engaged in the RPAS industry (e.g. operators, other service providers).

It should be noted that many of the Annexes will require more than one amendment to fully address the safe and efficient integration of RPAS.

UNMANNED AIRCRAFT SYSTEMS (UAS)

In 2015, it was recommended during ICAO's High-level Safety Conference that the Organization provide supporting material to assist States in the mitigation of risks posed to international flights from RPA and UA.

In 2016, the ICAO Assembly expanded the scope of the Organization's work programme to include the regulation of UA beyond IFR international operations. The focus of this expansion would be particularly on UA weighing up to 25 kg, most of which conduct domestic operations. These operations are conducted for commercial, professional or recreational purposes; however the aircraft do not, and normally cannot, meet the strict standards applying to commercial aviation operations. In order to safely regulate these activities, the Assembly advised that an innovative and flexible approach should be adopted, taking into account ongoing developments at national, regional and international levels.

The Unmanned Aircraft Systems Advisory Group (UAS-AG)

The UAS-AG was established in 2016 to provide guidance and best practices to States, regulatory bodies and stakeholders. The UAS-AG is comprised of a multidisciplinary membership of UAS regulatory and operational personnel, ATM and related industry technical experts from geographically diverse Member States, international organizations, industry and academia.

The UAS-AG developed an online Toolkit to assist States that have no, or limited, regulations or guidance material, and to enable UAS operations in a safe manner. The Toolkit offers not only helpful information and resources, but also serves as a platform for the exchange of global best practices, lessons learned, and effective governance approaches. The Toolkit is accessible at the following link: https://www.icao.int/safety/UA/UASToolkit/Pages/default.aspx.

UAS Traffic Management (UTM)

UTM is a concept being developed that would serve as a more automated ATM like system for areas with high density UA operations, including package delivery, public safety, infrastructure inspections, etc. Initially UTM is planned to include low altitude airspace where manned aircraft (such as low flying helicopters) could be affected.

Recognizing that a variety of UA are set to be used in lower-level domestic airspace for professional or recreational flights, consumer deliveries, urban mobility and many other uses still to be imagined, ICAO announced in May 2017 a Request for Information (RFI) calling for solutions from industry, States and stakeholders to establish a common global framework for UTM. In particular, submitters were asked to provide their views on solutions for the following three components of UTM:

    a) the 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. To accommodate UA that are increasingly transported from one State to another for either recreational or professional use, this database should allow global access;

    b) communications systems for control and tracking of UA within the UTM area. The communications system used for tracking UA must be able to identify when a manned aircraft is entering UTM airspace and provide an acceptable level of protection between it and UA

operating in the airspace. Furthermore, it must facilitate detection of potential collisions with other UA and with obstacles such that appropriate avoidance action can be taken; and

c) 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.

As the development of UTM moves forward, ICAO is focusing on the next evolution of the ability for aircraft (both manned and unmanned) to safely and efficiently transition between any future UTM system and the concurrent ATM systems. The primary requirement is to ensure safe integration, without negatively impacting manned aviation or the safety of persons and property on the ground, taking into account security and equal accessibility for all airspace users. Understanding the boundaries and the transition phases between these systems, how they interact and how best to exchange essential information will enable States, regulators and industry to continue to advance this global industry while preserving safety of all airspace users.

ICAO received a total of 76 responses from industry, States and other stakeholders. Building on the success of the first RFI initiative, ICAO announced in February 2018 a second RFI seeking practical solutions for describing the ATM/UTM boundaries, the transition between the boundaries and the capabilities needed by each system to allow for secure and efficient operations. The deadline for submission has been set for 30 April 2018. For more information please visit: https://www.icao.int/safety/UA/Documents/State%20letter%2018-26%20RFI.pdf

The UAS-AG is in the process of developing a UTM global harmonization document based on the first RFI submissions and will be incorporating the proposals from the second round of RFI submissions in due course.

ICAO'S UNMANNED AVIATION SYMPOSIA

In September 2017, ICAO hosted the Second Global RPAS Symposium under the theme of *Licensing Training and Operator Responsibilities: Initial Steps for RPAS/UAS Entrance into the ATM Environment*. The meeting provided an opportunity for States, international organizations and other stakeholders to gain a more detailed understanding of the roles and responsibilities of RPAS operators, airspace managers, training facilities, licensing authorities, regulators and industry towards ensuring safe operations. In addition, participants were briefed on the operational impact of human performance and how safety management principles support early accommodation. ICAO also held DRONE ENABLE, its first ever UAS Industry Symposium. Leading experts from academia, industry, States and international organizations presented their perspectives on solutions for domestic UA operations and for a common UTM framework, with particular focus on necessary registration, communications and geofencing-like systems.

The Third Global RPAS Symposium and the Second DRONE ENABLE event will be held in September 2018 in Chengdu, China. These meetings will explore the following themes: *From Accommodation to Integration*; and *UTM to ATM – Transitioning from Segregation to Integration*. A selection of top submission authors will present their solutions regarding the UTM-ATM interface. Discussion will focus on complex issues such as categorization for RPAS operations as well as UTM. In addition, the events will provide a unique opportunity to assess the status of regulations currently used in various parts of the world. Through these activities, ICAO plays the leadership role as the global facilitator for the development of a comprehensive and harmonized regulatory framework for unmanned aviation.