Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183
	)	

REPLY COMMENTS OF AVIATION SPECTRUM RESOURCES INC.

I. INTRODUCTION

Aviation Spectrum Resources Inc. ("ASRI") provides the below reply comments to the *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz Notice of Inquiry* adopted by the Commission on 8 August 2017 (the "NOI"), specifically potential new terrestrial services in the 3.7-4.2 GHz band. In response to the comments of the Aerospace Vehicle Systems Institute and The Boeing Company[1], ASRI wishes to fully concur with these comments and provide wider context from a commercial aviation perspective for aeronautical systems used in and adjacent to the 3.7-4.2 GHz band.

Whilst the NOI considers existing services within the 3.7-4.2 GHz frequency band, ASRI notes that it does not fully explore potential adjacent band systems that maybe affected. As described below, both in-band, and adjacent band systems supporting aviation safety should be considered in any potential future process for new or expanded terrestrial services in the 3.7-4.2 GHz band.

ASRI is the communications company of the US civilian air transport industry and is owned by the airlines and other airspace users. As sponsor of the Aeronautical Frequency

[1] *See* Comments of The Aerospace Vehicle Systems Institute, GN Docket No. 17-183, (filed 2 October 2017); Comments of The Boeing Corporation, GN Docket No. 17-183, (filed 2 October 2017)

Committee ("AFC"), ASRI brings together expertise and opinions from across the aviation sector to promote the safe and effective operation of commercial aviation radio communications systems in use within the US.[2]

II. USE OF 3.7 – 4.2 GHZ BY AVIATION

Within the 3.7 – 4.2 GHz band, the aviation industry is a regular user of C-band SATCOM backhaul connectivity for Air Traffic Management ("ATM") data. These connections allow reliable remote links to aviation communications sites that are in (primarily) remote or underserved locations where existing wired infrastructure is not available or unreliable. This enables nationwide deployment of VHF ground-to-air voice or datalink communications while maintaining a high availability cannot always be met by alternative Ku and Ka systems[3].

Additional C-band SATCOM usage includes supporting systems such as NOAAPORT, a dedicated weather data feed received across the US from the National Oceanic and Atmospheric Administration ("NOAA").[4] The weather data feed is provided to various users of weather data, including aviation, to combine with other weather information sources. While not fully equivalent to the NOAA Geostationary Operational Environmental Satellite ("GOES") feed in the L-band, it does provide users with a key capability that is relied upon to make operational decisions, especially in severe weather events.

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[2] AFC membership includes: Airlines for America (A4A), Alaska Airlines, American Airlines, Aircraft Owners and Pilots Association (AOPA), ARINC/Rockwell Collins IMS, Aviation Spectrum Resources, Inc. (ASRI), Boeing Corporation, Bristow Helicopters, Chevron, Delta Airlines, Era Helicopters, Federal Aviation Administration (FAA), Federal Express (FedEx), Frontier Airlines, Harris Corporation, Helicopter Association International (HAI), Helicopter Safety Advisory Conference (HSAC), International Air Transport Association (IATA), JetBlue Airways, National Air Transportation Association (NATA), PHI, Inc., Societe Internationale de Telecommunications Aeronautique (SITA), Southwest Airlines, United Airlines, United Parcel Service (UPS)

[3] Severe weather events can disrupt higher frequency systems due to rain fade, etc. C-band SATCOM has proven itself to be the most resilient of available SATCOM backhaul services, providing over 99.989% reliability.

[4] *See* http://www.nws.noaa.gov/noaaport/html/np_rfold.shtml

III. AVIATION USAGE IN BANDS ADJACENT TO 3.7-4.2 GHZ

The adjacent 4.2-4.4 GHz band is allocated to both the Aeronautical Radionavigation Service ("ARNS") and Aeronautical Mobile (Enroute) Service ("AM(R)S") allocations on an international basis.

The ARNS has been used by the airborne radio altimeter for over 40 years to improve safety after a number of studies looked at the occurrence of Controlled Flight Into Terrain ("CFIT") accidents.[5] As a result of these studies and recommendations from the U.S. National Transportation Safety Board ("NTSB"), the radio altimeter is required equipment on commercial aircraft as part of the Ground Proximity Warning System ("GPWS") for operation during all phases of flight.[6] The international adoption of this system has significantly improved aviation safety in the United States and worldwide.[7]

The radio altimeter system operates between 4.2-4.4 GHz, sweeping or pulsing[8] through almost all of the 200 MHz band to achieve the necessary measurement accuracy of altitude.[9] Performance has been generically defined at the ITU-R,[10] and International Civil Aviation Organization ("ICAO") preliminary studies based on this have shown potential interference from new adjacent terrestrial services in the 3.7-4.2 GHz band during low level operations such as

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[5] *See* FAA Advisory Curricular 23-18 'Installation of Terrain Awareness and Warning System (TAWS) Approved for Part 23 Airplanes' at 9 (dated 14 June 2000).

[6] This includes all large commercial passenger aircraft, business aircraft and helicopters.

[7] *'The experience with GPWS and Controlled Flight Into Terrain, or CFIT, is more dramatic. Between 1946 and 1955, large passenger aircraft averaged 3.5 fatal CFIT accidents a year. Think of it: A fatal CFIT accident about every 15 weeks. Through the mid-70s we were still averaging two fatal passenger airline accidents per year due to CFIT. In contrast, no jet operator has suffered such an event in U.S. airspace since 1974.'* Excerpt from speech by Nicholas A. Sabatini, FAA Associate Administrator for Aviation Safety. Dated May 12, 2006.

[8] Two main types of radio altimeter systems used commercially are either a Frequency Modulated Constant Wave (FMCW), or pulsed radar systems.

[9] *See* Comments of ASRI in the Matter of Spectrum Task Force Requests Information on Frequency Bands Identified By NTIA As Potential Broadband Spectrum, ET Docket No. 10-123 (Dated 22 April 2011).

[10] *See* Operational and technical characteristics and protection criteria of radio altimeters utilizing the band 4 200-4 400 MHz, ITU-R Recommendation M.2059-0.

landing and takeoff.[11] Combined with the Global Positioning System ("GPS") location data, the radio altimeter is one of the main aircraft sensor systems during the critical phases of flight such as landing and takeoff in low/zero visibility weather, and any interference that compromises the reported information can immediately affect aircraft safety systems such as the autopilot function or the GPWS. Therefore, any and all interference to the radio altimeter, no matter how brief, should be considered a safety of flight issue.

The AM(R)S service was recently allocated at WRC-15 on a worldwide basis, intended for the Wireless Avionic Intra-Communication ("WAIC") systems.[12] WAIC will allow wireless communication among different safety systems onboard an aircraft, replacing some aircraft wiring whilst also allowing greater resilience and flexibility in aircraft design. The WAIC system is currently in advanced development by major aerospace manufacturers and being internationally standardized for medium and large sized aircraft.

Lastly, it should also be noted the aviation SATCOM provider Inmarsat also uses the extended C-band below 3.7 GHz to provide space-Earth feederlinks to its FAA certified system for aviation. These feederlinks are critical to both domestic and oceanic air traffic control message delivery, and protection of these existing receiving ground stations should be accounted for in any deliberations.

IV. CONCLUSION

Given the range of aeronautical safety systems within or adjacent to the 3.7 – 4.2 GHz frequency band, any such repurposing of the band in the US market could have implications for both domestic and international aircraft operations. Therefore, the aviation community requests

[11] *See* ICAO studies to WG-Frequency: Preliminary Study into Radio Altimeter Adjacent Band Compatibility, dated 13 March 2014
[12] *See* http://waic.avsi.aero/

the Commission fully consider the above systems in any deliberations that increases terrestrial transmissions in the 3.7-4.2 GHz band.

Respectfully submitted,

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