



*International Civil Aviation Organization*

**MIDANPIRG Communication, Navigation and Surveillance Sub-Group**

**Eleventh Meeting (CNS SG/11)**  
*(Muscat, Oman, 16-19 May 2022)*

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**Agenda Item 4: CNS Planning and Implementation in the MID Region**

**OUTCOME OF THE RADALT ACTION GROUP MEETINGS**

*(Presented by the Secretariat)*

**SUMMARY**

This paper presents the outcome of the Radio Altimeter Action Group meetings and present the Draft Guidance Material on protecting Radio Altimeter Operation from Potential 5G interference, for review and improvement.

Action by the meeting is at paragraph 3.

**REFERENCES**

- MIDANPIRG/19 & RASG-MID/9 Meetings Report

**1. INTRODUCTION**

1.1 The Radio altimeter is a mandated safety-critical aircraft system used to determine an aircraft's height above terrain. It is the only sensor onboard the aircraft capable of providing a direct measurement of the clearance height above the terrain and obstacles.

1.2 The information from the radio altimeters is essential to enable several safety related flight operations and navigation functions on all commercial aircraft and are potentially impacted by 5G interference and would pose a serious safety risk to passengers, crew, and people on the ground.

**2. DISCUSSION**

2.1 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.

2.2 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.

2.3 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.

2.4 During MIDANPIRG/19 meeting (14-17 February 2022), the meeting recalled that ICAO issued State Letter (dated 25 March 2021) on the potential impact of the 5G on Radio Altimeter in the MID Region. Potential 5G interferences was acknowledged as a safety concerns and potential operational impacts on the Radio Altimeter.

2.5 Furthermore, the MIDANPIRG/19 meeting updated the Frequency Management Working Group Terms of Reference as at **Appendix A** to include tasks related to the issue of 5G & Radio Altimeter interferences.

2.6 The MIDANPIRG/19 meeting agreed to establish Radio Altimeter (RADALT) Action Group to develop guidance material to protect the aircraft operations from potential Radio Altimeter interference.

*MIDANPIRG DECISION 19/23: RADALT ACTION GROUP*

*That, the Radio Altimeter (RADALT) Action Group be:*

- a) established to develop guidance material to protect the aircraft operations from potential Radio Altimeter interference associated with the deployment of cellular broadband/5G ground infrastructure near the bands used by RADALT; and*
- b) composed of:*
  - Ridha Dridi, (Saudi Arabia, Rapporteur);*
  - Khaled Alhazmi (Saudi Arabia)*
  - Fares A. Alzahrani (Saudi Arabia)*
  - Abdullaziz Hussain (Saudi Arabia)*
  - Mohammed Kamal (Egypt);*
  - Nevin Askar (Jordan);*
  - Talal Al Jasmi (UAE);*
  - Jehad Faqir (IATA);*
  - Hecham Bennani (ACAO);*
  - Gerlof E Osinga (Boeing)*
  - ICAO MID RO/CNS*

2.7 Moreover, the MIDANPIRG/19 meeting invited States to share information on their practices to mitigate 5G potential interference that may affect the radio altimeters during aircraft operations. Furthermore, the meeting agreed to task the CNS SG to coordinate with the RASG-MID relevant subsidiary bodies the 5G Safeguarding measures around the aerodromes to protect RADALT from any interference.

2.8 The meeting may wish to note that, MIDANPIRG agreed to the following MIDANPIRG Decision:

*MIDANPIRG DECISION 19/24: 5G SAFEGUARDING MEASURES*

*That, the CNS SG coordinate with the RASG-MID relevant subsidiary bodies the 5G Safeguarding measures around the aerodromes to protect RADALT from any interference.*

2.9 Based on all the above, the RADALT Action Groups conducted five (5) meetings during the period (16/3 - 0/5/2022). The RADALT AG agreed to disseminate a briefing material on the Radio Altimeter and 5G rollout issue developed by the ICAO Frequency Spectrum Management Panel (SL AN7/5.6 & ME3 – 22/045 dated 20 March 2022), to assist States carrying out the necessary analyses of their operations and developing the necessary mitigation mechanisms to avoid a decrease in safety. The ICAO MID State Letter is at **Appendix B**.

2.10 Additionally, the RADALT Action Group developed a Draft guidance material to protect the aircraft operations from potential Radio Altimeter interference associated with the deployment of cellular broadband/5G. The Content of Guidance material is as follow:

- a) Chapter 1 - Background on 5 G and frequency band allocation.
- b) Chapter 2 - Potential impacts of 5G on Radio Altimeters during aircraft operations.
- c) Chapter 3 - Safeguarding measures adopted at regional and global levels for current and future use of IMT networks in 4.0 – 4.2 GHz.
- d) Chapter 4 - Methodologies for defining safeguarding measures for aerodromes & heliports.

### **3. ACTION BY THE MEETING**

3.1 The meeting is invited to review and update, as deem necessary, the Draft Guidance Material developed by the RADALT AG.

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## APPENDIX A

### Frequency Management Working Group (FMWG)

#### 1. TERMS OF REFERENCE (TOR)

The FMWG will undertake the following tasks in the work required to manage the MID Region frequency assignments in order to ensure sufficient access to the resource for the provision of aeronautical communication, navigation and surveillance services (CNS) in an efficient and safe manner:

- a) develop MID Region frequency assignment plan including long term spectrum usage of radio systems;
- b) validate the ICAO Global database and keep it up to date;
- c) resolve current frequency assignments conflict in the ICAO Global database;
- d) develop recommendation or proposal for improvement to the existing regional VHF frequency assignment process based on the ICAO Global Spectrum Management tool, ICAO 9718 Volume II Handbook provision and current coordination issues;
- e) propose solutions for the interference incidents occurred in MID Region states in a timely manner;
- f) escalate the intentional frequency interference matters and coordinate with other relevant international organizations, as and when required;
- g) provide guidance/support to States to protect the GNSS signals;
- h) collaborate with ITU and other relevant international organization to address frequent interference incidents;
- i) support for ICAO Position at World Radio Communication Conference (WRC) and ensure MID States' support ICAO at ITU meetings;
- j) collaborate with Regional Groups; Arab Spectrum Management Group (ASMG) African Telecommunication Union (ATU), and Asia/Pacific Telecommunication Group (APT) to support ICAO position at WRC;
- k) ensure the continuous and coherent development of the relevant sections of the MID eANP, taking into account the evolving operational requirements in the MID Region and the need for harmonization with the adjacent regions in compliance with the Global Air Navigation Plan;
- l) develops recommendations for CNS SG about how to address the future operational needs and limitations in VHF voice communications, aiming at avoiding introduction of 8.33 kHz spacing in the MID Region for as long as practicable; and
- m) Frequency Management Working Group will be responsible for overall supervision of the frequency issues in the MID Region and will review/update the FMWG work plan whenever required.
- n) Collect and share information on the best practices implemented by States and Regional Organizations to mitigate potential radio altimeters (RADALT) interference that caused by 5G operation.
- o) Develop guidance material to protect aircraft operations from potential Radio Altimeter interference associated with the deployment of 5G ground infrastructure.

**2. COMPOSITION**

- a) ICAO MID Regional Office;
- b) MIDANPIRG CNS Sub Group Chairpersons;
- c) Members appointed by the MIDANPIRG member States; and
- d) other representatives, who could contribute to the activity of the Working Group, could be invited to participate as observers.

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منظمة الطيران  
المدنى الدولى

国际民用  
航空组织

File Ref.: AN7/5.6 & ME3 – 22/045

11 April 2022

**Subject: Follow-up to MIDANPIRG/19 Decision 19/23 related to the Potential Safety Concerns regarding Interference to Radio Altimeters**

**Action Required: To note and carry out suitable actions to mitigate safety concerns**

Sir,

I have the honour to refer to the outcome of the Nineteenth meeting of the Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG/19) held in Riyadh, Saudi Arabia from 14 to 17 February 2022, in particular to the establishment of the RADALT Action Group, through the Decision 19/23.

The RADALT AG/3 Meeting (Virtual, 4 April 2022) recommended to disseminate the attached briefing material on the Radio Altimeter and 5G rollout issue developed by the ICAO Frequency Spectrum Management Panel, to assist States carrying out the necessary analyses of their operations and developing the necessary mitigation measures to avoid a decrease in safety.

Should you need further information, please contact Ms. Muna Alnadaf, RO/CNS at email [malnadaf@icao.int](mailto:malnadaf@icao.int).

Accept, Sir, the assurances of my highest consideration.



Mohamed Abubaker Farea  
Regional Director  
ICAO Middle East Office

## Attachment

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## **Briefing material on the Radio Altimeter and 5G rollout issues**

### **1. Briefing, Key Points**

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. Technical Background**

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. Safety net 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.