

## **ATTACHMENT A – RESPONSE TO ISSUES FOR COMMENT**

- 1. Comment is sought on the case for action and desirable planning outcomes for the 3700–4200 MHz band, including the supporting information at Appendices A, B and C.*

### **Need to ensure coexistence with radio altimeter in the 4200-4400 MHz band**

Airservices Australia (Airservices) supports the introduction of wide area (WA) wireless broadband (WBB) and local area (LA) WBB in parts of the 3700-4200 MHz band provided coexistence is clearly demonstrated between WBB and radio altimeter (RA) operating in the adjacent 4200-4400 MHz band.

RAs are critical sensors on commercial aircraft and many civil aircraft used to enable safety and navigation functions throughout all phases of flight. These functions include terrain awareness warning systems (TAWS), traffic collision avoidance systems (TCAS) and airborne collision avoidance systems (ACAS), and auto-land systems including auto-throttle and automated landing flare manoeuvres. RA is the only sensor on-board an aircraft that provides a direct measurement of the clearance height above the terrain providing situational awareness to the flight crew. Loss of situational awareness for the flight crew can lead to controlled flight into terrain (CFIT) in extreme cases. Measurements from the RA are also used by automatic flight control systems (AFCS) during instrument approaches, and to control the display of information from other systems, such as predictive wind shear (PWS), the engine-indicating and crew-alerting system (EICAS), and electronic centralised aircraft monitoring (ECAM) systems.

RA systems remain active for all phases of flight and are designed to operate for the entire life of the aircraft in which they are installed. The installed life can exceed 30 years, resulting in a wide range of equipment age, performance and tolerance. RAs have successfully operated on-board civil and commercial aircraft since their widespread introduction in the 1970s, without any substantial issues or incidents related to harmful RF interference. This is mainly due to the international protection of the 4200-4400 MHz band, along with the adjacent-band RF interference environment being quite benign, consisting mainly of fixed service (FS) and fixed-satellite service (FSS) links. The existing RA minimum operational performance standards (MOPS) do not include any specific performance requirements to ensure protection from adjacent-band interference, and no updates to the MOPS to include such requirements were previously considered necessary, given the decades of successful operation.

### **Appendix A – Summary of submissions (Question 16)**

Airservices comments on Appendix A, summary of submissions to consultation “Planning of the 3700-4200 MHz band” released on 7 August 2019, are specifically in regards responses to Question 16. This question asked whether there is, “any additional information available that would assist the ACMA in assessing compatibility of potential new WBB services in the 3700–4200 MHz band with WAIC and radio altimeter systems in the 4200–4400 MHz band.”

Airservices response to the consultation “Planning of the 3700-4200 MHz band” agreed with the ACMA that existing studies provided different conclusions noting that it is difficult to summarise the behaviour of the wide range of RA equipment deployed. In the response we indicated that the International Civil Aviation Organization (ICAO) may develop recommended practices to assist in coexistent assessment by early 2020, and that mitigation such as power and geographical restrictions may be required. Both Boeing Australia and Lockheed Martin Australia believed that sharing and compatibility studies need to be undertaken by the ACMA before any consideration of WBB in the 3700–4200 MHz band, noting that large guard bands were likely required.

The ICAO Frequency Spectrum Management Panel (FSMP) has issued a job card for the development of RA selectivity masks and Standards and Recommended Practices (SARPs) for RA systems in response to ITU-R activities considering the introduction of mobile broadband systems in bands adjacent to the 4200–4400 MHz band. However, this work will not assist ACMA in the current replanning of the 3700-4200 MHz band, as the RA SARPs will be high-level and likely only apply to future RA and not to

currently fielded equipment. ICAO is fully aware that RA deployed on new aircraft should have better performance to limit adjacent band emissions, as the adjacent-band RF interference environment is different from when RA was first introduced on aircraft in the 1970s. It is anticipated that the RA selectivity mask and draft SARPs will be developed by Q1 2021.

In the comments on Appendix C below further details are provided on significant international activities underway that will assist the ACMA in assessing compatibility of potential new WBB services in the 3700–4200 MHz band with RA systems and wireless avionics intra-communications (WAIC) in the 4200–4400 MHz band.

#### **Appendix B – Domestic issues (Arrangements in the 4200–4400 MHz band)**

Arrangements in the 4200–4400 MHz band have not changed since the release of the 2019 discussion paper. The Australian Radiofrequency Spectrum Plan 2017 allocates the 4200–4400 MHz band to aeronautical radionavigation and aeronautical mobile receive services (ARNS and AM(R)S). Aircraft currently operate RA systems in the band in order to determine their altitude and WAIC system standards are currently being developed by industry. RA systems and WAIC systems, once fitted to aircraft, are licensed under the Radiocommunications (Aircraft and Aeronautical Mobile Stations) Class Licence 2016. As ARNS and AM(R)S operating in the 4200–4400 MHz band are for safety of life, any changes to the in the 3700–4200 MHz band need to consider and afford protection to these services.

#### **Appendix C – Technical issues (Coexistence between WBB and RA)**

Aviation is currently conducting RA studies in a number of different fora. Efforts are underway through standards development organisations to update the existing RA MOPS. RTCA Special Committee 239 (SC-239) and EUROCAE Working Group 119 (WG-119) were established in December 2019 and January 2020, respectively, to address concerns about interference to RA caused by the introduction of WAIC systems operating in the 4200–4400 MHz band, as well as potential interference arising from proposed changes to allocations in adjacent frequency bands to facilitate WBB.

RTCA's SC-239 5G Task Group is currently assessing the effect of 5G operations in the 3700–3980 MHz band to RA in the 4200–4400 MHz band in the United States (US) and a 5G interference assessment report is expected to be approved by 21 September 2020. This work is being performed in cooperation with a multi-stakeholder group (MSG) to develop recommendations for mitigation that might be necessary in the deployment of new services in 3700–3980 MHz band to ensure continued safe operation of RAs.<sup>1</sup> Technical WG 3 (TWG-3) of the MSG is dedicated to the issue of coexistence with aviation systems. TWG-3 participants include several representatives from the aviation industry, most of whom are also active participants in RTCA SC-239, as well as several representatives from the mobile wireless industry. The primary role of TWG-3 has been to facilitate the exchange of technical information between subject matter experts in the aviation and wireless industries. Whilst the 5G deployments in the US will be different to other countries, the development of RA performance information in defining the studies will be one of the most thorough available and applicable internationally. The RTCA work has taken many months with input from all major manufacturers, airframers and operators (from the US and other administrations).

Further, work is occurring in Europe's CEPT Electronics Communications Committee (ECC) on IMT systems currently operating or planned to operate in the 3400–3800 MHz band in Europe. In July 2020 ICAO sent a liaison statement to the ECC, expressing concern about possible interference from 5G to RAs, taking into account emission limits of already existing European regulation. The issue relates to the fact that there is no specific limit of unwanted emissions from IMT base stations defined within the 4200–4400 MHz band. Using the operational and technical characteristics contained in ITU-R Recommendation M.2059 and applying the out-of-band emission limits contained within the

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<sup>1</sup> The FCC Report and Order released 3 March 2020 recommended that a multi-stakeholder industry group be established to coordinate on any outstanding issues related to the reallocation of the 3700–4200 MHz band prior to the spectrum auction, including any potential coexistence issues with radar altimeters.

[European Commission implementing Decision \(EU\) 2019/235](#) results in the following separation distances between WBB operating in the 3400-3800 MHz band and RA in the 4200-4400 MHz band:<sup>2</sup>

- For an active antenna systems (AAS), a separation distance of more than 27 km is required (when including a 6 dB safety margin); and
- For a non-AAS, a separation distance of more than 5.5 km (when applying a 6 dB safety margin).

The issue was referred to ECC Project Team 1 (PT1) (IMT Matters), and ICAO was invited to participate and provide information on RA characteristics and operational scenarios. Elements for an ICAO response was prepared at the 10<sup>th</sup> meeting of the FSMP WG (FSMP-WG/10) from 17-25 August 2020. The ICAO response to the ECC PT1 indicates that most technical characteristics for RAs operating within the 4200-4400 MHz band can be found in Recommendation ITU-R M.2059. The response provides additional information on antenna patterns for RA and relevant scenarios to consider such as, the base station scenario for general aircraft, commercial aircraft landing and medical helicopter landing; and the user equipment scenario for general aircraft and operations inside the cabin of an aircraft. ICAO recommends using the aeronautical safety margin when assessing the impact of 5G unwanted emissions into the radio altimeter. The ECC PT1 will consider this paper at its September 2020 meeting and will report outcomes back to the ECC.

The technical parameters and operational scenarios considered in the above international work should be taken into account by the ACMA when undertaking compatibility studies on coexistence of WBB in the 3700-4200 MHz band and RA operating in the 4200-4400 MHz band. Potential risk and operational impacts of interference to RAs from WBB operations near the 4200-4400 MHz band should take account interference from base stations, user equipment located on the ground, and user equipment located on-board an aircraft. The ACMA view on an appropriate guard band between WBB services in the 3700-4200 MHz band and RAs in the 4200-4400 MHz band should not be pre-determined until the above international work is finalised and agreed.

Finally, as mentioned previously, the ICAO FSMP is developing a RA selectivity mask for SARPs that will apply to future RA systems. Until recently there has been no need for RA SARPs as there are no technical interoperability requirements for RA. A variety of systems used in aviation, especially “self-contained avionics systems” such as RA, do not have clear visibility in ICAO documentation, and Annex 10 in particular.<sup>3</sup> The aviation sector has so far been satisfied with the protection afforded to RA operation through ITU-R Recommendation M.2059. The RTCA/EUROCAE work on revised MOPS will be incorporated into the high-level RA SARPs being developed by ICAO. This will allow the guard band between WBB and RA to reduce in the future once all aircraft are fitted with new RA systems.

*2. Comments is sought on the proposed options, including appropriate values for frequency segment breakpoints as well as any alternative options.*

Airservices’ preferred option is Option 3 as it allows for WBB both exclusively and shared with existing services in some segments, with no change to current arrangements in the remaining segment. Specifically, Option 3 limits the deployment of WA WBB to metropolitan and regional areas in the 3700-3800 MHz band, with LA WBB deployment limited to remotes areas in the 3700-3800 MHz band, and Australia-wide in the 3800-3900/4000 MHz band. This leaves the current arrangements unchanged in the 3900/4000-4200 MHz band. Airservices supports this option as it provides the greatest guard band between WA WBB deployments and RA systems in metropolitan and regional areas, where major airports are located and aircraft are likely to use RA systems for landing.

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<sup>2</sup> EU 2019/235 of 24 January 2019 amends Decision 2008/411/EC in regards relevant technical conditions applicable to the 3400-3800 MHz band (defines baseline power limits below 3400 MHz and above 3800 MHz)

<sup>3</sup> Annex 10 tends to focus on systems with aircraft and ground or space-based components, with requirements allocated to system elements to ensure safety and interoperability.

Airservices believes that until international compatibility studies between WBB and RA are finalised and agreed that the sensible decision on the frequency segment breakpoint is to make it 3900 MHz. This will provide a 300 MHz guard band between WBB and critical RA systems that must be afforded protection as a safety service. Once international studies using RA operational scenarios and appropriate technical characteristics for both RA systems and WBB, the frequency segment breakpoint could shift to 4000 MHz if it is shown that there is no impact on RA systems in the adjacent band. This may require the use of technical conditions on the LA WBB (such as lower powers) to achieve coexistence between WBB and RA.

*3. Comment is sought on possible variations to the proposed options and implementation considerations.*

Airservices could support the proposed variation to clear incumbent services (point-to-point links and the FSS) in low incumbency metropolitan areas (Melbourne, Canberra, Adelaide and Brisbane) in the 3800-3900/4000 MHz segment, keeping shared arrangements proposed in Perth, Sydney, regional and remote, provided Option 3 implementation is adopted. Again, the frequency segment breakpoint should be 3900 MHz until coexistence between WBB and RA systems in the adjacent band is ensured.

At this stage, Airservices does not support coordinated LA WBB deployments in parts of the band that allowed shared arrangements above 3900/4000 MHz. Agreed studies need to clearly demonstrate that there is protection of RA in adjacent bands, including any mitigation required, before this variation can be explored further.

*4. Comment is sought on the discussion and outcomes of the assessment of options, including the cost benefit analysis and its assumptions. This includes any evidence for the value placed on the band for WBB and FSS use.*

No comment.

*5. The ACMA invites comment on its preliminary preferred option.*

Airservices supports ACMA's preferred option (Option 3) although has concerns that the ACMA already considers a guard band of no more than 200 MHz is sufficient, without completion of suitable adjacent band compatibility studies.

Airservices agrees that coexistence with adjacent band RAs operating above 4200 MHz could be enabled via the implementation of a suitable guard band and possibly coordination criteria. As indicated above, a lot of work is currently happening internationally considering the impact on RA from new services in the 3700–4200 MHz band. Both Europe and the US are reviewing RA technical parameters and performance in specific operational scenarios. This work needs to be carefully reviewed by the ACMA noting that the deployment of WBB in various countries differs resulting in different outcomes. The option of smaller guard bands (potentially with coordination arrangements) should only be considered when more detailed parameters for RAs performance are obtained.