

International Civil Aviation Organization

ICAO

**Twenty Ninth Meeting of the Communications/
Navigation and Surveillance Sub-group (CNS SG/29)
of APANPIRG**

Bangkok, Thailand, 16-20 June 2025

Agenda Item 6: Aeronautical Mobile Communications Service and Aeronautical Electromagnetic Spectrum Utilization

- 6.4 Other issues related to aeronautical communications service and aeronautical radio spectrum management, especially on 5G implementation and potential impacts on aircraft radio altimeters

SPACE-BASED VHF UPDATE

(Presented by Australia)

SUMMARY

This paper provides an update on Space-Based VHF and the progress within ICAO since the new spectrum allocation was achieved at the World Radiocommunications Conference 2023. It also provides a brief overview of the technology and the challenges associated with frequency planning and the need for cooperation at the regional and inter-regional levels when implementing Space-Based VHF.

1 INTRODUCTION

1.1 Air-Ground terrestrial VHF Communications is limited by line of sight when using terrestrial based ground stations. This limitation leaves vast areas of the globe, and more specifically large areas of key aviation flight routes not serviced by VHF.

1.2 A significant amount of the Australian land area has little to no infrastructure to support installation of terrestrial VHF ground stations. Installing additional facilities in these remote areas and the ongoing maintenance of those facilities is very costly.

1.3 At the World Radiocommunications Conference 2023, a new aeronautical mobile-satellite (R) service (AMS(R)S) allocation was approved in the frequency band 117.975 - 137 MHz. This allocation is for use by Space-Based VHF, that ICAO is now working to standardize.

1.4 Multiple administrations in the Asia Pacific have expressed interest in using Space-Based VHF and this paper will provide some information and updates on the progress towards a service being available.

2 DISCUSSION**Space-Based VHF Overview**

2.1 Space-Based VHF is an Aeronautical Mobile- Satellite (R) Service (AMS(R)S) in the frequency band 117.975 – 137 MHz, that provides an Air-Ground VHF Digital Link (VDL) and/or VHF Voice Communication System from non-geostationary satellites.

2.2 Space-Based VHF communication will allow aircraft operating in remote regions and oceanic areas to communicate with air traffic control (ATC) via satellite radio links in the frequency band 117.975 – 137 MHz. This will support air traffic management and flight operations in oceanic and remote airspace and will complement current aviation use of satellite-based navigation and surveillance technologies, e.g. Automatic Dependent Surveillance – Broadcast (ADS-B) and – Contract, (ADS-C).

2.3 The implementation of Space-Based VHF communication technologies will not require the addition of new avionics equipment, nor changes to existing avionics equipment on the aircraft. Apart from a larger coverage area, it will appear the same to a pilot or a controller as a terrestrial VHF service.

2.4 Space-Based VHF is not a replacement for terrestrial VHF. Frequency re-use is low due to the large coverage volume. This limits the number of frequencies available for use.

SARPS Development

2.5 The ITU Radio Regulations Resolution 406 requires that the new AMS(R)S allocation must be operated in accordance with international aeronautical standards. ICAO are working to update the Standards and Recommended Practices (SARPS) for Aeronautical Telecommunications (Annex 10) to support Space-Based VHF.

2.6 The Frequency Spectrum Management Panel (FSMP) and the Communications Panel - Data Communications Infrastructure Working Group (CP-DCIWG) have been working to develop the required updates to the SARPS and documents to support Space-Based VHF.

2.7 The CP-DCIWG have established the Project Team – Space Based VHF (PT-SBV). The PT-SBV is tasked to develop ICAO provisions which are necessary to support global/regional adoption of future aeronautical communication technologies operating within the VHF frequency band. The Proposal for Amendment (PfA) for Annex 10 Vol III is one of the key deliverables by the PT-SBV, which includes the Validation Report and the Impact Assessment and Implementation Plan.

2.8 The FSMP Working Group has established the Space-Based VHF Correspondence Group (SB-VHF CG) was established at FSMP WG/17 and the Terms of Reference (ToR) for the group was approved at FSMP WG/18. The ToR requires that the SB-VHF CG makes recommendations to the FSMP membership on PfA's relating to the ICAO Standards and Recommended Practices (SARPs) Annex 10 Volume V.

2.9 The SB-VHF CG is working closely with PT-SBV and both groups are planning to start inter-panel coordination of the PfA's with the Air Traffic Management Operations Panel (ATMOPS), Separation and Airspace Safety Panel (SASP), Communications Panel - Operational Datalink Specific Working Group (CP-OPDLWG) and the Flight Operations Panel (FLTOSP) in the 2nd half of 2025.

2.10 It's anticipated that in October 2025 the FSMP-WG will endorse the PfA items relating to Annex 10 Volume V and in December 2025 the CP-DCIWG will endorse the PfA items relating to Annex 10 Volume III. From there, the ICAO secretariat will present the PfA for the Air Navigation Commission (ANC) review, there will be an ICAO State Letter requesting comments on the PfA before the ANC endorses the PfA to go to the ICAO Council for approval in March 2028. This will result in an Applicability Date of November 2028.

Frequency Planning

2.11 The standards for geographical separation between VHF facilities operating on the same frequency are contained in Annex 10 Volume V, Aeronautical Radio Frequency Spectrum Utilization. Two methods are allowed in the calculation of geographical separation, the radio horizon method, or a desired to undesired signal ratio method.

2.12 Frequency Finder, the tool used in the APAC region for VHF frequency planning, only considers the radio horizon method. Considering that the radio horizon of a satellite orbiting at an altitude of 800km has a radio horizon of 3,364km, this will result in a very large geographical separation between VHF facilities operating on the same frequency.

2.13 To ensure efficient usage of the VHF spectrum, while still avoiding harmful interference, methods other than the radio horizon should be considered.

Regional Coordination

2.14 The ITU Radio Regulations states that the use of the VHF Airband (117.975-137 MHz) by terrestrial VHF has priority over Space-Based VHF. However, for administration to benefit from the introduction of Space-Based VHF, they will need to cooperate on the identification of frequencies.

2.15 The ICAO FSMP is working on the preparation of an initial proposal for Regional and Inter-Regional coordination for Space-Based VHF that will be agreed with the ICAO Regional Offices.

The Future

2.16 SASP and OPDLWG are considering if additional separation standards are required and how Required Communications Performance (RCP) could be applied to Space-Based VHF, however no formal work in this area has started.

2.17 It is expected that testing and operational trials will begin in late 2026 or early 2027, including in the APAC region.

2.18 Once the SARPs are published and the regional coordination process has been agreed, there are expected to be multiple service providers providing a Space-Based VHF and Space-Based ADS-B service for the aviation industry.

3 ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) Note the contents of this paper; and
- b) discuss any relevant matters as appropriate.
