



SAIB: AIR-21-18R1

Date: December 23, 2021

SUBJ: Risk of Potential Adverse Effects on Radio Altimeters

This document contains information and recommended action. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies.

Introduction

This Special Airworthiness Information Bulletin (SAIB) informs aircraft manufacturers, radio altimeter manufacturers, operators, and pilots of the planned deployment of wireless broadband networks in the 3700-3980 MHz bands (C-Band).¹ C-Band wireless broadband deployment is permitted to occur in phases with the opportunity for operations in the lower 100 megahertz of the band (3.7-3.8 GHz) in 46 markets beginning as soon as December 5, 2021; however, the FAA does not expect actual deployment to commence until January 5, 2022. This SAIB recommends that radio altimeter manufacturers, aircraft manufacturers, and operators voluntarily provide to federal authorities specific information related to altimeter design and functionality, specifics on deployment and usage of radio altimeters in aircraft, and that they test and assess their equipment in conjunction with federal authorities. Results from that testing and assessment should be reported to the appropriate civil aviation authorities (CAAs) and spectrum regulators. The FAA is currently collaborating with the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA) to assess the need for mitigation beyond the recommended action in this SAIB.

Background

For the past 15 years, the 3 GHz band globally has been the subject of harmonization activity for mobile broadband, both at the International Telecommunication Union and within regional groups. A number of countries already have allocated and assigned spectrum for wireless deployments in the 3 GHz range and additional countries are following suit. Many countries around the world are already deploying wireless networks in the bands from 3300-4200 MHz; some countries have implemented temporary technical, regulatory and operational mitigations, including temporary proximity and power restrictions, on wireless broadband networks operating in bands ranging from 3700-4200 MHz. There have not yet been proven reports of harmful interference due to wireless broadband operations internationally, although this issue is continuing to be studied. In the United States, there has been wireless broadband deployment in the 3.65-3.7 GHz band since 2007. The FCC started a proceeding to authorize mobile broadband service in the 3.55-3.7 GHz band in December 2012 and adopted final rules in April 2015 and October 2018. Commercial deployment started in September 2019, with no known issues for altimeters to date.

With respect to 3.7-4.2 GHz, the FCC first sought comment on introducing mobile broadband into the band in 2017. In March 2018, the MOBILE NOW Act directed the FCC to evaluate the feasibility of commercial wireless deployments in the 3.7-4.2 GHz range. The FCC started a proceeding in May 2018 and adopted the C-band Report and Order authorizing flexible use of the 3.7-3.98 GHz band in March 2020. In February 2021, the FCC completed an auction of the 3.7-3.98 GHz frequency band and subsequently issued licenses to several wireless network providers subject to license conditions

¹ This revision clarifies the radio altimeter anomaly reporting request.

about deployment timing and parameters. Under the FCC’s rules, actual wireless broadband deployment will occur in phases with operations beginning only in the lower 100 megahertz of the band (3700-3800 MHz) and only in 46 markets as soon as December 5, 2021. (See 47 CFR § 27.1412(b)(1), which specifies the 46 market areas as Partial Economic Areas (PEAs) 1-4, 6-10, 12-19, 21-41, and 43-50. A list of PEAs is available at <https://www.fcc.gov/oet/maps/areas>).

Radio altimeters operate between 4200-4400 MHz. Currently, the FAA’s approval process for radar altimeters is based on FAA Technical Standard Order TSO-C87A, Airborne Low-Range Radio Altimeter. TSO-C87A does not provide criteria for compatibility with adjacent band operations, including potential impacts associated with wireless communications system deployments. RTCA formed a task force to assess the interference impact of wireless broadband operations in the 3700-3980 MHz band on radio altimeters. Based on the work of the task force, RTCA published a report entitled, “Assessment of C-Band Mobile Telecommunications Interference Impact on Low Range Radar Altimeter Operations” ([RTCA Paper No. 274-20/PMC-2073](#)). Additional information about RTCA can be found at <https://www.rtca.org/about/>. The RTCA report is under review. The FAA is actively participating in the RTCA/SC-239 committee, which is developing adjacent band-compatible minimum operational performance standards (MOPS) for future radio altimeter designs. The FAA encourages radio altimeter manufacturers to participate in the international radio altimeter standards development activity conducted jointly by RTCA and EUROCAE to establish a common set of performance requirements and compliance demonstration methods to promote compatibility with the international adjacent-band spectrum environment.

The FAA is currently conducting a risk assessment to ascertain whether further mitigation is warranted in addition to the recommended actions in this SAIB. The FAA is basing its risk assessment on the conditions in the FCC Report and Order (R&O) in the Matter of Expanding Flexible Use of the 3700-4200 MHz Band (FCC 20-22) and 3GPP specification TS 38.104 V17.2.0 (2021-06). Further, in the event that wireless broadband deployment conditions evolve, if the FAA becomes aware of further relevant information or guidance, or if additional information further validates or invalidates concerns of potential harmful interference, the FAA will update its risk assessment.

Therefore, in preparation for the December 2021 wireless network deployment in the 3700-3800 MHz band, the FAA recommends the following actions and requests that affected parties voluntarily submit information for consideration by the FAA, FCC and NTIA prior to the planned wireless network deployments:

Radio Altimeter Manufacturers

1. We request that radio altimeter manufacturers submit receiver radiofrequency (RF) selectivity, interference tolerance masks, and baseline operational specifications for each model number in production or still in use, and approximate numbers of each radio altimeter model currently in service in the United States; and, if appropriate, mark submissions as proprietary. This information can be submitted to the FAA at OperationalSafety@faa.gov and should indicate “Radio Altimeter SAIB” in the subject line. The FAA will provide any information you submit to the FCC and NTIA subject to those agencies’ processes for protection of confidential information, where such protection is requested.
2. We recommend radio altimeter manufacturers complete analysis or testing of each model number either in production, supported, or still being employed, to determine the susceptibility to interference from fundamental emissions in 3700-3800 MHz which is available for wireless broadband in December of 2021 and the full 3700-3980 MHz band which will become available later, as well as potential spurious emissions in the 4200-4400 MHz band, and assess this susceptibility for compatibility with the adjacent spectrum environment in accordance with the FCC R&O and 3GPP specification, as well as the

environment in other countries in which each radio altimeter could be operated. We encourage radio altimeter manufacturers to work with the FAA to facilitate this process.

3. Report instances of erroneous altimeter performance to the FAA and FCC, or other appropriate civil aviation authorities (CAAs) and spectrum regulators. If the equipment is susceptible to harmful interference, determine what design changes are necessary to remediate.
4. Collaborate with aircraft manufacturers on design changes and issue guidance to operators on potential retrofit plans for radio altimeters susceptible to harmful interference, if necessary.
5. Determine any necessary operational restrictions or actions needed to address in-flight radio altimeter anomalies in order to maintain safe operations with radio altimeter equipment susceptible to harmful interference and communicate this information to CAAs, operators, and pilots.

Aircraft Manufacturers

1. We request that aircraft manufacturers submit approximate numbers of each radio altimeter model installed on each aircraft currently in service in the United States; and, if appropriate, mark submissions as proprietary. This information can be submitted to the FAA at OperationalSafety@faa.gov and should indicate “Radio Altimeter SAIB” in the subject line. The FAA will provide any information you submit to the FCC and NTIA subject to those agencies’ processes for protection of confidential information, where such protection is requested.
2. Communicate with radio altimeter suppliers and the FAA to ascertain equipment susceptibility to harmful interference caused by fundamental emissions in the 3700-3800 MHz and 3700-3980 MHz band, as well as spurious emissions in the 4200-4400 MHz band. We encourage aircraft manufacturers to work with the FAA to facilitate this process.
3. Conduct testing and analysis of the effects of loss of function, and erroneous or misleading radio altimeter data from potential harmful interference caused by fundamental emissions in the 3700-3800 MHz and 3700-3980 MHz band, as well as spurious emissions in the 4200-4400 MHz band, due to wireless broadband deployment. We encourage aircraft manufacturers to work with the FAA to facilitate this process.
4. Evaluate the potential for harmful interference on the different types of aircraft in the manufacturer’s fleet based on aircraft architecture and radio altimeter integration, including cascading effects.
5. Determine any operational restrictions necessary or actions to take to maintain safe operations with radio altimeter equipment susceptible to harmful interference due to wireless broadband operation in the 3700-3800 MHz band. Restrictions and other actions should address all systems that use the radio altimeter. Information regarding such restrictions or other actions should be communicated to operators, pilots, and each CAA for the country in which the aircraft operates. Revise aircraft flight manual procedures, if appropriate.
6. Update operators’ anomaly reporting process to ensure accurate recording and reporting of erroneous radio altimeter readings to the aircraft manufacturer.
7. Collaborate with radio altimeter manufacturers and issue guidance to operators on retrofit plans for radio altimeters susceptible to harmful interference due to wireless broadband operation in the 3700-3800 MHz band.

Operators and Pilots

1. Review the 14 CFR Part 5 requirements for Part 121 certificate holders, if appropriate. Other certificate holders should use the Safety Management Systems (SMS) tools to assess the risk to each type of radio altimeter configuration and how it impacts typical flight operations.
2. Remind passengers that all portable electronic devices allowed for transport in checked baggage (including smartphones and other devices) should be turned off and protected from accidental activation and that compliance is mandatory for lithium battery-powered portable

- electronic devices. *See* 49 CFR 175.10(a)(18).
3. Remind passengers to set all portable electronic devices in the cabin and any carried on the aircraft to a non-transmitting mode or turn them off. *See* 14 CFR 91.21, 121.306, 125.204 and 135.144.
 4. Seek information from the manufacturers of the aircraft and the radio altimeter on possible effects of harmful interference due to wireless broadband deployment in the 3700-3800 MHz band and possible pilot interventions.
 5. Operators should ensure their pilots are aware of the potential degradation of the radio altimeter capabilities and any means to compensate for in-flight radio altimeter anomalies. Consider both erroneous altimeter readings and loss of altimeter function.
 6. Operators should ensure their pilots are aware of the potential degradation to the capabilities of safety systems and other equipment dependent upon radio altimeters and any means to compensate for resulting anomalies. Consider both the loss of function of the safety systems and other dependent systems and the manners in which they may malfunction.
 7. Operators should consider the potential loss of pilot trust in dependent aircraft safety systems in the assessment of existing and the development of new crew procedures.
 8. Operators and pilots who experience radio altimeter anomalies should notify air traffic control, as soon as practical. Post flight, pilots are encouraged to submit detailed reports of radio altimeter disruptions or interference events, as soon as practical, using the *Radio Altimeter Anomaly Reporting Form* available on the FAA website at https://www.faa.gov/air_traffic/nas/RADALT_reports/

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