



**Twentieth Meeting of the CAR/SAM Regional Planning and Implementation Group  
 (GREPECAS/20)  
 Salvador, Brazil, 16 – 18 November 2022**

**Agenda Item 3: Second GREPECAS-RASG-PA Joint Meeting**  
 3.2 CAR/SAM Regions Air Navigation Priorities, Targets and Emerging Risks

**MITIGATION MEASURES IMPLEMENTED  
 DUE TO COMMISSIONING OF 5G TECHNOLOGY**

(Presented by the Secretariat)

**EXECUTIVE SUMMARY**

This working paper presents a summary of the activities carried out in the CAR and SAM regions in the implementation of mitigating measures that protect operations at airports due to the commissioning of 5G technology.

<b>Action:</b>	Suggested actions in numeral 5 of this Working Paper.
<i>Strategic Objectives:</i>	<ul style="list-style-type: none"> <li>Air Navigation Capacity and Efficiency</li> </ul>
<i>References:</i>	<ul style="list-style-type: none"> <li>State Letter Ref.: SP 74/1-21/22:  <a href="https://www.icao.int/MID/Documents/2021/FM%20WG2/74-1e.pdf">https://www.icao.int/MID/Documents/2021/FM%20WG2/74-1e.pdf</a></li> <li>Radio altimeter operation information  <a href="https://www.icao.int/NACC/Documents/Meetings/2018/RPG/RPGITUWRC2019-P08.pdf">https://www.icao.int/NACC/Documents/Meetings/2018/RPG/RPGITUWRC2019-P08.pdf</a></li> <li>NAM/CAR/SAM Workshop on the ICAO Position for the International Telecommunication Union (ITU) World Radiocommunication Conference (2023) (WRC-23), 20 October 2021:  <a href="https://www.icao.int/NACC/Documents/Meetings/2021/CRM23/SummaryDiscussion-ICAOPositionWRC23Rev.pdf">https://www.icao.int/NACC/Documents/Meetings/2021/CRM23/SummaryDiscussion-ICAOPositionWRC23Rev.pdf</a></li> <li>CAR/SAM Planning and Implementation Regional Group (GREPECAS) of the Fourth GREPECAS Programmes and Projects Review Committee (PPRC) Virtual Meeting (ePPRC/04), from 21 to 22 April 2022:  <a href="https://www.icao.int/NACC/Documents/Meetings/2022/PPRC04/eCRPP04-Minute.pdf">https://www.icao.int/NACC/Documents/Meetings/2022/PPRC04/eCRPP04-Minute.pdf</a></li> </ul>

## 1. Introduction

1.1 Through State Letter *Ref.: SP 74/1-21/22*, ICAO shared information on previous meetings and concerns about interference to radio altimeters. Several administrations are currently considering or have already started to implement new cellular broadband technologies (such as 5G) in the frequency bands close to radio altimeter operating frequencies (3,3-3,8 GHz and 4.2-4.4 GHz), a critical aviation safety system.

1.2 The international aviation industry has noted with concern that these broadband technologies may cause harmful interference to radio altimeters.

1.3 The radio altimeter is a mandatory critical aircraft safety system used to determine the height of an aircraft above the ground. Its information is essential to enable various safety-related flight operations and navigation functions on all commercial aircraft, as well as a wide range of other civil aircraft. Such functions and systems include terrain awareness, aircraft collision avoidance, wind shear detection; flight controls and functions to automatically land an aircraft. If not adequately mitigated, harmful interference to radio altimeter operation during any phase of flight can pose a serious risk to the security of passengers, crew and those on the ground.

1.4 The ICAO NACC and SAM Regional Offices have been working with States, conducting workshops and sharing lessons learned from States that have already implemented mitigation mechanisms, since this experience is of enormous benefit to States that are still working on it.

1.5 CAR/SAM Planning and Implementation Regional Group (GREPECAS) of the Fourth GREPECAS Programmes and Projects Review Committee (PPRC) Virtual Meeting (ePPRC/04), held from 21 to 22 April 2022, the following conclusion was adopted:

<b>CONCLUSION ePPRC/04/01      MITIGATION MEASURES AGAINST POTENTIAL INTERFERENCE DERIVED FROM THE IMPLEMENTATION OF 5G TECHNOLOGY</b>	
<p><b>What:</b></p> <p>That, in view of the possible impact/interference due to the implementation of 5G technology in the operations of commercial aircraft and general aviation radio-altimeters, the States/Territories of the CAR/SAM Regions:</p> <ul style="list-style-type: none"> <li>a) conduct an analysis that includes the domestic aircraft fleet, telecommunication companies, and spectrum management agencies to assess the impact of this technology on aviation operations;</li> <li>b) based on the results of the impact analysis, develop and implement the necessary mitigation mechanisms to prevent interference to radio altimeter operations; and</li> <li>c) Inform the NACC and SAM Regional Offices by GREPECAS/20 meeting of the measures implemented in order to share this information among the States.</li> </ul>	<p><b>Expected impact:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Political / Global</li> <li><input checked="" type="checkbox"/> Inter-regional</li> <li><input type="checkbox"/> Economic</li> <li><input type="checkbox"/> Environmental</li> <li><input checked="" type="checkbox"/> Operational/Technical</li> </ul>

<b>Why:</b> It is important for States to analyse this impact and integrate mitigation measures aimed at ensuring safety.	
<b>When:</b> By GREPECAS/20 Meeting	<b>Status:</b> <input checked="" type="checkbox"/> Valid / <input type="checkbox"/> Superseded / <input type="checkbox"/> Completed
<b>Who:</b> <input checked="" type="checkbox"/> States <input type="checkbox"/> ICAO <input type="checkbox"/> Other:	All CAR and SAM States.

1.6 The objective of this Conclusion was for States to carry out risk assessments at their international airports and, based on their results, implement mitigating measures to prevent incidents in operations. States, following up on this Conclusion, have implemented mitigating measures at their airports.

## 2. Mitigation measures implemented by NAM/CAR States

2.1 The NAM/CAR States have communicated the actions carried out to date at their airports. Detailed information is found in **Appendix A**.

## 3. Mitigation measures implemented by SAM States

3.1 The SAM States have communicated the actions carried out to date at their airports. Detailed information is found in **Appendix B**.

## 4. Conclusions

4.1 The majority of the States have taken this potential risk to aeronautical operations very seriously, however, it is necessary that all the States of the NAM/CAR/SAM regions complete the analysis and implementation of the corresponding mitigating measures, in accordance to your operations.

4.2 If States do not implement mitigation measures, they run the risk of:

- a) Limitation/suspension of precision approach and landing capabilities: this limitation/suspension will reduce airline 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 terrain awareness and warning system, which is mandatory for all air transport aircraft.
- c) Lack of State regulations issuance requiring modifications and recertification of aircraft radio altimeters and other related functions.

**5. Suggested actions**

5.1 The States are invited to:

- a) continue to follow up on the actions implemented to date: constant monitoring is important;
- b) carry out the corresponding risk assessments at States' international airports and carry out the corresponding actions, if they have not been carried out yet; and
- c) implement the corresponding short-term mitigation measures, when necessary.

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**APPENDIX A**  
**MITIGATION MEASURES IMPLEMENTED BY NAM/CAR STATES**

No.	State	Comments
1	Cuba	It has carried out an internal coordination with the different Organizations; has created a working and monitoring group to implement mitigating measures where applicable.
2	Dominican Republic	The corresponding analyses and internal coordination with different Organizations have been carried out. The implementation of the corresponding mitigating measures is in process.
3	Honduras	The State has coordinated internally with the entities and it follows a monitoring process of the agreements and the technical parameters necessary to avoid interference.
4	Mexico	The separation in frequency between the land mobile services of the frequencies assigned in the State for 5G and the radio altimeters is at least 600 MHz, so no affectation is expected. Mexico has implemented a constant monitoring mechanism to avoid possible interference.
5	<b><u>Netherlands:</u></b> Aruba Bonaire Curacao Saba Sint Eustatius Sint Maarten	The islands belonging to the Netherlands are carrying out coordination through the Civil Aviation Directorates to avoid interference in the radio altimeters.  The implementation of this technology in the islands has not been carried out yet.
6	Nicaragua	State has implemented a series of coordination with the different organizations within the country, especially with the entity that is responsible for the allocation of frequencies in the State, as well as with the telecommunications provider.
7	United States	State has implemented the following mechanism in its operations:  <ol style="list-style-type: none"> <li>1. Performs an analysis of operations at different airports due to the implementation of 5G technology.</li> <li>2. Works jointly with its national organizations that manage the assignment of frequencies.</li> <li>3. Works jointly with the local telecommunications companies responsible for the implementation of 5G technology and in the same way with the air operators.</li> <li>4. Applies the necessary palliative measures as soon as possible.</li> </ol>

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**APPENDIX B**  
**MITIGATION MEASURES IMPLEMENTED BY SAM STATES**

No.	State	Comments
1	Argentina	<p>The National Civil Aviation Administration (ANAC) contacted the National Communications Entity (ENACOM), informing it on the impact of this new technology in the field of aeronautical telecommunications and requested to keep the civil aviation authority informed regarding the future deployment of 5G nationwide.</p> <p>To date, and according to information received from said authority, one of the frequency bands considered suitable for the implementation and deployment of mobile communications services that use state-of-the-art technologies in Argentina is 3500 MHz (3300 MHz – 3600 MHz). Initial consultations have also been carried out with telecommunications companies in order to gather information on the possible installations of these 5G systems in airports; informing them that it is necessary to evaluate the cases of potential interference to radio electric systems for aeronautical use, in particular, the radio altimeter. Likewise, the <i>Empresa Argentina de Navegación Aérea</i> (EANA), the air navigation services provider, will be promptly required to notify ANAC on any reports received from Recommendation No. 9 of WARNING 001/DOA.</p>
2	Bolivia	<p>The Vice-Ministry of Telecommunications and the Telecommunications and Transport Regulation and Control Authority (ATI) notified the Directorate General of Civil Aeronautics (DGAC) that the 3.3 to 3.6 GHz band is planned to be used for the purpose of 5G, and there are no deployments in the 3.7 to 3.98 MHz band. In this context, both authorities consider that there would be no impact on the 4.2 to 4.4 GHz band used by radio altimeters.</p>
3	Brazil	<p>The National Civil Aviation Agency (ANAC) of Brazil is aware of the risks related to the potential interference caused by the 5G system and is working together with the National Telecommunications Agency (ANATEL) to establish the restrictions deemed necessary for its implementation in Brazil, especially in the areas of attention related to the areas near certain aerodromes. In addition, on 4 July 2022, ANATEL <i>Act No. 9064/2022</i> was published in the Official State Gazette, which establishes limitations on the transmission power of the 5G signal in areas near certain aerodromes. It is important to point out that the subject is under constant study and evolution and both, ANAC and ANATEL, are making efforts to eventually reduce or eliminate the restrictions imposed.</p>
4	Chile	<p>The General Directorate of Civil Aeronautics (DGAC) of Chile has maintained constant monitoring of the initiatives to implement 5G cellular technology in Chile, specifically in matters related to the possibility of interference between the frequencies used by the equipment on board of an aircraft and such telephony. This work has been carried out with the participation of State organizations, mainly with the Undersecretary of Telecommunications (SUBTEL) of Chile, which is added to the evaluations carried out by the DGAC specialists in their different areas. Added to this is the interaction with international organizations that can provide relevant information on this matter.</p> <p>In accordance with the provisions of SUBTEL, responsible in Chile for the assignment of frequencies, in the case of 5G, the frequencies assigned in Chile reach up to 3.7 GHz and the radio altimeters have frequencies from 4.2 GHz, with a large separation bandwidth. In a working meeting with SUBTEL, it pointed out that the separation range makes it possible to establish that the possibility of interference is extremely low. In addition, in relation to the doubt regarding the assignment of frequencies in the range above the</p>

No.	State	Comments
		3.8 GHz spectrum, SUBTEL indicates that it has no plans to assign said spectrum, since that range is assigned to satellite systems (cable operators and other systems).
5	Colombia	<p>Aerocivil has carried out the necessary coordination with the Ministry of Communications, the National Spectrum Agency (ANE), those responsible for the Colombian radio spectrum and other organizations involved in this issue, to whom it issued the following recommendations:</p> <ol style="list-style-type: none"> <li>1. If possible, only use the 3.4 to 3.8 GHz range of the C band for the 5G network.</li> <li>2. Restrict the installation of antennas in areas close to airports, especially on the approach path.</li> <li>3. Limit the transmission power and take into account an inclination of the antennas to limit the interference.</li> </ol> <p>At this time, both the Ministry of Communications and ANE are evaluating these recommendations and several meetings have been held in which their viability has been stated. Work is being done to exactly define the restriction zone at international airports and the power limits according to their proximity to them. Once the conditions and definitive actions taken by Colombia are established, ICAO will be informed.</p>
6	Ecuador	<p>The Telecommunications Regulation and Control Agency (ARCOTEL) ruled out the possibility of interference to radio altimeters by 5G networks to be installed in areas near airports, due to the considerable radioelectric distance between the Medium Band assigned to cellular telecommunications 3.3 GHz to 3.6 GHz, and the operating band of the radio altimetry equipment 4.2 GHz to 4.4 GHz. The security strip between bands is 600 MHz. The Agency ratified this statement in the documentary response issued to the General Directorate of Civil Aviation (DGAC) with Official Letter <i>No. ARCOTEL-ARCOTEL-2022-0103-OF</i>, dated 17 March 2022.</p>
7	Guyana	<p>Currently, there is no 5G network system in operation within 3 NM of Guyana's international airports. The Guyana Civil Aviation Authority (GCAA) has contacted the Guyana Telecommunications Agency to develop and implement a plan to maintain this status to the extent possible and to facilitate necessary regulations where appropriate. Guyana will keep the SAM Regional Office informed of these plans as they become available.</p>
8	Panama	<p>Consultations were made with the National Authority for Public Services, the entity responsible for assigning radio frequencies in Panama and, in accordance with the National Frequency Allocation Plan, the 4.2 - 4.4 GHz band is assigned to the Aeronautical Mobile and Aeronautical Radio Navigation Service, for the exclusive use of the Civil Aeronautical Authority, in accordance with ICAO recommendations. In this sense, Panama is not affected by the 5G system, since the radio altimeter band is protected exclusively for aeronautical uses.</p>
9	Paraguay	<p>The regulatory body for the use of spectrum in Paraguay (CONATEL) has informed that there is still no deployment of International Mobile Telecommunications (IMT) systems, using 5G technology in any frequency band, so that, once the frequency bands for the deployment of new IMT system technologies have been defined, additional mitigation measures could be adopted, such as the establishment of operating areas with reduced powers, the use of antennas with orientation, inclination and radiation pattern that reduce the probability of occurrence of harmful interference, as well as other international provisions and recommendations in force.</p>

No.	State	Comments
10	Peru	<p>Through a press release dated 13 April 2021, the Ministry of Transport and Communications authorized the implementation of 5G technology to three telecommunications operators (Claro, Entel and Movistar). In this press release, the Vice Minister of Communications indicated that It would be done under the NSA standard (over existing networks) in the previously assigned spectrum blocks in the 1.7 GHz, 2.1 GHz, 2.5 GHz and 3.5 GHz bands.</p> <p>Contact was made with the main national air operators who are taking preventive measures on the possible impact of 5G technology on radio altimeters and others, in coordination with the manufacturers of their aircraft, communicating them to their organizations through Operational Circulars and Safety Alerts.</p> <p>Meetings have been planned with the competent technical areas of the General Directorate of Civil Aeronautics (DGAC) and the General Directorate of Policies and Regulation in Communications and the General Directorate of Communications Programs and Projects to learn about the planning regarding the implementation of 5G technology in the Peruvian State, as well as the mitigation measures planned to avoid possible effects on aircraft radio altimeters.</p>
11	Suriname	<p>This matter was discussed in a meeting with the Telecommunications Authority of Suriname.</p> <p>They confirmed that the 5G network was introduced in Suriname earlier this year. However, they indicated that this was implemented in Paramaribo. There are no 5G transmitters located within a 45 km radius of the international airport (Johan Adolf Pengel Airport, SMJP).</p> <p>The Civil Aviation Authority has requested that, with plans to expand 5G services, it be consulted in order to mitigate potential impacts on air navigation services.</p>
12	Uruguay	<p>The Communications Services Regulatory Unit (URSEC) was informed on the safety risk for aviation, which entails assigning the use of the 5G band from 3.7 to 3.98 Ghz.</p> <p>It was considered to create a coordinated and joint work instance between the National Directorate of Civil Aviation and Aeronautical Infrastructure (DINACIA) and URSEC so that, if necessary, the authorization of transceiver installations in the 5G band from 3.7 to 3.98 GHz is possible, taking into account its geographical location, power and antenna radiation pattern, so that they do not constitute a factor affecting safe air operations using radio altimeters.</p> <p>In addition, a publication was made of the location of the transceivers working in the 5G band from 3.7 to 3.98 GHz so that operators know the location of probable sources of interference to radio altimeters.</p> <p>Advisory circulars were also issued, if necessary, regarding the possibility of interference in the radio altimeter that could affect the safe operation of aircraft, so that operators take the corresponding precautions.</p>
13	Venezuela	<p>After evaluating the National Table of Frequency Band Allocation published by the National Telecommunications Commission (CONATEL), it was determined that, at present, the frequency bands in which radio altimeters operate by 5G technologies are not in use; that there are not any short-term projects for the installation of the aforementioned technology in the territory of Venezuela, hence aircraft operations in the State will not be affected.</p>