GAMA 18-66

Federal Communications Commission,
Washington, DC 20554

Re: GN Docket No. 18-122 "Expanding Flexible Use of the 3.7 to 4.2 GHz Band

COMMENTS OF AEROSPACE INDUSTRIES ASSOCIATION AND THE GENERAL AVIATION MANUFACTURERS ASSOCIATION

The Aerospace Industries Association ("AIA") and the General Aviation Manufacturers Association ("GAMA") hereby respond to the Federal Communication Commission's (FCC) Order and Notice of Proposed Rulemaking regarding the expanded flexibility for wireless systems in the frequency bands between 3.7 and 4.2 GHz[1] .

AIA is the nation's most authoritative and influential voice of the aerospace and defense industry. AIA represents more than 100 leading aerospace and defense manufacturers, along with a supplier base of nearly 200 associate members, all of which supports over 2.4 million U.S. jobs.

GAMA is an international trade asso3.7-ciation representing over 90 of the world's leading manufacturers of general aviation airplanes and rotorcraft, engines, avionics, components, and related services. GAMA's members also operate repair stations, fixed based operations, pilot and maintenance training facilities and they manage fleets of aircraft.

Our Association's members are concerned with the critical issue of authorizing additional services in the 3.7-4.2 GHz band since such action could directly impact the aeronautical communications and safety services operating in the adjacent 4.2-4.4 GHz frequency band. This harmful interference could have significant adverse effects on aviation safety and the aviation economy.

AIA and GAMA expects that our member companies, who are studying this issue in greater technical detail, will provide separate comments providing valuable assessments of the potential impacts of the FCC's proposed changes to the allocation, but are providing these comments to assist the Commission in determining the best use of the 3.7-4.2 GHz spectrum and to highlight the importance of this matter to AIA and GAMA's full membership.

This past May, AIA and GAMA both submitted comments to the Commission as part of the initial comment phase. Those comments provided our Association's recommendations regarding how to properly study the possible effects of expanded the services eligible to operate in the 3.7-4.2 GHz band. In those comments, the Associations noted the impact that expanding the band could have on critical systems that either currently exist or are being developed and deployed using frequencies immediately adjacent to the 3.7-4.2 GHz band. Two communications systems, which are essential to aviation safety, are authorized to operate in the 4.2-4.4 GHz band which are the Wireless Avionics Intra-Communications (WAIC) systems and aircraft radio altimeters. As explained below, these concerns

[1] *Office of Engineering and Technology, International, and Wireless Telecommunications Bureaus Seek Comment for Report on the Feasibility of Allowing Commercial Wireless Services, Licensed or Unlicensed, to Use or Share Use of the Frequencies Between 3.7-4.2 GHz*, Petition for Rulemaking, RM-11 18-446 (rel. June 21, 2018).

Aerospace Industries Association of America, Inc.
1000 Wilson Blvd., Suite 1700, Arlington, VA 22209
Tel (703) 358-1000 Fax (703) 358-1011
Internet: http://www.aia-aerospace.org

General Aviation Manufacturers Association
1400 K Street NW, Ste 801 | Rue de la Loi 67/3
Washington, DC 20005 | 1040 Brussels Belgium
Tel +1(202) 393-1500 | Tel +32 (0)2 550 39 00
Internet: http://www.GAMA.aero

remain, and any services permitted by the Commission to operate in the 3.7-4.2 GHz band must be sufficiently restricted to ensure that WAIC systems and radio altimeters are adequately protected from harmful interference. Any failure to do so could directly impact safe operation of flights putting the safety of the millions of daily passengers in the American skies at risk.

I. THE COMMISSION MUST ENSURE THE PROTECTION OF THE FLYING PUBLIC AND THE SAFE OPERATION AND LANDING OF AIRCRAFT

The 3.7-4.2 GHz band is important to the aviation community due to its high availability and superior qualities during weather issues. Such uses include providing redundancy, weather distribution, and backhauling of aviation data. Some aviation operations also receive direct data from the National Weather Service for use in weather product generation by private sector meteorologists via the commercial satellite-delivered 'NOAAPort' system that operates in the 3.7-4.2 GHz band. These services are provided to the aviation community from commercial satellite operators that operate within the 3.7-4.2 GHz band. Any alterations to what is currently permitted to operate within the band could directly impact the ability for commercial satellite operators to provide these services.

Similarly, the 4.2-4.4 GHz band is exclusively allocated globally to the aeronautical radio navigation service[2] for the use of both radio altimeters, and more recently WAIC systems. Radio altimeters are an essential component of the safe operation of aircraft, supporting precision approach, landing, ground proximity, and collision avoidance systems[3]. Radio altimeters operate by transmitting radio signals toward the ground and calculating the amount of time it takes for the signals to be reflected back to the aircraft receiver[4]. Using the velocity of these radio signals, along with the amount of time the signals travel, the altimeter is able to make these calculations based on the relationship of distance, speed, and time, and can accurately determine the aircraft's altitude.

Every commercial aircraft in use today is equipped with radio altimeters that operate continually during flight, and larger aircraft utilize multiple radio altimeters[5]. This data is essential to the safe operation of the Automatic Flight Control System (AFCS) during automated approaches and landings. In many aircraft, the radio altimeter is also directly connected to the Ground Proximity Warning System (GPWS), which warns the pilot if the aircraft is flying too low or descending too quickly, thereby assisting the aircraft's safety systems further[6].

To adequately perform their function, radio altimeters require access to the entire 4.2-4.4 GHz band, as the accuracy of the resulting altitude data is directly linked to the total available bandwidth of the radio altimeter's signal[7]. Accurate and reliable altitude data is vital for safe flight for the millions of passengers who fly on commercial aircrafts daily. Because most radio altimeters operate at relatively low power[8] throughout the flight, there is an interference concern with respect to ground-based radio transmitters operating near the 4.2-4.4 GHz band.

---

[2] *See* 47 C.F.R. § 2.106, notes 5.438 and US261 (indicating that "[u]se of the band 4200-4400 MHz by the aeronautical radio navigation service is reserved exclusively for radio altimeters installed on board aircraft and for the associated transponders on the ground").

[3] *See* Operational and technical characteristics and protection criteria of radio altimeters utilizing the band 4 200-4 400 MHz, Recommendation ITU-R M.2059-0, at 1, 3 & 5 (2014).

[4] *See id.* at 5.

[5] *See id.* at 11.

[6] *See id.*

[7] *See id.* at 11 (explaining that "radio altimeters operate in wide bandwidths to achieve the necessary accuracy levels" and therefore any reduction in the available frequency bandwidth "proportionately reduces the accuracy of radio altimeters").

[8] See id. at 12-17 (providing transmit power levels of different types of analog and digital radio altimeters).

Although these new transmitters would be operating in the 3.7-4.2 GHz band, the interference issues are prevalent. These new devices would be operating at relatively stronger power, and if directed upwards, could overpower the relatively weak radio altimeter signals that have been reflected off the ground. Therefore, this would prevent their reception by the radio altimeter receiver on the aircraft. While it is true that radio altimeters employ band pass filters, due to physical constraints these filters have limited ability to reject transmissions close to the 4.2-4.4 GHz band[9]. As a result, radio altimeter performance could be adversely affected by any signals of sufficient strength transmitted near the edge of the 4.2-4.4 GHz band.

Furthermore, the 2015 World Radiocommunications Conference (WRC-15) allocated the 4.2-4.4 GHz band on a global co-primary basis to the aeronautical mobile (route) service exclusively for WAIC systems[10]. WAIC equipment is being deployed on newer aircrafts to increase the safety and efficiency of their operations by replacing portions of aircraft wiring by using onboard short-range wireless systems[11]. These systems can improve aircraft safety by providing dissimilar redundancy in communications links between critical aircraft systems and can also make aircraft more economical to operate than traditional wiring by reducing weight. The total weight of wiring and related fixtures on modern passenger aircraft is often more than six tons, so the substantial reduction in weight can improve fuel efficiency, thereby providing environmental benefits and cost savings to aircraft manufacturers, operators and the flying public.

One notable advantage identified in support of allocating the 4.2-4.4 GHz band for WAIC systems was that this spectrum is already allocated for aeronautical safety services and the spectrum has no adjacency issues[12]. These adjacency issues stem from mobile consumer devices such as smartphones, laptops, and tablets, all of which are routinely carried by passengers onto commercial aircrafts and used during aircraft operation.

Currently, these devices are not designed to operate between or near the 4.2-4.4 GHz band meaning that there are no inherent safety risks with passengers carrying them on board. However, if the Commission were to create band allocation for the 3.7-4.2 GHz adjacent band, the global aviation industry would likely face a substantial new public safety problem stemming from use of this adjacent spectrum.

In fact, at a recent U.S. Senate Committee on Science, Space and Transportation hearing, witnesses from the telecom industry indicated that they would use the entire range of spectrum offered between 3.7 and 4.2 GHz[13]. While not a surprise, this indication further highlights the safety concerns regarding the adjacency issues that these new devices would have on aviation safety. Simply, use of this adjacent spectrum band could impact the safe operation of the aircraft.

---

[9] *See id.*

[10] *See* ITU Radio Regulations No. 5.436 (indicating that use of the frequency band 4 200-4 400 MHz by stations in the aeronautical mobile (R) service is reserved exclusively for wireless avionics intra-communication systems that operate in accordance with recognized international aeronautical standards).

[11] *See, e.g.,* Presentation of the Aerospace Vehicle Systems Institute for Working Parties 5A, 5B, 5C, "Agenda Item 17 Wireless Avionics Intra-Communication" (May 23, 2012) (available at https://www.itu.int/ITU-R/study-groups/docs/workshop-wp5abc-wrc15/WP5ABC-WRC15-P2- 5.pdf).

[12] WAIC systems will not interfere with radio telemetry operations in the same spectrum because the significant attenuation of aircraft "skin" protects radio altimeters from the relatively low power WAIC transmissions inside the aircraft.

[13] See, U.S. Senate Committee on Commerce, Science and Transportation Hearing entitled The Race to 5G: Exploring Spectrum Needs to Maintain U.S. Global Leadership which took place on July 25, 2018 (https://www.commerce.senate.gov/public/index.cfm/hearings?ID=BB7A0421-CD2B-41D7-ABF6-6241B29EF928)

II. THE COMMISSION MUST STUDY THE OUT-OF-BAND IMPACT ON AVIATION CRITICAL SAFETY SYSTEMS SUCH AS RADIO ALTIMETERS AND WAIC

As stated in AIA and GAMA's comments filed in May, our Associations strongly believe that the Commission must study the impacts that high density mobile use of the 3.7-4.2 GHz band could have on the 4.2-4.4 GHz band's ability to perform its critical safety functions[14]. Due to the critical nature of radio altimeters, particularly during takeoff and landing, any interference in the 4.2-4.4 GHz band could present risks to the safety-of-life operations for aircraft that carry nearly 900 million passengers in the U.S. per year[15]. It is imperative that the Commission do everything in its power to properly mitigate these risks as it examines the flexible use of any adjacent spectrum band.

Our Associations believe that prior to making any allocations for high density mobile services within the 3.7-4.2 GHz band, the Commission should consult with the aviation industry to examine the impacts on the above-mentioned systems in order to minimize risk to the flying public. Such a study examining the impacts of out-of-band interference must be thorough and comprehensive in order to adequately address the great risks that could be associated with mobile services operating within the 3.7-4.2 GHz spectrum band.

III. CONCLUSION

AIA and GAMA recognize the Commission's goal of identifying additional spectrum suitable for flexible usage for high density mobile services. The Commission, however, must ensure that any additional use of the 3.7-4.2 GHz band properly protects the aeronautical communication and safety systems that are operating in the adjacent 4.2-4.4 GHz band. Without properly studying the issue and determining proper ways in which to mitigate risk, it would be premature to allocate additional use of the 3.7-4.2 GHz band. In doing so, it could impact safety-of-life operations for all aircraft and could potentially result in a catastrophic situation due to wireless spectrum interference issues.

GAMA and AIA appreciate your attention to these comments and would welcome the opportunity to answer any questions regarding our feedback.

Sincerely yours,

David Silver
Vice President, Civil Aviation
Aerospace Industries Association (AIA)

Jonathan Archer
Director, Engineering and Airworthiness
General Aviation Manufacturers Association (GAMA)

[14] While these comments primarily consider immediate impacts of wireless system services on radio altimeter operations, AIA & GAMA highlight that additional critical services could be compromised. Specifically, potential impacts to the second harmonic of GPS L2 signals and to the third harmonic of the IFF receive signal are possible, depending on the harmonic effects of wireless system RF out-of-band allowable emissions, and warrant close study

[15] *See* The Economic Impact of Civil Aviation on the U.S. Economy, Page 4, accessible at https://www.faa.gov/air_traffic/publications/media/2016-economic-impact-report_FINAL.pdf