|  |  |  |
| --- | --- | --- |
|  | | CPG15(15)084 Annex IV-18 |
| Norway, Bergen, 14th - 18th September 2015 | | |  |
|  | | |  |
| Date issued: | | 18th September 2015 | |
| Source: | | Minutes CPG15-8 | |

CEPT BRIEF ON AGENDA ITEM 1.17

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)

# ISSUE

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:
   1. frequency bands within existing worldwide aeronautical mobile service, aeronautical mobile (R) service and aeronautical radionavigation service allocations;
   2. 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).

# CEPT position

CEPT supports a primary AM(R)S allocation in the 4 200 - 4 400 MHz band exclusively reserved for WAIC systems to accommodate the required frequency spectrum of 145 MHz.

CEPT is of the view that such systems operating in the AM(R)S allocation shall not cause harmful interference, nor create any constraint to systems (i.e. radioaltimeter) operating under the ARNS allocation in the frequency band 4 200-4 400 MHz.

# Background

The civil aviation industry is continually developing future generations of aircraft. Each subsequent generation is designed to enhance efficiency and reliability while maintaining current required levels of safety. Wireless avionics intra-communications (WAIC) systems make use of radio communications between two or more stations on a single aircraft; consisting of on-board networks supporting the safe operation of the aircraft. WAIC system transmissions are not limited to the interior of the aircraft structure. For example, sensors mounted on the wings or engines could communicate with systems located within the airplane.

WAIC systems will be used for safety-related aircraft applications, providing communications within a single aircraft (i.e. WAIC systems do not provide communications between an aircraft and the ground, another aircraft or a satellite). WAIC systems are intended to provide the opportunity for lower cost of operations and environmental benefits.

A major application field for WAIC systems is wireless sensing. It is expected that future and even existing aircraft will be equipped with wireless sensors of all kinds. These sensors will be located at various points of the aircraft and will be used to wirelessly monitor the health of the aircraft structure and all of its critical systems, and to communicate this information within the aircraft to a central on-board entity. WAIC will 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.

Wireless technologies are intended to offer the means to implement systems that can enhance reliability. By having fewer wires on an aircraft, the need for wire maintenance to remediate chafing conditions, aging wiring and associated fire hazards is reduced. Adding new sensors on an aircraft to monitor parameters such as equipment temperature around components to provide a more accurate status of equipment cooling has for example the potential to improve the reliability of aircraft systems. The introduction of these additional sensors is currently limited due to wiring weight and cost impact, but they might be implemented using wireless technology.

Additional functions can be incorporated on an aircraft with wireless technology which cannot be performed with wires, e.g. engine rotor bearing monitoring. Reliably routing wiring harnesses to engine rotator bearings is impractical due to the rotation of parts. Utilizing a special sensor and transmitting this sensor information wirelessly could provide significant benefits by furnishing sensor data while the aircraft is in-flight.

To reflect the diverging conditions and requirements different categories of WAIC systems, based on the two criteria “data rate requirements” and “transmit antenna location on the aircraft”, i.e. internal or external to the aircraft structure, are defined. For determining bandwidth requirements, low rate and high rate systems are separately considered due to differing technical requirements and technological restrictions their implementation may face.

WAIC is an application of a safety service as defined in RR 1.59. As WAIC systems carry aeronautical safety related content they are classified as an application of the aeronautical mobile (route) service (AM(R)S). With the spectrum requirement of 145 MHz for WAIC as determined in the Report ITU-R M.2283 the priority for evaluations is on frequency bands within existing worldwide aeronautical mobile service, aeronautical mobile (R) service and aeronautical radionavigation service allocations.

Based on the results of an initial evaluation of the suitability of aeronautical frequency bands for the WAIC implementation under a potential AM(R)S allocation, carried out in Report ITU-R M.2318, several frequency bands have been selected for more detailed analysis.

## results of Relevant ICAO and ITU-R Studies

ITU-R has considered a number of frequency bands with respect to this agenda item. Some bands were considered as not requiring further study.

The compatibility studies are structured as follows:

Frequency bands with existing AM(R)S allocation

* 960 - 1 164 MHz
* 5 030 - 5 091 MHz
* 5 091 - 5 150 MHz

Frequency bands with ARNS or AMS allocations

* 2 700 - 2 900 MHz
* 4 200 - 4 400 MHz
* 5 350 - 5 460 MHz

An initial evaluation showed that existing AM(R)S allocations in the frequency bands 960-1 164 MHz, 5 030-5 091 MHz and 5 091-5 150 MHz are not appropriate to accommodate the spectrum requirement for WAIC, considering the numerous already existing and planned applications in these frequency bands.

In the frequency bands 2 700-2 900 MHz and 5 350-5 460 MHz WAIC systems were found to be incompatible with incumbent systems. The analysis of the frequency band 4 200 - 4 400 MHz confirms that sharing between all WAIC system categories and the incumbent services and applications in the band is feasible. For all relevant interference scenarios it can be summarized that low and high data rate WAIC systems operating in accordance with the characteristics specified in Report ITU-R M.2283 are compatible with all types of radio altimeters according to Recommendation ITU-R M.2059, provided that suitable measures for outside WAIC applications are undertaken. This applies for both FMCW as well as pulsed radio altimeters.

# List of relevant documents

ITU-Recommendations:

* Recommendation ITU-R P.525 – Calculation of free-space attenuation
* Recommendation ITU-R M.2059 - Operational and technical characteristics and protection criteria of radio altimeters utilizing the band 4 200-4 400 MHz
* Recommendation ITU-R M.2067 - Technical characteristics and protection criteria for wireless avionics intra-communication systems
* Recommendation ITU-R M. is M.2085 - Technical conditions for the use of wireless avionics intra-communication systems operating in the aeronautical mobile (R) service in the frequency band 4 200-4 400 MHz

ITU-Reports:

* Report ITU-R M.2197 – Technical characteristics and operational objectives for Wireless avionics intra-communications (WAIC)
* Report ITU-R M.2283 – Technical characteristics and spectrum requirements of Wireless Avionics intra-Communications systems to support their safe operation
* Report ITU-R M.2318 - Consideration of the aeronautical mobile (route), aeronautical mobile, and aeronautical radionavigation services allocations to accommodate wireless avionics intra-communication
* Report ITU-R M.2319 - Compatibility analysis between wireless avionics intra-communication systems and systems in the existing services in the frequency band 4 200 – 4 400 MHz

Other ITU documents:

Updated information/documentation on the ITU-R Preparatory Studies for WRC-15 are available at <http://www.itu.int/ITU-R/go/rcpm-wrc-15-studies>.

## CEPT and/or ECC Documentation (Decisions, Recommendations, Reports):

## EU Documentation (Directives, Decisions, Recommendations, other), if applicable:

# Actions to be taken

None

# Relevant information from outside CEPT

## European COMMISSION - Radio Spectrum Policy Group (19 February 2015)

Elements for a common policy objective:

Member States should support a globally harmonized solution in the 4 200-4 400 MHz band for Wireless Avionics Intra-Communications (WAIC) while ensuring the protection of all radio-altimeters operating in this band.

## Regional telecommunication organisations:

APT (1 August 2015)

APT Proposals:

* APT Members support a primary allocation to AM(R)S in the frequency band 4 200-4 400 MHz, limited to WAIC systems
* 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
* APT Members support the single method, included in the CPM 15-2 Report

ATU (23 July 2015)

African Common Position:

ATU members support the single method proposed in the CPM 15-2 Report.

Arab Group (27 August 2015)

ASMG Position:

ASMG supports the only method in CPM which specifies a primary AM(R)S allocation in the 4200 - 4400 MHz band exclusively reserved for WAIC systems inside the aircraft through a footnote or footnotes with a resolution to include the requirements of protection systems operating in accordance with the existing allocation.

CITEL (21 August 2015)

Inter-American Proposals:

* MOD Article 5 for a new primary AM(R)S allocation in the 4 200-4 400 MHz band with a footnote limiting its use for WAIC systems
* ADD a footnote to indicate that passive sensing in the EESS and SRS may be allocated on a secondary basis (maintaining the current allowance of these services), and that no protection is afforded to these services.
* ADD Resolution to indicate regulatory provisions related to the operation of WAIC

ECOWAS (1 September 2015)

ECOWAS Common Position:

ECOWAS members support the single method proposed in the CPM 15-2 Report.

RCC (22 April 2015)

The RCC Administrations have no objections for the allocation of 4 200-4 400 MHz frequency band to the air mobile (R) service to be used only by WAIC systems, keeping the status of Earth exploration satellite service (EESS) and space research service (SRS) as passive services and ensuring protection of aeronautical radionavigation service (ARNS) systems.

The RCC Administrations support the existing method to satisfy the agenda item.

## International organisations

ICAO (19 August 2015)

To support global aeronautical mobile (route) service allocation in the frequency band 4 200 – 4 400 MHz exclusively reserved for Wireless Avionics Intra-Communications (WAIC) systems operating in accordance with recognized international aeronautical standards.

NATO (31 August 2015)

NATO supports a primary AM(R)S allocation in the 4 200 - 4 400 MHz band limited to WAIC to accommodate the required frequency spectrum of 145 MHz providing that the protection of the military ARNS (radio altimeters) in this band is ensured through appropriate provisions in the RR.

SFCG (31 August 2015)

SFCG Objective:

SFCG supports the protection of existing space science service allocations. No identification of bands for WAIC systems operations should be made in bands allocated to science services unless acceptable sharing criteria with the affected space science service are developed. SFCG objectives appear to be met by the single method included in the CPM Report.

WMO (23 December 2014)

WMO Position:

WMO opposes the use of the 2 700-2 900 MHz and 5 350-5 460 MHz frequency bands for WAIC based on the approved ITU-R studies which conclude that sharing between meteorological radars and WAIC is not feasible in these bands.

If other frequency bands were to be considered for WAIC (e.g. the frequency band 13.25-13.4 GHz or the frequency bands 22.5-22.55 GHz and 23.55-23.6 GHz), compatibility with meteorological and Earth observation applications would need to be assessed and the adequate protection has to be ensured.

## OTHER INTERNATIONAL AND REGIONAL ORGANISATIONS

ASFCG (3 September 2015)

European Aeronautical Common Position:

To support a global aeronautical mobile (route) service allocation in the frequency band 4 200 – 4 400 MHz exclusively reserved for Wireless Avionics Intra-Communications (WAIC) systems operating in accordance with recognized international aeronautical standards such that WAIC systems will not cause harmful interference to existing or planned aeronautical systems operating in frequency bands allocated to aeronautical safety services (radio altimeters).

ESA (September 2014)

Support SFCG positions

EUMETNET (September 2014)

Support WMO positions.

EUROCONTROL (3 September 2015)

Support ASFCG positions