

**BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554**

In the Matter of

Expanding Flexible Use of the 3.7-4.2 GHz
Band

GN Docket No. 18-122

COMMENTS OF ROCKWELL COLLINS, INC.

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May 31, 2018

I. Introduction and Summary

Rockwell Collins, Inc. (“Rockwell Collins”) submits the following comments to the Commission’s Public Notice regarding the feasibility of allowing commercial wireless services, licensed or unlicensed, to use or share use of frequencies between 3.7-4.2 GHz pursuant to Section 605(b) of the MOBILE NOW Act.¹

Rockwell Collins is a world leading developer and supplier of avionics to the business, commercial, and military aviation market. We keep people safe, connected, and informed with our high integrity solutions for aviation and have an unwavering dedication to safety. Rockwell Collins’ avionics products, including the radio altimeters described below, are used on thousands of civil and military airplanes, including Boeing and Airbus transport airplanes; Embraer business jets; and Bombardier business, regional and C Series jets.

As a leading supplier to U.S.-based manufacturers such as the Boeing Company and to U.S.-based airlines, Rockwell Collins is part of a civil aviation ecosystem that accounts for \$1.6 trillion in total economic activity and supports nearly 11 million jobs in the US.² The U.S. civil aviation industry has achieved a stellar safety record based on the combined efforts of Original Equipment Manufacturers (“OEMs”), suppliers, operators, and regulators all steadfastly focused on safety as the number one priority. The Federal Aviation Administration (“FAA”) NextGen program to modernize our nation’s air transportation systems lists as its primary goal “to

¹ Public Notice, Expanding Flexible Use of the 3.7-4.2 GHz Band, GN Docket No. 18-122, DA 18-446 (rel May 1, 2018) (“Public Notice”).

² The Economic Impact of Civil Aviation on the U.S. Economy, FAA, November, 2016.

*increase the **safety**, efficiency, capacity, predictability, and **resiliency** of American aviation.*³
(emphasis added).

The MOBILE NOW Act directs the Commission to prepare a report on the usage possibilities of the 3.7-4.2 GHz band for commercial wireless services. In such a report, the Commission must consider not only the significant current uses of the 3.7-4.2 GHz band for satellite services, but also the impact 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.

Rockwell Collins is concerned with the potential harm to aeronautical safety services currently operating in the 4.2-4.4 GHz band caused from harmful interference resulting from commercial wireless services as proposed in the immediately adjacent 3.7-4.2 GHz band. There are two aeronautical safety services authorized to operate in the 4.2-4.4 GHz band: 1) radio altimeters, and 2) wireless avionics intra-communications (“WAIC”). Any services permitted by the Commission to operate in the 3.7-4.2 GHz band must be sufficiently restricted to ensure that these two aeronautical safety services are adequately protected from harmful interference. Impacts to the safe operation of radio altimeters or WAIC systems would be detrimental to the safety and resiliency of our nation’s airspace and could negatively impact the \$1.6 trillion and 11 million jobs supported by the U.S. civil aviation industry.

The potential impacts to the radio altimeter and WAIC systems are described below.

³ FAA NextGen homepage: [https://www.faa.gov/nextgen/what is nextgen/](https://www.faa.gov/nextgen/what%20is%20nextgen/).

A. The Commission Must Ensure the Continued Safe Operation of Radio Altimeters used for Aviation Radio Navigation Systems, Including Safe Landings and Terrain Avoidance.

Radio altimeters are critical systems used by aircraft for approach and landing. The Commission must ensure the protection of the flying public and safe operation and landing of aircraft. It would be unwise to release the use of the 3.7-4.2 GHz spectrum without first understanding the interference threat that commercial wireless services would pose to the safety critical radio altimeter systems used for aircraft approach and landing.

Radio altimeters are an integral part of the Instrument Landing System (“ILS”) used for precision approaches to land in all weather conditions. Radio altimeters provide critical height above-terrain to the pilot and, if equipped, to the aircraft’s autoland system. Height information is used by the pilot to determine if the aircraft is on the correct glidepath to the runway and has sufficient ground and obstacle clearance. This information is especially critical during night or low visibility conditions when the pilot may be unable to see the terrain out of the cockpit windows.

For many precision approaches, the radio altimeter is used to determine the height, termed the “decision height”, at which the pilot must see the runway or break off the approach. On aircraft equipped with autoland systems, the radio altitude data is displayed to the pilot to monitor the approach. Autoland systems also use radio altimeter height data to determine when to execute the ‘flare’ maneuver that places the airplane in the proper attitude for landing.

Radio altimeter data is so important to the pilot and the autoland system that commercial transport airplanes with ILS capability are required to have two, and sometimes three, independent radio altimeters in order to meet FAA regulations and safety requirements. The final approach and landing is considered a critical phase of flight. Any interference to the radio altimeters resulting in erroneous height data or loss of data could cause an unsafe condition for the airplane. It is critical that interference issues be studied because the radio altimeter antennas location and coverage pattern (located on the underside of the airplane's fuselage and pointed toward the ground) may be particularly susceptible to interference originating from ground transmission towers in the vicinity of the approach paths to an airport.

The FAA's ILS system is a fully mature system that has been in operation for decades and will continue to be used in the future FAA NextGen airspace. While some precision approaches, such as ILS Category I, are being replaced by GPS-based landing systems, the more stringent ILS Category II and III installations, used in the most severe low visibility conditions at the nation's busiest airports, will continue to be utilized by airlines for the foreseeable future.

In addition to precision landing, radio altimeter altitude data is also used by aircraft terrain alerting systems such as Ground Proximity Warning System ("GPWS") and the Terrain Awareness and Warning System ("TAWS"). These systems have been credited with dramatically reducing the occurrence of controlled flight into terrain ("CFIT") accidents, especially for commercial transport aircraft for which such equipment is mandated to be installed. Because of the way the radio altimeter data is used by these systems, out of band interference emanating from low power ground transmitters may not be as much of a concern as

to precision landing systems; nevertheless, it is vital the Commission protect the safe operation of the GPWS and TAWS systems.

B. The Commission Must Ensure the Safe Operation of Wireless Intra-communications (“WAIC”) Systems.

In 2015, the World Radiocommunication Conference (“WRC-15”) allocated the 4.2-4.4 GHz band on a global co-primary basis to the aeronautical mobile (route) service (“AM(R)S”) exclusively for WAIC systems.⁴ WAIC systems are being developed as a new means to wirelessly transmit operational data within an aircraft. Use of WAIC wireless intra-connections has the potential to reduce the amount of wiring needed for airplane systems, thereby reducing airplane weight and improving fuel efficiency. WAIC also can enable new functions, such as connection of extensive on-board sensor networks for improved system health monitoring, that can increase airplane reliability and safety.

Notably, the WRC-15 excludes WAIC from being used by passengers or for passenger information/entertainment purposes. This restriction is to mitigate cyber-security concerns as well as to mitigate interference of passenger devices with installed WAIC equipment, both of which would be used inside the fuselage.

Since the WAIC 4.2-4.4 GHz band is shared on a co-primary basis with radio altimeters, the aviation industry has already begun to test interoperability of WAIC systems with aviation radio altimeters to ensure the two systems can operate without interference. This testing is being carried out by the Aerospace Vehicle Systems Institute (“AVSI”), which is “a cooperative research environment comprised of major aerospace companies and government organizations

⁴ ITU Radio Regulation No. 5.436.

working along with academia to solve problems common to its members.”⁵ Notably, the probability of WAIC and radio altimeter interference is mitigated in part by the fuselage and the exterior location of the radio altimeter antennas: the radio altimeter antennas are located on the outside of the fuselage and are pointed down, away from the interior of the aircraft, whereas the WAIC equipment is contained within the fuselage.

The WAIC 4.2-4.4 GHz band is already allocated for aeronautical safety services and currently has no radio frequency adjacency issues with mobile consumer devices used by passengers on-board aircraft. The Commission is reminded of its responsibility to consider the impacts of the commercial wireless services to systems that “*either currently exist* (for example, radio altimeters) *or are being developed* (such as WAIC)” (emphasis added).

⁵ AVSI homepage: <http://avsi.aero/about/>.

II. Conclusion

Rockwell Collins requests that the Commission not release 3.7-4.2 GHz spectrum to commercial wireless services until adequate impartial studies are completed to understand the interference limits to radio altimeter systems from out-of-band signals and the potential safety hazards with respect to operation and landing of commercial aircraft.

Respectfully submitted,

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