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SAFO

Safety Alert for Operators

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Subject: Risk of Potential Adverse Effects on Radio Altimeters (RA) when Operating in the Presence of 5G C-Band Wireless Broadband Signals.

Purpose: This SAFO provides information and guidance to operators regarding the risk of potential adverse effects on RAs when operating in the presence of 5G C-Band wireless broadband signals.

Background: The Federal Aviation Administration (FAA) published Airworthiness Directives (AD) 2023-10-02 and AD 2023-11-07, which supersedes ADs 2021-23-12 and 2021-23-13, for all transport and commuter category airplanes, and all helicopters, equipped with a RA. These ADs were issued due to a determination that RAs cannot be relied upon to perform their intended function if they experience interference.

Discussion: The RA's intended function is to provide direct height-above-terrain/water information to a variety of aircraft systems. Commercial aviation RAs operate in the 4.2 to 4.4 gigahertz (GHz) band, which is separated by 220 megahertz (MHz) from 5G C-Band transmissions in the 3.7-3.98 GHz band.

- a. RA Function.** The RA 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 during autoland or other low altitude operations. The receiver on the RA is typically highly accurate, however it may deliver erroneous results in the presence of out-of-band radiofrequency emissions from other frequency bands. The RA must detect faint signals reflected off the ground to measure height, in a manner similar to radar. Out-of-band signals could significantly degrade RA functions if the altimeter is unable to sufficiently reject those signals.
- b. RA System Relationships.** The FAA issued ADs to address operations immediately at risk (e.g., those requiring a RA to land in low visibility conditions). In addition, the telecommunication companies agreed to coordinate emitter information with the FAA around certain airports. However, there remains a wide range of other automated safety systems that rely on RA data whose proper function may also be affected. There are concerns associated with the cumulative effects of RA interference on aircraft systems that rely on RA inputs, particularly for those aircraft that have not been retrofit. Anomalous (missing or erroneous) RA inputs could cause these other systems to operate in an unexpected way during any phase of flight - most critically during takeoff, approach,

and landing phases. These anomalous inputs may not be detected by the pilot in time to maintain continued safe flight and landing. Operators and pilots should be aware of aircraft systems that integrate the RA and should follow all Standard Operating Procedures related to aircraft safety system aural warnings/alerts. These helicopter and airplane systems include, but are not limited to:

- Terrain Awareness Warning Systems (TAWS-A and HTAWS)
- Ground Proximity Warning Systems (EGPWS and GPWS)
- Traffic Alert and Collision Avoidance Systems (TCAS)
- Take-off guidance systems
- Flight Control (control surface)
- Tail strike prevention systems
- Windshear detection systems
- Envelope Protection Systems
- Altitude safety call outs/alerts/Aural warnings
- Autothrottle
- Thrust reversers
- Flight Director/Flight Displays
- Primary Flight Display of height above ground
- Alert/warning or alert/warning inhibit
- Stick pusher / stick shaker
- Engine and wing anti-ice systems
- Auto-Flight Systems

- c. **Effects on the National Airspace System (NAS).** Wireless telecommunication companies are now operating their 5G C-Band networks at or very near the power levels authorized by the Federal Communication Commission (FCC). Additionally, 19 more wireless telecommunication companies are starting to deploy 5G C-Band emitters throughout the contiguous U.S., making the process of using Notices to Air Missions (NOTAM) and Alternative Method of Compliance (AMOC) runway lists untenable. With the deployment of 5G C-Band throughout the contiguous U.S., it's imperative all operators and pilots assume that 5G C-Band emitters are deployed anywhere they fly in the contiguous U.S. and any aircraft not equipped with a 5G C-Band tolerant RA will be subject to harmful interference.

Recommended Action:

1. The FAA encourages all operators to equip their aircraft with 5G C-Band tolerant RAs as soon as possible.
2. Domestic and foreign operators and pilots should be familiar with the content of this SAFO, all applicable 5G C-Band related ADs, Special Airworthiness Information Bulletin (SAIB) AIR-21-18 and the 5G Domestic Notices.
3. Domestic and foreign operators and pilots should review the aircraft systems that integrate the RA. They should be aware of the potential degradation of the RA capabilities, the potential degradation to the capabilities of safety systems and other equipment dependent upon the RA.

Contact: Direct questions or comments regarding this SAFO to the Flight Technologies and Procedures Division, Flight Operations Group at (202) 267-8790 or e-mail: 9-AWA-AVS-AFS410@faa.gov.