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| **The 4thMeeting of the APT Conference Preparatory Group for WRC-15 (APG15-4)** | **Document****APG15-4/OUT-14 (Rev.1)** |
| 09 – 14February 2015, Bangkok, Thailand | **13 February 2015** |

**Working Party 3**

**preliminary views on WRC-15 agenda item 1.17**

**Agenda Item 1.17:**

*to consider possible spectrum requirements and regulatory actions, including appropriate aeronautical allocations, to support wireless avionics intra-communications (WAIC), in accordance with Resolution* ***423 (WRC‑12)***

**1. Background:**

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.

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.

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 onboard 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.

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.

In November 2010, ITU-R Study Group 5 approved [Report ITU-R M.2197](https://www.google.com/url?q=http://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-M.2197-2010-PDF-E.pdf&sa=U&ei=ngUsUZiOCImLkwX4ioCIAQ&ved=0CAcQFjAA&client=internal-uds-cse&usg=AFQjCNFw3dt66uzxOivImIrELEPNLI1Kog) - *Technical characteristics and operational objectives for wireless avionics intra-communications* (*WAIC*). Consecutively, Resolution **423 (WRC-12)** invites ITU-R to study:

1. to conduct, in time for WRC‑15, the necessary studies to determine the spectrum requirements needed to support WAIC systems;
2. to conduct sharing and compatibility studies, based on the results of invites ITU‑R 1, to determine appropriate frequency bands and regulatory actions;
3. when conducting studies in accordance with invites ITU‑R 2, to consider:
4. frequency bands within existing worldwide aeronautical mobile service, aeronautical mobile (R) service and aeronautical radionavigation service allocations;
5. additional frequency bands above 15.7 GHz for aeronautical services if spectrum requirements cannot be met in frequency bands studied under invites ITU‑R 3 i).

In response to the Resolution **423 (WRC-12)**, the following ITU-R Recommendation and Reports have been, or are being, developed:

* Recommendation ITU-R M.2067 (approved in November 2014) provides definitions, technical characteristics and protection criteria for Wireless Avionics Intra-Communications systems.
* Preliminary Draft New Recommendation ITU-R M.[WAIC CONDITIONS] - *Definition and technical conditions for the use of the aeronautical mobile* (*R*) *service to support Wireless Avionics Intra-Communication systems*. This document has been drafted to support an option to provide technical limits by incorporation of the Recommendation by reference.
* Report ITU-R M.2283 (approved in December 2013) provides the technical and operational characteristics of WAIC systems and bandwidth requirements to support their safe operation. The Report defines four application categories dependant on data rate requirement and the location of the transmit antenna. The Report concludes that the total spectrum requirement for WAIC is 145 MHz, with the spectrum requirement for each application category as follows:
* Low data rate inside/internal (LI) applications: 11 MHz
* Low data rate outside/external (LO) applications: 40 MHz
* High data rate inside/internal (HI) applications: 32 MHz
* High data rate outside/external (HO) applications: 62 MHz
* Report ITU-R M.2318 (approved in November 2014) provides consideration of the aeronautical mobile (route), aeronautical mobile and aeronautical radionavigation services allocations to accommodate WAIC systems in the frequency bands between 960 MHz and 15.7 GHz. Among the aeronautical bands studied below 15.7 GHz, only in the frequency band 4 200-4 400 MHz has sharing been shown to be feasible.
* Recommendation ITU-R M.2059 (approved in December 2013) provides operational and technical characteristics and protection criteria of radio altimeters utilising the band 4 200-4 400 MHz.
* Report ITU-R M.2319 (approved in November 2014) provides a compatibility analysis between WAIC systems and incumbent systems in the frequency band 4 200-4 400 MHz.
* Preliminary draft new Report ITU-R M.[WAIC\_SHARING\_22/23 GHz] provides sharing studies between WAIC systems and systems in the 22.5-22.55 GHz and 23.55-23.6 GHz frequency bands.

Following APG15-2, a liaison statement as contained in Document APG15-2/OUT-25 (Rev.1) was sent to the APT Wireless Group (AWG). The AWG was invited to study the regional technical requirements relating to work being undertaken by ITU-R WP 5B which is examining compatibility between WAIC systems and existing services including in the bands 2 700-2 900 MHz, 4 200-4 400 MHz and 5 350-5 460 MHz.

The response from AWG-17, in its final reply liaison statement, observes that “*the band 4 200-4 400 MHz is primarily used for aeronautical radionavigation (radio altimeters). There is also some use on a secondary basis by Iran (Islamic Republic of). Furthermore, the band 2700-2 900 MHz is mainly used for primary surveillance radar for aeronautical purposes and the band 5 350-5 460 MHz is mainly used for airborne and ground-based weather radar, although other uses have been identified in each of the bands.”*

In September 2014, ITU-R Working Party 5B has also updated the draft CPM text in which two methods to address the agenda item were proposed:

**Method A**

This method adds a primary AM(R)S allocation to the frequency band 4 200-4 400 MHz. Relevant footnotes are modified and new footnotes are added to limit the use to WAIC systems, maintain the status of passive sensing in the EESS and SRS, and maintain the use of the ARNS. A new Resolution is proposed in Method A. The method contains three different options for this new Resolution **[A117-WAIC] (WRC-15)** in order to satisfy the agenda item.

**Option 1:** the previous exclusive method using a proposed Resolution developed in November 2013**.**

**Option 2:** adds an additional considering in the proposed Resolution to protect FSS operating below 4 200 MHz.

**Option 3:** adds aggregate effective isotropic radiated power (e.i.r.p.) limits on WAIC in the proposed Resolution to protect non-ICAO standardized radio altimeter.

The draft CPM text also includes an alternative footnote proposal that may not require a new Resolution. This alternative footnote incorporates all of the important aspects of Method **A**, namely: limit use by the AM(R)S service to WAIC systems; provide a higher priority to radio altimeter systems; define WAIC systems without modifying Article **1**; and state that Article **43.1** shall not apply to WAIC systems:

**5.XXX** –Use of the frequency band 4 200-4 400 MHz by stations in the aeronautical mobile (R) service is reserved exclusively for wireless avionics intra-communications systems that operate in accordance with recognized international aeronautical standards. These systems shall not cause harmful interference to, nor claim protection from the aeronautical radionavigation service. Wireless avionics intra-communications (WAIC) is defined as radiocommunication between two or more aircraft stations located on a single aircraft; supporting the safe operation of the aircraft. No. **43.1** shall not apply.

**Method B**

This method is based on Method A Option 3. However, instead of referencing a WRC Resolution in a footnote it uses an ITU-R Recommendation incorporated by reference through the same footnote. The main reason for proposing Method B is concern that in order to develop or modify a Resolution, a new Agenda Item is required.

**2. Documents**

***2.1 Input Documents:***

* APG15-4-INP-10 Liaison statement from AWG
* APG 15-4/INP-12 from Thailand
* APG 15-4/INP-18 from Rep. of Korea
* APG 15-4/INP-25 and /INP-28 from New Zealand
* APG 15-4/INP-38 from Islamic Rep. of Iran
* APG 15-4/INP-43 from P.R of China
* APG 15-4/INP-57 from Australia
* APG 15-4/INP-71 from Malaysia
* APG 15-4/INP-79 from Japan
* APG 15-4/INP-93 from S.R of Vietnam
* APG 15-4/INF-23 from Rep. of Indonesia

***2.2 Information Documents:***

* APG 15-4/INF-19 from CEPT

**3. Summary of Discussion:**

1. Based on contributions from the APT Members, there are similar views on supporting WAIC technology. APT Members agreed that the technology of WAIC systems is important to the aviation industry, but the technical, regulatory and operational actions should not put other aeronautical safety services at risk.
2. APT Members noted that the Report ITU-R M.2283 (approved in December 2013) concludes that the total spectrum requirements for WAIC is 145 MHz.
3. APT Members noted that the Report ITU-R M.2318 (approved in November 2014) indicates that sharing is difficult in the 2 700-2 900 MHz and 5 350-5 460 MHz frequency bands. The band 4 200-4 400 MHz appears suitable for all category applicationsof WAIC.
4. APT Members noted that the Report ITU-R M.2319 (approved in November 2014) provides compatibility and sharing studies between WAIC systems and existing services allocated in the frequency band 4 200-4 400 MHz.
5. APT Members noted that the proposed two methods,included in the draft CPM Report to address this agenda item added a new allocation to the AM(R)S limited to WAIC systems to the frequency band 4 200-4 400 MHz.
6. APT Members support a primary allocation to AM(R)S, limited to WAIC systems, in the frequency band 4 200-4 400 MHz, and also support protection of the primary services in the band.
7. Some APT Members (New Zealand, P.R. of China, Australia) prefer Method A, Option 1 to satisfy the Agenda Item. New Zealand and Australia could support a variation to Method A, Option 1 that does not include a reference to a new Resolution via footnote.
8. Some APT Members (Malaysia and Islamic Rep. of Iran) prefer Method A, and have not decided which Option to satisfy the Agenda Item
9. Some APT Members (Thailand, Rep. of Korea, Japan, S.R. of Vietnam, Rep. of Indonesia) are yet to develop a position on a method to satisfy the Agenda item.
10. APT Members also noted that the development of WP 5B’s working document towards preliminary draft new Report ITU-R M.[WAIC\_SHARING\_22/23 GHz] provides sharing studies between WAIC systems and services allocated in the 22.5-22.55 GHz and 23.55-23.6 GHz frequency bands.

**4. APT Preliminary Views:**

1. APT Members support relevant ITU-R studies on WAIC in accordance with Resolution **423 (WRC-12)**.
2. APT Members support a primary allocation to AM(R)S in the frequency band 4 200-4 400 MHz, limited to WAIC systems.
3. APT Members note that studies show that the introduction of WAIC systems do not constrain the incumbent services having primary allocation in the frequency band 4 200-4 400 MHz.
4. Some APT Members have decided a specific method (and option) to satisfy the Agenda item, while some others are yet to develop a position on a method to satisfy the Agenda item.

**5. Issues for consideration at APG15-5 Meeting:**

As the issues regarding relevant studies have been finalized, APT Members are encouraged to identify the specific Method and Option to satisfy the Agenda item to the APG15-5 meeting.