



*International Civil Aviation Organization*

**MIDANPIRG Communication Navigation and Surveillance  
Sub-Group (CNS SG)**

**Sixth Meeting**  
*(Tehran, Iran, 9 – 11 September 2014)*

**Agenda Item 5: Performance Framework for CNS Implementation in the MID Region**

**WIRELESS AVIONICS INTRA-COMMUNICATIONS (WAIC)  
SPECTRUM REQUIREMENTS**

*(Presented by I.R.Iran)*

**SUMMARY**

This paper describes a method to possible spectrum requirements and regulatory actions, including appropriate aeronautical allocations, to support wireless avionics intra-communications (WAIC).

Action by the meeting is at paragraph 4.

**REFERENCES**

- Agenda Item 1.17 WRC2015.

**1. INTRODUCTION**

1.1 The safety of air operation is dependent on the availability of reliable communication and navigation services. Current and future Communication, Navigation and Surveillance/Air Traffic Management (CNS/ATM) provisions are highly dependent upon sufficient availability of radio frequency spectrum that can support the high integrity and availability requirements associated with aeronautical safety systems, and demand special conditions to avoid harmful interference to these systems.

1.2 States and International Organizations are requested to make use of the ICAO Position, to the maximum extent possible, in their preparatory activities for the WRC-15 at national level, in the activities of the Regional Telecommunication Organizations and in the relevant meetings of the ITU.

1.3 Iranian Aviation frequency experts practically participate in national WRC studies and seriously support ICAO frequency policies.

**2. DISCUSSION**

2.1 The 2012 World Radiocommunication Conference (WRC-12) approved Agenda Item 1.17 to conduct sharing and compatibility studies to determine appropriate frequency bands for Wireless Avionics Intra-Communications (WAIC) systems.

2.2 The aerospace industry is developing the future generation of commercial aircraft to provide airlines and the flying public with more cost-efficient, safe, and reliable aircraft. One important way of accomplishing these aims is to reduce aircraft weight while providing multiple and redundant methods to transmit information on an aircraft. Wireless technologies can be employed to accomplish these goals while also providing environmental benefits and cost savings.

2.3 Current aircraft communications systems require complex electrical wiring and harness fabrication, which adds weight to the aircraft and increased fuel costs. Wireless Avionics Intra-Communications (WAIC) is expected to improve flight-safety and operational efficiency, while reducing manufacturing and operational costs. WAIC systems consist of radiocommunications between two or more transmitters and receivers on a single aircraft. Both the transmitter and receiver will be integrated with or installed on the aircraft. In all cases, communication is part of a closed, exclusive network required for aircraft operation. WAIC systems will not provide air-to-ground or air-to-air communications or air-to-satellite communications, and will only be used for safety-related applications.

2.4 Providing sensor information wirelessly is an example of an application of WAIC systems. These sensors will be installed at various locations both within and outside the aircraft, and will be used to monitor the health of the aircraft structure and its critical systems, and to communicate this information within the aircraft to a central on board entity which can make the best use of such information. They include applications to monitor cabin pressure, fuel tank/line, temperature, ice detection, landing gear, engine sensors, air data, etc; and applications to control emergency lighting, cabin functions etc. WAIC systems are also intended to support data, voice and safety related video surveillance applications such as taxiing cameras and may also include communications systems used by the crew for safe operation of the aircraft.

2.5 As a result, WAIC technology will allow for better monitoring of the health or maintenance of the aircraft, and it could also lead to improved aircraft manufacturing techniques. The combined effects of these changes may provide the opportunity for lower costs of operations and environmental benefits. The ability to use WAIC communication systems is important to the Civil Aviation industry, but presents a significant challenge given the safety of life of existing and planned aeronautical safety services.

### 3. ANALYSIS OF THE RESULTS OF STUDIES

3.1 The following aeronautical frequency bands were studied under this Agenda Item:

3.1.1 ***Analysis of the frequency band 2 700-2 900 MHz.*** Preliminary compatibility studies between WAIC systems and radionavigation systems utilizing the frequency band 2 700-2 900 MHz show that WAIC systems are not compatible with incumbent systems. Therefore, this frequency band is not considered to be a candidate for WAIC systems.

3.1.2 ***Analysis of frequency band 4 200-4 400 MHz.*** Preliminary compatibility studies between WAIC systems and aeronautical radionavigation systems utilizing the frequency band 4 200-4 400 MHz show that WAIC systems are compatible with the incumbent aeronautical radio navigation service as well as other services that have allocations in the band. [under certain conditions with mitigation techniques]. Given the fact that both the radio altimeter and WAIC systems are aeronautical applications and are also regulated by aviation certification authorities as well as ICAO, additional efforts, including development of standards and certification guidance material within the aviation community will occur in order to guarantee the safe operation of WAIC and radio altimeter systems.

3.1.3 ***Analysis of frequency band 5 350-5 460 MHz.*** Preliminary compatibility studies between WAIC systems and aeronautical radionavigation, radiolocation, space research (active) and earth exploration-satellite (active) systems show that outside WAIC systems are not compatible with incumbent systems. Therefore, this frequency band is not considered to be a candidate for WAIC systems.

3.1.4 ***Other Frequency bands below 15.7 GHz.*** Frequency bands below 960 MHz do not support the implementation of WAIC systems as antenna sizes would not be compatible with the space available on-board aircraft. The AM(R)S frequency bands 960-1 164 MHz, 5 030-5 091 MHz and 5 091-5 150 MHz were found to not be appropriate to accommodate WAIC systems, considering the numerous existing and planned applications in these frequency bands.

#### **4. ACTION BY THE MEETING**

4.1 To consider possible spectrum requirements to support Wireless Avionics Intra-Communications (WAIC) systems

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