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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2021-0953; Project Identifier AD-2021-01169-T; Amendment 39-21810; AD 2021-23-12]

RIN 2120-AA64

Airworthiness Directives; Transport and Commuter Category Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule; request for comments.

SUMMARY: The FAA is adopting a new airworthiness directive (AD) for all transport and commuter category airplanes equipped with a radio (also known as radar) altimeter. This AD was prompted by a determination that radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 3.7-3.98 GHz frequency band (5G C-Band). This AD requires revising the limitations section of the existing airplane/aircraft flight manual (AFM) to incorporate limitations prohibiting certain operations requiring radio altimeter data when in the presence of 5G C-Band interference as identified by Notices to Air Missions (NOTAMs). The FAA is issuing this AD to address the unsafe condition on these products.

DATES: This AD is effective December 9, 2021.

The FAA must receive comments on this AD by January 24, 2022.

ADDRESSES: You may send comments, using the procedures found in 14 CFR 11.43 and 11.45, by any of the following methods:

- Federal eRulemaking Portal: Go to <https://www.regulations.gov>. Follow the instructions for submitting comments.
- Fax: 202-493-2251.
- Mail: U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.
- Hand Delivery: Deliver to Mail address above between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

Examining the AD Docket

You may examine the AD docket at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2021-0953; or in person at Docket Operations between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this final rule, any comments received, and other information. The street address for the Docket Operations is listed above.

FOR FURTHER INFORMATION CONTACT: Brett Portwood, Continued Operational Safety Technical Advisor, COS Program Management Section, Operational Safety Branch, FAA, 3960 Paramount Boulevard, Lakewood, CA 90712-4137; phone: 817-222-5390; email: operationalsafety@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

In March 2020, the United States Federal Communications Commission (FCC) adopted final rules authorizing flexible use of the 3.7-3.98 GHz band for next generation services, including 5G and other advanced spectrum-based services.¹ Pursuant to these rules, 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 AD refers to “5G C-Band” interference, but wireless broadband technologies, other than 5G, may use the same frequency band.² These other uses of the same frequency band are within the scope of this AD since they would introduce the same risk of radio altimeter interference as 5G C-Band.

In April 2020, RTCA formed a 5G Task Force, including members from RTCA, the FAA, aircraft and radio altimeter manufacturers, European Organisation for Civil Aviation Equipment (EUROCAE), industry organizations, and operators, to perform “a quantitative evaluation of radar altimeter performance regarding RF interference from expected 5G emissions in the 3.7-3.98 GHz band, as well as a detailed assessment of the risk of such interference occurring and impacting aviation safety.”³ Based on the work of the task force, RTCA published a report which concludes that there is “a major risk that 5G telecommunications systems in the 3.7-3.98 GHz band will cause harmful interference to radar altimeters on all types of civil aircraft—including commercial transport airplanes; business, regional, and general aviation airplanes; and both transport and general aviation helicopters.”⁴

The report further concludes that the likelihood and severity of radio frequency interference increases for operations at lower altitudes. That interference could cause the radio altimeter to either become inoperable or present misleading information, and/or also affect associated systems on civil aircraft. The RTCA report refers to FCC Report and Order (R&O) FCC 20-22,⁵ which identifies radio

¹ The FCC's rules did not make C-Band wireless broadband available in Alaska, Hawaii, and the U.S. Territories.

² The regulatory text of the AD uses the term “5G C-Band” which, for purposes of this AD, has the same meaning as “5G”, “C-Band” and “3.7-3.98 GHz”

³ RTCA Paper No. 274-20/PMC-2073, Assessment of C-Band Mobile Telecommunications Interference Impact on Low Range Radar Altimeter Options, dated October 7, 2020 (RTCA Paper No. 274-20/PMC-2073), page i. This document is available in Docket No. FAA-2021-0953, and at https://www.rtca.org/wp-content/uploads/2020/10/SC-239-5G-Interference-Assessment-Report_274-20-PMC-2073_accepted_changes.pdf.

⁴ RTCA Paper No. 274-20/PMC-2073, page i.

⁵ FCC Report and Order (R&O) 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. This document is available in Docket No. FAA-2021-0953, and at <https://www.fcc.gov/document/fcc-expands-flexible-use-c-band-5g-0>.

frequencies and power level conditions for the new C-Band services. The RTCA report identified the possibility of interference from both wireless emitters (on base stations, for example) as well as onboard user handsets. The RTCA report and conclusions remain under review, including by federal spectrum regulators. The FAA risk assessment included consideration of the RTCA report, public comments to the RTCA report, and analyses from radio altimeter manufacturers and aircraft manufacturers in support of the safety risk determination. The analyses FAA considered were consistent with RTCA's conclusions pertaining to radio altimeter interference from C-Band emissions. The FAA determined that, at this time, no information has been presented that shows radio altimeters are not susceptible to interference caused by C-Band emissions permitted in the United States.

Additionally, the deployment of C-Band wireless broadband networks is occurring globally. In certain countries, deployment has already occurred in C-Band frequencies. In some countries, temporary technical, regulatory, and operational mitigations on C-Band systems have been implemented while aviation authorities complete their safety assessments. Under the FCC rules adopted in 2020, base stations in rural areas of the United States are permitted to emit at higher levels in comparison to other countries which may affect radio altimeter equipment accuracy and reliability.

The radio altimeter is an important aircraft instrument, and its intended function is to provide direct height-above-terrain/water information to a variety of aircraft systems. Commercial aviation radio altimeters operate in the 4.2-4.4 GHz band, which is separated by 220 megahertz from the C-Band telecommunication systems in the 3.7-3.98 GHz band. The radio altimeter is more precise than a barometric altimeter and for that reason is used where aircraft height over the ground needs to be precisely measured, such as autoland or other low altitude operations. The receiver on the radio altimeter is typically highly accurate, however it may deliver erroneous results in the presence of out-of-band radiofrequency emissions from other frequency bands. The radio altimeter must detect faint signals reflected off the ground to measure altitude, in a manner similar to radar. Out-of-band signals could significantly degrade radio altimeter functions during critical phases of flight, if the altimeter is unable to sufficiently reject those signals.

Many operators need to be able to land in low visibility conditions. These operators employ specially certified equipment and flightcrew training in order to be able to fly closer to the ground during approach in instrument conditions, in some cases all the way through the landing phase, without visual reference to the runway environment. These operations can only be conducted with reference to actual height above the ground, as measured by a radio altimeter.

Additionally, automatic and/or manual flight guidance systems on airplanes facilitate low visibility operations and rely on accurate radio altimeter inputs. These inputs determine when and where the aircraft flares for landing, when power reductions are made for landing, and when automated crosswind controls and other control inputs are made. Anomalous (missing or erroneous) radio altimeter inputs to these systems may cause the aircraft to be maneuvered in an unexpected or hazardous manner during the final stages of approach and landing, and may not be detectable by the pilot in time to maintain continued safe flight and landing. Inaccurate radio altimeter data can result in pilots not trusting their instruments, eroding the foundation on which all instrument flight training is built.

Although the FAA has determined the operations immediately at risk are those requiring a radio altimeter to land in low visibility conditions, a wide range of other automated safety systems rely on radio altimeter data. Harmful interference to the radio altimeter could cause these systems to operate in an unexpected way. The FAA continues to work with inter-agency and industry stakeholders to collect data on potential effects to these systems to determine whether additional mitigations are necessary. The FAA determined, however, that mandatory action is not immediately required for these systems.

The FAA plans to use data provided by telecommunications providers to determine which airports within the United States have or will have C-Band base stations or other devices that could potentially impact airplane systems. NOTAMs will be issued, as necessary, to state the specific airports where the data from a radio altimeter may be unreliable due to the presence of 5G C-Band

wireless broadband signals.⁶ For this reason, this AD requires flight manual limitations that prohibit certain operations requiring radio altimeter data at locations that will be identified by NOTAMs. Due to the dynamic nature of both the base station activation and the ongoing process of identifying the resulting affected airspace, including potential consideration for variability in C-Band deployment conditions such as radiated power levels and locations, the FAA has determined that NOTAMs are the best means to communicate changes in restrictions at affected airports.

Finally, the FAA notes that in accordance with paragraph (h) of this AD, any person may propose and request FAA approval of an alternative method of compliance (AMOC). The proposed AMOC must include specific conditions that would address the unsafe condition (e.g., by providing information substantiating that certain aircraft or altimeter models are not susceptible to C-Band radiofrequency interference).

FAA's Determination

The FAA is issuing this AD because the agency has determined the unsafe condition as described previously is likely to exist or develop in transport and commuter category airplanes with a radio altimeter as part of their type design.

AD Requirements

This AD requires revising the limitations section of the existing AFM to incorporate limitations prohibiting certain operations requiring radio altimeter data when in the presence of 5G C-Band wireless broadband signals as identified by NOTAM. These limitations could prevent dispatch of flights to certain locations with low visibility, and could also result in flight diversions.

Compliance With AFM Revisions

Section 91.9 prohibits any person from operating a civil aircraft without complying with the operating limitations specified in the AFM. FAA regulations also require operators to furnish pilots with any changes to the AFM (14 CFR 121.137) and pilots in command to be familiar with the AFM (14 CFR 91.505).

Interim Action

The FAA considers this AD to be an interim action. If final action is later identified, the FAA might consider further rulemaking.

Justification for Immediate Adoption and Determination of the Effective Date

Section 553(b)(3)(B) of the Administrative Procedure Act (APA) (5 U.S.C. 551 et seq.) authorizes agencies to dispense with notice and comment procedures for rules when the agency, for “good cause,” finds that those procedures are “impracticable, unnecessary, or contrary to the public interest.” Under this section, an agency, upon finding good cause, may issue a final rule without providing notice and seeking comment prior to issuance. Further, section 553(d) of the APA authorizes agencies to make rules effective in less than thirty days, upon a finding of good cause.

An unsafe condition exists that requires the immediate adoption of this AD without providing an opportunity for public comments prior to adoption. The FAA has found that the risk to the flying public justifies forgoing notice and comment prior to adoption of this rule because radio altimeter anomalies that are undetected by the aircraft automation or pilot, particularly close to the ground

⁶ The FAA's process for issuing NOTAMs is described in FAA Order 7930.2S, Notices to Air Missions (NOTAM), December 2, 2021.

(e.g., landing flare), could lead to loss of continued safe flight and landing. The urgency is based on C-Band wireless broadband deployment, which is expected to occur in phases with operations beginning as soon as January 5, 2022. Accordingly, notice and opportunity for prior public comment are impracticable and contrary to the public interest pursuant to 5 U.S.C. 553(b)(3)(B).

In addition, the FAA finds that good cause exists pursuant to 5 U.S.C. 553(d) for making this amendment effective in less than 30 days, for the same reasons the FAA found good cause to forgo notice and comment.

Comments Invited

The FAA invites you to send any written data, views, or arguments about this final rule. Send your comments to an address listed under ADDRESSES. Include “Docket No. FAA-2021-0953 and Project Identifier AD-2021-01169-T” at the beginning of your comments. The most helpful comments reference a specific portion of the final rule, explain the reason for any recommended change, and include supporting data. The FAA will consider all comments received by the closing date and may amend this final rule because of those comments.

Except for Confidential Business Information (CBI) as described in the following paragraph, and other information as described in 14 CFR 11.35, the FAA will post all comments received, without change, to <https://www.regulations.gov>, including any personal information you provide. The agency will also post a report summarizing each substantive verbal contact received about this final rule.

Confidential Business Information

CBI is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to this AD contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to this AD, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as “PROPIN.” The FAA will treat such marked submissions as confidential under the FOIA, and they will not be placed in the public docket of this AD. Submissions containing CBI should be sent to Brett Portwood, Continued Operational Safety Technical Advisor, COS Program Management Section, Operational Safety Branch, FAA, 3960 Paramount Boulevard, Lakewood, CA 90712-4137; phone: 817-222-5390; email: operationalsafety@faa.gov. Any commentary that the FAA receives that is not specifically designated as CBI will be placed in the public docket for this rulemaking.

Regulatory Flexibility Act

The requirements of the Regulatory Flexibility Act (RFA) do not apply when an agency finds good cause pursuant to 5 U.S.C. 553 to adopt a rule without prior notice and comment. Because the FAA has determined that it has good cause to adopt this rule without notice and comment, RFA analysis is not required.

Impact on Intrastate Aviation in Alaska

For the reasons discussed above, this AD will not affect intrastate aviation in Alaska.

Costs of Compliance

The FAA estimates that this AD affects 6,834 airplanes of U.S. registry. The FAA estimates the following costs to comply with this AD:

Estimated Costs

Action	Labor cost	Parts cost	Cost per product	Cost on U.S. operators
AFM revision	1 work-hour × \$85 per hour = \$85	\$0	\$85	\$580,890

As previously discussed, there may be other impacts to aviation; however there remains uncertainty as to cost due to various factors such as which airports within the United States have, or will have, base stations or other devices that could interfere with aircraft radio altimeters.

Authority for This Rulemaking

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator. Subtitle VII: Aviation Programs describes in more detail the scope of the Agency's authority.

The FAA is issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701: General requirements. Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

Regulatory Findings

This AD will not have federalism implications under Executive Order 13132. This AD will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

The Amendment

Accordingly, under the authority delegated to me by the Administrator, the FAA amends 14 CFR part 39 as follows:

PART 39—AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

§ 39.13 [Amended]

2. The FAA amends § 39.13 by adding the following new airworthiness directive:



2021-23-12 Transport and Commuter Category Airplanes: Amendment 39-21810; Docket No. FAA-2021-0953; Project Identifier AD-2021-01169-T.

(a) Effective Date

This airworthiness directive (AD) is effective December 9, 2021.

(b) Affected ADs

None.

(c) Applicability

This AD applies to all transport and commuter category airplanes equipped with a radio (also known as radar) altimeter. These radio altimeters are installed on various transport and commuter category airplanes including, but not limited to, the airplanes for which the design approval holder is identified in paragraphs (c)(1) through (19) of this AD.

- (1) The Boeing Company
- (2) Airbus SAS
- (3) Bombardier Inc.
- (4) Embraer S.A.
- (5) Gulfstream Aerospace Corporation
- (6) Gulfstream Aerospace LP
- (7) Textron Aviation Inc.
- (8) Pilatus Aircraft Limited
- (9) Fokker Services B.V.
- (10) Saab AB, Support and Services
- (11) DeHavilland Aircraft of Canada Limited
- (12) Airbus Canada Limited Partnership
- (13) ATR-GIE Avions de Transport Régional
- (14) Yaborã Indústria Aeronáutica S.A.
- (15) MHI RJ Aviation ULC
- (16) BAE Systems (Operations) Limited
- (17) Lockheed Martin Corporation/Lockheed Martin Aeronautics Company
- (18) Viking Air Limited
- (19) Dassault Aviation**

(d) Subject

Air Transport Association (ATA) of America Code 31, Indicating/Recording System; 34, Navigation.

(e) Unsafe Condition

This AD was prompted by a determination that radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 3.7-3.98 GHz frequency band (5G C-Band). The FAA is issuing this AD because radio altimeter anomalies that are undetected by the automation or pilot, particularly close to the ground (e.g., landing flare), could lead to loss of continued safe flight and landing.

(f) Compliance

Comply with this AD within the compliance times specified, unless already done.

(g) Airplane/Aircraft Flight Manual (AFM) Revision

On or before January 4, 2022: Revise the Limitations Section of the existing AFM by incorporating the limitations specified in figure 1 to paragraph (g) of this AD. This may be done by inserting a copy of this AD into the existing AFM.

Figure 1 to paragraph (g) – AFM Revision

(Required by AD 2021-23-12)
Radio Altimeter Flight Restrictions
When operating in U.S. airspace, the following operations requiring radio altimeter are prohibited in the presence of 5G C-Band wireless broadband interference as identified by NOTAM (NOTAMs will be issued to state the specific airports where the radio altimeter is unreliable due to the presence of 5G C-Band wireless broadband interference):
<ul style="list-style-type: none">• Instrument Landing System (ILS) Instrument Approach Procedures (IAP) SA CAT I, SA CAT II, CAT II, and CAT III• Required Navigation Performance (RNP) Procedures with Authorization Required (AR), RNP AR IAP• Automatic Landing operations• Manual Flight Control Guidance System operations to landing/head-up display (HUD) to touchdown operation• Use of Enhanced Flight Vision System (EFVS) to touchdown under 14 CFR 91.176(a)

(h) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Operational Safety Branch, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or responsible Flight Standards Office, as appropriate. If sending information directly to the manager of the Operational Safety Branch, send it to the attention of the person identified in paragraph (i) of this AD. Information may be emailed to: AMOC@faa.gov.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the responsible Flight Standards Office.

(i) Related Information

For more information about this AD, contact Brett Portwood, Continued Operational Safety Technical Advisor, COS Program Management Section, Operational Safety Branch, FAA, 3960

Paramount Boulevard, Lakewood, CA 90712-4137; phone: 817-222-5390; email: operationalsafety@faa.gov.

(j) Material Incorporated by Reference

None.

Issued on December 7, 2021.

Gaetano A. Sciortino,
Deputy Director for Strategic Initiatives, Compliance & Airworthiness Division, Aircraft
Certification Service.

[FR Doc. 2021-26777 Filed 12-7-21; 2:00 pm]