

**57th CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGIONS**

*Incheon, Republic of Korea
4 – 8 July 2022*

AGENDA ITEM 4: AIR NAVIGATION

**AERONAUTICAL SPECTRUM UTILIZATION
AND PROTECTION**

Presented by the International Civil Aviation Organization (ICAO)

SUMMARY

This Discussion Paper presents the work required on Aeronautical Spectrum Utilization and Protection in the Asia and Pacific Regions by supporting the ICAO Position on the various agenda items to be addressed during the International Telecommunication Union (ITU) World Radiocommunication Conference in 2023 (WRC-23). The paper also discusses the need to enhance the regional coordination process on Aeronautical Spectrum, the necessary monitoring of 1090 MHz congestion and addresses the 5G and Radio Altimeter issue. The Conference is invited to ensure that States/Administrations work hand-in-hand with the ICAO Asia and Pacific Regional Office on the utilization and protection of aeronautical spectrum in the Region.

AERONAUTICAL SPECTRUM UTILIZATION AND PROTECTION

1. INTRODUCTION

1.1 Considering the key components of aviation with a focus on radio technology and spectrum, there is a large number of Aeronautical Radiocommunication, Navigation and Surveillance systems that are necessary to provide functions critical to the safe flight of aircraft. An average size commercial aircraft is fitted with close to or over 30 antennas. Communications, Navigation and Surveillance (CNS) technology elements rely on a common resource - continued and interference-free access to frequency spectrum, for aviation safety, capacity and efficiency.

1.2 ICAO has been working closely and effectively in cooperation with its Contracting States and stakeholders to address the challenges in aeronautical spectrum utilization and protection through making and maintaining SARPs, promoting harmonized implementation of ICAO provisions at global and regional levels, introducing new technology to optimize the robustness and the efficiency in using spectrum, monitoring hotspots and being alert for potential safety risks.

1.3 A positive outcome from this joint effort of ICAO and its Contracting States will only be enabled by the active participation and implementation of States, in particular in the promotion and defense of the ICAO Position to ITU WRC, by enhancing coordination of aeronautical frequency and SSR Interrogator Codes (IC), by actively monitoring frequency congestion and taking appropriate action with emerging issues caused by the implementation and rollout of new non-aviation technologies in the neighbouring bands at regional level.

2. DISCUSSION

Support the ICAO Position to ITU WRC-23

2.1 The ITU is the specialized agency of the United Nations for telecommunication matters where international agreements are made on the use of the radio frequency spectrum. At World Radiocommunication Conferences (WRCs), convened about every four years, changes are made to the ITU Radio Regulations, including the Table of Frequency Allocations (Article 5 of the ITU Radio Regulations), on the basis of proposals made by States.

2.2 A consequence of this process is that a coordinated aeronautical position (the ICAO Position) must be established for every ITU WRC and finalized well in advance of the ITU conference itself, in order to be of maximum use to aviation authorities. The ICAO Position for the WRC-23 was approved by the ICAO Council on 14 June 2021. States and international organizations are requested to make use of the ICAO Position, to the maximum extent possible, in their preparatory activities for the WRC-23 at the national level, in the activities of the regional telecommunication organizations and in the relevant meetings of the ITU.

2.3 A number of WRC-23 Agenda Items address issues where aviation is seeking action by the WRC. To mention a few, Agenda Item 1.6 addresses spectrum used by sub-orbital vehicles, Agenda Item 1.7 is about allocation for aeronautical VHF over satellite, Agenda Item 1.8 is about successful finalization of a satellite allocation enabling beyond radio line-of-sight C2 link for RPAS.

2.4 The Asia Pacific Telecommunity (APT) is an inter-governmental regional telecommunication organization. APT conducts conference preparatory group (APG) meetings to develop regional proposals for WRCs. As WRC decision on Agenda Items will be relying more on regional discussions, it is very important to ensure that the aviation position on various agenda items of WRC-23 is duly reflected in the States' position papers to be submitted to the APG meeting. Aviation regulators of States which have not yet submitted their national positions on WRC-23 agenda items in support of the ICAO position need to coordinate the position with their respective telecommunications regulators before the States' positions are finalized and submitted to the APT APG. The 4th Meeting of the APT APG (APG23-4) will be held from 15 to 20 August 2022 in hybrid mode in Bangkok, Thailand.

Enhance the Regional Coordination Process on Aeronautical Spectrum

2.5 The Third Asia/Pacific Regional Air Navigation (ASIA/PAC/3 RAN) Meeting (1993) agreed that the frequency lists prepared by the ICAO Asia and Pacific (APAC) Regional Office will be the frequency planning documents for the Regions. The ICAO APAC Regional Office was charged to continue to maintain its frequency selection and coordination role, including the maintenance and promulgation of Frequency List Nos. 1, 2 and 3 at appropriate periodic intervals.

2.6 The ICAO tool Frequency Finder, including its global database, was formally introduced to the APAC region in 2015 for efficient frequency management across ICAO Regions, consequentially the publication of Frequency List No. 3 (117.975 - 137 MHz) has been discontinued. However, the ICAO APAC Regional Office continues to update and publish the Frequency List No.1 (190-526.5 kHz – NDB) and Frequency List No.2 (108 - 117.975 MHz and 960 - 1215 MHz; VOR/DME, ILS and VDL Mode 4) through a State Letter every year. It is foreseen that Frequency Finder will in the near future also be utilized for the management and registration of NAV systems.

2.7 While implementing SSR Mode S, States should ensure that SSR interrogators with overlapping coverage are not operated using the same Interrogator Code (IC), coordinate with the ICAO APAC Regional Office and the neighbouring States when the coverage of the interrogator extends beyond the boundaries of the State and inform the ICAO APAC Regional Office of the assigned IC for the installations.

2.8 The ICAO APAC Regional Office acts as the only centralized portal for aeronautical frequency and IC coordination, providing a one-stop solution for States. The current process has served the APAC community well over the years, minimizing any bureaucracy and overhead when performing the coordination and registration. The efficiency and accuracy of the process rely on the support from States to the Regional Office by submitting all frequency and SSR/IC assignments for international coordination in a timely manner. In any case, ICAO holds the view that frequency and IC assignments that have been coordinated with ICAO have priority over those that have not been coordinated.

Monitoring 1090 MHz Congestion

2.9 1090 MHz is utilized by SSR transponders for SSR interrogation replies, aircraft broadcast of ADS-B downlinks, and ACAS. The utilization of the 1090 MHz frequency has greatly increased in certain areas of the world. The impact of high channel occupancy is the consequential corruption of messages. This can ultimately result in reduced detection probability for both ground systems as well as ACAS, ADS-B IN and Space-based ADS-B. If no action is taken in areas where severe congestion is experienced, the situation will reach an unacceptable level that may cause harmful corruption or loss of information to the aeronautical surveillance and collision avoidance systems.

2.10 The density of congestion at 1090 MHz depends on many factors, the level of congestion in various parts of Asia Pacific is currently unclear (pre-COVID traffic levels). Some States have reported that 1090 MHz occupancy is not high, less than 10% at busy airports, based on their measurements at radar sites, while some other States have highlighted the need to implement directional antennas to ensure the performance of ADS-B ground stations.

2.11 The use of Mode S Extended Squitter for ADS-B by an increasing number of UAS may seriously affect the continued use of ICAO standardized surveillance systems, due to the resulting congestion of the 1090 MHz frequency. Additionally, States should be aware that widespread 1090ES-capable Mode S transponder equipage by a large population of UAS may not be feasible due to the limited number of available 24-bit aircraft address allocations.

2.12 When examining 1090 MHz channel occupancy, it is necessary to consider both terrestrial receivers and airborne receivers. States are urged to follow the guidance provided in SARPs and associated guidance material to keep the frequency utilization healthy, and always seek to minimise 1090 MHz channel occupancy commensurate with their operational needs and environment. States with the necessary

capabilities are encouraged to make periodic measurements, so that the environment status of 1090 MHz congestion is known, and perform 1090 MHz channel occupancy monitoring at operating Flight levels (e.g. near FL300) and at ground level.

Addressing the 5G and Radio Altimeter issue

2.13 Radio Altimeter (RA) is a mandated critical aircraft safety system used to determine an aircraft's height above terrain. The information from the RA is an essential enabler for several safety-related flight operations and navigation functions on all commercial aircraft as well as a wide range of other civil aircraft, in particular the use of RA is essential during the final approach and landing of an aircraft. The RA operates at 4 200 - 4 400 MHz band under the Aeronautical Radionavigation service. The frequency bands adjacent to 4 200 - 4 400 MHz were previously mainly used for downlinks from geostationary satellites, and have traditionally been "quiet" until the recent introduction of 5G cellular networks in those bands.

2.14 The frequency bands just below the Aeronautical RA band are well suited for the provision of 5G cellular networks, optimizing both range and speed of the service provided. A number of studies suggest that there could be potential harmful interference to RA operations if high-powered 5G base stations, at distances close to airports/runways, when these are operating in the bands adjacent to 4 200 - 4 400 MHz. If not properly mitigated, harmful interference into the RA may pose a serious safety risk. Additionally, if the mitigation measures taken will result in operation of RA being prohibited at certain airports, then this may infer the necessary shutdown of those airports, in particular during foul weather (i.e. Instrument Flight Rules) conditions, which in turn may lead to widespread disruptions.

2.15 The 5G rollout strategies in the various APT Member countries are different in terms of key parameters such as how close the frequency band used is to the 4 200 - 4 400 MHz band, the total transmitting power of the base stations, as well as the antenna tilt. Hence the mitigatory strategies taken will need to be tailored to each specific situation.

2.16 As the radio altimeters are highly sensitive avionic equipment which is required to achieve the necessary performance and accuracy to enable safe flight, especially during IFR rules, any substantive change in the RF environment of this equipment may have dramatic consequences. Therefore, information sharing by national spectrum regulators, telecommunication service providers and aviation community are required to mitigate any potential risk.

2.17 On 23 August 2022, the ICAO APAC Regional Office will co-host together with APT a Webinar on 5G Implementation and Radio Altimeters, using APT's online meeting platform. This Webinar/dialogue session is intended to promote a common understanding among the spectrum regulators and industries on the operation of Radio Altimeters in the band 4 200 - 4 400 MHz and the implementation of 5G in the adjacent bands.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

- a) Note the regional activities regarding preparation for WRC-23, including the fourth APT APG meeting for WRC-23, which will be held in Bangkok in August 2022;
- b) Ensure active participation in WRC-23 preparatory activities of the APT APG and at WRC-23 by aviation representatives, to support the ICAO position for WRC-23;
- c) Urge States/Administrations to coordinate their frequency and IC use with the ICAO APAC Office, using the Frequency Finder tool to ensure that the Frequency Lists are correct and up-to-date and list all NAV stations that are currently in operation or planned;

- d) Invite States which currently have the capability to do so to monitor and report the occupancy of 1090 MHz; and
- e) Request States to directly engage with their national spectrum regulators on the 5G RA issue.

— END —