International Civil Aviation Organization

MIDANPIRG Communication, Navigation and Surveillance Sub-Group

Seventh Meeting (CNS SG/7)
(Cairo, Egypt, 31 May - 02 June 2016)

Agenda Item 4: CNS Planning and Implementation in the MID Region

CHALLENGES AND ISSUES FACED INTEGRATION OF UAS INTO NON-SEGREGATED AIRSPACE AND USING FIXED SATELLITE SERVICE SPECTRUM TO SUPPORT THE SAFE OPERATION OF UAS

(Presented by Egypt)

SUMMARY

This paper describes challenges , integration requirements to establish appropriate unmanned aircraft system (UAS) control and non-payload communications (CNPC) links between ATC and UA operator and possible spectrum requirements and regulatory actions, including appropriate spectrum allocations, to support integration of UAS into Non-Segregated Airspace (controlled airspace)

Action by the meeting is at paragraph 3.

REFERENCES

- Agenda Item 1.5 WRC 2015
- Chicago Convention article 8
- ICAO CIR 328
- Radio Regulation 4.4 , 4.10
- Report ITU-R M.2171

1. INTRODUCTION

1.1 The Unmanned Aircraft Systems (UAS) are certainly one of the most active segments in both the military and commercial aviation market. Those systems are classically defined as one (or more) flying components, so called air vehicle(s), but also there is always a component on ground, which deals with at least a minimum command and control of the system, plus usually additional data exploitation features depending on the specific goal that the UAS system is tasked to achieve. In order to keep those air and ground components connected, there is also a third component, embedded in both air and ground segments, which we define as the Communication link (CNPC).

1.2 The integration process for UAS in NAS (National Air Space) to be able to act like any aircraft required the following items :

- Certification: UA, operator, remote pilot
- Approval: UAS as a complete system

- Collision and hazard avoidance
- Interact with ATC and other aircraft
- Security: data links, UA, remote pilot station
- Predictable actions (not autonomous!)
- Contingency procedures

2. DISCUSSION

2.1 This paper will conduct with the third and fourth items in the integration process of UAS in NAS which related to Interact with ATC and other aircraft, Collision and hazard avoidance.

2.2 For safe operations of UA under LOS (Line Of Sight) and BLOS (Beyond Line Of Sight) conditions, three types of radio communications between the UA and the UACS (Unmanned Aircraft Control Station) are required, which are as follows:

- Radio communications in conjunction with air traffic control relay;
- Radio communications for UA command and control; and
- Radio communications in support of the sense and avoid function.

2.3 The ITU-R has determined that 34 MHz and 56 MHz of spectrum would be required for the terrestrial and satellite components of the UAS CNPC, respectively. WRC-12 considered that UAS operating beyond line-of-sight (BLOS) could utilize the existing 5030-5091 MHz AMS(R)S allocation, however it must be recognized that no current or near-future satellite systems use that band or are planned to use that band. As a result, that band could not be used to support near-term UAS CNPC BLOS operations.

2.4 WRC-15 agenda item 1.5 provides the basis for developing radio regulations for satellites in the fixed satellite service (FSS) to be used to provide for the BLOS operation of UAS CNPC in non-segregated airspace instead of the existing 5030-5091 MHz AMS(R)S allocation . Such satellites could be used to address both near and far-term UAS CNPC requirements.

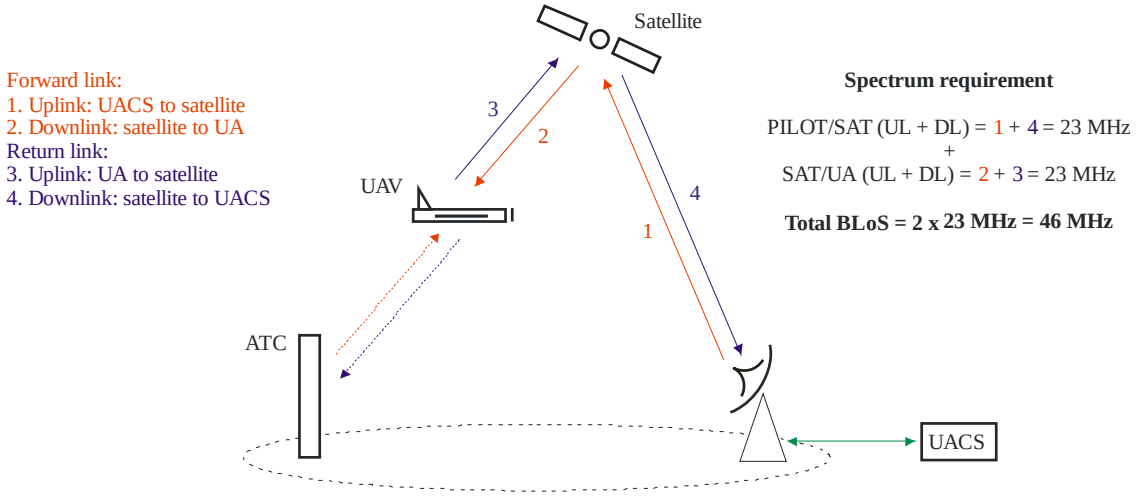
2.5 Existing commercial FSS systems operating in Ku and Ka-band FSS allocations offer immediate access to spectrum to support UAS. Specifically, various segments of the FSS Ku-band (10.95 – 14.5 GHz) and FSS Ka-band (17.30 – 31.0 GHz) are suitable for UAS CNPC links. Furthermore, initial technical studies by the ITU-R indicate that commercial FSS Ku/Ka band satellites can support UAS control links and meet the desired link availability.

2.6 ICAO position on WRC-15 agenda item 1.5 includes a set of conditions which would need to be met by any satellite system supporting UAS CNPC

- The assignments and use of the relevant frequency bands have to be consistent with 4.10 of the Radio Regulations which recognizes that safety services require special measures to ensure their freedom from harmful interference.
- The coordination agreements between satellite operators would spell out any specifics as regards the use of frequencies on a particular satellite network.
- The frequency assignment is recorded in the Master International Frequency Register (MIFR) by the ITU-BR.
- Regular update on the state of harmful interference could be included in reports to aviation authorities.

- Any operational considerations for UAS will be handled in ICAO and not in the ITU (It is important that the respective roles of ICAO and the ITU be fully understood to ensure appropriate separation of regulatory needs).

2.7 Simple figure to show general system structure for Links involved with beyond line of sight (BLOS) via satellite and spectrum allocation calculation:



2.8 Future contribution from our side (ECAA) with support from NANSC expert will conduct the process after assign FSS Ku-band (10.95 – 14.5 GHz) and FSS Ka-band (17.30 – 31.0 GHz) to operate the UAS.

2.8.1 This process is related to resource allocation in the assigned spectrum for operate UAS using the following technology:

1- Channel assignment using a novel cognitive Air/Ground Communication (ensure to comply with requirement mentioned in ICAO Doc 9869 “MANUAL ON REQUIRED COMMUNICATION PERFORMANCE (RCP)”).

2- Transmission scheme with Non-Continuous Interferometry Orthogonal Frequency Division Multiplex (NCI-OFDM).

3. ACTION BY THE MEETING

3.1 The meeting is invited to encourage States to follow-up:

a) the developments of Frequency Spectrum Management Panel meetings and attend its meeting as appropriate for the members; and

b) the result and contribution of Working Party 5B and Working Party 4A.

- END -