International Civil Aviation Organization

SEVENTH MEETING OF SPECTRUM REVIEW WORKING GROUP (SRWG/7)

Bangkok, Thailand, 15-17 February 2023

Agenda Item 7: 5G and Radio Altimeter issues

POTENTIAL IMPACTS FROM 5G IMPLEMENTATION ON AIRCRAFT RADIO ALTIMETERS – OUTCOMES IN RELEVANT MEETINGS AND REGIONAL UPDATES

(Presented by the Secretariat)

SUMMARY

This paper presents the discussion in APAC after SRWG/6, other than APANPIRG and its contributory bodies which discussed in WP/02 of this Meeting, about 5G implementation and potential impacts on aircraft radio altimeters, and relevant regional updates.

1. INTRODUCTION

1.1 The concerns about potential interference to radio altimeters onboard aircraft due to implementation of new cellular broadband technologies, such as 5G, in the frequency bands close to the radio altimeter's frequencies of operation have been identified globally and in ICAO meetings.

1.2 This paper summarized the discussions in APAC Region on the topic after SRWG/6. Information on forums of discussions is given below.

1.3 The 12th Meeting of Regional Aviation Safety Group – Asia and Pacific (RASG-APAC/12) held from 17 - 18 November 2022 in Bangkok, Thailand with hybrid participation, reviewed the potential impacts from 5G Implementation on Aircraft Radio Altimeters shared by certain APAC States. The report and papers of RASG-APAC/12 are available at
https://www.icao.int/APAC/Meetings/Pages/2022-RASG-APAC12.aspx

1.4 The 14th and 15th Meetings of Frequency Spectrum Management Panel Working Group (FSMP WG/14 and FSMP WG/15), which were held respectively on 25-29 April 2022 and 22 August - 1 September 2022 discussed various issues related to radio altimeters, including the status of testing, national efforts to implement broadband mobile near 4.2-4.4GHz and outcome from the correspondence group on radio altimeters. In connection, leveraging in part the work performed during the meeting of FSMP WG/15, the 3rd Meeting of FSMP (FSMP/3) was held virtually on 7 September 2022 reviewed the brief status report of FSMP WG/15, including status of development of SARPs describing the radio frequency and interference rejection characteristics for Radio Altimeters, and other status of Frequency-related Job Cards.

1.5 The report and papers of FSMP WG/14, FSMP WG/15 and FSMP/3 are available at https://www.icao.int/safety/FSMP/MeetingDocs/FSMP%20WG14/ https://www.icao.int/safety/FSMP/MeetingDocs/FSMP%20WG15/ and https://www.icao.int/safety/FSMP/MeetingDocs/FSMP-3/ respectively.

2. DISCUSSION

Discussions in RASG-APAC/12

2.1 Two papers were discussed related to the topic – ICAO Asia Pacific Regional 5G Interference Workshop presented by Boeing (WP/22) and Outcomes from CNS SG/26 Meeting presented by ICAO APAC CNS Secretariat (WP/23)

2.2 With the objectives of raising awareness, promoting best practices and sharing mitigation strategies with States in Asia Pacific, ICAO APAC Regional Office Safety Section organized a 5G interference workshop on 16 November 2022 with the support of the partners including Boeing, Singapore, United States, IATA and the ICAO MID Regional Office. The Workshop, conducted in a hybrid format and was attended by over 140 participants from 20 States and Administrations, provided a holistic view of the issue by covering the perspectives from regulators, the industry and aircraft manufacturers. The key takeaways include raising awareness within the aviation industry and with the telecommunications industry. The RASG-APAC/12 recommended States to work with the telecommunications regulator in respective States to proactively address potential 5G interference with aviation activity and requested ICAO to further facilitate the direct engagement between aviation regulators and the telecommunications community.

2.3 5G/Radio Altimeters issue and Frequency Interference – Outcomes from CNS SG/26 Meeting (WP/23) was presented by the Secretariat (CNS) updating RASG-APAC/12 on the discussions conducted in CNS SG/26 and its contributory bodies about 5G implementation and potential impacts on aircraft radio altimeters, as well as frequency interference issue in the Region. The RASG-APAC/12 noted with concern, on the information presented and urged States/Administrations to report to the relevant contributory bodies of the ICAO RASG-APAC in a timely manner on the events reported on the frequency interference. Singapore called for States of Design and aircraft manufacturers to, when possible, share relevant technical information with States. This would facilitate data-informed discussions between CAAs and State telecommunication authorities on the deployment of C-band 5G base stations in a manner that would minimize the risk of interference to aircraft radio altimeters in and around airports.

Discussions in FSMP WG/14 and FSMP WG/15

2.4 Under FSMP WG, the Correspondence group on radio altimeters (CG-RA) was formed to discuss on various issues and follow-ups regarding the issue of "5G" broadband mobile terrestrial interference to radar altimeters. The CG-RA has been compiling reports via IP01rev3 of FSMP WG/14 and IP08 of FSMP WG/15 to reflect the latest development of discussion being conducted on the subject. The report also included a comprehensive listing of 5G implementation activities in different countries including APAC countries. Resources to online forums for valuable discussions on the topic are also introduced in these papers.

2.5 In FSMP WG/15 there were some IPs discussed Radio Altimeter issues. IP03 of FSMP WG/15 provided radio altimeter (RA) interference susceptibility characteristics as measured at Japanese Sub-6 frequency conditions. Japanese Sub-6 frequency bands are 3.7 GHz–4.1 GHz and 4.5 GHz–4.6 GHz, (i.e., both sides of the RA band with the 100 MHz guard band). In particular in-band and out-of-

band electromagnetic interference susceptibility was measured for 12 RAs used by large fixed-wing aircraft and 8 RAs used by medium/small fixed-wing aircraft and helicopters. The measurement procedures and the interference criteria were fundamentally same as those described in the RTCA 5G Interference Assessment Report, and ARINC429 altitude output or analog voltage output were obtained and evaluated.

2.6 IP07 of FSMP WG/15 provided an initial comparison of published RF performance data for aviation and non-aviation receivers operating adjacently in the C-band. The intent was to show that in terms of adjacent band signal rejection, the radio altimeters were in general better than the performance specified in the 3GPP mobile standards. The meeting appreciated the analysis and noted it would be useful material to counter current criticism in some fora that "altimeters are looking outside their band".

2.7 IP09 of FSMP WG/15 noted that ICAO has received studies from several States and organizations regarding the potential for 5G interference to radio altimeters. Those studies generally concluded that some models of radio altimeters will not operate as required if new cellular broadband technologies (5G) are deployed in frequency bands close to the frequencies used by radio altimeter's operation (4.2-4.4 GHz). In reply to a request from the Secretariat of the ICAO HQ and considering the importance of this topic globally, the RADALT AG and ICAO MID office developed the draft guidance material presented in the IP and provided to FSMP for their information. The draft guidance material addressed both technical issues and operational impacts, and it was suggested to be updated and form the basis for an electronic bulletin or manual on the topic.

Discussions in FSMP/3

2.8 The FSMP/3 meeting held virtually on 7 September 2022, reviewed the outcomes from FSMP WG/15, endorsed proposal of amendments for SARPs and guidance to prevent interference between Wireless Avionics Intra-Communication (WAIC) Systems and Radio Altimeters, reviewed/updated job cards and discussed future work programme of FSMP, including Radio Altimeter related items.

2.9 The FSMP/3 meeting adopted several Recommendations, including the following related to update of Radio Altimeter related job cards:-

Recommendation 5/6 Amend Job-Card FSMP.006.01 - Develop radio frequency and interference rejection characteristics for radio altimeters

That this Job Card be amended as shown in the Appendix to the report on this agenda item. The "Document Affected" column has been modified to indicate Annex 10 Volume V as the intended target for the deliverable and the on-going work developing radio altimeter (RA) guidance within EUROCAE and RTCA is being reflected. The Action field has been superseded by the on-going RA/5G mitigations. Given the current progress of work within EUROCAE and RTCA it is envisioned that the RA SARPs deliverable out of FSMP will be finalized by 2025.

Recommendation 5/7 Amend Job-Card FSMP.007.01 - Develop and maintain SARPs and guidance to prevent WAIC / Radio Altimeter interference

That this Job Card be amended as shown in the Appendix to the report on this agenda item. Noting the agreed new WAIC SARPs deliverable, the Job-Card FSMP.007.01 was touched to reflect the deliverable being envisaged for Annex 10 Volume V and to indicate the envisaged effective and applicability dates of the new SARPs.

2.10 In addition, it was reported in the meeting that the work on minimum operational performance standards (MOPS) by a joint committee of EUROCAE and RTCA is ongoing, with two deliverables foreseen, RTCA DO-xxx "Guidance Document on Radar Altimeter Radio Frequency (RF) Interference Rejection and Tolerance"; and RTCA DO-155A "MOPS for Low Range Radar Altimeters" (these documents will also have corresponding EUROCAE "ED" numbers). The interim work package, looking at possible performance standards, was foreseen to be finalized by the end of 2022 and the outcome will correspondingly be captured in the EUROCAE/RTCA standards by the end of 2023. The meeting agreed that the high level Radio Altimeter SARPs, which will leverage and support the outcome of this work, would need two meetings in 2024 for finalization. Correspondingly, FSMP/4 was tentatively scheduled for Q2 2025, the main goal of that meeting being to finalize the initial Radio Altimeter SARPs deliverable to the ANC for a preliminary review.

Summary

2.11 CNS Section of ICAO APAC Regional Office has received ZERO report on such interference in radio altimeter from the Member States or IATA so far. As a reminder of agreement in CNS SG/25, Member States would keep an eye on monitoring the impact of 5G on radio altimeters in their States/Administration with reference to the safety and frequency spectrum issues. In parallel, it was advised that Member States CAA and airworthiness office may collect all relevant information and past issues reported, if any, and inform RASG-APAC in case of any significant concern. The issues related to frequency spectrum may be brought to the attention of CNS section of the ICAO APAC Office for further coordination with RASG-APAC and ICAO Headquarters.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) report to the relevant contributory bodies of the ICAO RASG-APAC in a timely manner for events on interference to radio altimeters;

c) report issues related to frequency spectrum to the CNS section of the ICAO APAC Office for further coordination with concerned parties; and

d) discuss any relevant matter as appropriate.

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