

**STATEMENT OF
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FEDERAL AVIATION ADMINISTRATION
HEARING BEFORE THE UNITED STATES HOUSE OF REPRESENTATIVES
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
SUBCOMMITTEE ON AVIATION:
FINDING THE RIGHT FREQUENCY: 5G DEPLOYMENT AND AVIATION SAFETY
FEBRUARY 3, 2022**

Chair Larsen, Chair DeFazio, Ranking Members Graves and Graves, and members of the subcommittee: thank you for the opportunity to be here today to discuss fifth-generation wireless network technology—or 5G—and aviation. To start, I would like to thank each of you for your continued unwavering support for aviation safety. Although the Department of Transportation (Department) and the Federal Aviation Administration (FAA) have made great progress in advancing our safety objectives related to 5G, we understand that our job would be significantly more difficult without the continued support of this committee and we greatly appreciate it. Similarly, the progress we have made on 5G would not have been achievable without the active leadership and sustained commitment of Secretary Buttigieg. The Secretary’s engagement on this issue has significantly raised awareness of the safety concerns associated with 5G and his collaboration with the FAA and the wireless telecommunications companies (wireless companies) has helped enable much of the progress we have achieved in support of the safety and efficiency of the national airspace. We also appreciate the ongoing positive collaboration with the wireless companies and the participation of the Federal Communications Commission (FCC). Their willingness to work with us and provide us with needed data has allowed us to effectively carry out our mission and chart a path forward that maintains safety while minimizing flight disruptions.

The FAA's first priority is the safety of the national airspace. That has guided the agency's actions so aviation and 5G can safely coexist. Cooperation with the FCC, the wireless companies, the aviation industry, and others has been critical to minimize disruptions to aviation while more than 90 percent of the wireless companies' 5G deployment has been able to go forward as planned.

Background

Before I provide you with further details, I would like to lay the foundation of the 5G issue and offer some background on how we got to this point. At the outset, it is important to keep in mind that the FAA is responsible for the safe and efficient use of the national airspace. The FAA does not regulate electromagnetic spectrum or the telecommunications industry. Although the FAA manages assigned spectrum related to certain airspace management ground systems, for example, 5G has been a novel issue for the aviation industry. Also, all of the work that we have done in coordination with stakeholders outside of aviation, including the wireless companies, has been achieved through voluntary cooperation.

I wanted to provide some highlights of the history of this issue. In 2018, the MOBILE NOW Act directed the FCC to evaluate the feasibility of commercial wireless deployments in the 3.7—4.2 gigahertz (GHz) band (C-band).¹ That same year, in filings with the FCC, Boeing communicated its concern that aeronautical safety services that operate adjacent to the C-band should be adequately protected.² Also in 2018, the Airline Pilots Association (ALPA) urged in a filing to the FCC that appropriate steps be taken to ensure that interference on avionics by mobile

¹ See section 605(b) of Title VI of Division P of the Consolidated Appropriations Act, 2018 <https://www.govinfo.gov/content/pkg/PLAW-115publ141/pdf/PLAW-115publ141.pdf>

² <https://ecfsapi.fcc.gov/file/121184623679/Boeing%20C-band%20NPRM%20Reply%20Comments%2012%2011%202018%20final.pdf>

wireless systems be fully analyzed and mitigated.³ The ALPA filing also referenced a study presented to the International Civil Aviation Organization expressing similar concerns as far back as 2014.⁴

Additionally, since 2018 the FAA has either partnered with or supported specific research conducted by the Aerospace Vehicle Systems Institute (AVSI), a cooperative research entity, and RTCA, a non-profit aerospace consensus standards development organization, concerning the potential effects of C-band interference on aircraft avionics. In 2019, the FAA sent a letter to the National Telecommunications and Information Administration (NTIA) requesting that it consider the implications of the AVSI research and that it work to ensure that aircraft altimeters that operate in spectrum adjacent to the C-band do not receive harmful interference.

In March 2020, the FCC released a report and order making 280 megahertz (MHz) of the C-band available for 5G services.⁵ Their plan was to begin auctioning C-band spectrum on December 8, 2020.⁶ Shortly before that auction, the then-Acting Deputy Secretary of Transportation and I sent a letter to the NTIA expressing our concerns with the potential impact on aviation safety.⁷ We noted in the letter that recent testing had revealed the potential for harmful interference with radio (also known as radar) altimeters installed aboard aircraft and we requested a deferral of the auction to allow the FAA to conduct a safety risk assessment and identify mitigations. In our letter we referenced, for example, a 2019 study by AVSI that

³ <https://ecfsapi.fcc.gov/file/10531182083849/ALPA%20Comments%2017-183%2018-122.pdf>

⁴ <https://www.icao.int/safety/acp/ACPWGF/ACP-WG-F-30/ACP-WGF30-WP14%20Radio%20Altimeter%20Adjacent%20Bands%20Compatibility%20Study%20with%20IMT-FINAL%20Rev1.docx>

⁵ <https://www.fcc.gov/document/fcc-expands-flexible-use-c-band-5g-0>

⁶ <https://www.fcc.gov/document/fcc-begins-major-5g-spectrum-auction>

⁷ https://www.faa.gov/sites/faa.gov/files/2021-10/DOT_Letter_to_NTIA_FCC3.7_GHz_Band_Auction.pdf

summarized preliminary data suggesting altimeter performance degradation from out-of-band interference.⁸ An October 2020 report by RTCA was also referenced in the letter.⁹ The RTCA report concluded that 5G operations in the C-band may create harmful interference to some radio altimeters that would significantly degrade or completely interrupt their operation during critical phases of flight. As concerning as these and other findings have been to us, we also noted in our letter that we recognized the importance of making spectrum available for commercial purposes and ensuring American leadership in this space. We have continually maintained that, through mutual cooperation, 5G and aviation can safely coexist.

Radio altimeters operate in the 4.2—4.4 GHz range. Even with a frequency separation of 220 MHz, from 5G operations, there may still exist potential harmful interference under certain circumstances. As a pilot, I know from experience that a radio altimeter is one of the most crucial pieces of safety equipment aboard an aircraft. Radio altimeters are used in low visibility landings and are the only sensors aboard civil aircraft that provide a pilot with a direct measurement of the distance between the aircraft and the ground or other obstacles. Many other critical safety systems rely directly upon input from radio altimeters including terrain awareness warning, wind shear surveillance, traffic collision avoidance, tail strike prevention, automated landing, and other related cockpit display and alert warning systems. Harmful interference affecting any of these systems has the potential to be catastrophic. There is no scenario under which harmful interference is acceptable from a safety standpoint, absent sufficient mitigations to address that interference.

⁸ <https://avsi.aero/wp-content/uploads/2021/12/AVSI-RA-Interim-OOB-Interference-Report-211206.pdf>

⁹ https://www.rtca.org/wp-content/uploads/2020/10/SC-239-5G-Interference-Assessment-Report_274-20-PMC-2073_accepted_changes.pdf

Operational Mitigations

Before and since the 2020 spectrum auction, the FAA has been involved in a sustained effort to assess and mitigate the risks associated with potential degraded radio altimeter performance. Prior to the initially scheduled 5G roll out for December 5, 2021, the Department and the FAA successfully worked with the telecommunications carriers to agree to a 30-day pause of the deployment to allow added time for safety mitigation actions. The FAA moved quickly to take advantage of the delay to protect the safety of the flying public:

- In November, and again in December of 2021, the FAA issued Special Airworthiness Information Bulletins to inform manufacturers, operators, and pilots of the planned deployment of 5G.¹⁰ The bulletins contain detailed guidance for aircraft and altimeter manufacturers as well as aircraft operators and pilots and sought information from each group to further assist the FAA in assessing the reliability and accuracy of altimeters and the potential risks of 5G deployment on aviation safety.
- On December 7, 2021, the FAA issued an Airworthiness Directive (AD) for all transport and commuter category airplanes equipped with a radio altimeter.¹¹ The AD was based on our determination that radio altimeters cannot be relied upon to perform their intended function if they experience harmful interference from 5G C-band wireless broadband operations. The AD requires revising the flight manual to incorporate limitations prohibiting certain operations requiring radio altimeter data when in the presence of 5G

¹⁰[https://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/dc7bd4f27e5f107486257221005f069d/27ffcbb45e6157e9862587810044ad19/\\$FILE/AIR-21-18.pdf](https://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/dc7bd4f27e5f107486257221005f069d/27ffcbb45e6157e9862587810044ad19/$FILE/AIR-21-18.pdf)

[https://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/dc7bd4f27e5f107486257221005f069d/379cfb187d16db10862587b4005b26fc/\\$FILE/AIR-21-18R1.pdf](https://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/dc7bd4f27e5f107486257221005f069d/379cfb187d16db10862587b4005b26fc/$FILE/AIR-21-18R1.pdf)

¹¹ https://www.faa.gov/sites/faa.gov/files/2021-12/FRC_Document_AD-2021-01169-T-D.pdf

C-band harmful interference in areas identified by Notices to Air Missions (NOTAMs).

A similar AD was issued on the same day for helicopters.¹²

- On December 23, 2021, the FAA issued a Safety Alert for Operators (SAFO). The SAFO provides information and guidance to operators regarding the risk of potential adverse effects on radio altimeters when operating in the presence of 5G C-band wireless broadband signals, and the role of NOTAMs in identifying the geographic areas where certain operations requiring a radio altimeter are prohibited in the presence of 5G signals.

Simultaneous with each of these safety actions, the FAA and the Department continued to engage with wireless company officials, who agreed to an additional voluntary two-week pause in 5G deployment to provide the FAA with a path forward that would allow for sufficient safety mitigations and minimize disruptions in air travel. On December 31, 2021, Secretary Buttigieg and I proposed an interim solution to the wireless companies.¹³ We suggested that with an additional two-week pause in deployment, the FAA and the aviation industry would identify key airports where a buffer zone with minimized 5G transmissions would permit aviation operations to continue safely while the FAA continued assessments of the interference potential around those airports. Our goal was, and continues to be, to identify mitigations for key airports to enable as many commercial aircraft as possible to operate safely in all conditions. This will allow for 5G C-band to deploy around these airports on a rolling basis, such that all C-band planned locations can be activated barring unforeseen technical challenges or new safety concerns.

¹² https://www.faa.gov/sites/faa.gov/files/2021-12/FRC_Document_AD-2021-01170-R-D.pdf

¹³ <https://www.faa.gov/sites/faa.gov/files/2021-12/12.31.2021%20-%20DOT%20and%20FAA%20Letter%20to%20ATT%20and%20Verizon%20.pdf>

We also conveyed that the FAA will safely expedite the review and determinations regarding proposals for Alternate Methods of Compliance (AMOC) for operators with high-performing radio altimeters to operate at those airports. The FAA may approve AMOCs for altimeter/aircraft configurations that have been proven to meet equivalent levels of safety in this novel environment. An FAA-approved AMOC allows an aircraft with a particular model of altimeter to conduct operations that require a radio altimeter in a geographic area where such operations would otherwise be prohibited because of 5G. As part of the agreement, the wireless companies agreed to provide the FAA with data relevant to existing and planned locations as well as operating characteristics of 5G base stations. The data provided has allowed the FAA to precisely determine which aircraft are cleared for specific runways at airports in the 5G area based on altimeter equipage and antenna location. This information is captured in the approved AMOCs and its accuracy is the foundation of the coexistence of aviation safety and 5G deployment in the short term. To date the FAA has issued over 20 AMOCs for commercial and business jets, covering approximately 90 percent of the U.S. commercial fleet.

Since January 19, 2022, wireless companies have activated more 5G C-band towers in 46 markets nationwide. Prior to and since the 5G deployment, the FAA has worked around the clock to enable implementation of mitigations, where needed, to address risks. Approximately 80 airports with low-visibility approaches in 5G deployment areas were identified, and the wireless companies agreed to turn off approximately 500 towers in the vicinity of those airports. These mitigations have enabled airlines and other flight operators to access most runways at airports in places where 5G is deployed, even in low visibility conditions. Although some flights have been affected by safety mitigations required in 5G deployment areas, significant disruptions

to the air transportation system have been avoided. Further, our analysis of the data received has allowed us to focus our efforts and work much more efficiently.

Moving Forward

The FAA is continuing to work with avionics manufacturers to evaluate altimeters and review manufacturer testing data to measure the accuracy, reliability, and robustness of each model. This includes data for altimeters used in regional and business aircraft. Also, the FAA is allowing helicopter air ambulance operators to continue using safety-enhancing night vision goggles in areas where the aircraft's radio altimeter could be unreliable due to 5G C-band interference as identified by NOTAMs. Similar to commercial aircraft, helicopters may perform day and night operations that do not require the use of a radio altimeter. Further, despite the breadth and diversity of the general aviation fleet, the FAA is working as quickly as it can to enable these aircraft to operate safely and efficiently.

As referenced earlier, NOTAMs let pilots and others know where 5G is present and operations are restricted. Although the wireless companies' actions creating buffer zones reduce the strength of 5G signals around airports, they do not fully eliminate it. The restrictions in a NOTAM do not apply if an aircraft has an altimeter that is approved by an AMOC for that location. Some aircraft, however, still do not have an approved AMOC for their altimeter. Additionally, even aircraft with an AMOC-approved altimeter may not be allowed to operate at all runways in the 5G area. Consequently, the restrictions outlined in the NOTAMs remain in place while the FAA continues to determine the accuracy and reliability of other altimeters that have not been approved by an AMOC.

We are confident we will work through this issue safely with minimal disruptions, but we acknowledge that some altimeters—especially older models used by certain segments of the

aviation industry—may not receive approval as being safe in the presence of 5G emissions and interference, and may need to be replaced. The strengthening partnership across the aviation and telecommunications industries and the federal government has enabled substantial progress. In coming weeks, FAA will move quickly to use testing data and other insights to further refine our models and safely enable additional 5G deployment.

Spectrum is a limited resource, and demand for it will likely increase in coming years, including new applications across the transportation sector. As we move forward, we will work with the industry and our federal partners to strengthen processes to safely unlock the rapid innovation that we seek as a nation. Early and open communications with stakeholders from all involved industries, and a robust interagency process, are key to identifying and solving potential issues long before they have a real-world impact.

Thank you for the chance to provide this update and we look forward to continued engagement with the committee and subcommittee on this important issue.