

5G C-Band NOTAMs

MEETING 22-01

Christina Clausnitzer, FAA/AFS-410, [briefed](#) on Radio Altimeter issues and 5G C-Band deployment. Almost two years ago, the Federal Communications Commission (FCC) announced a portion of the frequency band spectrum (3.7-3.98 GHz) would be auctioned off. The Radio Technical Commission for Aeronautics (RTCA) published a report that assessed 5G telecommunications interference impact on low range radio altimeter operations in the United States that said it can cause harmful interference and could degrade the radio altimeter to the point of loss and/or erroneous data. The FAA believes the expansion of 5G C-band and aviation can safely co-exist and will continue to work closely with the FCC and wireless companies.

The FAA was initially told the telecommunication companies would deploy broadband in phases into the 46 markets highlighted on [slide 6](#) until December 2023; however, it is expanding more rapidly than initially expected. [Slide 8](#) shows the mitigations that are in place. The FAA has published Airworthiness Directives (ADs) including a transport AD, a rotorcraft AD and Boeing issued six aircraft-specific ADs. The FAA also issued Alternative Methods of Compliance (AMOCs) and additional guidance in a Special Airworthiness Information Bulletin ([SAIB:AIR-21-18R1](#)) and a Safety Alert for Operators ([SAFO 21007](#)). Verizon and AT&T have voluntarily agreed to use reduced power levels, lower the frequency and provide partial protection for vulnerable airports.

The FAA determined NOTAMs are the best tool to provide the flexibility needed to convey the necessary information to pilots. Dez Silagyi, FAA/AJV-A360, explained the different types of NOTAMs being issued ([slides 11-15](#)). They are all issued where the radio altimeter is unreliable due to the presence of 5G C-Band interference and operations are prohibited unless the operator has an approved AMOC. [Slide 16](#) shows the total numbers of NOTAMs currently published.

Dez said the NOTAMs are issued for two years so they will have time to work with Aeronautical Information Services and Flight Standards to come up with a long term plan. Consideration is being given to charting a symbol on Instrument Approach Procedures (IAPs), updating the Temporary Flight Restriction (TFR) website with airspace NOTAMs, and/or adding aerodrome NOTAMs to the Chart Supplement.

Dez shared that the FAA has a 5G and Aviation Safety website with a lot of useful information on this topic that may be of interest: <https://faa.gov/5g>

Rich Boll, NBAA, said pilots are confusing the ADs and the NOTAMs and are misunderstanding that 5G NOTAMs take out everything on the AD. Pilots are dropping procedures that are not part of the NOTAM. He asked that guidance be added to make it clear exactly what the NOTAM governs. Christina said they have received several comments about this and they are working on updating the SAFO to address that concern.

Darrell Pennington, ALPA, asked if 5G interference is being considered at the procedure design phase. Christina said every radio altimeter on every aircraft responds differently. They built their NOTAMs based on the most susceptible radio altimeters. That is why most aircraft can use AMOCs. Christina said the first filters have been approved and are being installed on those aircraft with susceptible altimeters, which will allow the areas covered by NOTAM to shrink significantly. The long term solution is to publish new standards for radio altimeters that will allow aviation and 5G to safely coexist. Dez said the FAA is not yet ready to identify impacts on individual procedures, but that will be part of the ultimate goal in order to clear out the NOTAMs.

Bill Tuccio, Garmin, asked whether the FAA is getting reports of alerts because of the radio altimeters. Christina said in the first two weeks, the FAA received hundreds of reports. Lately they have been receiving fewer reports and they are primarily coming from those aircraft with more susceptible radio altimeters. This suggests the mitigations are working. For the alerts they are seeing, it has not been proven that 5G is definitely the cause of the interference, but it cannot be discounted either. Data is still being gathered and assessed.

Mark Mentovai, Manhattan Flight Club, asked how much the present AMOCs are predicated on the mitigations that have been taken by the telecommunications companies and whether there will be more problems waiting once the mitigations are removed. Christina said July 5, 2022 is the date telecommunications companies will remove the mitigations. The main issue will be power levels because at that time the watts will double. We know that currently telecommunications companies are not utilizing those power levels, but the FCC has authorized those higher levels. She said they are trying signal in space modeling so they can figure out the impacts for a specific aircraft at a specific airport. Once they have enough data, they can set limits on the power at a specific location. Mark asked if they are concerned with the passenger emitters that are on board the aircraft particularly as 5G handsets become more widely deployed. Christina said that is another issue and the FAA does not yet know the impact. Mark then asked whether this problem might recur and whether there is a plan now in place for future issues with the spectrum. Christina said the FCC's job is to regulate the spectrum and she hopes more studies will be done in advance next time. She agreed that how the FCC decides to manage the spectrum with aviation should be based on lessons learned from this experience.

Wes Googe, American Airlines, serves on a coalition that is led by Aerospace Industries of America (AIA) that is focused on the 5G issue. He reported the RTCA stood up a Spectrum Compatibility committee (SC-242) to help guide the aeronautical industry's process for developing standards for new equipment with a goal to make it as robust as possible for adjacent band interference. He said several industry groups raised the interference issue with the FCC when they were considering it two years ago, but the FCC ignored the concerns. The FAA doesn't control the FCC, but they are working toward joint consideration of these issues.

Valerie thanked Christina and Dez for their briefing and for all the work they have done. She asked that they provide an update at the next ACM.

MEETING 22-02

Christina Clausnitzer, FAA/AFS-410, [briefed](#) on Radio Altimeter issues and 5G C-Band deployment. Christina explained the reason that radio altimeters are susceptible to interference is because they are designed to receive signals which bounce back from the ground that are within a specific remote altimeter band of the spectrum. 5G signals broadcast close to this same band and can result in a loss or misleading remote altimeter data. Different remote altimeter models have different levels of susceptibility to the interference. This has a large impact on the U.S. fleet as well as foreign-registered aircraft that fly in the U.S. Christina explained the mitigations that are in place. The FAA has published Airworthiness Directives (ADs) including a transport AD, a rotorcraft AD and Boeing issued six aircraft-specific ADs. The FAA also issued Alternative Methods of Compliance (AMOCs) and additional guidance in a Special Airworthiness Information Bulletin ([SAIB:AIR-21-18R1](#)) and a Safety Alert for Operators ([SAFO 21007](#)). Verizon and AT&T have voluntarily agreed to use reduced power levels, lower the frequency and provide partial protection for vulnerable airports. Christina then explained the actions the FAA has taken since January 2022. The FAA gets new antennae location data every month and issues NOTAMs and AMOCs. They are also continuing outreach efforts, continuing to refine the airspace protection models and working with manufacturers to retrofit altimeters, but all of these actions take years to develop.

Dez Silagyi, FAA/AJV-A360, reported that over the past ten months the number of affected areas has more than doubled. Everything is happening faster than expected and the pace is not sustainable. The FAA is still using NOTAMs at this time, however they are continuing to look for other long-term solutions. In the meantime, they are also looking at ways to shorten the airspace NOTAMs. For November, the FAA plans to release a Domestic Notice which can contain all of the geographic coordinates, as well as graphics and hyperlinks. As a result, the airspace NOTAMs won't have to include as much information and can refer to the Domestic Notice.

Christina reported that the voluntary telecommunications companies' mitigations end July 1, 2023. Resulting considerations can be found on [slide 8](#). Christina discussed the conditions that are necessary for 5G C-Band to operate compatibly with aviation. The hope is that the airport environment will become safer through rulemaking changes rather than voluntary mitigations. They have asked the FCC to reduce the spurious emission limits, implement a downward tilt requirement, maintain the 220 MHz guard band (separation), and implement reduced power limits near certain airports.

The overall plan after July 2023, is for domestic aircraft to follow the restrictions in the AD and to reference the Domestic Notice. The plan for foreign operators is to follow the Aeronautical Information Publication (AIP) and the Domestic Notice. Christina shared the Draft AIP language ([slide 11](#)).

John Moore, Jeppesen/Boeing, said AIP language states "The FAA requires that radio altimeters are accurate and reliable..." He asked if there is any specific information published regarding what kinds of

radio altimeter equipment is recommended in order to attain that accuracy and reliability. Christina said there was a plan to add that information to the Domestic Notice. She agreed that may need to go into the AIP as well.

Christina suggested referring to the [FAA's 5G website](#) for more information.

MEETING 23-01

Christina Clausnitzer, FAA/AFS-410, [briefed](#) on Radio Altimeters and 5G C-Band Deployment. She reported that since the last ACM, the FAA asked industry to begin to retrofit their altimeters and they are making good progress. There are still a lot of Notices to Air Missions (NOTAMs) in the National Airspace System (NAS) ([slide 2](#)). She said that AT&T and Verizon plan to have unlimited 5G operations by July 2023. At that time, they will end their mitigation efforts in most areas except for 5G C-Band Mitigated Airports (CMAs). 5G C-Band emitters are anticipated throughout the contiguous U.S. The current NOTAM/Alternative Method of Compliance (AMOC) process is not tenable so they have updated the current Transport Airworthiness Directive (AD) ([slide 3](#)). The new AD went out for comment and the comments are currently under review. See [slide 4](#) for links to the Transport Notice of Proposed Rulemaking (NPRM) and the Rotorcraft NPRM.

Christina explained that after July 1, 2023, U.S. ADs will not apply to foreign operators. Domestic aircraft will follow the restrictions in their respective ADs. For international aircraft, the FAA does not have a solid legal way forward so guidance has been included in the 5G C-Band Domestic Notices and in the Aeronautical Information Publication (AIP). As additional safety measures, the FAA will publish 20 Contiguous United States (CONUS) Air Route Traffic Control Center (ARTCC) NOTAMs and will keep approximately 150 Instrument Approach Procedure (IAP) NOTAMs against all public and special SA CAT I/II, CAT II, and CAT III approaches.