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Introduction

Chairman DeFazio, Chairman Larsen, Ranking Member Sam Graves, Ranking Member Garret Graves, and members of the committee, thank you for inviting me to appear before the Aviation Subcommittee today. My name is Eric Fanning, and I serve as the President and CEO of the Aerospace Industries Association (AIA). For over 100 years, AIA has advocated for America's aerospace and defense (A&D) companies and the more than two million men and women who are the backbone of our industry.

AIA applauds this committee for its ongoing leadership in ensuring 5G in the C-Band will safely coexist with users of the National Airspace System. Chairman DeFazio and Chairman Larsen, we are particularly thankful for your ongoing work to highlight aviation safety concerns about potential 5G interference to multiple federal agencies and the White House as far back as November 2019. Over the past two-plus years, your staff continuously took time to meet with AIA and other members of the coalition to best understand how we can safely deploy 5G. For these things, we are grateful.

Our Industry's Role in Protecting Aviation Safety

Today, AIA represents over 300 aerospace and defense (A&D) companies ranging from family-run businesses to larger corporations exporting products around the globe. Our membership includes aircraft and engine manufacturers, companies that design and build radio altimeters and other aircraft systems that are integrated with them, as well as a vital supply chain network of companies that provide equipment, parts, maintenance, repair, and other services. Our members would tell you that our companies are in the safety business. And over the latest 25 years, in

partnership with the Federal Aviation Administration, we set the highest safety standards across the globe. We are proud to be considered part of this "gold standard" safety system.

AIA members manufacture fixed-wing and rotary aircraft of all sizes. These aircraft are first-in-class—superior in design and performance. The safety features are extensive, starting in the cockpit, deployed throughout the cabin, found in the engines, and even on the wings. One of the most critical safety features in an aircraft is a radio altimeter, which is the workhorse of the overall integrated safety system. While it is a simple device, it has the most sophisticated of purposes—helping to save lives.

Altimeters help pilots determine a jet's altitude and its distance from other objects. These devices are essential to a number of aircraft functions, including precision approach, landing, ground proximity, and collision avoidance. It is the only sensor that provides this crucial information. All commercial and most general aviation aircraft, as well as many helicopters, use an altimeter. The devices are unique to each aircraft type and model. They are each designed, manufactured, tested, and certified against the most rigorous safety requirements and standards as a single component. They also go through the same stringent process once integrated into a specific aircraft where they are tested and certified as part of a coordinated aviation safety system.

Altimeters are especially important for pilots when dealing with low-visibility conditions and in other situations such as encountering windshear. Because of the rigorous safety standards of the aviation industry and their reliability, radar altimeters are the backbone of an aircraft's overall safety system.

To provide a real-world example of one of many critical instances where radar altimeters are used, consider when an aircraft encounters windshear. Windshear is a weather phenomenon that causes aircraft to experience a rapid decrease in airspeed due to wind flows near the ground. This can be particularly hazardous during takeoff and landing. When encountering a windshear, the pilot flying the aircraft may need to execute a manual escape maneuver, which adjusts pitch to a nose-up altitude and increases engine thrust to full power. It is worth noting that escape maneuvers often happen at low altitudes. The co-pilot or cockpit audible alerts then continuously

call out radar altitude to help with decision making as they work to avoid ground contact. Loss of, or erroneous, radar altitude readings during the escape maneuver due to interference would greatly reduce the chances of a successful and safe outcome.

Because of the unique and necessary role altimeters play in aviation, concern arose quickly about possible interference upon deployment of new 5G service in the C-Band from a broad group of stakeholders, ranging from the airlines, commercial pilots, the helicopter and regional airline associations, the manufacturers, and others.

Aviation Industry Support of 5G

While safety is the cornerstone of our business, the aerospace and defense (A&D) industry is also an ecosystem rooted in technology and innovation. That means our sector needs advanced telecommunication services to include 5G and beyond and supports their rollout. Spectrum is the lifeblood of our industry, and we need safe, reliable, and continuous access to various bands, not just for today's technologies, but also for technologies that will be integrated into our airspace in the future.

Perhaps more than any other industry, the A&D industry knows what it is like to introduce complex technologies into society and is committed to doing it safely. That is why we are confident that 5G in the C-Band and aviation can safely coexist. Over the past several years, our industry's concerns regarding the pending use of 5G in the C-Band have been focused on continued adherence to the highest level of aviation safety. Safety isn't as easy as flipping a switch, so the manufacturers' design and technical expertise must be brought into play. Again, I want to reiterate that you can't just provide a band-aid solution to assure gold-standard safety, which is defined as the chance of one catastrophic incident in one billion flight hours.
We will continue to offer industry expertise to our government partners and airline or general aviation customers to help mitigate any possible interference.

How Did We Get Here?

While we would all like to focus our efforts on continuing to make progress toward a safe and comprehensive resolution, examining how we arrived at this hearing is important for policymakers, the public, and the organizations involved in this issue.

In 2018, the FCC released the first Public Notice expressing its intent to auction spectrum in the 3.7-4.2 GHz band (or C-Band). Consequently, AIA submitted comments to the FCC highlighting the potential inference to aeronautical communications and safety services, including radio altimeters, operating in the 4.2-4.4 GHz band. Over the last four years, AIA and our colleagues across the aviation industry have worked diligently to provide the FCC, FAA, National Telecommunications and Information Administration (NTIA), Department of Defense (DoD), the White House, and Members of Congress with as much data as possible on the potential for interference.

Additionally, with the FCC's encouragement, the Radio Technical Commission for Aeronautics (RTCA) studied this issue. While the telecommunications industry was invited to participate in the analysis, it chose not to do so. In October 2020, RTCA concluded that 5G systems operating in the C-Band would likely cause interference with altimeters. Shortly thereafter, in December 2020, the Acting Deputy Secretary of Transportation and the FAA Administrator wrote to the NTIA expressing safety concerns over the planned auction and asking that it be deferred.[1] According to the Wall Street Journal,[2] this letter did not receive broad attention because it was not made public in the NTIA regulatory docket.

One of the key arguments against the aviation industry's concern is that 5G technology has been deployed in other countries around the world without causing harm to public and aviation safety. However, conditions are different in the United States due to three important factors: power levels, proximity to airports, and orientation of base towers.

[1] Letter to National Telecommunications and Information Administration re: "Expanding Flexible Use of the 3.7 to 4.2 GHz Band", December 1, 2020, signed by Steven G. Bradbury, Acting Deputy Secretary and General Counsel, U. S. Department of Transportation and Steve Dickson, Administrator, Federal Aviation Administration.

[2] "*Agencies Feud Over Aviation Safety, 5G Rollout*", Wall Street Journal, November 15, 2021.

The U.S. aviation system is incredibly complex. It's not nearly as simple as adopting another country's safety playbook for many reasons, such as orientation of the base tower and differing maximum power levels. The deployment examples from other countries come with specific government-mandated restrictions, lower power levels, and different technical features that must be considered in making any comparison between the U.S. and overseas 5G deployment. Here are some specific examples which make the American deployment of 5G in the 3.7-4.2 GHz range different:

- Japan: While Japan has deployed 5G up to 4.1 GHz, the power levels permitted for 5G are at least 90% below those permitted in the United States. If 5G providers in the United States operated 5G with this mitigation, then the issue with aviation users would be reduced.

- Europe: The 3.4-3.8 GHz band is utilized for 5G. However, the amount of separation from adjacent bands is 100 MHz farther than authorized in the United States, meaning that interference is less likely to occur, and the maximum power level permitted in most of Europe is well below the level permitted in the United States.

- France: Regulators in France imposed mitigations on the use of 5G -- exclusion zones -- to protect public safety. This type of mitigation is consistent with recommendations made to the FCC by the aviation industry.

- Australia: Compared to Europe, Australia operates even farther away from the radio frequency band used by the radio altimeter. In addition, the power levels permitted in Australia are 76% lower than that allowed in the United States.

The A & D industry believes in the incredible potential of 5G for our country and our companies, and we are committed to find ways to ensure that 5G in the C-Band and aviation can safely coexist. For this reason, in 2018 we called for a collaborative environment for the aviation industry and the telecommunications industry to share information. Our goal was to provide both the FAA and FCC with necessary data to address potential interference and, in turn, come to a

long-term mutually agreeable solution that addressed the needs and concerns of all parties. Unfortunately, that collaboration did not begin until December 2021, the same month FCC licenses allowed 5G services to begin.

In July 2021, the FAA met with AIA and the aviation industry and we expressed a need for information from the telecommunications industry including details such as 5G tower locations, antenna angles, and power levels. AIA subsequently joined a letter of 20 aviation associations and aerospace companies to the Department of Transportation and Department of Commerce requesting support from the Administration to facilitate interagency coordination and information sharing between the aviation and telecommunications industries.[3] In November 2021, the National Economic Council (NEC) began discussions with both respective industries and the deployment of 5G in the C-Band was delayed by one month to January 5, 2022.

Between December 2021 and the beginning of this year, aviation engineers and technical experts worked tirelessly to collaborate and examine the consequences of interference. We are grateful Verizon and AT&T agreed to another delay on January 3, 2022, until January 19, 2022, as we began to receive the FAA's Notice to Air Missions (NOTAMs) and manufacturers could empirically analyze the impact to specific aircraft and their radio altimeter models and ultimately propose Alternative Means of Compliance (AMOCs).

Thanks to strong communication and cooperation among the government and the aviation and telecommunication industry, significant progress has been made over the past few weeks. The intervention of this Committee, along with that of the NEC, the DOT, and the FAA has been a catalyst for bringing the different stakeholders together. Since the January 3rd agreement was signed, AT&T and Verizon have been working with aviation manufacturers daily — sharing data and developing additional mitigations to allow most commercial flights to take off and land safely. Fortunately, the telecommunications companies agreed to delay full deployment on January 18, 2022. While the process is belatedly making significant positive progress, there is more work to be done for 5G to deploy safely.

[3] Aviation industry stakeholder letter to Transportation Secretary Pete Buttigieg and Commerce Secretary Gina Raimondo, July 14, 2021.

While the FAA is currently working with the manufacturers, airlines, and the telecommunications companies, and progress is being made, it is important to note this is not the same as declaring the problem solved. What matters most is the percentage of overall U. S. aviation operations that are affected because they do not have an appropriate temporary approval from the FAA as reflected in an Alternative Means of Compliance (AMOC). Delays are still occurring, and AMOCs have not yet been approved for most regional airline operations, general aviation aircraft, or most helicopter operations.

As this subcommittee knows well, our aviation system is a complex network of airports in small and mid-sized communities as well as big cities. FAA's 2021 National Plan of Integrated Airport Systems lists 3,300 active airports in the United States. Many of these airports in small communities depend heavily on aviation because of remoteness or other factors. We need to ensure that all airports can maintain their operations, not just the large ones, as the 5G rollout continues. Furthermore, we will need to ensure the same agreements are in place as additional licensees deploy their systems. It is clear there is much more to be done over the coming months.

While we wish intergovernmental coordination had been stronger and given more credence to the views of aviation experts and regulators, our industry needs 5G services and is committed to seeing their rollout, while preserving the highest levels of aviation safety at the same time. The aviation industry has the most knowledgeable and accomplished engineers, pilots, systems operators, and avionics experts in the world. Moving forward, it is our hope that their expertise on the complex science of machines in flight is given deference and greater weight as the NTIA and FCC continue their difficult job of deciding how to effectively utilize limited radiofrequency spectrum.

We are glad to be making progress and working together, but by no means are we on a glide path. With many outstanding questions still on the table, there are disruptions in our future, even with further compromise and collaboration.

What Can This Committee Do?

The United States has set the gold standard as the safest aviation system in the world, and we have incredibly high requirements to keep it that way. But currently, there is no formal requirement for 5G interference tolerance, an incomplete understanding of spurious emissions, and no agreed-upon worst case interference scenario. Based on where we are today, the development of new standards, including the implementation of minimum performance standards via Technical Service Orders (TSOs), will take considerable time. Because of this, a proposal to retrofit out-of-band filters or other solutions cannot be accomplished overnight. Manufacturing and certifying new radar altimeter designs on a forward-fit basis is the ultimate goal, but that will take even longer. In fact, it will take testing and take time.

One of the lessons learned in this case is that the effects of spectrum relocation or sharing are not simple or clear-cut. The auction process seeks to address and indemnify in-band users that are being relocated to make room for new purchasers, whether 5G or other licensees. However, the effects of interference on nearby users and the requisite mitigation – as in this case – is not adequately addressed by the regulations governing spectrum allocation and auction. Aviation is left with the task of financing these fixes, over both the short- and long-term, and it is not clear whether auction proceeds are available for this purpose. We believe that needs to be considered.

Finally, we hope Congress will consider changes to the spectrum auction process to consider the views of the government's aviation safety experts more appropriately in the DOT and the FAA. Just three months ago, Congress provided the DoD and the Congressional Armed Services Committees with additional authorities in future spectrum actions affecting the 3.1 to 3.45 GHz band in H.R. 3684, the Infrastructure Investment and Jobs Act. This provision was designed to ensure this potential auction does not cause DoD the same kind of problems we are now experiencing in aviation, and ensures the appropriate Congressional committees are involved early in the process. Our aviation system is too important to our economy, and too vital to our small, rural communities, to face mass groundings again in the future. We urge this Committee and the Congress to explore similar authorities for the DOT, to ensure that the coordination with this committee, and the role of our government's aviation authorities, are strengthened in future spectrum decisions.

We are not out of the woods yet and some disruptions are likely. The process will take a while because the stakes are so high. We are hopeful we can anticipate and address challenges or concerns earlier in the future. We know that the telecommunications industry carriers will continue to innovate, as will aviation. Spectrum is the lifeblood of our industry, and we need safe, reliable, and continuous access to various bands, not just for today's technologies, but also for technologies that will be integrated into our airspace in the future.

Thank you, and I look forward to your questions.