



# ICAO

International Civil Aviation Organization  
North American, Central American and Caribbean Office

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**Workshop for the NAM/CAR/SAM Regions on Risk Mitigation in Aviation  
Due to the Use of 5G Frequency**  
On-line, 8 November 2022

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## Summary of Discussions

**Date** 8 November 2022  
**Location** On-line  
**Opening Ceremony** 180 delegates attended the Workshop from 24 States/Territories from the NAM/CAR/SAM/MID Regions, and seven International Organizations and the Industry. The list of participants is shown in the **Attachment**.

### 1. References

1.1 State letter Ref.: NT-N1-3 — E.OSG-NACC94728, dated 29 September 2022.

### 2. Objective

2.1 The objective of the workshop was to present lessons learned, implementation of mitigation measures and all related information that will support States in a timely manner to implement their own mitigation measures at international airports due to the implementation of 5G technology for cellular services.

2.2 Information of this event is under the following link:  
<https://www.icao.int/NACC/Pages/meetings-2022-5gmw.aspx>

### 3. Introduction

3.1 The workshop provided information on the activities of the NAM/CAR/SAM States aimed at implementing mitigation measures to avoid interference to the operation of radio altimeters caused by the operation of 5G cellular phone services as they operate on a frequency close to the one on which radio altimeters operate. In addition, the event was attended by the industry, that presented its views on the problem of 5G interference.

### 4. Potential Safety Concerns to Aeronautical Radio Altimeters due to Interference from 5G Frequency

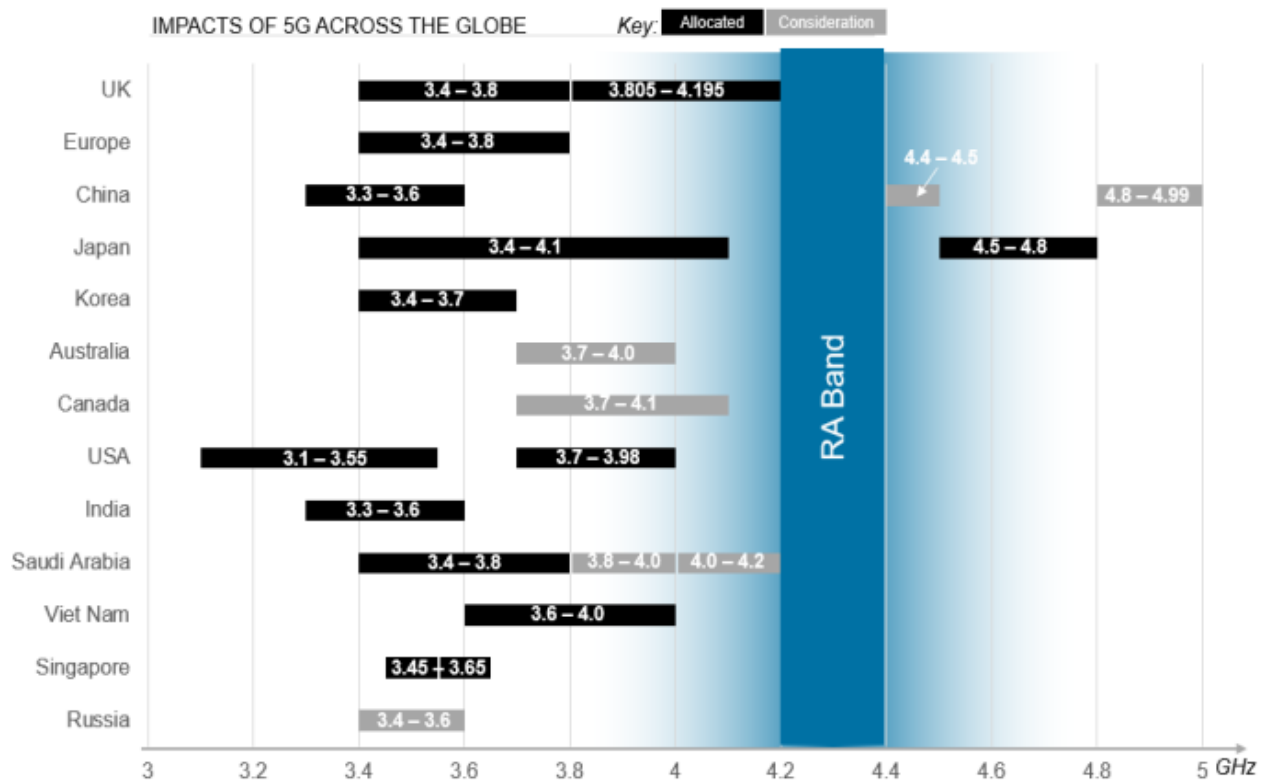
4.1 The International Telecommunication Union (ITU) declared that “[the 5G issue is] an opportunity for policy-makers to empower citizens and businesses. 5G will play a key role in supporting governments and policy-makers in transforming their cities into smart cities, allowing citizens and communities to realize and participate in the socio-economic benefits delivered by an advanced, data-intensive, digital economy.”

4.2 Deployments of 5G need frequency spectrum – a very limited and finite natural resource.

4.3 In the recent 5G spectrum auction, the telecommunication industry spent over \$80 billion dollars to obtain a 10-year lease of spectrum from the government of United States.

4.4 The immense political and economic pressure often overwhelmed aviation safety arguments.

4.5 The following graph shows the 5G proposals across the globe:



4.6 The implementation of the 5G will be a serious aviation safety risk if States do not implement mitigation measures, with the potential for catastrophic consequences:

- a) the cellular broadband/5G services in radio frequency bands near the bands used by radio altimeters;

- b) “If not properly mitigated, harmful interference to the function of the radio altimeter during any phase of flight may pose a serious safety risk to passengers, crew and people on the ground.” (ICAO);
- c) an undetected failure of the radio altimeter can lead to catastrophic results for people on board the aircraft and on the ground; and false alarms have the potential to undermine trust in the avionics systems.

4.4 If not mitigated, the following negative impacts could be faced:

- a) limitation/suspension of precision approach and landing capabilities – This limitation/suspension will reduce airlines access to airports in low visibility conditions;
- b) limitation/suspension of night operations, particularly for airports with challenging terrain – The radio altimeter is critical for the terrain awareness and warning system, which is mandatory for all air transport aircraft;
- c) issuance of State regulations mandating retrofits and re-certification of aircraft radio altimeter and other related functions.

4.5 ICAO explained that one of the 41st Session of the ICAO Assembly (A41) outcomes was related to its policy on radio frequency spectrum matter:

- a) The Assembly requested ICAO and its Member States to continue taking necessary measures and efforts to ensure that radio altimeters and other aeronautical systems are free from harmful interference, including implementation of mitigation measures, sharing of best practices, as well as development of relevant provisions and guidance.
- b) Recognizing the criticality of radio frequency spectrum, the Assembly encouraged States and regions to actively participate in spectrum defence activities and to endorse ICAO’s position for the ITU WRC-23.

## **5. Mitigation measures implemented in the CAR/SAM regions due to the installation of 5G technology equipment**

5.1 ICAO indicated again that all States must have coordinated internally with the different organizations (airports, spectrum regulators, telecommunications companies, among others) with the following objectives:

- a) performing an analysis of operations at different airports due to the implementation of 5G technology;
- b) working jointly with its national organizations that manage the assignment of frequencies;

- c) working jointly with the local telecommunications companies responsible for the implementation of 5G technology and in the same way with the air operators;
- d) implementing the necessary palliative measures as soon as possible.

5.2 States establish frequency separation between terrestrial mobile services on frequencies allocated in the State for 5G and radio altimeters to ensure that there will be no interference between the operations of the two services.

5.3 States implement national monitoring mechanisms to ensure:

- a) a correct analysis of the impact of the implementation of 5G technology at airports;
- b) implementation of mitigating measures, according to the analysis carried out; and
- c) establishment of a mechanism for continuous monitoring of the implemented actions.

## **6. 5G Radio Altimeter Interference (BOEING)**

6.1 Boeing, according to its analysis, presented information on the problem and impacts of the 5G implementation, indicating that:

- a) Governments around the world are implementing 5G cellular systems in frequency ranges adjacent to or near the radio frequency band used by radio altimeters.
- b) The aviation industry and aviation regulators are concerned the 5G deployments will cause interference to radio altimeters operating in the radio frequency band 4.2 - 4.4 GHz.
- c) Concerns are based on a study carried out by the industry and United States Federal Aviation Administration (FAA) via the Radio Technical Commission for Aeronautics (RTCA) organization, in which:
  - i. The study concluded 5G transmissions can interfere with radio altimeters.
  - ii. The study was limited to regulations issued by United States Federal Communications Commission (FCC) that allow 5G to operate in the radio frequency band 3.7 – 3.98 GHz and was limited to the review of only 9 radio altimeters.

6.2 Boeing indicated that 5G interference into radio altimeters is a global problem:

- a) interference to radio altimeters is a public safety issue;
- b) interference can cause numerous aircraft safety hazards;
- c) restriction of deployment and provision of mitigations along flight paths and airports will help significantly;

- d) national aviation and telecommunications regulators need to work together;
- e) States' support is critical to maintaining public safety.

## **7. Radio Altimeters and 5G C-Band Deployment in United States**

7.1 According to the FAA and two major United States telecommunications companies, it has been demonstrated that 5G C-Band and aviation can safely coexist:

- a) FAA has worked closely with aviation industry stakeholders, the National Administration of Civil Aviation (ANAC) of Argentina, the European Aviation Safety Agency (EASA), Transport Canada Civil Aviation (TCCA), and other international partners to harmonize approaches to global deployment of 5G.
- b) Technology will continue to evolve, but it highlighted how we leverage and apply what has been learned for the future.
- c) Today is a conversation among partners to share experiences and listen to other points of view.

7.2 United States shared the actions taken through the development and implementation of mitigation measures within:

- a) Special Airworthiness Information Bulletin (SAIB): AIR-21-18 2 November 2021:
  - i. provides recommendations for radio altimeter manufacturers, aircraft manufacturers, and operators and pilots.
- b) Airworthiness Directives (AD): 2021-23-12 and 2021-23-13 9 December 2021.
  - ii. Prohibits certain rotorcraft and transport category airplane operations in the presence of 5G C-Band (3.7- 3.98 GHz) emissions.
  - iii. The unsafe condition is due to unreliable radio altimeters in the presence of 5G C-Band.
- c) Safety Alert for Operators (SAFO): 21007 23 December 2021:
  - iv. Provides information and guidance to operators regarding the risk of potential adverse effects on radio altimeters when operating in the presence of 5G C-Band wireless broadband signals.
- d) Beginning of data exchange with telecommunications companies in United States AT&T and Verizon: site locations and antenna characteristics.

7.3 Other actions taken by United States since January 2022:

- a) Monthly assessment of new antenna locations (approximately 5- 8K/month).
- b) Monthly Notice to Air Missions (NOTAMs), Alternative Methods of Compliance (AMOCs).
- c) Monthly meetings with stakeholders to increase outreach efforts.

- d) Continued refinement of airspace protection models.
- e) 5G roundtable discussions between aviation and Telecommunications stakeholders.

7.4 Lessons learned in United States:

- a) United States' approach is an example of safe integration.
- b) Radio altimeters (after modification) will perform reliably in a 3.7-3.98 GHz C-Band environment, provided the following conditions are met:
  - a Guard Band is maintained – Reduced emissions around airports.
  - spurious emissions are limited – Downward tilt requirement for antenna energy
- c) If any one of these conditions is not met, then further investigation is needed to assure safety.
- d) A new generation of performance standards will be needed to ensure technology evolutions does not have an impact.

**8. Recommendations**

8.1 It is fundamental that all States in the NAM/CAR/SAM Regions complete the analysis and implementation of mitigation measures that are appropriate to their operations.

8.2 It is important to implement a monitoring mechanism to evaluate the impact of the mitigation measure implementation and to improve any of them according to the results.

8.3 It is crucial to work together between Civil Aviation Authorities and telecommunication companies, since it is the most effective way to obtain better results.

**9. Accomplishments**

9.1 The information reviewed during the event provided important insights into lessons learned about mitigation measures implemented and the development of activities by States and Industry that will enhance future activities in CAR and SAM States and thereby avoid any interference with radio altimeter operations.

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**Taller en línea para las Regiones NAM/CAR/SAM sobre mitigación de riesgos en la aviación por el uso de la frecuencia 5G/  
Online Workshop for the NAM/CAR/SAM Regions on Risk Mitigation in Aviation Due to the Use of 5G Frequency  
(5G-Mitigation)**

Online, 8 November 2022 / En línea, 8 de noviembre de 2022

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