澳門特別行政區 REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU



Number: SN-2023/01

Issued: 01 February 2023

SAFETY NOTICE

SUBJECT: Potential risk of interference to radio altimeters from 5G cellular broadband technologies

GENERAL: Safety Notices (SNs) are issued by the Civil Aviation Authority – Macao, China to convey advisory information to Macao aviation entities to enhance safety. SNs contain safety-related recommendations, guidance and/or industrial best practices to specific subjects which may or may not have been addressed by established requirements and regulations.

RELATED REGULATIONS: Sixth Schedule of the Air Navigation Regulation of Macao (ANRM); Aeronautical Circular no. AC/OPS/031

APPLICABILITY: This SN applies to all Macao air operators.

CANCELLATION: This SN supersedes SN-2022/03 dated 07 March 2022 .

REFERENCES: The following material was referred to for the development of this SN:

- ICAO State Letter SP 74/1-21/22
- EASA Safety Information Bulletin No. 2021-16
- United Kingdom CAA Safety Notice No. SN–2021/017
- CASA Airworthiness Bulletin AWB 34-020 Issue 7
- RTCA Paper No. 274-20/PMC-2073
- ICAO RASG-APAC/12-WP/22

1. Introduction

1.1 This Safety Notice is issued to raise air operator's safety awareness, provide information and guidance for operators on the potential risk of interference to radio altimeter (RA) from 5G cellular broadband technologies.

2. Background

- 2.1 The RA is a critical aircraft safety system as required in the sixth schedule of the ANRM. It provides critical data for the safe execution of aircraft operation.
- 2.2 A number of states and regions are currently considering or have already begun deploying 5G cellular broadband technologies. Some of the 5G networks are operating in the C-band, at

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frequencies that are close to the frequencies utilised by the RA (4.2 to 4.4 GHz) installed on many aircraft. Concerns have been raised that RA may be prone to interference from 5G telecommunications frequencies that could result in loss or malfunction of RA functionality.

2.3 AACM has been closely monitoring the global development of the subject.

3. 5G in Macao

- 3.1 5G service has been launched in Macao since November 2022.
- 3.2 The AACM, has conveyed the potential safety concerns regarding interference of 5G ground stations to RA to Macao Post and Telecommunications Bureau (CTT).
- 3.3 According to CTT, the frequencies that can be used for 5G services in Macao are 703-743 / 758-798 MHz, 3.3-3.4 GHz, 3.4-3.6 GHz, 4.8-4.93 GHz, 24.25-27.5 GHz, 27.5-28.35 GHz, etc ¹. These frequencies are well away from the RA frequencies of 4.2-4.4 GHz.
- 3.4 At this stage, there is no safety risk of unsafe RA interference by 5G ground stations has been identified in Macao.

4. Operations in the USA

4.1 The AACM acknowledges the Federal Aviation Administration's ("FAA") assessment of the increased risk specific to the United States, along with the release of the associated Airworthiness Directives ("AD") and the potential for FAA to publish NOTAMs prohibiting certain operations. FAA ADs 2021-23-12 and 2021-23-13 must therefore be followed when operating in the USA where a NOTAM is in place.

5. Recommended Actions

- 5.1 Operators should ensure their flight crew are aware of the possible implications of RA malfunctions for the types of aircraft operated; this may be particularly relevant when conducting Low Visibility Operations and RNP Authorization Required Approaches.
- 5.2 Whilst being reminded of the obligation to comply with the laws, regulations and procedures of those States in which operations are conducted, operators should pay particular attention to any information promulgated by the State of the Aerodrome (e.g. through NOTAMs) prohibiting instrument approach procedures. Such NOTAMs might significantly affect the approach and landing capability and can be issued without prior notice.

¹ Radio Spectrum (2021, December 12). Macao Post and Telecommunications Bureau. <u>https://telecommunications.ctt.gov.mo/5g/en/article/radio/</u>

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CIVIL AVIATION AUTHORITY

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- 5.3 Operators should consider in their safety risk assessment potential interference from 5G ground stations that might impair the reliable functioning of RA installed on the aircraft. Among the possible mitigations, operators should:
 - (a) Consider exposing flight crews to unreliable RA scenarios in the approach and take-off phases of recurrent flight training sessions conducted in the Flight Simulation Training Devices. Such mitigation is particularly relevant in case flight crews undergo Low Visibility Operations training as per Aeronautical Circular no. AC/OPS/031.
 - (b) Whatever the type of approach conducted, ensure awareness of the crews of the potential degradation in the performance of installed RA and of other systems dependent on data from RA.
- 5.4 Flight crew experiencing RA or auto-flight malfunctions should not assume that this has been caused by 5G interference and should follow normal operating procedures for any malfunctions or failures. Although flight crew should be aware of the possibility of 5G interference, any malfunctions observed may well be caused by other factors such as RA and associated antenna technical failures, for example, due to poor antenna bonding, water ingress or poor antenna cable connections. It is therefore essential that the appropriate maintenance actions continue to be performed in response to a report of anomalous RA behaviour.
- 5.5 Operators are responsible for ensuring compliance with Aeronautical Circular no. AC/OPS/032 regarding the use of Portable Electronic Devices on board an aircraft.
- 5.6 Safety reporting
 - 5.6.1 Any flight crew observations of RA or auto-flight malfunction should be reported using normal company safety reporting procedures. Flight crew should include as much detail regarding the type of malfunction, including duration and location (particularly if during an approach or departure phase), the runway in use and the height above the ground that the malfunction was observed.
 - 5.6.2 Ensure that events of anomalous RA behaviour, including results of the defect investigation and rectification, are reported to the aircraft manufacturer without delay.
 - 5.6.3 Reports of consistent anomalous RA behaviour in approximately the same location could be an indication of potential interference. Individual cases may however be due to other causes than interference from 5G ground stations. RA anomalies due to potential 5G interference shall be reported to this Authority in accordance with Aeronautical Circular no. AC/GEN/003.

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