



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 21

[Docket No. FAA-2023-0938]

Demonstration of Radio Altimeter Tolerant Aircraft

AGENCY: Federal Aviation Administration, DOT

ACTION: Notice of availability; final policy and disposition of comments.

SUMMARY: The Federal Aviation Administration (FAA) announces Policy Statement PS-AIR-600-39-01 for demonstrating an aircraft is a “radio altimeter tolerant airplane” or a “radio altimeter tolerant rotorcraft” using a method approved by the FAA.

DATES: This policy is effective [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].

FOR FURTHER INFORMATION CONTACT: For technical questions concerning this policy statement, contact Barbara Clark, Supervisory Aviation Safety Specialist, Avionics Navigation & Flight Deck Unit (AIR-626B), 800 Independence Ave SW, Washington, DC 20591; telephone: 2022678569; email: barbara.clark@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

The current performance standards for radio altimeters (also known as radar altimeters) are based on the presumption that no occupancy of an adjacent radio frequency spectrum would cause interference with radio altimeters. During 2021, the radio frequency (RF) operating environment surrounding radio altimeters substantially changed when wireless telecommunication service providers began offering 5G C-Band services near the 4.2 – 4.4 GHz band. In both the U.S. and internationally, this band is allocated on a primary basis for aeronautical radionavigation service, which is used by

aviation radio altimeters. The FAA subsequently determined that radio altimeters could not be relied upon to perform their intended function if they experience interference from 5G wireless broadband operations in the C-Band.

Deployment of the new 5G C-Band services prompted the FAA to address the risks posed by RF interference to radio altimeters. On December 7, 2021, the FAA issued airworthiness directive (AD) 2021-23-12¹ for transport and commuter category airplanes equipped with a radio altimeter and AD 2021-23-13² for helicopters equipped with a radio altimeter. AD 2021-23-12 and AD 2021-23-13 prohibit certain flight operations requiring radio altimeter data when flying in the presence of 5G C-Band interference as identified by Notices to Air Missions (NOTAMs). In response to AD 2021-23-12, the aviation industry developed a method to show compatibility with 5G emissions in the United States national airspace system for the initial 5G deployment, which was limited to 3.7-3.8 GHz, and the 5G spurious emissions in the radio altimeter band (4.2-4.4 GHz). The FAA accepted this method as support for proposals for alternative methods of compliance (AMOCs) with AD 2021-23-12 and AD 2021-23-13. These AMOCs used standardized assessment parameters, values, and methods to estimate an installed altimeter system protection radii or distance. Aircraft with an altimeter operating beyond this distance from all 5G base stations would not expect harmful effects from RF incompatibility and indeed could depend upon the radio altimeter system to perform fully its intended function. These AMOCs were based on interference thresholds of specific individual radio altimeter transceivers. That is, each transceiver was tested to benchmark their performance in the presence of out-of-band and in-band C-Band signals.³ The thresholds were then modified and tailored to installation factors specific to the installed

¹ Amendment 39-21810, 86 FR 69984, December 9, 2021.

² Amendment 39-21811, 86 FR 69992, December 9, 2021.

³ “In-band signals” have frequencies in the radio altimeter band of 4.2-4.4 GHz. The frequencies of “out-of-band” signals are outside of the radio altimeter band.

platform (e.g., measured antenna gains and cable losses). These values were then used to determine the necessary mitigations to protect the airport airspace most critical for the safety of operations. The mitigations included actions by wireless providers as well as flight limitations imposed by the FAA for the airspace areas identified by NOTAM, unless operating under an approved AMOC.

The deployment of new 5G C-Band stations continues. Their signals are expected to cover most of the contiguous United States at transmission frequencies between 3.7–3.98 GHz.⁴

On May 26, 2023, the FAA superseded AD 2021-23-12 with AD 2023-10-02.⁵ The flight limitations imposed by AD 2023-10-02 depend on whether an airplane has a radio altimeter system that demonstrates the tolerances specified in paragraph (g)(1) of the AD using a method approved by the FAA (i.e., whether the aircraft is a “radio altimeter tolerant airplane”).⁶

On June 22, 2023, the FAA superseded AD 2021-23-13 with AD 2023-11-07.⁷ The flight limitations imposed by AD 2023-11-07 depend on whether a rotorcraft has a radio altimeter system that demonstrates the tolerances specified in paragraph (g)(1) of the AD using a method approved by the FAA (i.e., whether the aircraft is a “radio altimeter tolerant rotorcraft”).

The FAA published a notice of availability and request for comments on proposed guidance for demonstrating an aircraft is a “radio altimeter tolerant aircraft” in the Federal Register on May 8, 2023 (88 FR 29554). The public comment period for the notice closed on June 7, 2023.

⁴ Federal Communications Commission (FCC) Report and Order FCC 20-22 in the Matter of Expanding Flexible Use of the 3.7-4.2 GHz Band, adopted February 28, 2020, and released March 3, 2020, see <https://www.fcc.gov>.

⁵ Amendment 39-22438, 88 FR 34065, May 26, 2023.

⁶ The FAA subsequently issued several ADs to address 5G interference for specific Boeing airplane models: AD 2023-12-05, AD 2023-12-10, AD 2023-12-11, AD 2023-12-12, AD 2023-12-13, AD 2023-12-14, and AD 2023-12-15.

⁷ Amendment 39-22453, 88 FR 40685, June 22, 2023.

Discussion of Comments

The FAA received comments from eight organizations: Thales Group, Airlines for America (A4A), MHI RJ Aviation ULC, Dassault Aviation (Dassault), Embraer S.A. (Embraer), the Cargo Airline Association (CAA), Gulfstream Aerospace Corporation (Gulfstream), and the Aviation Coalition. Comments fell into broad categories to include requests regarding how to show compliance; suggestions to harmonize language between the policy and the newly published ADs; statements regarding 5G bandwidth, and recommendations on content, editing, and formatting. One commenter urged the FAA to withdraw the policy.

A copy of the FAA's disposition of the public comments received is also available at [regulations.gov](https://www.regulations.gov) in Docket No. FAA-2023-0938.

A. Showing Compliance

The FAA received several comments regarding how to show compliance with the policy statement and with AD 2023-10-02 or AD 2023-11-07.

Thales Group asked if performance justifications submitted for a prior AD must be re-submitted as evidence to support compliance with AD 2023-10-02 or AD 2023-11-07. Performance justification evidence must be re-submitted to the FAA to show compliance. Performance justifications for prior ADs were approved by the FAA before the method in the policy statement was defined. Although the FAA expects that aircraft with AMOCs approved for prior ADs may be able to meet the definition of a "radio altimeter tolerant airplane" or "radio altimeter tolerant rotorcraft," design approval holders (DAHs) or operators will need to provide the FAA with data showing explicitly that the aircraft meets the tolerances in paragraph (g)(1) of AD 2023-10-02 or AD 2023-11-07 before the FAA will approve the method they propose to use. However, the FAA has updated the policy statement to clarify that data previously submitted for AMOCs

with AD 2021-23-12 or AD 2021-23-13 may be referenced to support the method in PS-AIR-600-39-01 without re-submitting the referenced documents themselves.

Gulfstream commented that the policy allows for the use of existing data and analysis, which manufacturers collected for AMOCs with AD 2021-23-12 or AD 2021-23-13, to demonstrate compliance with the new AD. The FAA acknowledges that while the use of existing data is supported, additional data and analysis is not precluded. The use of power spectral density (PSD) curves for compliance demonstration is different.

Gulfstream and CAA requested that the FAA identify the radio altimeter technologies that meet the AD requirements. Gulfstream stated the policy creates a duplicative effort and burden on the aviation community in that it asks for data the FAA already possesses based on prior AMOC approvals. CAA stated that the policy creates an undue burden on operators to coordinate with DAHs and radio altimeter manufacturers.

The FAA disagrees. The FAA approved AMOCs for AD 2021-23-12 and AD 2021-23-13 before the radio altimeter tolerant PSD curves were defined. Although the FAA expects that the aircraft with AMOCs approved for AD 2021-23-12 or AD 2021-23-13 may be able to meet the definition of “radio altimeter tolerant” aircraft, DAHs will need to provide the FAA with data showing explicitly that the aircraft meets the tolerances in AD 2023-10-02 or AD 2023-11-07 before the FAA will approve the method they propose to use. Additionally, the FAA does not maintain a list of tolerant radio altimeters; the determination of a radio altimeter tolerant aircraft must consider the installation details, which vary from aircraft to aircraft. However, the FAA has added guidance to the policy to assist with obtaining FAA approval expeditiously.

CAA requested the FAA accept requests for AMOCs for operators to continue to operate without restrictions after July 1, 2023, given the same level of safety could be achieved. Operators will not need an AMOC provided their aircraft meets the fundamental and spurious emissions PSD curve thresholds specified in AD 2023-10-02

and AD 2023-11-07. No flight restrictions are mandated by AD 2023-10-02 and AD 2023-11-07 for radio altimeter tolerant aircraft.

Dassault requested the FAA confirm whether bench tests performed by the transceiver manufacturer would be sufficient for substantiation without additional tests. The FAA partially agrees. Bench tests of multiple units of a given transceiver model; antenna patterns, both in-band and out-of-band; and an analysis of the installed system to determine the appropriate cable loss are all necessary for substantiation. A test of the system (transceiver, antenna(s), and cabling) when installed on the aircraft is not necessary.

B. Harmonize Guidance

The guidance for spurious emissions in the proposed policy statement was based on a spurious emission level. When the FAA issued AD 2023-10-02 and AD 2023-11-07, the FAA replaced the proposed fixed emission level with a spurious PSD tolerance curve. Embraer, Dassault, and the Aviation Coalition requested the FAA revise numerous references in the policy from the spurious level to the spurious emissions PSD curve to be consistent with AD 2023-10-02 and AD 2023-22-07. The FAA agrees and has revised the policy statement accordingly.

C. 5G Bandwidth and Interference

The Aviation Coalition requested the FAA clarify whether actual 5G C-band transmissions will present a condition where cumulative 5G signaling bandwidths in excess of 100 MHz will be in practice after July 1, 2023. It commented that the cumulative impact of multiple 100 MHz bands is not fully characterized for existing altimeters. The Aviation Coalition further stated the current accepted practice reflects the use of 100 MHz 5G signaling bandwidth for the purposes of compatibility assessment between 5G and radio altimeters. The FAA does not expect cumulative 5G signaling

bandwidths in excess of 100 MHz for a given frequency at any one location in practice, based on communication with the FCC.

The Aviation Coalition asked why the policy specifies an interference tolerance threshold (ITT) measurement since the superseding ADs establish a curve for fundamental tolerance thresholds. The commenter stated it should be sufficient for an applicant to test to the appropriate tolerance levels of the curve and show that the radio altimeter performance at those levels is not unacceptably degraded. The FAA agrees that compliance with the curve can be determined without necessarily determining the transceiver's performance limit. The FAA changed the policy to reflect an interference tolerance (IT) measurement instead of an ITT measurement and updated the definition accordingly.

Dassault requested the FAA add the exact 5G fundamental frequency bandwidth to the guidance. The FAA agrees and has revised the document accordingly.

D. Definitions, Editing, and Formatting

The FAA agreed with multiple requests from Dassault and the Aviation Coalition for editorial and formatting changes and reorganization, and revised the proposed policy statement accordingly, including the following:

- The FAA added introductory text to the beginning of sections 1 and 2.
- The FAA added a diagram as figure 1 for clarity and improve understanding.
- The FAA added a definition of the “stair-step method” to sections 1 and 2.
- The FAA changed “the log-linear interpolation” to “a log-linear interpolation,” as both terms are equivalent.
- The FAA changed “line losses” to “cable losses” for consistency in terminology.
- The FAA moved the discussion of the 5G spurious PSD formula from paragraph 2.c to the introductory part of section 2.

Dassault asked whether the performance criteria in the policy section only applies to the transceiver. The performance criteria applies to the installed radio altimeter system. The FAA notes that the equations include terms to characterize the performance of the entire system. The FAA has replaced four instances of “radio altimeter” with “radio altimeter system” to clarify.

The FAA disagreed with the Aviation Coalition’s request to revise the language in paragraph 2.a regarding base stations. The statement is correct as written, as it is a factual definition of 5G base station and aircraft compatibility. For clarity, the FAA moved the statement to the policy section before section 1 as background information.

E. Request for the FAA to Withdraw the Policy

A4A requested the FAA withdraw the proposed policy because operators who are not DAHs do not have the data and information to show compliance with the methods in the policy without significant assistance from aircraft original equipment manufacturers (OEMs) and radio altimeter manufacturers. A4A stated this would be infeasible given the short compliance timeframe, as well as duplicative since the same data and information associated with aircraft type and radio altimeter technology combination will have already been submitted to the FAA by the DAH/OEM. Lastly, A4A stated the FAA does not have the appropriate resources to timely coordinate and evaluate every operator’s submissions while simultaneously reviewing data submitted by the DAH/OEM.

Alternatively, A4A requested that operators who are not DAHs be permitted to submit a letter of compliance to their principal avionics inspector, citing either an FAA-published list of compliant aircraft model/radio altimeter combinations or a list from the DAH/OEM.

The FAA disagrees with withdrawing the policy, as it provides guidance for obtaining FAA approval of a method showing compliance with AD 2023-10-02 and AD

2023-11-07. However, the FAA has added guidance to the policy to assist with obtaining FAA approval expeditiously.

F. Request Regarding Horizontal Separation for Rotorcraft

The Aviation Coalition noted that language in the proposed policy referring to horizontal separation distance by wing span may be appropriate for airplanes, but not for rotorcraft. Because of other changes made to the policy statement (replacing the proposed spurious emissions level with a spurious PSD curve), the language noted by the commenter has been removed from the document. As a result, no change to the policy is necessary.

G. Request to Include “Should”

The Aviation Coalition requested that the FAA add the word “should” to several places throughout the policy statement, to be consistent with nature of the policy as a guidance document. The FAA disagrees as the specified language identifies how to use the guidance in this policy as a means of compliance. In some instances, the language specified by the commenter defines a certain value and therefore the addition of “should” would be inappropriate.

H. Request to Clarify

MHI RJ Aviation ULC requested the FAA clarify an apparent inconsistency between figure 1 in AD 2023-10-02 and AD 2023-11-07 and the section of the policy on 5G spurious tolerance. The FAA understands the commenter to be comparing the *fundamental* PSD curve in AD 2023-10-02 with guidance for *spurious* tolerance in the policy statement.

Policy

The FAA’s policy statement provides guidance for operators and manufacturers to demonstrate an aircraft is a radio altimeter tolerant aircraft, as defined in AD 2023-10-02 and AD 2023-11-07. You may view the final policy statement, PS-AIR-600-39-01,

Demonstration of Radio Altimeter Tolerant Aircraft, at [regulations.gov](https://www.regulations.gov) in Docket No. FAA-2023-0938 or on the FAA's Dynamic Regulatory System website at drs.faa.gov.
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