

# ICAO UAS Study Group

By Leslie Carey, Secretary, ICAO UAS Study Group



Unmanned aircraft systems are a new and challenging addition to the work programme of the International Civil Aviation Organization (ICAO). Tracing back to the Paris Convention in 1919, pilotless aircraft were in the minds of aviation experts. Although at the time such aircraft were seen as a threat to public safety, today the benefits to be gained from their unique characteristics are becoming ever more evident. Whether unmanned aircraft are being developed to support search efforts, act as communications relay stations, gather environmental data for scientific research or even transport cargo, it is clear that they are gaining visibility and acceptance as a valid member of the global aviation system. The task of ICAO is to ensure these aircraft are integrated into the existing international civil aviation system safely and efficiently by developing the requisite Standards and Recommended Practices (SARPs) and complementary Procedures for Air Navigation Services (PANS) to comprise a regulatory framework.

### Background

The Unmanned Aircraft Systems Study Group (UASSG) was established by the Air Navigation Commission (ANC) of ICAO in 2007 to assist the Secretariat in coordinating the development of ICAO SARPs, PANS and guidance material for civil unmanned aircraft systems (UAS) in order to support a safe, secure and efficient integration of UAS into non-segregated airspace and aerodromes. Sixteen contracting States, and eight international organizations have nominated experts to the Study Group, many with backgrounds as regulators and inspectors, some with air traffic control experience and others from the technical design arena. UVS International, holding observer status, supports the work with its extensive global access to UAS information. The group is currently chaired by Mr. Holger Matthiesen of EUROCONTROL. Mr. Kenneth «Doug» Davis of the U.S. Federal Aviation Administration was co-chair until recently.

The UASSG is the focal point at ICAO for all activities pertaining to UAS. Working together with ANC Panels on issues such as frequency spectrum, airworthiness, surveillance, operations and aerodrome design, among others, the UASSG will ensure that the work proceeds in a cohesive manner such that as one set of SARPs are developed, the many interdependencies are identified and progressed in concert. Where appropriate, ICAO and/or the UASSG will work with external agencies such as the International Telecommunications Union, International Maritime Organization, European Organisation for Civil Aviation Equipment (EUROCAE), RTCA, Inc. and others.

### Work Programme

The first question for the UASSG in approaching this rather daunting initiative has been to determine where to start. Which component of a subject as broad as UAS is the priority? Which aspect will best facilitate the building of an entire regulatory framework? Is there one starting point or are there many? Should the focus be line-of-sight operations with visual flight rules or would it be more productive to address complex UAS operating under instrument flight rules? These questions

garnered extensive debate and are still not fully resolved.

When considering a starting point, it is important to remember that ICAO's role is to address international civil aviation and the Standards and Recommended Practices that make international operations safe, secure and efficient, harmonizing procedures and terminology to the extent practicable across all airspaces and aerodromes of the world. Taking this into account, it is clear that the UASSG must focus on those subjects that will make it possible for an unmanned aircraft to cross international borders in non-segregated airspace without posing an undue hazard for other airspace users. To look at it another way, one can ask «what is required of the UAS so as to permit that UAS to be treated like the other aircraft in its vicinity – airborne or on the ground?» Keeping this thought at the forefront provides the UASSG the basis for establishing a way forward and setting priorities.

### Terminology

Terminology is critical for every subject. Without an established set of terms with corresponding meanings, subjects become confused or disjointed. Developing such a list of terms for UAS is fundamental to progressing all future work. The first term dealt with by ICAO was that unmanned aircraft are, by definition, aircraft and must be so referred. An aircraft is defined as «any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.»

A second term which came to early prominence was that of «accident» which currently reads «an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked...». The UASSG began its work by developing a revision to this definition in order to accommodate aircraft designed to be operated without a person on board and proposed the following which is now proceeding through the lengthy ICAO Standard amendment process:

*Accident* An occurrence associated with the operation of an aircraft with the intention of flight which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which: . . .

*Note 3* An occurrence associated with the operation of an unmanned aircraft system with the intention of flight takes place between the time the aircraft is ready to move with the purpose of flight until such time it comes to rest at the end of the flight and the primary propulsion system is shut down.

The list of new terms needed to support UAS regulations is extensive. Terms must be compatible with those already in use, in some instances, like with «accident» existing definitions can be expanded easily to include UAS while in others, such as «command and control», «detect and avoid» and «lost link», entirely new definitions must be agreed upon



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### Simultaneous interpretation into ICAO's working languages:

Arabic, Chinese, English, French, Russian and Spanish.

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and promulgated. Various terms in common use currently, *inter alia*, operator, controller, unmanned aerial vehicle, unmanned air system, which conflict with existing definitions or are inconsistent with ICAO lexicon are expected to gradually fall into disuse. A priority list of terms has been identified by the UASSG and many of the corresponding meanings have gained preliminary agreement. As the Study Group continues its work during the upcoming years, the list will undoubtedly expand.

### Regulatory Framework

In order to develop a regulatory framework for unmanned aircraft systems, one must first be familiar with the existing framework that was built piece by piece as the phenomena of aviation grew. To this end, the UASSG is undertaking a detailed study of the *Convention on International Civil Aviation*, also known as the Chicago Convention, and the 18 Annexes which come under it. A determination is made for each Article, Standard and Recommended Practice as to its applicability to UAS; does it apply exactly as written or will it need to be revised; if it does not apply, is there an underlying intent that needs to be addressed by developing a new SARP(s); and finally, is the issue entirely outside the existing framework thereby necessitating a new set of SARPs to be developed. This is an extensive process requiring painstaking work by many experts.

Among the obvious items is Article 8 of the Convention which reads:

*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. Each contracting State undertakes to insure that the flight of such aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft.*

Two issues stand out here, first is the meaning of «flown without a pilot» and second is determining what «special authorization» entails. Does the presence of a remotely-located pilot, e.g. on the ground or in another aircraft, exempt an unmanned aircraft from this Article? Must each UAS obtain prior approval from each State affected for every individual flight? Is there a means by which States can provide broad

approvals if they so choose?

The answers to each of these questions are currently being debated within ICAO, the UASSG, States and industry. The Articles of the Chicago Convention are the basis for international air law and must be considered from that standpoint. It is likely that final determination will be made that all UAS are subject to Article 8 in that the aircraft are flown without pilots on-board. In addressing «special authorization», the UASSG is studying both the meaning and potential solutions to facilitate this requirement. Many States, and more especially the UAS industry, have stated that their goal is to achieve routine operations of UAS nationally and internationally with as few constraints being imposed as possible. Lengthy or cumbersome approval processes for each flight by each State to be flown over would certainly not be conducive to advancing the UAS segment of aviation.

The UASSG is working toward practical solutions which States can implement as the still-fledgling international civil UAS industry grows. To this end, the UASSG is identifying at a high level all those requirements the UAS must meet in order to be compliant with the Chicago Convention, the SARPs and PANS and will describe them in an Appendix to Annex 2 — *Rules of the Air*, similar to what has been done for unmanned free balloons. Key to this is determining what is needed to make the UAS compatible with other aircraft in the airspace or on the aerodrome. Generally speaking, this includes having an ability to communicate with air traffic control (ATC) using the same means (e.g. VHF or HF communications, controller/pilot data link communications) as other aircraft, having the necessary surveillance capabilities (SSR, ADS-B, ADS-C, etc.), meeting the navigation performance specified (e.g. RNAV, RNP) and being able to manoeuvre on the surface at aerodromes, if applicable. Furthermore, airworthiness of the aircraft and its operating system must be assured, the security and reliability of its communications links must be unquestioned, an operational approval must be granted and a licensed pilot with the same responsibilities for ensuring the safe operation of the aircraft must be designated pilot-in-command.

### Development Process

The criteria listed above are consistent with those required for manned aircraft. The basis for these are contained in the



18 Annexes to the Chicago Convention, the PANS and supporting guidance material. As stated above, the UASSG is undertaking a detailed review, beginning with the Annexes, to determine where gaps exist between current SARPs and those that will be needed for UAS. Once the scope of work has been identified, priorities will be established, based on two factors – what is most critically needed for work to progress and what interdependent subjects can be developed as «packages». An example of a package might be all the aspects contributing to an airworthiness approval, including the 'command and control' and 'detect and avoid' capabilities, the aircraft itself and the pilot position, any one of which is insufficient by itself.

Development of a new Standard can take as little as two years if it is simple and non-controversial. Complex Standards that are difficult or costly to implement can take many years to work through the development, review and adoption process. It is likely that UAS will necessitate development of SARPs that span the full breadth of this timeline. There are currently 190 Contracting States of ICAO. Each State has the opportunity to review and comment on every amendment, with adoption by the Council only following resolution of all non-concurrences.

### **UAS Circular**

The first deliverable to be provided by the UASSG will be in the form of a Circular. The ICAO Unmanned Aircraft Systems Circular will provide an overview of UAS activities including extensive background information for use by States in

developing their regulatory frameworks. Likewise, it will assist industry in understanding what goals to aim for and what performance-based SARPs are to be anticipated in the future. The preliminary list of terms with their agreed meanings will be included and many examples of solutions States have already implemented will be provided. The UAS Circular, which should be available in final draft early in 2010, will be a living document to be updated as information matures. It is expected that the Circular will evolve into a Manual containing the supporting information for SARPs as the latter are developed and published.

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