TWELFTH AIR NAVIGATION CONFERENCE

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

THE INTEGRATION OF REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) INTO CIVIL AIRSPACE

(Presented by South Africa)

SUMMARY

The non-existence of civil airworthiness certification and operational approval criteria for remotely piloted aircraft systems (RPAS) has been, and still is a major obstacle in the development of RPAS application for civil purposes in civil airspace in South Africa and the world at large.

The purpose of this paper is to highlight the position and obligation of the South African Civil Aviation Authority (SACAA) for the initial integration of remotely piloted aircraft systems into civil airspace, in complying with its overall safety oversight functions as a regulator. This is in line with the current objectives of SACAA that ensures industry development and transformation whilst maintaining the highest standards of safety, security and environmental protection.

1. INTRODUCTION

1.1 The objectives of the South African Civil Aviation Authority (SACAA) are to control and regulate civil aviation and to oversee the functioning and development of the civil aviation industry, and in particular to control, regulate and promote civil aviation safety and security.

1.2 SACAA is also responsible for the safety regulations regarding airports, air navigation services (ANS), air traffic management (ATM) and aviation security (AVSEC).

1.3 SACAA as a regulator has the responsibility to develop a set of technical, safety and operational standards for the certification and safe integration of RPAS into civil airspace and aerodromes.

2. BACKGROUND AND DISCUSSION

2.1 Remotely piloted aircraft systems (RPAS) are a new component of the aviation system, one which ICAO, States and the aviation industry are working to understand, define and ultimately integrate. These systems are based on cutting-edge developments in aerospace technologies, offering advancements which will open new and improved civil/commercial applications as well as improvements to the safety and efficiency of civil aviation.

The safe integration of RPAS into non-segregated airspace will be a long-term activity with many stakeholders adding their expertise on such diverse topics as licensing and medical qualification of RPAS flight crew, technologies for detect and avoid systems, frequency spectrum (including its protection from unintentional or unlawful interference), separation standards from other aircraft, and development of a robust regulatory framework.

2.2 The goal of ICAO in addressing unmanned aviation is to provide the fundamental international regulatory framework through Standards and Recommended Practices, with supporting Procedures for Air Navigation Services and guidance material, to underpin routine operation of RPAS throughout the world in a safe, harmonized and seamless manner comparable to that of manned operations.

2.3 South Africa has been highly successful in the development and application of unmanned aircraft systems for military operations. However, in recent years, demand for their use for civilian purpose in civil airspace has experienced a steady increase. South Africa, for example, is one of the first countries that successfully used remotely piloted aircraft systems for civilian missions such as monitoring the 1994 Democratic Elections and carrying out crime prevention operations with the SEEKER II.

2.4 South Africa is part of an international study group established by the ICAO, the Unmanned Aircraft Systems Study Group (UASSG) to look at all aspects of RPAS operations including their safety.

3. INDUSTRY AND STAKEHOLDERS, TECHNICAL EXPERTS INVOLVEMENT

3.1 The South African Minister of Transport is the major shareholder and custodian of all modes of transportation.

3.2 Other stakeholders include individual aviation organizations, National Health & Laboratory Services (NHLS), air traffic and navigations services (ATNS), Airports Company South Africa (ACSA) and military entities like Denel Dynamics and Directorate System Integrity (DSI – SAAF).

3.3 Universities, other research and development institutes like the CSIR, Mining Industry, Department of Agriculture, Law Enforcement Agencies, and the SA Weather Service, etc.

3.4 The Director of Civil Aviation, including all SACAA technical divisions and their support functions.

4. OBJECTIVE AND SCOPE

4.1 **Air Safety:** The objective is to:

a) draft a set of technical, safety and operational requirements for the certification and safe integration of RPAS into civil airspace and at aerodromes; and

b) promote a safe and smooth introduction of RPAS into civil airspace, whilst maintaining and ensuring the safety of any other airspace user by minimising the risk of collision with other air traffic as well as the safety of persons and property on the ground.

4.2 **Regulatory Framework:** This requires review and consideration of '*existing'* regulations, ICAO SARPs, other material applicable to manned aircraft; and the drafting of specific RPAS guidance material to cover the unique features of RPAS taking into account:

a) Airworthiness requirements: Airworthiness certification of the RPAS including accessory components such as launch-recovery components, fixed and mobile remote pilot station and security of the C2/C3 data-link. Type certification criterion, certificates of airworthiness (e.g. standard, restricted, special flight permit, experimental, special operations) and continued airworthiness (maintenance) requirements. Certification of RPAS maintenance organizations, personnel qualifications and training of RPAS maintenance personnel.

b) Operator requirements: Air operator certification for organizations involved in the operation of RPAS for commercial air transport; commercial aerial work and corporate aerial work. Also to be considered under this requirement are leasing, chartering and sub chartering of RPAS.

c) Organizational requirements: Certification for organizations involved in the design, production, manufacture, maintenance and continued airworthiness for RPAS.

d) Remote pilot licensing and training requirements: Pilot licensing for the remote pilot-in-command, remote pilot, student pilot, observer and training requirements for the remote pilot.

e) Detect and avoid technology performance requirements: Certification of detect-and-avoid equipment for RPAS – ground-based initially, compatibility with ACAS II, ADS-B and detect and avoid in an ATM environment (separation assurance).

f) Command, control and communications (C3) requirements: ATM requirements including Frequency Spectrum requirements/allocation. The development of performance requirements for command and control (C2) link, security, protection and transfer of data. ATC communications including ATC voice communications, ATC Data communications, and requirements for a dedicated COM Service provider. RPAS operations at airports and aerodromes (see Appendix A for further comments).

g) Dangerous goods: Transportation and security requirements.

h) Special topics/special operations: The impact of issues relating to human factors (HF) (human-machine-interface) and safety management systems (SMS) for RPAS operations.

i) Model aircraft requirements: Development of a classification scheme for model aircraft and their operational consideration in respect of commercial air transport; commercial aerial work and corporate aerial work.

j) Civil aviation regulations and technical standards – performance-based regulations: The current legislation is to be reviewed, amended or new material incorporated to cover the RPAS requirements as the technology is being developed and matures.

5. RESEARCH AND DEVELOPMENT:

a) comprehensive guidance material on RPAS operations in South Africa;

b) RPAS/RPAS certification specifications;

c) provisions for commercial and corporate RPAS operations;

d) provisions for organizations involved in design, production, maintenance and continued airworthiness;

e) provisions for remote pilot licensing and training;

f) provisions for detect and avoid/sense and avoid;

g) provisions for command and control data link including oversight of related communications (COM) service providers;

h) system safety assessment for all categories of RPAS and accessories (AMC 1309);

i) provisions governing organizations involved in the design, production, operation and continuing airworthiness of RPAS;

j) impact of human factors (HF) on the design, certification, maintenance and operation of RPAS and related equipment;

k) development of a classification scheme for RPAS;

l) safety management considerations (SMS);

m) definition of model aircraft; and

n) amendment and review of Civil Aviation Regulations to incorporate RPAS – formation of performance-based regulations in parallel with ICAO developments.

6. TIMESCALES

The proposed timescales as at 2012, taking into account the various internal technical delays in the last 4 years, are presented in Table 1 below:

Table 1. Introduction of remotely piloted aircraft systems into civil airspace

SCAA ROADMAP – INTRODUCTION OF RPAS INTO CIVIL AIRSPACE 2012-2015/17

Description	Skills compliment	Deliverable	Start	Current Status	End
Comprehensive interim technical guidance material on RPAS operations in South Africa (living document)	Work Group - SACAA + Industry	TGM on RPAS operations in SA	**2012**	**Internal -** On-going as of July 2012	**2013**
Airworthiness certification specification on RPAS and related components	Work Group - SACAA + Industry	Draft Certification Policy	**2013**	**Internal/External –** SACAA re-organizing technical experts – October 2012	**2017**

Design and production org. maintenance and continued airworthiness requirements	Work Group - SACAA + Industry	Maintenance requirements on RPAS	**2013**	**Internal/External** – SACAA re-organizing technical experts – October 2012	**2020**
Operator certification requirements	Work Group - SACAA + Industry	Manual on RPAS Operations	**2013**	**Internal/External** – SACAA re-organizing technical experts – October 2012	**2017**
Remote pilot licensing and training requirements	Work Group - SACAA + Industry	Personnel licensing & training policy	**2013**	**Internal/External** – SACAA re-organizing technical experts – October 2012	**2015**
Medical Certification Standards for RPAS Pilots/ Medical classification	AVMED Team + Industry	Medical Standards for RPAS Pilots (CAR)	**2012**	**Mature Draft** Document under review July-September 2012	**2014**
Detect & avoid/sense & avoid technology performance requirements	Work Group - SACAA + Industry	RPAS collision avoidance policy	**2013**	**Internal/External** – SACAA re-organizing technical experts – October 2012	**2020**
Command, control and communication (C3) requirements	Work Group - SACAA + Industry		**2013**	**Internal/External** – SACAA re-organizing technical experts – October 2012	**2020**
Definition and requirements of model aircraft	Work Group - SACAA + Industry	Model aircraft regulation	**2013**	**Internal/External** – SACAA re-organizing technical experts – October 2012	**2015**
Human factors (HF) requirements and safety management (SMS) considerations	Work Group - SACAA + Industry	HF and SMS Policy	**2013**		**2017**
Formulation of performance-based regulations	Work Group/ CARCOM	Civil Aviation Regulations on RPAS	**2013**	On-going/in-parallel with technical developments	**2025**

7. CONCLUSION

7.1 The Conference is invited to note the information contained in this paper.

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APPENDIX

INPUT ON SPECTRUM ISSUES TOWARDS COMMAND, CONTROL AND COMMUNICATIONS (C^3) REQUIREMENTS

1.1 A requirement of **34 MHz of terrestrial spectrum** and up to **56 MHz of satellite spectrum** to support RPAS line- of-sight (LOS) and beyond-line-of-sight (BLOS) command and control communications (C^3) was identified during the preparations leading up to the World Radio Conference of 2012 (WRC-12), ITU-R studies, supported by ICAO.

1.2 The results of the Conference

1.2.1 LOS: While retaining priority to the MLS service in the 5 030 – 5 091 MHz band, this band was also allocated to the Aeronautical Mobile (Route) Service (AM(R)S), limited to internationally standardized aeronautical systems. Unwanted emissions from the AM(R)S in this band **shall** be limited to protect RNSS system downlinks in the adjacent 5 010 – 5 030 MHz band (future GNSS service and user downlink band).

1.2.2 BLOS: An existing allocation to the AMS(R)S in the 5 000 – 5 150 MHz band was slightly modified. In the bands 5 000 – 5 030 MHz and 5 091 – 5 150 MHz, the allocation was limited to internationally standardized aeronautical systems. In the band 5 030 – 5 091 MHz, coordination procedures were modified from footnote No. **9.21** to footnote No. **9.11A** which is more appropriate for coordination with terrestrial services, and the allocation was limited to internationally standardized aeronautical systems.

1.2.3 In line with WRC-07, and as reflected further under agenda item 1.4 during the WRC-12 conference; when making allocations to AM(R)S in bands already allocated to ARNS and used by ICAO standardized systems, it was acknowledged that compatibility between ICAO standardized systems would be taken care of within ICAO. Hence these new AM(R)S and AMS(R)S allocations are limited to internationally standardized aeronautical systems.

1.2.4 The conference did not support the allocation or use of FSS spectrum for the provision of BLOS C^3, without substantive modifications to such allocations. Such required modifications were not identified at the conference. However, a study item was assigned to the upcoming ITU-R cycle; to identify technical, regulatory and operational recommendations, and an agenda item for WRC-15 was agreed; to consider, based on the result of the ITU-R studies, the possible regulatory actions to support the use of FSS frequency bands for the RPAS C^3 links, while ensuring the safe operation of RPAS C^3 links, consistent with the provision of a safety service. ICAO was invited to participate in the ITU-R studies.

Note.– *At the WRC-12, ICAO expressed the opinion that SARPS will only be available in the 2020 to 2025 time frame.*

1.2.5 The ICAO position was also to ensure that allocations used, in particular, for RPAS command and control, ATC relay and sense and avoid in non-segregated airspace are in the aeronautical mobile (route) service (AM(R)S), aeronautical mobile satellite (route) service (AMS(R)S) and/or aeronautical radio-navigation service (ARNS) and do not adversely affect existing aeronautical system

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