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| U.S. Radiocommunications SectorFact Sheet |
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| **Purpose/Objective:** This contribution provides updates to the Working Document towards Draft CPM Text for WRC-23 Agenda Item 1.7 pursuant to Resolution 428 (WRC-19), on a possible new AMS(R)S allocation to accommodate the relay of VHF communications in 117.975-137 MHz frequency band. |
| **Abstract:** Pursuant to Resolution 428 (WRC-19), this contribution provides some edits to the WD-Draft CPM Text for WRC-23 AI 1.7 on a possible new AMS(R)S allocation to accommodate the relay of VHF communications in 117.975-137 MHz frequency band. |

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| **Radiocommunication Study Groups** |  |
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**Introduction**

Pursuant to Resolution 428 (WRC-19), this contribution provides some updates to the WD-Draft CPM Text for WRC-23 AI 1.7 on a possible new AMS(R)S allocation to accommodate the relay of VHF communications in 117.975-137 MHz frequency band.

Attachment: 1

ATTACHMENT

working document towards a draft cpm text for wrc-23 agenda item 1.7

CHAPTER 2

Aeronautical and maritime issues

(Agenda items 1.6, 1.7, 1.8, 1.9, 1.10, 1.11)

Agenda item 1.7

**(WP 5B[[1]](#footnote-1)\* / WP 3M, WP 4C, WP 7B)**

*1.7 to consider a new aeronautical mobile-satellite (R) service (AMS(R)S) allocation in accordance with Resolution* ***428 (WRC-19)*** *for both the Earth-to-space and space-to-Earth directions of aeronautical VHF communications in all or part of the frequency band 117.975‑137 MHz, while preventing any undue constraints on existing VHF systems operating in the AM(R)S, the ARNS, and in adjacent frequency bands;*

Resolution **428 (WRC-19)** – *Studies on a possible new allocation to the aeronautical mobile satellite (R) service within the frequency band 117.975-137 MHz in order to support aeronautical VHF communications in the Earth-to-space and space-to-Earth directions.*

# 2/1.7/1 Executive summary

To address this agenda item, ITU-R has undertaken studies, pursuant to Resolution **428 (WRC-19)**, on a possible new aeronautical mobile satellite (Route) service (AMS(R)S) allocation to accommodate the relay of VHF communications, towards the development of an ITU-R Report (see section 2/1.7/3).

Two methods are considered to address this agenda item:

– Method A: NOC

– Method B proposes to add a new allocation to the AMS(R)S in the Earth-to-space and space-to-Earth directions in all or part of the frequency band 117.975-137 MHz, limited to internationally standardized aeronautical systems and a pfd limit, where appropriate, to ensure protection of adjacent band services above 137 MHz.

# 2/1.7/2 Background

The level of aircraft traffic and separation in oceanic and remote areas remains limited due to the difficulty of providing and maintaining suitable terrestrial communication, navigation and surveillance means. Progress has been made over the last years in the areas of navigation and surveillance, with the existing availability of global navigation satellite systems and reception by satellite of automatic dependent surveillance-broadcast (ADS-B) signals in the frequency band 1 087.7-1 092.3 MHz.

WRC-23 agenda item 1.7 deals with a possible new allocation to the AMS(R)S within the frequency band 117.975-137 MHz, to relay standard VHF communications operating under the AM(R)S, and to complement terrestrial infrastructures over oceanic and remote areas. This would not require modification to aircraft equipment, as the space segment would be able to receive and transmit to standard VHF radios already installed onboard aircraft.

The services using the in-band and adjacent bands allocations were identified and technical and compatibility analysis were carried out to determine the operating conditions for the new AMS(R)S. This is to ensure the protection of these in-band and adjacent band services from possible interference resulting from the introduction of an AMS(R)S allocation in this band.

# 2/1.7/3 Summary and analysis of the results of ITU-R studies

## 2/1.7/3.1 Summary of technical and operational studies

In liaison with the International Civil Aviation Organization (ICAO), ITU-R has first studied the architecture, parameters, and baseline link budgets of a reference AMS(R)S system for the provision of voice communications for air traffic management, without modification to aircraft equipment. Considering the different elements provided by ICAO regarding antenna pattern for aircraft VHF equipment, performance requirement for this equipment, and overall availability considerations, ITU-R has determined that an AMS(R)S system would have to rely on non-geostationary satellites. Reference link budgets for satellite-to-aircraft (downlink) and aircraft-to-satellite (uplink) VHF links have been developed, based on propagation considerations discussed with Working Party 3L as the ITU-R expert group.

Maximum Doppler shift and latency times associated with the AMS(R)S system were discussed with ICAO. It is envisaged to implement a compensation mechanism on the satellite transmitter to mitigate Doppler effects at the aircraft receiver without making any modification on existing aircraft equipment. And no operational impact would be expected, as the latency ranges from the AMS(R)S systems are compatible with existing aeronautical VHF systems.

Compatibility with existing primary services in-band and in adjacent bands has been assessed in close liaison with:

– ICAO for the AM(R)S in 117.975-137 MHz and in adjacent band below 117.975 MHz, and for the aeronautical radionavigation service (ARNS) in adjacent frequency band below 117.975 MHz.

– ITU-R Working Party 4C for the mobile-satellite service (space-to-Earth) in adjacent frequency band above 137 MHz.

– ITU-R Working Party 7B for the space operation service (space-to-Earth), space research service (space-to-Earth), and meteorological satellite service (space-to-Earth) in adjacent frequency band above 137 MHz.

– ITU-R Working Party 7D for the protection of radio astronomy in the frequency band 150.05‑153 MHz.

In addition, consideration has been given to the in-band compatibility between AMS(R)S and the aeronautical mobile (off-route) service (AM(OR)S) which is allocated on a primary basis under RR Nos. **5.201** and **5.202**, respectively in the band 132-136 MHz (24 countries) and in the frequency band 136‑137 MHz (22 countries).

## 2/1.7/3.2 Relevant ITU-R Recommendations and Reports

The relevant ITU-R Recommendations are: [M.1231-0](https://www.itu.int/rec/R-REC-M.1231/en), [M.1232-0](https://www.itu.int/rec/R-REC-M.1232/en), [M.2092-0](https://www.itu.int/rec/R-REC-M.2092/en), [P.531-14](https://www.itu.int/rec/R-REC-P.531/en), [SA.363-5](https://www.itu.int/rec/R-REC-SA.363/en), [SA.609-2](https://www.itu.int/rec/R-REC-SA.609/en) and [SA.1027-6](https://www.itu.int/rec/R-REC-SA.1027/en) and [SA.1743](https://www.itu.int/rec/R-REC-SA.1743/en).

To perform studies required under agenda item 1.7 and Resolution **428 (WRC-19)**, Report ITU-R M.[SPACE-VHF] is being developed.

## 2/1.7/3.3 Analysis of the results of studies

### 2/1.7/3.3.1 In-band sharing between the systems operating in the aeronautical mobile satellite (route) service and systems operating in the aeronautical mobile (route) service.

ICAO has outlined that even though AM(R)S and AMS(R)S would represent two different radiocommunication services within the frequency band 117.975-137 MHz, the same on-board cockpit avionics system (for air traffic control (ATC) VHF communications) would be used for ground and satellite communications. Indeed, AMS(R)S would not correspond to a new aeronautical application but would relay VHF communications operating under the AM(R)S over oceanic and remote areas, without modification to aircraft equipment. AMS(R)S would therefore not trigger new compatibility issue with aircraft system.

ICAO position is that if there is any potential interference between AM(R)S and AMS(R)S, it would be resolved by the ICAO through conventional frequency planning exercise, assigning frequencies to the satellite system over interested regions, to ensure compatibility between ground and satellite facilities. Therefore, from an ICAO perspective there is no need to perform a comprehensive compatibility study between these two different services, that cover the same system on-board the aircraft. Both are technically similar services as the same on-board cockpit avionics system (for ATC VHF communications) would be used for ground and satellite communications.

### 2/1.7/3.3.2 Adjacent band compatibility between systems operating in the aeronautical mobile satellite (route) service above 117.975 MHz and systems operating in the aeronautical radionavigation service below 117.975 MHz

Similarly, ICAO has outlined that there is also no need to perform a comprehensive compatibility study between the AMS(R)S and ARNS. The same frequency planning and coordination works on-going within ICAO will be performed to ensure compatibility between AMS(R)S and ARNS.

### 2/1.7/3.3.3 Adjacent band compatibility with non-ICAO services above 137 MHz

Although a possible new primary AMS(R)S allocation within the frequency band 117.975-137 MHz would be in both directions (Earth-to-space and space-to-Earth) compatibility studies only need to be conducted with respect to AMS(R)S (space-to-Earth) as the Earth-to-space transmissions occur already. This is because transmitting earth stations in the AMS(R)S (Earth-to-space) would correspond to the AM(R)S aircraft station that is already in place.

Characteristics and protection criteria have been received for systems operating above 137 MHz in the mobile satellite service (space-to-Earth), the space operation service (space-to-Earth), the space research service (space-to-Earth), and the meteorological satellite service (space-to-Earth). Compatibility studies are on-going, to investigate the AMS(R)S voice application and voice-like application in the frequency band 117.975-136 MHz and the AMS(R)S VDL Mode 2 application in the frequency band 136-137 MHz, which requires further discussions.

– For AMS(R)S operating in the sub band 117.975-136 MHz:

• Protection of adjacent-band systems operating above 137 MHz in the mobile satellite service (space-to-Earth), space operation service (space-to-Earth), space research service (space-to-Earth), and meteorological satellite service (space-to-Earth) might be ensured, due to the existence of 1 MHz guard band in 136‑137 MHz. This requires finalization of the studies for its confirmation. It should be noted that this guard band might also ensure compliance with pfd limit below.

– For AMS(R)S operating in the sub-band 136-137 MHz:

• Protection of adjacent-band systems operating above 137 MHz in the mobile satellite service (space-to-Earth), space operation service (space-to-Earth), space research service (space-to-Earth), and meteorological satellite service (space-to-Earth) might be ensured by limiting the radiation of AMS(R)S in the adjacent band above 137 MHz, to XX dB lower than its maximum in-band level, thus limiting to a maximum power flux density of [XXX] in any adjacent band above 137 MHz. This requires finalization of studies for its confirmation.

Protection of the radio astronomy service in the frequency band 150.05-153 MHz has also been addressed. Considering that AMS(R)S emissions are narrow band, and that the frequency separation between the possible new AMS(R)S allocation and the radio astronomy allocation in 150.05-153 MHz would be 13.05 MHz or more, it does not appear necessary to mandate specific protection limit.

### 2/1.7/3.3.4 In-band sharing with non-ICAO service

The characteristics of AM(OR)S systems are not available and no sharing studies have been undertaken. Nevertheless, the AM(OR)S systems are understood to operate in channels within the national assignments of AM(R)S, thus the compatibility between AM(OR)S and AMS(R)S assignments would be resolved through the existing frequency planning exercise. If a new allocation is made to AMS(R)S in this VHF band, ICAO will continue to perform the conventional frequency planning exercise, assigning frequencies to the satellite system over interested regions, to ensure compatibility between ground and satellite facilities. This planning exercise will continue to be reflected as necessary in ICAO SARPs. [This approach will protect any existing assignments including those for AM(OR)S.]

# 2/1.7/4 Methods to satisfy the agenda item

## 2/1.7/4.1 Method A: No change

## 2/1.7/4.2 Method B: New allocation to the aeronautical mobile satellite (route) service in the frequency band 117.975-137 MHz

Create a new co-primary allocation for the AMS(R)S in the Earth-to-space and space-to-Earth directions in all or part of the frequency band 117.975-137 MHz while:

– limiting the use of the new AMS(R)S allocation to internationally standardised aeronautical systems;

– ensuring protection of AM(OR)S service in the frequency band 132-137 MHz, noting that the characteristics of AM(OR)S are not available. Nevertheless, AM(OR)S systems are understood to operate on channels within national assignments of AM(R)S, and coexistence between AM(R)S, AMS(R)S and AM(OR)S might therefore be envisioned through frequency planning and coordination;

– ensuring protection of services in adjacent bands and not constraining these services.

In-band coexistence between AM(R)S and AMS(R)S and adjacent-band coexistence between ARNS and AMS(R)S around 117.975 MHz will be ensured through frequency planning and coordination work.

Studies are on-going for the protection of adjacent band services operating above 137 MHz from AMS(R)S emissions. Subject to confirmation, this protection might be ensured:

– through the 1 MHz guard band in 136-137 MHz for AMS(R)S systems operating in 117.95-136 MHz; It should be noted that this guard band might also ensure compliance with pfd limit below.

– through a limit [XXX] on the level of unwanted emissions above 137 MHz for AMS(R)S emissions from systems operating in 136-137 MHz.

2/1.7/5 Regulatory and procedural considerations

2/1.7/5.1 For Method A: NOC

NOC

Articles

NOC

Appendices

2/1.7/5.2 For Method B: New allocation to the aeronautical mobile satellite (route) service in the frequency band 117.975-137 MHz

[Editor note: Regula tory proposals on method B are subject to confirmation based on results of ongoing study].

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. 2.1)

MOD

75.2-137.175 MHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| … |
| 117.975-136 AERONAUTICAL MOBILE (R) AERONAUTICAL MOBILE-SATELLITE (R) ADD 5.A17 5.111 5.200 5.201 5.202 |
| 136-137 AERONAUTICAL MOBILE (R) AERONAUTICAL MOBILE-SATELLITE (R) ADD 5.A17 ADD 5.B17 5.111 5.200 5.201 5.202 |
| … |

ADD

5.A17 The use of the frequency band 117.975-137 MHzby the aeronautical mobile-satellite (R) service is limited to internationally standardized aeronautical systems.     (WRC‑23)

**Reasons:** To ensure that the new AMS(R)S allocation is used only by internationally standardised aeronautical systems.

ADD

5.B17 In the frequency band 136-137 MHz, systems operating in the AMS(R)S should ensure that their maximum level of their emissions above 137 MHz does not exceed [XXX].     (WRC‑23)

**Reasons:** To ensure the protection of the incumbent services above 137 MHz.

2/1.7/5.3 For both Methods A and B: SUP Resolution 428 (WRC-19)

SUP

RESOLUTION 428 (WRC‑19)

Studies on a possible new allocation to the aeronautical mobile-satellite (R) service within the frequency band 117.975-137 MHz in order to support aeronautical VHF communications in the Earth-to-space
and space-to-Earth directions

1. \* Note: See relevant text in CPM23-1 meeting report (Annex 4 to BR Administrative Circular [CA/251](https://www.itu.int/md/R00-CA-CIR-0251/en)) on how to facilitate the work related to satellite. [↑](#footnote-ref-1)