

Draft CEPT Brief on agenda item 1.6

Agenda item 1.6: to consider additional allocations for the aeronautical mobile (R) service in parts of the bands between 108 MHz and 6 GHz, in accordance with Resolution **414 (WRC-03)** and, to study current satellite frequency allocations, that will support the modernization of civil aviation telecommunication systems, taking into account Resolution **415 (WRC-03)**

Issue

This agenda item covers the following issues:

Resolution 414 (WRC-2003):

- 1 to investigate, as a first step, the bands currently available for use by aeronautical systems in the frequency range between 108 MHz and 6 GHz in order to determine whether additional allocations to the aeronautical mobile (R) service are required and can be accommodated in these bands without placing undue constraints to services to which the frequency bands are currently allocated;
- 2 to further investigate, in case the first step above would not lead to satisfactory results, also the frequency bands currently not available for use by aeronautical systems, subject to not constraining the existing and planned use of such bands, taking account of existing use and future requirements in these bands;
- 3 to investigate how to accommodate the requirements for aeronautical systems in the bands 112-117.975 MHz, 960-1 164 MHz and 5 091 -5 150 MHz.

Resolution 415 (WRC-2003):

- 4 to examine the possibility of broadening the services and applications of the use of current satellite frequency allocations in order to allow the expansion of ICAO CNS/ATM systems that can also support other non-aeronautical telecommunication services;
- 5 to take appropriate actions, based on the results of the examination specified under 4.

Preliminary CEPT position

Resolution 414 (WRC-2003)

To support aeronautical mobile (R) service primary allocations in the bands 112-117.975 MHz, 960-1164 MHz and 5091 - 5150 MHz. All the proposed bands are currently available for use by aeronautical radionavigation systems. The support of additional allocations is limited to ICAO standard systems conditional on satisfactory compatibility verification with non ICAO-standard systems.

An Aeronautical Mobile Service (AMS) allocation for aeronautical security transmissions is supported in the band 5091 – 5150 MHz.

Allocations to the aeronautical mobile (R) service in the bands 5000-5010 MHz and 5010-5030 MHz shall not be supported

All relevant compatibility studies involving a non ICAO system should be completed and agreed within the ITU-R prior to any operational systems being introduced as a result of the allocations made with respect to this agenda item.

Resolution 415 (WRC-2003)

With respect to issues identified in Resolution 415 CEPT will, if required, support the development of an appropriate ITU-R Recommendation.

CEPT is not in a position to support proposals for new allocations to AMSS and CEPT considers that no change is necessary to the current provisions.

Background

Resolution 414 (WRC-03)

Reason for the European proposal is that a new system in the Aeronautical Mobile (R) Service (AM(R)S) and additional spectrum resource are required in order to overcome expected shortage in spectrum for line-of-sight air-ground communications. ICAO is considering frequency bands, already allocated to aeronautical services, for the introduction of new technologies to support air navigation, including airborne and ground surveillance applications.

ICAO have yet to select the technology solution to support the future communications system(s) and have yet to conclude on the amount of spectrum required for a future communications system(s). Preliminary indication of ICAO: propose 60 MHz in the band 960 – 1024 MHz and between 60 and 100 MHz in the frequency range 5000 – 5150 MHz (source document PT3(06)15). The selection of the spectral bands (other than mentioned above) required to meet the spectrum requirement for the future communication system(s) has yet to be made. More time is required to allow ICAO to complete studies to resolve the above issues.

Not all necessary Sharing studies with existing systems within the identified bands have been concluded within ITU.

Provisional allocations to AM(R)S should be made in the bands 112-117.975 MHz, 960-1164 MHz and 5091 - 5150 MHz to provide maximum flexibility for aviation in the develop of their future communications system with the certainty of spectrum access. An allocation to AMS should be made to support the aeronautical security system in the band 5091-5150 MHz, noting that Security has been considered as a non-safety nor regularity of flight application.

Any allocations made at this conference:

- should be available for operational use, subject to completion of necessary sharing studies; and
- should be subject to review at a future conference , however the scope of this review should be limited to review of the constraints associated with any allocations including possible removal of any allocation which is not required. taking due note of system developments

The band 112-117.975 MHz (the VOR band)

The European Civil Aviation Conference (ECAC) long term navigation strategy foresees a diminishing role for the current VHF Omnidirectional Radio Range (VOR) navigation aid in the band 112 – 117.975 MHz. Whilst the ICAO standardised Ground Based Augmentation System (GBAS) will operate in this band, studies conducted indicate that it could be feasible to stop using a part of the current ARNS band between 108 - 117.975 MHz for navigation purposes to provide spectrum for a future aeronautical communications system.

The use of the frequency band 112 - 117.975 MHz by the AM(R)S shall not be used as an extension band for the current analogue VHF voice communication system operating in the band 117.975 – 137 MHz unless required to advance the transition to the future communication system.

In any case the existing and future frequency requirements for navigation (VOR and GBAS) systems should be guaranteed.

In order to prevent additional constraints to the broadcasting service any new allocation in this Band shall be subject to Resolution 413.

Currently there is no non ICAO system operating in the band.

The band 960-1164 MHz (part of the DME band)

- *Compatibility studies with ARNS (DME/TACAN)*

Current experience shows that, systems using pulse signals can be designed in such a way as to make any interference generated to a DME/TACAN system tolerable. On the strength of this experience, studies show that it is possible to design new AM(R)S whose interference to current ARNS systems (DME/TACAN) is tolerable. Accordingly ICAO will be in a position to standardize a new AM(R)S system compatible with these systems. Furthermore in order to avoid any new AM(R)S system non conforming to ICAO standard which may raise compatibility issue with ARNS it is proposed to limit the new allocation to ICAO systems only.

- *Compatibility with JTIDS/MIDS*

No studies have been performed, and cannot be discussed in ITU-R. However, administrations with an interest in this matter, have national frequency clearance agreement in place to ensure that the JTIDS/MIDS system is constrained in such a way as to ensure that the interference caused to DME/TACAN is tolerable.

Any additional allocation in the band 960-1164 MHz shall be carefully studied in order to ensure the continued operation of JTIDS/MIDS in Europe as mentioned in the European Common Allocation Table. When developing the ECP and Brief the continued operation of JTIDS/MIDS should be taken into account.

- *Compatibility with RNSS above 1164 MHz*

The PDNR ITU-R M [] recommends a maximum tolerable aggregate interference level compatible with RNSS systems receivers protection. Accordingly, a hard limit of XXX is proposed to be implemented in the Radio Regulation for RNSS receiver protection.

- *Compatibility with mobile service below 960 MHz*

Studies have been performed to establish compatibility with mobile service systems operating below 960 MHz and lead to the conclusion that there is a need for regulatory provisions in order to ensure the protection of systems operating in the mobile service.

It has to be noted:

- that not all system operated in this band under the radionavigation service are subject to standard and recommended practices published in Annex 10 to the convention on international civil aviation;

- that other systems, such as Universal Access Transceiver (UAT) are planned in this band and an appropriate allocation should be made to allow the worldwide introduction of UAT, noting that studies have been completed for this issue (for ICAO / NATO standard systems);
- the fact that the lower DME band (960-977 MHz) is not extensively used.

The bands 5000-5010 MHz and 5010-5030 MHz

These bands are proposed for new primary allocations to the AM(R)S by some administrations outside CEPT, and are identified under method 3 of the CPM text.

The band 5000-5010 MHz is allocated to the Radionavigation Satellite Service (RNSS) in the earth-to-space direction, and the band 5010-5030 MHz is allocated to RNSS in the space-to-earth and space-to-space directions. The regulatory framework driving these RNSS allocations has been decided by WRC-00 and WRC-03. Galileo is using the band 5000-5010 MHz, and a number of RNSS systems (including Galileo for its second generation) are planning to use the band 5010-5030 MHz, which represent a strategic complement to RNSS L band allocations which face congestion.

Sharing studies on the compatibility of AM(R)S with RNSS are far from being completed, since only one contribution on this subject has been provided at the very last meeting of ITU-R WP8B, before CPM-2 and was not even discussed (see 8B/TEMP/236). Furthermore, the outcomes of this first study seem rather pessimistic on the compatibility of AM(R)S with RNSS receivers in the band 5010-5030 MHz : separation distances of a few tens kilometers between AM(R)S and RNSS stations are mentioned, which is in conflict with the ubiquitous deployment of RNSS receivers. This also means that a regulatory protection of RNSS, as proposed under method 3a of the CPM text, is not a workable solution since it couldn't be implemented in practice.

In the absence of any study, even preliminary, giving confidence on the compatibility of AM(R)S with RNSS in 5000-5030 MHz, CEPT shall strongly oppose any new AM(R)S allocation in this range at WRC-07.

The band 5091-5150 MHz (the extension band for MLS)

There is an identified requirement for both applications around airports and aeronautical security systems within the 5 GHz bands.

Due to the distinction between the MLS core band (5030-5091 MHz) and the MLS extension band (5091-5150 MHz) the Table allocation of the band 5030-5150 MHz has to be divided in two bands. The super primary status given by footnote 5.444 to MLS in the band 5 091 – 5 150 MHz should be removed.

- *Compatibility with ARNS (MLS)*

It may be possible to use the band 5091-5150 MHz for other services than ARNS, preferably aeronautical, provided that aircraft to be fitted with MLS are equipped with a Flight Management System (FMS) capable of soft-pairing and selecting all the Nav Aids frequencies used for that MLS approach and landing.

- *Compatibility with AMS(R)S*

There is currently no AMS(R)S system operating in this band therefore no characteristics available to perform compatibility studies.

- *Compatibility with FSS (uplink)*

Studies have shown that the impact of AM(R)S future system on FSS satellite receiver is about 2 % in $\Delta T_s/T_s$. Recommendation ITU-R S1432 recommends a limit 6% applicable to all other services (ARNS, AMS(R)S, AMS for aeronautical telemetry and security applications) than FSS. A single entry hard limit to protect FSS satellite receiver should be defined in the radio regulation through a footnote or resolution which would also provide the process to ensure that this hard limit is never exceeded under any circumstances.

- *Compatibility with AMT*

With respect to protection of AMS(AMT), studies show that a sufficient separation distance between the AMS(AMT) ground receiver and the airports would adequately protect AMS(AMT) ground receiver in co-frequency consideration.

Editorial note: this only applies when AMRS is used at airports

- *Compatibility with security*

Studies regarding compatibility of the aeronautical security system with the AMS(AMT) show that the two applications can share frequency bands with co-ordination

Link between studies for agenda item 1.5 and those for agenda item 1.6

It is also noticed that the agenda item 1.6 generally deals with safety and regularity of flight requirements under an AM(R)S allocation while agenda item 1.5 generally deals with aeronautical telemetry and associated telecommand requirements under an AMS allocation.

Agenda item 1.6 additionally requires an AMS allocation for security applications pursuant to considering d) of Res. 414).

Any new aeronautical allocation in the range 5030 – 5150 MHz under A.I. 1.5 needs to be protected.

Security requirements

Studies and flight trials have been undertaken to validate the use of adapted¹ IMT-2000 standards (W-CDMA and IS-95). Systems conforming to these adapted standards have been investigated in the band 5091-5150 MHz using analysis, simulation and validation through flight trials. The work concluded that adapted IMT-2000 systems operating in this band could well satisfy the infrastructure requirement.

Resolution 415 (WRC-03)

In the work in ITU-R Working Party 8D, two main issues are identified:

- a) the use of VSAT systems to overcome shortcomings in terrestrial ground-ground communication systems; and
- b) the use of (generic) mobile satellite systems that could support aeronautical CNS/ATM communications.

With regard to the use of VSAT systems ITU WP8D is investigating the development of an ITU-R Recommendation, Handbook or Report or other agreed documentation.

¹ For example, Doppler shift compensation

With regard to the use of (generic) mobile satellite systems that could support aeronautical CNS/ATM communications, it should be noted that current satellite systems offering CNS/ATM services operate in bands 1525-1559 MHz and 1626.5-1660.5 MHz which are allocated on a primary basis to the MSS. To date, the spectrum requirements of CNS/ATM have been met while also giving flexibility to allow for other uses of the spectrum by MSS systems. Bearing in mind: a) that No. **5.357A** gives priority to the spectrum requirements of AMS(R)S safety services in parts of the above mentioned spectrum, and b) the current use by AMS(R)S safety services is significantly less than this, there is no need to modify the existing regulatory provisions.

In relation to Resolution 415, CEPT is not in a position, under Agenda Item 1.6, to support proposals for new allocations to AMSS.

List of relevant documents

- Recommendation ITU-R S.1432
- Document PT3 (05) 016 Aeronautical Mobile Spectrum Model.
- Document PT3 (05) 017 Brief on applied methodology to calculate AM(R)S bandwidth requirements
- Document PT3 (05) 018 Presentation on BW calculation model
- Document PT3 (05) 019 AMS and AM(R)S requirements for UAV's
- Document PT3 (05) 029 Propagation Losses in the L band and the C band.
- Document PT3 (05) 067 Civil Aeronautical Security Requirements.
- European Commission, Radio Spectrum Policy Group, Draft Opinion on WRC-07 Document RSPG 05-103rev.1, dated 17 November 2005.
- Document CPG07(2006) 012 ICAO Position WRC-07
- Document PT3 (06) 012 European Aeronautical Common Position
- Document PT3 (06) 015 Need for radio-frequency spectrum for future aeronautical air-ground communication systems
- Document PT3(06) 033 APG Report PT3 issues
- Document PT3(06) 0xx_CITEL output_PCCII_0kt06
- Document PT3(07) 002 Issues related to AI 1.5 & AI 1.6
- Document PT3(07) 003 Sharing study in the band 5091-5150 MHz between the Aeronautical Mobile Service (AMS), Aeronautical Security and Aeronautical Telemetry.
- ITU-R (document 8B/240) Civil aeronautical security requirements
- ITU-R (Document 8B/429 Working document towards a preliminary draft new Report on AM(R)S sharing feasibility in the 960-1 164 MHz band
- Report of the meeting of ITU-R WP8D, September 2006 (Document 8D/xxx, page xx and xx, and Annex xx). (*8D/TEMP/293 Preliminary Draft CPM text for WRC-07 agenda item 1.6 (Resolution 415 (WRC-03))*).
- Report of the meeting of ITU-R WP8B, September 2006 (Document 8B/xxx, page xx, and Annex xx). (*8B/TEMP/225 (Rev.1) Preliminary Draft CPM text for WRC-07 agenda item 1.6 (Resolution 414 (WRC-03))*). (*8B/TEMP/237) Agenda item 1.6 - Executive summary*).
- Provisional CPM Report

- Document PT3 (06)049 Sharing study in the band 5 091-5 150 MHz between the Aeronautical Mobile Service (for Aeronautical Security) and other Services
- Preliminary Draft New Recommendation ITU-R M.[AM(R)S/AS 5 091-5 150 MHZ]

Actions to be taken

Summary of studies already completed and to be done

- To continue and complete the studies to see if part of the bands 112-117.975 MHz, 960 - 1164 MHz and 5091-5150 MHz could be envisaged for an additional allocation for AM(R)S. As the band 5091-5150 MHz could be also a candidate band for agenda item 1.5, a link between studies for Agenda 1.5 and those for Agenda 1.6 is therefore needed.
- Prepare input for studies within the framework of ITU.
- Consider carefully the results of the studies of ITU-R,
- Consider carefully the results of the European Aviation Aeronautical Spectrum Frequency Consultation Group,
- Consider carefully the results of ICAO and other regions.
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Proposals from outside CEPT

European Union interest (last update December 2006)

Opinion 4: Every effort should be made to meet the needs of the aeronautical community at WRC-07 in order to implement the Single European Sky objective (substantial increase in capacity), taking into account the following:

- 1 priority should be given to making maximum use of spectrum already allocated for aviation, given the increase of efficiency expected by technological development and the difficulties of gaining international agreement to access new bands;
- 2 the parallel operation of old and new aeronautical systems, although unavoidable taking into account the need for global migration to new technologies, should be kept to the minimum.

Regional telecommunication organisations

APT (January 2007)

Provisional views on the agenda item

Resolution 414

APT Administrations support global allocations to the aeronautical mobile (R) service in the frequency bands 116-117.975 MHz, 960-1 024 /1 164 MHz and/or 5 091-5 150 MHz if shown to meet global CNS/ATM requirements and future trends on the basis of compatibility with the existing services and it cannot operate in existing aeronautical mobile (R) spectrum. APT also supports an allocation to the aeronautical mobile service (AMS) in the band 5 091-5 150 MHz limited to aeronautical security/safety applications. In the 5 091-5 150 MHz band compatibility will be required with FSS Earth-to-space feeder links. Some Administrations in APT has operational feeder links in this band.

It is also recognized that there is a need to maintain compatibility with services in adjacent bands. In particular, any allocation changes in the 108-117.975 MHz band must be compatible with terrestrial broadcasting systems and place no additional constraints on the broadcasting service in the band 87-108 MHz.

In the frequency band 960-1024 /1 164 MHz, allocation of additional aeronautical mobile (R) service can be supported under conditions ensuring its compliance with recognized international aviation standards and protection of currently allocated aeronautical radionavigation services in the bands against the new aeronautical mobile (R) service.

The frequency band 5 000-5 030 MHz is allocated to RNSS and is either currently used or is to be used by some systems.

There is no APT Preliminary view on the allocation of the 5 000-5 030 MHz band to the AM(R)S. However, one APT Administration could only support an allocation to the AM(R)S in the 5 000-5 030 MHz band under the condition that no harmful interference is caused to, and no protection is

claimed from radionavigation-satellite service feeder and service links in this band. Another APT Administration supports no change to this band since these services should be protected completely.

In the frequency band 5 030-5 091 MHz, this band should be reserved for the designated use for Microwave Landing System. No change is required.

Some APT members could support the identification and allocation of suitable AM(R)S spectrum to support the safety service related aspects of UAV operations subject to further studies.

As a result of the above consideration, APT Administrations are of the view that the bands 108-116 MHz and 5 030-5 091 MHz should not be allocated for AM(R)S, with a view to protecting the services to which the bands are currently allocated.

Resolution 415

APT Administrations are of view that

1. existing Fixed Satellite Service (FSS) spacecraft and appropriate earth stations can be used to create, augment or enhance infrastructure to support civil aviation telecommunications services, including ICAO CNS/ATM applications.
2. the use of satellite-based facilities in connection with civil aviation applications will contribute to the overall improvement of the aviation communications infrastructure in developing countries and remote areas..
3. guidance material in the form of an ITU-R Recommendation or handbook should be prepared detailing the spectrum management issues associated with using VSAT networks for aeronautical telecommunication applications, noting that this spectrum may also support other non-aviation users.
4. with regard to long-term spectrum availability for aeronautical satellite communications for safety purposes (AMS(R)S) in 1.6/1.5 GHz bands, it is understood that, as most of these sub-bands are already used for non-safety communications, current spectrum requirements of AMS(R)S have not been satisfied in practice. The ITU-R has also examined the potential for the 1 525 to 1 559 MHz and 1 626.5 to 1 660.5 MHz MSS bands to meet the future requirements for aeronautical CNS/ATM communications taking into account recent developments in MSS systems. These ITU-R studies² concluded that “prioritization and intersystem real-time pre-emption” is not practical and, without significant advance in technology, is unlikely to be feasible for technical, operational and economical reasons. APT Administrations support that the current provisions of the Radio Regulations do not need to be changed at the WRC-07 to satisfy this issues of Agenda item. As a result APT Administrations support a future Agenda item to determine how future long-term stable spectrum availability for AMS(R)S in these bands can be met. This issue is to be considered under WRC-07 Agenda Item 7.2 and Resolution 803, item 2.3 and not through WRC-07 Agenda Item 1.6.

² The ITU-R Studies were conducted under Resolution 222 (WRC-2000) and the results can be found in Report ITU-R M.2073. Further, Study Group 8 decided that the summary and the conclusions of this Report will be included in the Chapter 7 of the CPM Report (preliminary Agenda item 2.3 of Resolution 803 for WRC-10).

APT Administrations do not see a need for a secondary aeronautical mobile-satellite service (AMSS) downlink allocations to complement the secondary 14 GHz uplink allocation to AMSS adopted by WRC-03.

African Group (last update 11 October 2006):

No information available.

Arab Group position (last update 11 October 2006):

No information available.

CITEL Preliminary views (last update 11 October 2006):

Resolution 414 (WRC-03)

Preliminary Proposals (USA)

- ADD footnote allocating the band 960-1024 MHz to AM(R)S subject to not causing harmful interference to nor claiming protection from ARNS
- ADD footnote allocating the band 5091-5150 MHz to the AM(R)S on a primary basis
- ADD Resolutions concerning use of the bands 960-1 164 MHz and 5091-5150 MHz by the AM(R)S
- NOC Resolution 413 (WRC-03) on use of the band 108-117.975 MHz by the Aeronautical Service

Resolution 415 (WRC-03)

Preliminary Proposals (B, CAN, USA):

- NOC Article 5 Table of Allocations in the band 10.7-12.75 GHz
- NOC footnote 5.504A
- Current FSS allocations can support expansion of broadband satellite services on-board aircraft and no changes to the Radio Regulations are necessary

(For further information see Document PT3(06) 0xx_CITEL output_PCCII_0kt06)

RCC Position (last update 11 October 2006):

Additional allocations for the aeronautical mobile service of the bands already allocated to the aeronautical services may be supported only in case when the aeronautical systems of the radiodetermination and aeronautical mobile satellite services are not affected or are protected.

The band 5091-5150 MHz may be considered as a “candidate” band for the new allocation to the aeronautical mobile service if sharing with MLS to be provided.

(For further information see RCC website xxx)

International organisations

ICAO Position (last update 15 December 2005):

To support global allocations to the aeronautical mobile (R) service in portions of the aeronautical radionavigation service (ARNS) frequency bands between 108 MHz to 6 GHz, if shown by aviation studies that these meet global CNS/ATM requirements. To support an appropriate provision allowing the use of frequency 978 MHz by the UAT system, subject to its standardization by ICAO, as required.

No change to the current allocation in the band 5 030 - 5 091 MHz since this band is required to satisfy the requirements of the aeronautical radionavigation service (MLS).

No change to the current allocations in the bands 108 - 112 MHz and 328.6 - 335.4 MHz.

(For further information see document CPG07(2006)012 ICAO Position WRC-07)

IATA Position (last update 15 December 2005):

On the CEPT relevant items, the IATA position is in line with the ICAO position.

NATO Military Position (last update February 2007):

- (a) New allocations for AM(R) service applications must not adversely impact frequency resources supporting essential military requirements.
- (b) The identification of suitable spectrum related to safety and regularity of flights for unmanned aeronautical vehicles (UAV) is supported.
- (c) Any additional allocation in the band 960-1215 MHz shall be carefully studied in order to ensure the continued operation of JTIDS/MIDS.

Regional organisations

European Aeronautical Common Position (last update January 2007):

The Preliminary European Aeronautical Common Position (EACP) for WRC-2007 has been developed by the European Aviation Spectrum Frequency Consultation Group

To support additional global allocations to the Aeronautical Mobile (R) Service to meet CNS/ATM and safety and regularity of flight requirements.

To support the removal of the current limitation on AM(R)S in the band 112 – 117.975 MHz. No change to the current allocations in the bands 108-112 MHz and 328.6 – 335.4 MHz.

To support allocations in portions of the band 5000-5150 MHz for Aviation Security related and other aviation systems subject to no harmful interference to MLS. No change should be made to the current allocation for in the MLS core band 5030-5091MHz

EUMETNET Position (last update 13 April 2006):

WMO urges that compatibility with related applications be ensured when new allocations for aeronautical mobile service may affect meteorological bands.