

EUROCAE WG73 Activity Update

By Tore Kallevig, Chairman



EUROCAE

The European Organization for Civil Aviation Equipment (EUROCAE) was formed in Lucerne, Switzerland, on April 24, 1963. EUROCAE has now for several decades been operating as a non-profit organisation, whose membership exclusively comprises aviation stakeholders made up of manufacturers (ATM systems, aircraft, airborne and ground equipment), national and international aviation authorities, service providers and users (airlines, airports, operators) from both inside and outside of Europe.

EUROCAE has developed a wide range of performance specifications and other documents exclusively dedicated to the aviation community. EUROCAE documents (ED) are widely referenced as a means of compliance to European Technical Standard Orders (ETSOs) and other regulatory documents like ICAO Standards and Recommended Practices (SARPS), Eurocontrol Safety and Regulatory Requirements (ESARR) and FAA standards.

The European Commission recognises EUROCAE's competence related to standardisation in order to support the Single European Sky initiative, leading to a profound involvement from EUROCAE in the development of technical material, as well as Community Specifications supporting the SESAR Joint Undertaking.

Working Group 73 on UAS

Working Group 73 on Unmanned Aircraft Systems (WG73) was established in April 2006 to deliver standards and guidance that will ensure the safety and regularity of unmanned aircraft missions. UAS users are currently operating or seeking authority to operate UAS in the European airspace system. Developed products are intended to help to assure the safe, efficient and compatible operation of UAS with other aircraft operating in non-segregated airspace. WG73 recommendations will be based on the premise that UAS and their operations will not have a negative impact on existing airspace users.

The main achievement of WG73 during the last year was the production of the concept document (Deliverable 3), which is now in the final stage of the EUROCAE review and acceptance process.

Following Dan Hawkes' retirement in 2009, the working group was temporarily chaired by Vice Chairman Gérard Mardiné, until I was appointed Chairman in March 2010. WG73's current sub-group leaders are:

- Gérard Mardiné, leader of Sub-Group 1 (UAS Operations & Sense and Avoid);
- Michael Allouche, leader of Sub-Group 2 (Airworthiness & Continued Airworthiness);
- Norbert Tränapp, leader of Sub-Group 3 (Command & Control, Communications & Spectrum, Security);
- Ron van de Leijgraaf, leader of Sub-Group 4 (Light UAS Operated with Visual Management of Separation).

In addition, Peter van Blyenburgh, UVS International, holds a position as standing advisor to the working group.

The Terms of Reference for the workgroup are now subject to a review, following the important milestone of production of the concept document. At the same time, a proposed re-organisation from a subgroup based structure to also including Focus Teams for ED78a Deliverables is under consideration.

Deliverables

The WG73 Terms of Reference depict the delivery of six products:

Deliverable 1 UAS related elements regarding the Operational Concept.

This internal working group report (UAS_009.8) was completed in January 2007. It provided a preliminary inventory of airworthiness certification and operational approval items that need to be addressed.

Deliverable 2 Work Plan

The plan (UAS_007) is maintained as a living document to guide and describe the future activities of WG73.

Deliverable 3 Concept for UAS Airworthiness Certification and Operational Approval in the Context of Non-segregated Airspace

The objective is to provide a document that assists in the development of recommendations and a requirements framework for civil UAS such that they will operate safely in non-segregated airspace in a manner compatible with other airspace users, and taking account of the existing ATM regulatory framework, existing ATM infrastructures, and existing procedures.

To meet medium term needs, the document had to explore concepts that identify limited UAS operational scenarios and required equipment for which a Restricted Certificate of Airworthiness would be appropriate and which could be granted against defined certification criteria. The described concepts also have to be consistent with longer term objectives.

Deliverable 3 comprises four volumes: ED-170 General Considerations for Civilian Operation of Unmanned Aircraft in Non-Segregated Airspace, ED-171 Operational Considerations for Civil Unmanned Aircraft in Non-Segregated Airspace, ED-172 Airworthiness Certification and Maintenance for Civilian Unmanned Aircraft and ED-173 Light UAS.

Deliverable 4 UAS Command, Control and Communication Systems
This deliverable shall define the requirements for command, control and communication systems including aspects related to 'autonomous operation' and should be coordinated with the MASPS to be developed by RTCA SC-203.

Deliverable 5 UAS Separation Assurance & Collision Avoidance Systems

This deliverable shall define the requirements for UAS Separation Assurance & Collision Avoidance Systems and should be coordinated with the MASPS to be developed by RTCA SC-203.

A working group-agreed Certification Basis shall be made available 4th quarter 2012.

Deliverable 6 Catalogue of UAS ATM Issues

This document shall identify those aspects of UAS normal and abnormal operations that would require special ATM consideration.

Potential technical and operational solutions should be identified that could support Eurocontrol and/or ICAO in developing the ATM regulatory framework.

Recognizing that this is an ongoing activity dependant on other activities within the working group, periodic summary reports shall be made available annually each 4th quarter.

Sub-Group 1: UAS Operations and Sense & Avoid

Most of the effort during the elapsed year has been dedicated to finalizing the concept views and fundamentals relative to UAS operations, as expressed in the Deliverable 3 Volume 2 (UAS operations).

A safety process must support the standardization activities in order to demonstrate that UAS operations compliant with the proposed standards are safe. The way to define the safety objectives must be discussed and agreed early in the standardization process. It is recommended that the relevant aviation Authorities address this important issue as soon as possible. It is proposed that these safety objectives are defined at the upper operational level. For example, the risk of mid-air collisions should be quantified (e.g. number of mid-air collisions per flight hour) as this type of formulation includes all the contributors in the separation and avoidance of mid-air collision process.

A stepwise UAS integration process is necessary to efficiently address the numerous associated challenges. A "full UAS integration" allowing UAS flights in all classes of airspace, under VFR and IFR flight rules and using non-segregated aerodromes would require a long and complex process of safety, performance and interoperability demonstration involving technical, operational, regulatory and legal issues. More pragmatic is a step by step approach aiming at developing initial standards offering significant additional flight capabilities in non-segregated airspace compared to flight in segregated airspace, in a reasonable timeframe and with an affordable effort.

Two UAS initial flight operations scenarios have been selected and will be analyzed and assessed according to the safety process in the coming months.

The first UAS flight operations scenario deals with UAS flight according to IFR flight rules in airspace class A, B or C and segregated aerodrome operations, including take off and initial climb and final approach and landing. This scenario means that the unmanned aircraft (UA) is nominally flying with ATC providing separation from other airspace users at all times. Aerodrome operations can be segregated on a temporary basis and do not require UAS dedicated aerodromes. To keep the effort at an affordable level, this first step scenario considers one single UAS controlled by one single control station during the flight duration. The second UAS flight operations scenario deals with UA flight within Visual Line Of Sight (VLOS) of the UAS Pilot. This scenario corresponds to short range operations achieved most of the time at low altitude and with small UAS.

Further steps will be defined in the future to be able to expand UAS operations to more capable flight operations scenarios, up to flight in all classes of airspace A-G, under IFR or VFR and to take into account SESAR (Single European Sky future ATM) concepts progress.

Sub-Group 2: Airworthiness

In August 2009, EASA officially published a policy statement regarding UAS Certification (E.Y01301 dated 25-08-2009) which basically provides a general methodology to establish UAS airworthiness certification basis.

EUROCAE WG73 Deliverable 3 Volume 3 (Airworthiness) has been prepared in parallel and in coordination with EASA in order to provide additional guidelines and generic recommendations to develop UAS Airworthiness Certification basis main components, namely:

- Manned Certification Specification tailoring guidelines;

- Basic System Safety Objectives and Criteria;
- Additional Airworthiness Criteria (that should help defining further Special Conditions) in areas related to specific UAS character.

The final document has been approved at the Plenary Session # 11 held in November 2009 and should be issued as EUROCAE ED172 technical report after final outstanding approval of EUROCAE Council. In the absence, at this stage, of a dedicated UAS Certification Specification, it should support UAS manufacturers and airworthiness authorities in establishing a detailed UAS Type Certification Basis, likely on a case by case basis, with due consideration of the envisaged UAS configuration and mode of operation.

Where a certain number of operational restrictions may be defined, one can apply the procedures related to the Restricted Type Certification process which are also reviewed in that document.

The definition of quantitative UAS System Safety Objectives and Criteria remains a central and still non-consensual issue that will have to be further developed. WG73 has served as a forum to discuss a concept initiated by JARUS, in consultation with EASA and FAA representatives, based upon kinetic energy and tailored hazard definitions. The WG73 airworthiness sub-group, in addition to its airworthiness support to ED78 focus teams work (which is currently under consideration), will focus its future activities around the "testing" of the proposed concept, by analyzing typical failure scenarios for typical UAS configuration with the objective of:

- Identifying possible drawback of proposed concept and definitions and propose concept iteration or alternative approach, where relevant;
- Where relevant, to provide inputs to future UAS Advisory Material ("UAS AMC 1309") providing examples of failure condition classification and safety objectives for typical UAS failure conditions.

It is also intended, pending on available resources, to initiate activities to support the conceptual definition of Light UAS Airworthiness Criteria and future UAS Airworthiness Code in general.

Sub-Group 3: Communication, Command and Control, Spectrum and Security (C3SS)

Any kind of UAS air traffic insertion relies on reliable data transmission for the purpose of ATC voice-communication as well as aircraft command and control (CCC). Since errors, malfunctions or incorrect conditions of use of this CCC-link can induce an immediate adverse impact on flight safety, the CCC link is considered to be highly flight safety related. Taking into account that current reliability of a data link achievable with single lane equipment is far below the reliability required from airworthiness point of view, it is evident the any kind of communication, irrespective whether voice or data, is one of the major challenges for UAS operation in non-segregated airspace. The strong relationship between communication and flight safety mandates also consideration of any kind of jamming, intrusion or intervention into the CCC-data link by third parties with malicious intent. The consideration of such kind of security threats posed onto a participant of an ATM-environment is reasonably new and has been initiated within SG3 of WG73 also as an issue of high relevance for any kind of UAS, irrespective if the UAS operates under civil or military operator. In this understanding SG3 shares a close cooperation and interaction with EUROCONTROL who has established a task force team which strongly supports an investigation into generic security threats and potential protection measures. Within SG3 two generalised scenarios have been developed which are proposed to be utilised for further investigation into potential security issues. Other EUROCAE activities of relevance in this area can be seen mainly in EUROCAE WG-72 which is dedicated to general security issues. Another important topic within SG3 is the identification of frequency candidate bands and assessment of proposals for frequency spectrum allocations for aeronautical services in

support to CCC-purposes. In the recent years this activity was mainly scheduled by the time horizon pre-determined by the overall schedule of the World Radio Conference and its sub-organisations. An ongoing support to these groups and to the relevant national delegates is necessary to maintain the strength of necessary frequency bands for the CCC-link of UAS.

SG3 will participate in the safety assessment of UAS flight operations according to ED78A methodology by addressing related CCC subsystem aspects.

Throughout all referred SG3-activities a continuous valuable link to RTCA SC-203 is established. In this understanding also the future activities consider a continuation and extension of the discussion and fruitful dialogue with related SC-203 activities.

Sub-Group 4 on Light UAS

The update concerning SG-4 on Light UAS is dealt with in a separate article in this publication.

Volcanic Ash and UAS

Following the recent disruption of air traffic due to the Icelandic ash cloud, EU transport ministers agreed on May 4th to fast-track «Single European Sky» measures aimed at a greater integration of national airspaces. It has also been identified that UAS fitted with on board air particle sampling instruments can provide precise measurements of volcanic ash particle concentrations, opening the way to more general interest UAS applications and reinforcing the need for coordinated UAS integration related efforts. Presentation of the recent volcanic ash cloud problems and consequences, as well as the advantages of using UAS for ash cloud analysis and trajectory assessment will be addressed in a separate workshop at the UAS 2010 conference.

Coordination / Cooperation

International coordination is necessary, as UAS integration is clearly not a national issue. EASA and Eurocontrol participation and inputs are very valuable, as is the EUROCAE WG73 participation in the ICAO UAS Study Group. FAA participates in WG73 activities as an observer, allowing limited coordination. I look forward to continued and increased coordination and cooperation between WG73 and FAA & RTCA SC203. It could also be of interest to members of CANSO to more actively participate in WG73.

WG-73 Membership

Membership in WG-73, together with access to its private workspace may be requested by downloading and submitting the completed application form available at www.eurocae.net

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