TESTIMONY OF DENNIS A ROBERSON

PRESIDENT AND CHIEF EXECUTIVE OFFICER

ROBERSON AND ASSOCIATES, LLC

Good morning Chairman Larsen, Ranking Member Graves, and Members of the Transportation and Infrastructure Committee's Aviation Subcommittee. By way of background, I am Dennis Roberson and I serve as the President and CEO of Roberson and Associates, LLC, a technology and management consulting firm serving government and commercial customers. In addition, I am a Research Professor at Illinois Institute of Technology and serve in advisory or board roles for several start-up companies in the technology space. Prior to my current roles I served as Executive Vice President and Chief Technology Officer of Motorola and over the years have held executive positions at AT&T, Digital Equipment Corporation (now part of HP), IBM and NCR. I also served as the Chairman of the FCC's Technological Advisory Council for the past eight years and serve on the Department of Commerce Spectrum Management Advisory Committee. My technical focus and personal passion through these roles has been to optimize the use of our nation's increasingly valuable spectrum resources through both technology enhancements and enhanced spectrum management policies and practices.

January 19th was the day that High Speed 5G Cellular service was launched by both AT&T and Verizon based on their very expensive Spectrum Auction wins at the FCC last year. The Aviation world including the FAA, commercial airline and private aircraft communities, airport authorities, and others have fought this roll-out for the last several months initially focusing on safety of life issues and more recently talking about massive disruptions in airline flight schedules. This has all been headline news with claims and counterclaims between the two major cellular providers operating in the contested spectrum band and the aviation industry. For their part, the cellular providers point to nearly 40 nations who have successfully deployed 5G in the so-called C-Band spectrum while the aviation community counters with the fact that these countries have significant restrictions on the use of the band which until recently did not exist in

the U.S. All this has made for a very confusing and contentious situation created by the lack of information and the failures of the FCC and FAA to resolve their differences in a timely fashion while the cellular carriers have delayed their roll-out and altered their plans on an almost weekly basis. 19 January was the day when all the hoopla finally came to a head when AT&T and Verizon began to deploy their high speed 5G service minus any deployments within a few miles of a major U.S. airport.

That is the top-level state of play but is there really a problem and going forward what should be done now to eliminate the current concerns? First, the unfortunate truth is that there is a real problem, but it is what can be described as an "edge case" problem, that is, a problem that only occurs in unusual circumstances and for a very limited number of aircraft. So, what is the problem? Fundamentally, the problem is a design issue with the aviation industry's radar altimeters. These are the devices that sense how high the aircraft is above the ground and especially in bad weather when ground visibility is limited and runway conditions are suboptimal, this is a crucial component of an aircraft's ability to safely land. Now to get a little technical. The altimeters are supposed to operate in their assigned spectrum band between 4.2 and 4.4 GHz. Unfortunately, when these devices were originally designed, they had very low power neighbors, i.e., satellites beaming their information to the earth from very distant orbits. Since the altimeters operate on a radar principle looking for a signal reflected from the ground their receivers couldn't detect the very low power neighboring satellite signals. This led the early designers of the altimeters to decide they really could ignore their assigned spectrum boundaries and as result they allow transmitted energy far outside their band into the receiver. For decades this was not an issue given their quiet neighborhood, but with new neighbors now moving in

(AT&T and Verizon), the spectral space that they were allowing into the receiver is now a potential problem.

Adding a little more technical information to the mix, AT&T and Verizon have now commenced operation in the spectrum range from 3.7 GHz to 3.8 GHz, i.e., 400 MHz away from the altimeter band. To put this in perspective, the whole FM radio band (all stations) is only 20 MHz wide, so the spectral separation between the new 5G cellular band and the altimeter band is very, very large. The FCC for its part when granting the use of the band (which will ultimately be expanded to cover 3.7 to 3.98 GHz) determined that there shouldn't be an issue because of the vast separation between the 5G cellular use of the new spectrum and the altimeter spectrum allocation. Unfortunately, this is not the case for old, technically "wide open" altimeters. These radar altimeters may send out a signal and be unable to discern the reflected signal because of energy from the far away 5G towers entering the receiver, causing the radar altimeter to either fail to function or possibly provide a false reading.

To make matters worse, though the altimeters were once only a standalone instrument that had an altitude indicator on the pilot's panel, today the altimeter is highly integrated into the avionics for modern aircraft. If for instance the altimeter says the aircraft is still in the air when it has actually landed, it will cause the reverse thrusters and spoilers that normally create a rapid reduction in the airplane's speed on the ground to not operate. I am told that in icy runway conditions the lack of reverse thrusters and spoilers could increase the landing distance by as much as four times which for short runway airports (e.g., Washington's Regan National Airport or even worse Chicago's Midway Airport) with the potential for poor landing and runway conditions could be an enormous problem.

So how do we get out of this mess? First, most of the time the situation is not nearly as bad as the dire challenges the worst-case scenarios would suggest. Modern altimeters are well designed and do not have the problem of looking far outside their assigned band. The addition of a very low-cost component, historically a small piece of ceramic, called a filter at the antenna input to the altimeter receiver eliminates the issue of looking outside the altimeters assigned band. Of course, retrofitting and certifying a new radar altimeter in an aircraft is a non-trivial expense in both time and dollars. Happily, most modern altimeters have filters and will not experience any 5G interference problem. The FAA is currently determining both the robustness of various altimeter models, having currently cleared some 20 altimeter models, and which altimeters are installed on various aircraft, certifying those aircraft that have altimeters that properly filter out 5G transmissions. Those aircraft that don't have appropriate altimeters should be required to replace their altimeter or suffer a significant reduction in the weather conditions in which they are allowed to fly. Using this process, the FAA has reported that approximately 90% of commercial aircraft have been certified for safe operation in the presence of 5G transmissions.

Given this straightforward, but critical set of steps, the aviation world can be returned to a safe environment in the presence of 5G technology and AT&T and Verizon can fully deploy their new C-Band systems including deployments around airports. As an important aside, while all of this turmoil has been proceeding, it should be noted that T-Mobile's deployment of high speed 5G is currently unimpeded by these concerns since it operates in spectrum that is even further away from the altimeter band at 2.5 GHz.

Hopefully this Testimony will help clarify the technical aspects of this high-profile issue and the way forward. I look forward to hearing the questions or comments that this testimony inspires.