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WORKING PAPER

TWELFTH AIR NAVIGATION CONFERENCE

Agenda Item 4: Optimum capacity and efficiency – through global collaborative ATM
4.2: Dynamic management of special use airspace

INTEGRATION OF REMOTELY PILOTED AIRCRAFT SYSTEMS IN CIVIL AVIATION IN EUROPE

(Presented by the Presidency of the European Union on behalf of the European Union and its Member States[1]; by the other Member States of the European Civil Aviation Conference[2]; and by the Member States of EUROCONTROL)

EXECUTIVE SUMMARY

Remotely piloted aircraft system (RPAS) operations are spreading beyond the original military applications, towards other State non-military operations (e.g. police, coast guard and similar), but also into civil aviation.

ICAO has already amended Annexes 2, 7 and 13 to the Chicago Convention to accommodate RPAS. In all continents, including Europe, civil RPAS present a challenge for competent aviation authorities, in order to allow their safe integration in the aviation system. Actions to address this issue that are already underway in Europe are described in this paper.

It is certain that civil RPAS will gain momentum in the next decades. Therefore their timely accommodation in the aviation system block upgrades proposed to the Conference is essential.

Action: The Conference is invited to agree to the recommendation in paragraph 7.

1. INTRODUCTION

1.1 This paper provides an overview of the integration of remotely piloted aircraft systems (RPAS) in the civil aviation system in Europe, including the approach to ATM. The general consensus is that RPAS should:

a) first be ‘safe to fly’: i.e. the remotely piloted aircraft (RPA) needs an individual and valid Certificate of Airworthiness (CofA), while all the other elements of the system also need appropriate certification, like e.g. the remote pilot station (RPS) and/or be under proper safety oversight (e.g. service providers of satellite communications for ‘command and control’);

[1] Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom. All these 27 States are also Members of ECAC.

[2] Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia, Iceland, Moldova, Monaco, Montenegro, Norway, San Marino, Serbia, Switzerland, The former Yugoslav Republic of Macedonia, Turkey and Ukraine.

b) be ‘safely flown’ by properly competent and licensed pilots and other personnel; and

c) be under the legal and managerial responsibility of a certified RPAS operator (for both commercial and corporate operations, since the risk for the society is identical).

1.2 The integration into non-segregated airspace is foreseen through a stepped approach, supported by progressive introduction of new technology which could also benefit manned aviation. It is foreseeable that this stepped approach, summarised at Appendix 1, might be in fact parallel to those of the deployment of the main current technological initiatives such as SESAR, NextGen or CARATS.

2. PROPORTIONATE REGULATION AND SPECIAL OPERATIONS

2.1 Aviation safety rules have historically been developed to protect:

a) paying passengers and crews on board;

b) other airspace users with respect to the risk of ground and mid-air collisions (MAC); and

c) third parties and property on the ground.

2.2 In the case of RPAS, the need to protect persons on board does not exist. Protection of people and property on the ground can sometimes be mitigated by specific measures (e.g. parachutes or else to reduce kinetic energy at impact; prohibition to over fly densely populated areas or else).

2.3 Furthermore RPAS are often designed and operated in airspace volumes where there is almost no ‘manned’ traffic (e.g. below 400 ft, indoor, into volcanic or other dangerous clouds and so on).

2.4 Finally, at the present time, most RPAS used for public non-military missions or for civil applications, weigh less than 150 Kg or even less than 25 Kg. There is no previous aviation experience with such very small ‘machines’ that, albeit equipped with complex systems, could be designed, produced, maintained and operated by small and medium enterprises (SMEs).

2.5 The safety regulation of RPAS should therefore not only adequately protect third parties on the ground and other airspace users, but also specific to envisaged RPAS operations and proportionate, in terms of administrative burden, for the SMEs active in this field.

3. INTEGRATION APPROACH

3.1 The main principle towards integration in non-segregated airspace is that unmanned aircraft system (UAS) will have to fit into the ATM system and not that the ATM system needs to adapt to enable UAS integrate safely. Nevertheless, the technological evolution that the ATM systems are experiencing globally through the various ongoing initiatives in Europe, the United States, Japan and other States, makes this moment a unique opportunity to have an advantageous parallel evolution of RPAS and ATM domains. In that sense, it could be said that now is an optimum moment to succeed in this integration process.

3.2 Just like manned aviation UAS will have to prove to be as safe as or safer than present manned operations. The safety equivalence with ‘manned’ aviation, since there are no humans on board RPA, could be demonstrated by comparison with historical data related in particular to the risks of:

a) injuries to people on the ground or damage to property;

b) mid-air collision (MAC) with large aeroplanes (in any airspace class); and

c) MAC with small general aviation aircraft in non-controlled airspace.

3.3 RPAS operations will also have to be as close as manned aviation certainly for ATC as it will not be possible for them to effectively handle many different types of UAS with different operational characteristics.

3.4 The largest obstacle toward integration in non-segregated controlled and uncontrolled airspace is the ability of the RPAS to replicate the human's ability to "see and be seen". This functionality has been named detect and avoid in the RPAS community. In an environment that is fully controlled by ATC the technology already exists to ensure safe execution of a flight, however detect and avoid covers more than only traffic and collision avoidance. It addresses issues like obstacle clearance, meteorological conditions, visual signs, distance from clouds and other possible hazards.

3.5 Apart from the capability to mimic 'see and be seen' the aspect of detect ability is another element that has to be solved. The equipage requirements (weight) for flying IFR or VFR will already set a physical boundary for small RPAS to fly in non-segregated airspace. The detect ability of RPAS will also have to be determined to ensure timely identification by other airspace users to ensure that the rules of the air can be applied safely when required.

4. COMMUNICATIONS

4.1 Communications is also an important enabler to achieve safe integration of RPAS in the current dense flying environment. It is backed by the adequate spectrum bandwidth necessary to achieve command and control, detect and avoid, along with the current aviation needs such as communication links between the controllers – being at the airport or in ATC – and the pilot in-command and navigation and surveillance systems. Already known aviation communications will have to be adapted to RPAS specifics. While manned aircraft communication failures are typically classified as "major", the safety impacts of RPAS communication failures must be further assessed, by means of a rigorous safety assessment, taking into account RPAS and ATM environment characteristics, to determine the impact on aviation safety.

4.2 Security in communications is to be assessed to reach the adequate balance between threat occurrence and severity and a practicable and affordable technical mitigation solution. Future spectrum resources for RPAS will have to be negotiated at a global level in tight coordination with all other ICAO Contracting States. The next WRC conferences and working groups in ITU will more clearly define the future of available spectrum for RPAS operations and consequently shape the possible operational use of RPAS in the future.

4.3 The possible use of SATCOM and the available MLS frequency band will make available more spectrum for RPAS operations in Europe. Since it is highly unlikely that satellites will be under direct control by the RPAS operator, ICAO should amend current standard 2.4.1 in Annex 10, Volume II in order to provide more guidance for oversight of COM Service Providers by competent authorities. This need, in view of the future data link applications envisaged by SESAR and NextGen, may go beyond RPAS.

5. ICAO WORK ON UAS TO DATE

5.1 ICAO has already undertaken work towards the integration of UAS. Through the development of Circular 328 in 2011 the Unmanned Aircraft Systems Study Group (UASSG) paved the way for further work to

be undertaken supporting the member States with the final aim of developing UAS SARPS. The UASSG is now in the process of developing the UAS manual that is expected to be finalised in 2014. It is expected that before the end of the Block 0 timeframe of the aviation system block upgrade (ASBUs) the first UAS standards will be available. These standards will highly probably be for UAS operations and flight crew licensing. It is paramount that the work undertaken to date by the member States and ICAO is taken into consideration within the Block 0 timeframe. This will ensure timely development of global standards in support of harmonized UAS integration.

6. CONCLUSION

6.1 Through the identification of suitable airspace, without segregation, first integration experiences will contribute toward paving the way for safe insertion of certified RPAS. A stepped approach will also allow for suitable technology to be developed to support further integration, using military experiences gained so far. It is the European vision to set the condition for any certified UAS flown by licensed pilots under responsibility of a civil certified RPAS operator (or by a military or governmental non-military entity) to access all airspace classes if suitably equipped.

6.2 For a harmonised implementation of this concept world-wide, it is necessary that ICAO takes the lead, taking into consideration that RPAS operations will be an integral element of the global air navigation system resulting from the deployment of all the block upgrades.

7. RECOMMENDATIONS

7.1 The Conference is invited to:

a) note the information presented in this paper;

b) consider the specificities of RPAS in the planning of the deployment of the ICAO aviation system block upgrades;

c) consider the work already undertaken by ICAO specifically in the Block 0 time frame;

d) urge States and Regional Safety Oversight Organizations to build upon already adopted SARPs for initial integration of RPAS;

e) recommend to ICAO to provide more guidance for oversight of COM Service Providers; and

f) recommend to ICAO to further develop the RPAS manual to provide guidance for the integration of different types of RPAS in non-segregated airspace, with a specific view on the foreseeable evolution of the ATM systems at global level.

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APPENDIX

The way forward as foreseen by Europe can be identified through three phases:

Phase 1: Present -2016 (Block 0)

In this time frame all RPAS related activities will be 'federated' under the leadership of the European Commission (EC), supported by all the other involved entities that will bring together all disciplines to ensure a coherent consolidation.

The first phase is a consolidation phase where Europe will bring together all efforts so far in EASA, Eurocontrol, the SESAR Joint Undertaking, JARUS, national authorities, and other main actors in the fields of Standardization, Aviation Research and Development, Civil/Military coordination, the Spatial sector, etc. to share best practices and avoid duplication of effort and fragmentation.

In this phase Visual Line of Sight (VLOS) and Extended VLOS operations will occur on a regular basis in all European airspace classes, under the responsibility of public entities or certified civil RPAS operators, employing licensed pilots and using certified RPAS. Exploitation of Art. 11 of Regulation 216/2008 might reduce the additional paperwork necessary to obtain the 'special authorization' per Article 8 of Chicago Convention.

IFR and VFR operations will be allowed on a case by case assessment in all airspace classes apart from F and G. Detect and avoid solutions could be partially supported by GBSAA, which has potential in particular to enhance situational awareness by Remote Pilots.

Airspace where RPAS operations could be conducted with minimum impact will be identified. In this timeframe the development of an UAS master plan will be finalised, including integration into SESAR.

When planning for the deployment of the Block Upgrades, ICAO should take into consideration that the RPAS will be an increasingly significant user of the resulting global air navigation system. In that regard, it is noted that Block 1 already contains a module for the Initial Integration of Remotely Piloted Aircraft Systems into non-segregated airspace.

First start towards public perception will try to make RPAS more acceptable and privacy aspects will be addressed.

Spectrum requirements will be assessed in preparation of ITU WRC2015.

Phase 2: 2017-2021 (Block 0/1)

The second phase is the partial integration of RPAS in all airspace classes inside the 'single European sky' (SES). In this phase additional solutions towards D&A will be available.

Direct link with SESAR will established to ensure consistency with the ATM Master Plan. In particular, an appropriate link with the Regulatory and Standardization Roadmaps should provide for Implementing Rules, SARPS and Standardisation material being available in this time frame, when necessary for the effective integration of UAS, while avoiding overregulation.

VLOS and Beyond (BVLOS) operations will have been fully integrated in day to day life, including cross border inside the EU.

VFR and IFR operations will occur on a more regular basis still excluding the major ATM bottlenecks.

D&A will have been developed and will also bring additional safety benefits towards manned aviation. Sufficient spectrum will be made available.

In this phase RPAS will have an impact the ATM network as they will be able to execute Commercial Air Transport (CAT) freight operations. In parallel first operations Beyond Radio Line Of Sight (BRLOS) will be introduced. This will require a proper regulatory framework (e.g. certification in the EU) for safety oversight of SATCOM Service Providers.

Phase 3: 2022-2050 (Block 1-3)

Full integration of RPAS on all levels including; VLOS-BVLOS-RLOS and BRLOS.

RPAS will be allowed to fly in all airspace classes if suitably equipped.

Mature certification and operational requirements will be in place and RPAS that are able to fly VFR/IFR will be fully SESAR compliant.

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