AIR LINE PILOTS ASSOCIATION, INTERNATIONAL
7950 Jones Branch Drive, Suite 400S | McLean, VA 22102 | 703-689-2270 | 888-FLY-ALPA
THE WORLD'S LARGEST PILOTS UNION | WWW.ALPA.ORG

National Telecommunications and Information Administration
1401 Constitution Ave. NW
Washington, DC 20230

Submitted via Federal e-Rulemaking Portal

12 April 2023

Subject: Comments on the National Spectrum Strategy, Docket NTIA-2023-003

Dear National Telecommunications and Information Administration ("NTIA"):

The Air Line Pilots Association, International ("ALPA") is the largest non-governmental safety organization in the world, representing the safety interests of over 67,000 pilot flying for 39 airlines in the United States ("U.S.") and Canada, who are the end users of aviation systems using federal spectrum. We have reviewed the NTIA Request for Comments on the National Spectrum Strategy and provide the following comments about aviation's use of federal spectrum. I also am the Chair of RTCA Special Committee 242 on Spectrum Compatibility.

Airline travel is incredibly safe. Through lessons learned from investigation of accidents, incidents, and data collected from proactive safety programs, there have only been 2 passenger fatalities on U.S. airlines since 2009, with over 11 billion passengers carried during that time. This 99.8% reduction in the passenger fatality rate was achieved by striving for less than one catastrophic accident in a billion flight hours, or 1e-9 per flight hour. To illustrate why this high target level of safety is necessary, the U.S. airline industry flies well over 10 million, or 1e+7 flight hours annually.[1] If aviation were to accept the

[1] The Federal Aviation Administration *Air Traffic by the Numbers* publication states there are over 10,000,000 scheduled *passenger* flights yearly (retrieved 4/7/2023 from https://www.faa.gov/air_traffic/by_the_numbers). The average flight length for a scheduled flight in the U.S. was about 995 miles (2018 data, Bureau of Transportation Statistics, https://www.bts.dot.gov/newsroom/2018-traffic-data-us-airlines-and-foreign-airlines-us-flights). Because this comfortably implies an average flight duration of over 1 hour, we can estimate with confidence that at least 10,000,000 flight hours are flown by scheduled passenger airlines each year. Note that this does not include *cargo* flights also operated under 14 CFR Part 121, so the actual number is even likely higher.

proverbial "one in a million" chance of a catastrophic accident, this would mean accepting over ten U.S. airline crashes every year.

Assurance that there is no Radio Frequency ("RF") interference in the aeronautical protected spectrum is one of the key enablers for achieving this safety. When that assurance does not exist, then aviation must prohibit operations that are not safe, leading to diversions, delays, and cancellations.

Economically, commercial aviation in the U.S. annually serves over 935 million passengers[2], moves 84 billion revenue ton-miles of cargo[3], supports 10 million jobs[4], and touches 5% or $1.25 Trillion of the U.S. GDP.[5] With safety and economics in mind, ALPA expresses our support for a National Spectrum Strategy and long-term spectrum planning.

Pilots are trained to trust their aircraft instruments and the safety systems that have dramatically reduced passenger and flight crew deaths. Highlighting a few of these systems:

- The Traffic Alert and Collision Avoidance System ("TCAS") was mandated by the U.S. Congress after several mid-air collisions involving airliners in the 1970s and 80s. TCAS works using radar transponders and Automatic Dependent Surveillance – Broadcast equipment aboard airliners. Since the TCAS mandate, there have been no fatal mid-air collisions in the U.S. involving airliners equipped with TCAS.

- Terrain Awareness and Warning Systems ("TAWS"). Prior to the mid-1990s, Controlled Flight into Terrain ("CFIT") was the leading cause[6] of aviation fatalities. TAWS uses aircraft Global Navigation Satellite System position information to compare the aircraft's location and velocity against a high-resolution terrain database to alert against high terrain in front of the

[2] Bureau of Transportation Statistics, U.S. Dept of Transportation. *Passengers, All U.S. and Foreign Carriers, All Airports 2022*. Retrieved 4/7/2023 from https://www.transtats.bts.gov/Data_Elements.aspx?Data=1
[3] Bureau of Transportation Statistics, U.S. Dept of Transportation. *All Cargo Summary Data (All) 2022*. Retrieved 4/7/2023 from https://www.transtats.bts.gov/freight.asp?20=E
[4] Airlines For America, *Economic Impact of Commercial Aviation*. Retrieved 4/7/2023 from https://www.airlines.org/impact/
[5] *Id*.
[6] Federal Aviation Administration, Flight Standards Service, AFS-210. *Implementation of Terrain Awareness and Warning System (TAWS) – Final Report to CAST*. May 24, 2006. Retrieved 4/7/2023 from https://www.skybrary.aero/articles/se001-terrain-awareness-warning-system-taws-final-report

aircraft. In addition, several other TAWS logic modes use radio altimeter and landing navigation aid information for additional protection against loss of terrain clearance. Since TAWS has become available, there have been no CFIT passenger fatalities on a U.S. airliner equipped with TAWS.

- Reactive and Predictive Windshear Warning. During the 1970s and 1980s, an atmospheric phenomenon known as windshear came to the attention of the aviation industry as the cause of over 25 accidents from 1964 to 1982, accounting for 491 fatalities during this period.[7] Windshear occurs at low altitudes, where a rapid shift in wind speed and direction can cause the loss of airspeed, leading to the aerodynamic stall of the aircraft. Windshear warning systems were mandated for installation aboard airliners in 1988. When flying a windshear escape maneuver, information from the radio altimeter is critical to success. In addition, technology using airborne weather radar alerts pilots to windshear conditions ahead of the aircraft, allowing the flight crew to take early action to avoid the phenomenon. The last U.S. airliner to crash due to low level windshear was in 1994.[8]

These safety systems rely upon RF equipment to work, including Global Navigation Satellite Systems (GNSS), radar Mode-S transponders, Automatic Dependent Surveillance – Broadcast, Radio Altimeters, weather radar, and others. Furthermore, the U.S. Congress mandated installation of some of these safety systems including TCAS; arguably, it would be thwarting the will of Congress if the performance of these systems were degraded due to inadequate spectrum planning processes.

To ensure that aviation safety and economic activity is not hurt in the future, the National Spectrum Strategy should proceed very carefully to ensure that the performance of aircraft systems, including safety systems, is not compromised.

[7] Federal Register, 52 FR 20560, 6/1/1987
[8] Skybrary. *Microburst*. Retrieved 4/7/2023 from https://www.skybrary.aero/articles/microburst

Nevertheless, the aviation industry does not have a philosophical objection to finding ways to repurpose spectrum, including for mobile wireless, as long as:

- Sufficient spectrum remains for aviation's continued growth, especially by new entrants including Uncrewed Aircraft Systems (UAS) and Advanced Air Mobility
- Any proposal is carefully analyzed, with input from the Federal Aviation Administration (FAA) and aviation industry given full consideration. The FAA as the aviation safety regulator should have the final say on aviation safety impacts.
- Spectrum plans recognize that new RF performance requirements cannot be retroactively applied to systems already in service with no cost or time impact.
- Funding from the Spectrum Relocation Fund is made available for any needed aircraft retrofits, and
- Sufficient time is given for any necessary equipment upgrades to occur.

To this latter point, because aviation must have certainty that new or revised equipment meets safety standards, there are a number of steps that are required to make changes to certified designs.

- There must enough time, and more importantly, enough detail to test and analyze the impact of a spectrum reallocation, including frequencies, waveforms, power levels, and in some cases proposed deployment characteristics.
- Industry and FAA must then work together to change the technical performance requirements. This often takes place at RTCA, Inc., an industry standards development organization which develops Minimum Operational Performance Specifications for aviation equipment.
- After the revised Minimum Operational Performance Specifications are complete, FAA must then publish the full set of certification standards for the equipment in a Technical Standard Order.

- Once the Technical Standard Order is complete, aircraft equipment makers must design and certify the revised avionics design with the FAA to obtain a Technical Standard Order Authorization and can then begin to manufacture equipment.
- Finally, there must be time for airlines and other aircraft owners to purchase and install upgraded equipment. Depending on how much modification is needed to the aircraft, installation may need to wait until aircraft are in heavy maintenance, which typically occurs every 3-5 years. Otherwise, additional cost will be incurred to pull aircraft out of revenue service for expedited equipment installations.

For planning, NTIA should estimate that the above will take about 10 years to complete for any given system, with some variance with the complexity of the change needed.

For its part, aviation via RTCA has embarked on work to better understand the current standardized RF performance of aviation systems, and to develop guidance on how to better ensure spectrum compatibility for new and future systems. This includes a better characterization of in-band and out-of-band performance for both transmitters and receivers. While this will not guarantee spectrum compatibility, it will help ensure that more complete information is available to perform the necessary analysis for a proposed reallocation of spectrum.

We encourage the NTIA to continue to participate in RTCA and to work with the FAA and aviation industry experts to enable aviation to remain a safe, efficient, and reliable form of transportation.

In closing, ALPA believes a National Spectrum Strategy is a good way to provide more certainty and lead time for changes in spectrum use, so that any adjustments that are needed are orderly and can be performed with no impact on the safety of the traveling public.

Sincerely,

/s/ Edward Hahn
Edward Hahn
Chair, RTCA Special Committee 242 Spectrum Compatibility
Sr Engineer ATM & Technology
Air Line Pilots Association, Int'l