

INTERNATIONAL CIVIL AVIATION ORGANIZATION

**Fifth Meeting of the APIRG Infrastructure and Information Management Sub-Group  
(IIM/SG5)**

*(Virtual, 26 - 29 July 2022)*

**Agenda Item 3.1 : Status of implementation of applicable ASBU elements**

**WP3.1C12 Radio Altimeter and 5G issues**

*(Presented by the Secretariat)*

<b>SUMMARY</b>
<p>The recent and ongoing rollout of 5G in the frequency band below the Radio Altimeter band at 4200-4400 MHz and the potential associated interference issues to Radio Altimeters that 5G base stations may cause has resulted in questions being asked to the ICAO Secretariat, by Aeronautical Regulators and others.</p> <p>This information paper contains informal briefing material, as developed for use by the FSMP Secretariat in January 2022, further supplementing the information provided in State Letter 21/22 as attached hereto.</p> <p><b>Action by the meeting in paragraph 3</b></p>
<p><b>REFERENCE(S):</b></p> <ul style="list-style-type: none"> <li>▪ ICAO PANS-OPS, Volume II, Part III, Chapter 21</li> <li>▪ ICAO SL 21/22, ‘‘Potential safety concerns regarding interference to radio altimeters’’, issued 25 March 2021 – and references contained therein.</li> <li>▪ RTCA 2020 Report</li> </ul>
<p>This working document relates to <b>ICAO Strategic Objectives: A and B</b></p>

**1. INTRODUCTION**

- 1.1 The allocation of radio frequency bands is beyond ICAO’s mandate as the international standard setting body for aviation. ICAO is nonetheless working very closely with State regulators to better understand their positions, and has received information from several countries which are presently conducting studies into the 5G and Radio Altimeter interference issue ahead of deployment of their 5G networks.
- 1.2 ICAO has been concerned by the apparent lack of a consistent standardized approach between States as they proceed with the rollout of 5G. Frequency ranges slated for 5G use vary from country to country, including with respect to how close they come to the Radio Altimeter band. There is also a very substantive difference in the prescribed maximum radiated power of the 5G base stations from one country to another.
- 1.3 ICAO has shared these concerns with regulators and has asked them to prioritize the safety of the public when deciding how to enable cellular broadband/5G services in radio frequency bands near the bands used by radio altimeters.

- 1.4 Any questions about the current regulations pertaining to 5G issues in specific countries must be addressed directly to the applicable national authorities.

## 2. DISCUSSIONS

- 2.1 Radio Altimeters (RA) are a mandated critical aircraft safety system used to determine an aircraft's height above terrain. The technical performance of the RA, including receive mask and interference resilience, is currently not standardized by ICAO. There are currently no applicable industry standards either describing those characteristics.
- 2.2 The RA operate at 4200-4400 MHz, in a portion of a frequency range often designated as the "C-band". The frequency bands adjacent to the RA band, have traditionally been "quiet" until the recent 5G rollout in the C-band". The adjacent bands were previously mainly used for downlinks from geostationary satellites.
- 2.3 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. Functions include terrain awareness, aircraft collision avoidance, wind shear detection and flight controls, functions to automatically land an aircraft including autothrottle and thrust reversers.
- 2.4 If not properly mitigated, harmful interference from 5G will pose a serious safety risk. Safetynet systems subject to interference by 5G such as the ground proximity warning system will become unreliable. These systems were introduced to avoid accidents based on lessons learned from previous ones. The unreliability of these systems defeats their purpose and poses a serious safety risk. Additionally, if the mitigations taken will result in operation of RA being prohibited at certain airports, then this would infer the necessary shutdown of those airports during foul weather (i.e. Instrument Flight Rules) conditions, which in turn could lead to widespread disruptions.
- 2.5 Studies from several States and organizations indicate the potential for harmful interference to RA if high powered base stations are implemented near the frequency band used by the RA and at distances close to airports/runways.
- 2.6 Industry studies cataloging the interference susceptibility of various RA types are still ongoing. While some RA typically used in helicopters, general aviation and business aircraft appear to be more vulnerable to interference, other RA, more often found in commercial aircraft appear to be less susceptible to potential interference from 5G.
- 2.7 The 5G rollout strategies in different States are different in terms of key parameters such as how close the frequency band used is to the RA frequency band and the total transmitting power of the base stations. Hence the mitigatory strategies taken will need to be tailored to each specific situation.
- 2.8 The current situation in the US is not directly comparable to that of the current rollout taking place within some European and other States, in that the "typical" 5G base stations being rolled out in the US operate in a frequency band closer to the RA band and may transmit at power levels which are up to an order of magnitude higher. The US FAA has issued a [Safety Alert for Operators](#) and Airworthiness Directives on the issue.
- 2.9 ICAO and industry standards are under development for the "future" RA, focusing especially on the interference environment. This however will be a longer-term solution.
- 2.10 To estimate the scope of potential RA replacements required, "one major air transport manufacturer representing approximately half of air transport sector, reports approximately 15,000 airplanes in service. There are three groups of altimeters operating on those airplanes, roughly representing three generations of RA equipment. All three groups were included in RA testing for the RTCA 2020 report. One group is represented by the RTCA 2020 report interference threshold and represents roughly 3000 airplanes. A second group performs somewhat better and is operating on 7000 airplanes. Finally, the third group is significantly more robust on the remaining 5000 airplanes. If only the most robust group of altimeters can

meet the updated standard, then 10,000 aircraft will need to replace altimeters at an estimated cost of several billion dollars.” (Ref. 12th Meeting of the Frequency Spectrum Management Panel Working Group (FSMP WG/12), 4-15 Oct 2021, WP/17 – presented by the International Coordinating Council of Aerospace Industries Associations (ICCAIA)).

- 2.11 Several States have already implemented temporary technical, regulatory and operational mitigations on new 5G systems in order to protect the RA while more permanent solutions are being devised

### **3. ACTIONS BY THE MEETING**

- 3.1 The meeting is invited to:
- a) take note of the above information
  - b) encourage States/Organizations to take the necessary measures when 5G is utilized around airports, to the aviation concerns about the major operational risks resulting from 5G technology deployment.

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