Rob McDowell ([00:00:03](https://www.rev.com/transcript-editor/Edit?token=J9nF1jtclJtuJX3SKuN7SQYZQLlENequ-Pu3ElvPl9m6xwd6YGKKcbqQPQb_I50iVvMfTe5K0BguayXxyh9AoyQ_i70&loadFrom=DocumentDeeplink&ts=3.14)):

So good afternoon. On behalf of the Satellite Safety Alliance and the GPS Innovation Alliance, I would like to thank all of you for joining us today. I'm Robert McDowell, and long ago I served as the commissioner for the Telecommunications Commission. Today I'm an attorney in private practice at Cooley LLP, and Iridium Communications is one of my clients, for full disclosure.

Rob McDowell ([00:00:24](https://www.rev.com/transcript-editor/Edit?token=yjJF2odWrC-x6g0jNLLXkzs-ccJCtHurHK8bf1UIZ-Ow2J1-W6nmVrSpYb-kP3pE6ShoLulXljYghD9sV9f4whgVvH0&loadFrom=DocumentDeeplink&ts=24.81)):

During this surreal year of 2020, American innovation and ingenuity have been a bright spot that has helped us get through these challenging times. The American satellite economic ecosphere has been a crucial component of our ability to move forward. The satellite industry keeps America competitive, and makes consumers lives better and safer. The US satellite industry made up of private companies generates over 110 billion dollars in revenue, which directly supports over 200,000 jobs. The GPS part of this sector has contributed over 1.4 trillion dollars directly to the US economy over the years, and GPS also provides safety services for the aviation sector, and the public. It has supported the creation of millions of jobs and the birth of countless new and innovative businesses.

Rob McDowell ([00:01:19](https://www.rev.com/transcript-editor/Edit?token=_nKSKxcOzzLwNb98UouYR7M449otM1MbMqWNFAkI1vPFtq_tMZVhcFw0GhdHPVaPQEgfkW1GOnWbYeD0cOMy_pMLDtY&loadFrom=DocumentDeeplink&ts=79.37)):

In fact, it is estimated that a loss of GPS for just one day would cost the American economy one billion dollars. What isn't captured in all those numbers, however, are the consumer benefits. Commercial passenger aviation, air cargo transport, medevac helicopters, emergency aviation operations fighting wildfires, and much, much more all depend on satellite communications to communicate from the cockpit to the ground so that they can operate safely. Remote workers servicing critical infrastructure such as the power grid, helping to secure the operations of financial services firms and major stock exchanges, supporting America's war fighters, especially our special operations forces, disaster recovery professionals, supply chain logistics, as well as telematics for precision agriculture, and much more all depend on satellite communications. Satellites also make real time weather data possible, that's crucial to warn Americans about approaching hurricanes and tornadoes, and monitor floods and tidal surges.

Rob McDowell ([00:02:37](https://www.rev.com/transcript-editor/Edit?token=_SxoTIjMYIQCSl-wa4eT8ytNjUeQ7Ly4s56WioGn85HSaPn7EWLXQHn0aX3Ws-LN6FfwxBIDvacJnmE5WS86eOxOCAs&loadFrom=DocumentDeeplink&ts=157.13)):

Nearly every segment of our economy uses GPS in some way. In addition to satellite communications, our war fighters also depend on accurate and reliable GPS data. GPS enables farmers to increase crop yields, to create cost efficiencies, and to work towards environmental sustainability. It supports our telecommunications networks including 5G services. It enables safe and efficient air travel. It's used by major financial institutions, marine operations, construction, public safety, and the list goes on and on.

Rob McDowell ([00:03:14](https://www.rev.com/transcript-editor/Edit?token=v0cjG5u6ESfAvTUG5YAILLpFV8X1nFj6_PVzTFxrVeIP5KYSAkEde0wYneh3TtBqYCderMKkYZAhEZF9ClrAWbpjjbY&loadFrom=DocumentDeeplink&ts=194.37)):

Having had the honor of serving on the Federal Communications Commission for seven years, I know that protecting critical infrastructure, consumer services and public safety is almost always a bipartisan public policy goal, but a recent order from the FCC involving a speculative venture known as Ligado could put much of all of that in jeopardy. Today we have some very distinguished guests who are going to guide us through, in substantive detail, the very real concerns they have about the Ligado order.

Rob McDowell ([00:03:49](https://www.rev.com/transcript-editor/Edit?token=ZyVgQ9XqVDo12QxP3K3RtMmM_6VpZdld68y6PDnAMjh8CkJwBONpptbPEKN8LFD5yBYU5bee7QQbhKzyj7v557jhVsg&loadFrom=DocumentDeeplink&ts=229.58)):

So let me quickly set the stage and give some background regarding the spectrum neighborhood we will be discussing, and that's known as the L-band. Ligado, formally a company called LightSquared has some small pieces of satellite spectrum that sit right next to existing private sector satellite licenses, including Iridium Communications, weather data satellite operators, and GPS. The purpose of this event today is to tell you about the real world and negative effects of that FCC order.

Rob McDowell ([00:04:21](https://www.rev.com/transcript-editor/Edit?token=0c_AUFAI9N1Bb5nXk8gEal02ALehzdUP1WJzdasEI2NtHXINBohSZslBDncR2UmM3kviLWSwacl5RBje9l0EwLbzEOE&loadFrom=DocumentDeeplink&ts=261)):

But first you have a quick primer on radio frequency regulation, I'll try not to lull you to sleep, but think of radio frequencies as being like real estate, like land. Some parcels of land are better suited for specific purposes than other parcels of land. Well, similarly, some radio frequencies are better suited for specific purposes than other frequencies due to radio physics. With real estate, we zone like with like for good reason, that is we group residential neighborhoods together and away from commercial or industrial neighborhoods. This is done to keep residential neighborhoods quiet. We don't want noisy neighbors where we live, we want to be able to have what is known as quiet enjoyment of our property.

Rob McDowell ([00:05:06](https://www.rev.com/transcript-editor/Edit?token=YRSsTJd5tfXzHbq87vYiyaTlVtcRkoRG7DZ7paGkNjCgiQ-ecZaPv2lsMKNdgKg5uQMR9M8IZ2x0wRVHPWx1v_SIYko&loadFrom=DocumentDeeplink&ts=306.14)):

Commercial or industrial neighbors in nosier neighborhoods can tolerate noise better. Think of a busy main street being set away from a residential neighborhood, people expect main street to be noisy, but residential neighborhoods to be quiet. In spectrum policy we call the equipment of noise harmful interference, and 86 years of spectrum jurisprudence at the FCC has meant avoiding harmful interference, until the FCC's Ligado order this spring.

Rob McDowell ([00:05:38](https://www.rev.com/transcript-editor/Edit?token=nc2PaOnUPKhPGCf6fMIM40wnresa9AXr57kNQTqbF7bVtqIvfdhPjZjYPQvy1mNEDXalBr-kiuGSFKzrt3KSkikKI0k&loadFrom=DocumentDeeplink&ts=338.54)):

Under the FCC's own rules, it is supposed to keep existing residents, or licencees in a spectrum neighborhood like the L-band that has been home only to satellite companies, from having to live next to noisy neighbors. In sort, you don't put a frat house next to a library. Satellite operations must be able to hear mere whispers from thousands of miles away up in space to satellites, so their spectrum neighbors like the L-band, must be exceptionally quiet and far away from noisy terrestrial neighbors, or else their whispers will get drowned out. But the FCC violate it's own rules last spring, they put a new and noisy terrestrial neighbor into the L-band, the L-band satellite neighborhood that absolutely has to be very quiet, and that noisy neighbor is Ligado.

Rob McDowell ([00:06:35](https://www.rev.com/transcript-editor/Edit?token=S1xpN5hMibzyLNYsfHZToxBONCOOIS6nNRAQ1VzU7MoKPsEKO95pYZbHxwhWKwZ3pOrrOhpl-oRm5JFzNyDXP1Lukts&loadFrom=DocumentDeeplink&ts=395.07)):

Over the years, many years, the LightSquared, or Ligado proceeding have been open at the FCC, many parties including GPS and Satellite communications companies put substantial evidence and technical studies into the record to show that Ligado's terrestrial operations would likely cause harmful interference that could impair operations for GPS, weather, and satellite communications providers alike. But after years of silence on this issue, in April the FCC suddenly granted Ligado's petition under the guise that Ligado's small amount of spectrum would somehow help the US in the race to 5G, even though Ligado's spectrum is ill suited for 5G, and is not even international harmonized for 5G. Something we can discuss a little later.

Rob McDowell ([00:07:24](https://www.rev.com/transcript-editor/Edit?token=Ot3H7AsuWGOuSmcik0IdSQ0P1EVRCwAWWCdqAYGZsUcFZKfiYwaJ3oMxQrL0njIb-mI80PwGpowlCRg60U4WO9fjLpw&loadFrom=DocumentDeeplink&ts=444)):

The order, the text of which was not disclosed to the public or to the effected parties to give them a chance to comment on it, was released on a Thursday, and remarkably, very quickly approved by all five commissioners by the following Sunday night. Believe me, that is highly unusual. By the way, it's important to know that Ligado just refinanced it's debt at the sky high interest rate of about 16%, but with only about 175 million dollars left over for expenses for the next few years. Now, you simply cannot build a nationwide 5G network, as Ligado asserts it wants to do, for 175 million dollars. So this recent refinance highlights that Ligado is only a spectrum flipping regulatory arbitrage venture. So all of this uncertainty and risk you're going to hear about shortly is not to help spur 5G build out, but to help speculators turn a profit by regulatory fiat.

Rob McDowell ([00:08:26](https://www.rev.com/transcript-editor/Edit?token=NzaEZmoWOrIk3aUbW00ZB9yLeKWM73QKOFwZRGmuPgAGUHU_H-Vc0IDAwdg1azLk0EY6kSe4GgOsvOfUNTKM4qDmvY4&loadFrom=DocumentDeeplink&ts=506.12)):

In addition to a bipartisan and bicameral coalition in congress, those are terms you don't hear much about these days, bipartisan, bicameral that is, that they're opposed to the FCC's Ligado order, there's also a broad coalition of private sector entities, and some of America's top civilian and military officials who have sounded the alarm over Ligado's plan. But to conclude and to introduce the next segment of our program, I'm very pleased to introduce someone I've worked with for years at the FCC, years ago, and also when he had a very distinguished career on Capital Hill, the Executive Director of the GPS Innovation Alliance, J. David Grossman, and David will introduce our incredible keynote speakers. So take it away, Dave, and thank you.

J. David Grossman ([00:09:12](https://www.rev.com/transcript-editor/Edit?token=KlcUBqiMQf7fhkFwWF4vtrz74ysq6WyBbR1Y0LNqhKojL9QcpCm13UNKc3pwIA1lKR65X4W6d5h-m-QE7nNSXvv5Z_s&loadFrom=DocumentDeeplink&ts=552.74)):

Thank you Commissioner McDowell. I'm honored to introduce our three keynote speakers, beginning with Dr. Brad Parkinson, better known as the father of GPS. Dr. Parkinson was the chief architect for the design of GPS, the first director of the GPS development program, and was ultimately responsible for shepherding the development and testing that proved GPS capability in 1978. Over the years, Dr. Parkinson has received many honors, including most recently the Queen Elizabeth Prize for Engineering, along with three other GPS pioneers. His work has had a monumental impact on our society and for that we are immensely grateful.

J. David Grossman ([00:09:56](https://www.rev.com/transcript-editor/Edit?token=zXdXGLGYxdg_Sd7lN9AHGdZelFIdtv_EBcOZuU0L6xvJxyZ5iW8XmBz4RfLg7ZDJDoFYFdV65lyhBGANGsdwSNdMjfQ&loadFrom=DocumentDeeplink&ts=596.22)):

Our second speaker is Admiral Thad Allen. Many of you will know Admiral Allen for his years of distinguished service in the US Coast Guard, including as Commandant from 2006 to 2010, Admiral Allen was the lead federal official for the responses to hurricanes Katrina and Rita and served as National Incident Commander for the Deepwater Horizon oil spill. Today Admiral Allen serves as chair of the National Space Base PNT Advisory Board. Admiral Allen, thank you for your service to our country, and for your advocacy in protecting GPS and sat com services.

J. David Grossman ([00:10:34](https://www.rev.com/transcript-editor/Edit?token=o1C-q4mA2wNTHciSUx-XygwMwM14xrc0e3f_5y6J4_Hf_NDlXAO5YogGutfTkQyWotBxaCGVqrM4ZbuvZPJE9L-H3Is&loadFrom=DocumentDeeplink&ts=634.34)):

Finally, it is a real great honor to introduce Captain Sully Sullenburger, who has dedicated his entire adult life to the pursuit of safety. While he's best known for serving as the Captain during what has been called the miracle on the Hudson, Sullenburger is a safety expert, a speaker, and an author. After serving as a fighter pilot in the US Air Force, Captain Sullenburger served over the next 30 years as an airline pilot, retiring from commercial flying in March 2010. As a pilot, Captain Sullenburger knows first hand the critical importance of protecting GPS and sat com services. Captain Sullenburger, thank you for your leadership and advocacy on this issue, and for taking time to join us today.

J. David Grossman ([00:11:24](https://www.rev.com/transcript-editor/Edit?token=Sgk6Jc_qi2LvSTwN1fp6PW8m-HLj-UQvxgJ1vK4llrjZLdlDSYwcYAFB0zaF3Sm2TZBi_zPh1baqh-7vIx1JQugIOC4&loadFrom=DocumentDeeplink&ts=684.13)):

I will now turn things over to Dr. Parkinson. Thank you.

Dr. Brad Parkinson ([00:11:29](https://www.rev.com/transcript-editor/Edit?token=ys9YJiwY1mUqjUmrPPdCeobL1-bp0pvQ5aX7NNl7K4Vl081kCu_PTZKDuwcF38CKybD2BMW0DfS0OcZTJVJJS30waYg&loadFrom=DocumentDeeplink&ts=689.8)):

Thank you, David. Let me share my screen. Can everyone hear me, if you can't, let me know I guess. Let me get the right one here. Yeah, right there I think. And slideshow.Let's see here. Right from start.

Dr. Brad Parkinson ([00:11:56](https://www.rev.com/transcript-editor/Edit?token=0-JF6JQBRV0ncBrwAnY4A4vapx5t5-AdwtYOyBiLEiogvsZpCXVMEjKVClqLk1Xsh7lCC4FB1sX2siDEzHuLDjnewCQ&loadFrom=DocumentDeeplink&ts=716.59)):

So, what I'd like to do is summarize and elaborate slightly with a few examples on the remarks that have already been made. The probable consequence of what I tend to describe as the FCC-Ligado experiment and then wrapping up our remarks will be Thad Allen and Sully. So thank you for coming. Appreciate the opportunity to talk to you.

Dr. Brad Parkinson ([00:12:21](https://www.rev.com/transcript-editor/Edit?token=rj9HDFpZY5MyS40wUYBo-_ZAM1bJtJRCLHgBZBUUg09-iIVwZXLR-2z4Oi9352nlNHPAFpCalgyTgfjg-k57RsyD9n4&loadFrom=DocumentDeeplink&ts=741.26)):

We sometimes call GPS GPTS as a reminder that we also are measuring time to a billionth of a second or in some cases even better, and the users span all kinds of applications, ranging from robotics, snow plows, to cargoes, to the space station, to fishing, and most of you are aware of some of these. I suspect none of you are aware of all of them. The point is that the Department of Homeland Security considers GPS an essential foundation fro every critical US infrastructure. It has enormous economic value that was just quantified by my previous speaker, and many safety benefits to humanity, but those benefits, economic and safety as well as convenience are being threatened by the FCC's Ligado experiment.

Dr. Brad Parkinson ([00:13:19](https://www.rev.com/transcript-editor/Edit?token=brsh63P-MiAdbdQf091awcl_VF_Tc14r7wAn0OGwaJoNqUpZfGL8sSL3C6IdWW9PumWxbBk1Mtszt9kUngdw19Tud4w&loadFrom=DocumentDeeplink&ts=799.96)):

So the summary of the PNT advisory board, and I should interject here, I am a member, Admiral Allen is a member, but we are not speaking for them. We are speaking for ourselves. Our bottom line is that FCC has ordered a very reckless experiment by authorizing high power, terrestrial communication network into this MSS L-band and right adjacent to GPS. By the way, about 15 years ago, the FCC assured the GPS community that this band would be exclusively for the faint radio signals coming from satellites. So I'm going to give you some irrefutable evidence and four examples very rapidly.

Dr. Brad Parkinson ([00:14:11](https://www.rev.com/transcript-editor/Edit?token=om9fpMBoUuwXLy8p8JHMGHzNJ_mQ8q56y5YN8OMbB7o5UsJL-rSTmt4CeWEdvw4ILuGXgtzPHjn2A8qY-tAOr5rT2G0&loadFrom=DocumentDeeplink&ts=851.45)):

Here's our situation. GPS or global navigation satellite systems because all four global satellite systems operate in this same band, that is one of the unique features of radio navigation. Here are the two bands that are being authorized by this FCC order. The upper band is apparently off the table, but we don't necessarily believe that since the FCC has already gone back on their word on the lower band.

Dr. Brad Parkinson ([00:14:46](https://www.rev.com/transcript-editor/Edit?token=QmO06w__xBw56GiAiAjGfdCmLmPJ2_BRuG-04f4pR4jkS_rSmAPZ8GlTluedGGKJLT8nBWNEGRytnfXVjqVFRnhfgYo&loadFrom=DocumentDeeplink&ts=886.88)):

They've authorized Ligado power at 10 watts, that sounds like not very much, but I'm going to quantify that in a minute, and you're going to see, it's a lot. The spacing of their transmitters wasn't specified, but it is reasonable to expect them, if they're to participate in 5G, to be about 400 meters which means a user of GPS in such a region would have a 5G transmitter at about every other street corner. So with typical Ligado transmitter spacing in the region of Ligado service, a GPS user will typically be within 100 meters or so, perhaps less, of such transmitters.

Dr. Brad Parkinson ([00:15:37](https://www.rev.com/transcript-editor/Edit?token=tv4XLIv7prDBYugKYvluFXPRGpCxLqRfaZ1BYcqc1ya0VIrIhVhefcswFEMFI0TJJwMdR5FAVDDWgqpWhd6Pft7qzwg&loadFrom=DocumentDeeplink&ts=937.19)):

This is the only real quantification chart I'm going to show, and it is a little complicated. This is the high performance receivers that are being degraded. If you look at the test results for the Department of Transportation, and they did a very extensive job of testing I think close to 80 receivers, the results are degradation starts to occur at these power levels, at that spacing. And again, if you look at that, this is quantitative data, the net result is the maximum tolerable power in a Ligado transmitter to not interfere is less than one tenth of one percent of their proposed 10 watts.

Dr. Brad Parkinson ([00:16:27](https://www.rev.com/transcript-editor/Edit?token=HaFIe4zpn07yHh1TW1O85PgMtlAxy01lK-LN-6ddthTEgTfK3p2WgkaqPqa3sHADA3iWYn4G5dcj6L-2mIg88eOFRiY&loadFrom=DocumentDeeplink&ts=987.67)):

So kind of keep in mind, we're talking three spacing, and keep in mind the tremendous differences in power. I'd like to quantify that because I think it's interesting. GPS in a receiver comes in at one tenth of one millionth of one billionth of a watt, and here is the nub of the problem, 5G is about a millionth of a watt, all these are very tiny, but 5G comes in at 10 billion times the GPS power, and because they are so close in frequency, that is a real difficulty.

Dr. Brad Parkinson ([00:17:09](https://www.rev.com/transcript-editor/Edit?token=dbdsJzeury5slOSFow9SqM14UFXYUsja2jhAiAqvq_3m89X3t7r0tbkKhEASv6ED4YMyKMOk7wp_m5-0ZnSl4QCXRnQ&loadFrom=DocumentDeeplink&ts=1029.86)):

The system requirements, GPS is based on safety of life, assurance of productivity, and assessing such things as earthquake hazards. 5G, the principal requirement is throughput for videos and other things like that. And from the standpoint of users, I'm going to show you a quick chart of 64 applications in 12 major categories and it is by no means the end of it.

Dr. Brad Parkinson ([00:17:36](https://www.rev.com/transcript-editor/Edit?token=VOiXOQZOrKxHDm61TQBuLNLqvlos87LcN5X1mWZR7HV9oxs93OwPzuMkUS1gufX1C1wbsgrWndClHXS-gtHaTVgcL10&loadFrom=DocumentDeeplink&ts=1056.39)):

So in terms of how we characterize such things, the FAA who has been a pioneer in quantifying how we should look at a radio navigation system, does that on the basis of availability, accuracy, and then whether the system ever lies to you, it's called integrity. And there are numbers that are put in, particularly on availability, 99.99% or better GPS signals are available world wide, that assumes there is no jamming locally, such as Ligado would offer. The accuracy is based on being able to time that signal to 10 billionths of a second or better, and integrity says within six seconds, the user should know that something is wrong. Radio communication doesn't have such quantification, to my knowledge, although they do have bit error rate specifications.

Dr. Brad Parkinson ([00:18:40](https://www.rev.com/transcript-editor/Edit?token=yLM0MrtP9pKsIbtpb-IiC5JenCKpmx89axiH4Ecma00KQZNFuQ8PSv1CYlFUTMxzK_u-YIyhUMDQBadEb_O2qYTzb9w&loadFrom=DocumentDeeplink&ts=1120.5)):

So very rapidly, I'd like to give you simply four examples, emergency providers, aircraft landing, precision auto farming, and tracking of many things. Let's start out with the emergency provider. You might think it was just the fire or policeman, but it's also the 911 call which is frequently positioned, and the 911 includes information on where the problem really is. In addition, the ambulance, the fire, the police, the rescue helicopters or response tracking. There are over 150,000 users in the United States and GPS is used to pinpoint the location, to vector the police, and to allow a dispatcher to precisely track progress.

Dr. Brad Parkinson ([00:19:34](https://www.rev.com/transcript-editor/Edit?token=hah0yFOkRes2b_Iz-mzLw4MqBcAbOdzHanyGDXzIMvRh0DFhnF-fBtndqM11V9lXszkKGf8TBkstId3tZ6vaT19Qxr4&loadFrom=DocumentDeeplink&ts=1174.76)):

So almost certainly, these users are going to be well within the region of Ligado deployment, and equally important, the precision 911 location, where they're supposed to be going, is also going to be degraded. So the impacts, missed or delayed location of the incident, delayed or missed response, and the inability of an emergency dispatcher to track the assets and figure out whether there is actually a response going on, all these are great problems.

Dr. Brad Parkinson ([00:20:10](https://www.rev.com/transcript-editor/Edit?token=899UxSquDEq827ytOj2UE6UUe_nQQEqgMiHkeHQUHH6Is2Jkt-qjhMQpg4VCn3M2ZYAcZNGtfV8OCPhFLjPVaEW843Q&loadFrom=DocumentDeeplink&ts=1210.35)):

Let me turn to aviation. We've got some really great news. The FAA has over the last 10 or 15 years put in place GPS aided approach and landing aides, these are called LPD approaches, or LP, this is with vertical, this is without. But the point is that over half of them are at airports which never previously had any ILS instrument landing system. So it is enabling a whole class, both from the standpoint of safety, and the standpoint of convenience. A whole new class of airports, and the productivity benefits are enormous.

Dr. Brad Parkinson ([00:20:56](https://www.rev.com/transcript-editor/Edit?token=obZIEnMd5Oi_De48o4DNyWhyv55-HYML72hPYWeCP-SMs0GqN6bhwZ6JzqmEDCAdBEG-2vPfG-CpDpMFtWshmOW1LsQ&loadFrom=DocumentDeeplink&ts=1256.23)):

Well, at 10 watts, the interference range of Ligado transmitters can exceed a kilometer for aviation. This is based again on the extensive DOT testing. And those landing approaches, which now outnumber the traditional ones at least two to one, are located all over the US, and that final approach is going to typically be within 400 meters or less of many of those Ligado interference sources.

Dr. Brad Parkinson ([00:21:26](https://www.rev.com/transcript-editor/Edit?token=aiqeFeatcUXdSOobiQ2VKqfX1fiz6JFMGGI3oSmNf6JIMVL9TKBCXxkEG96LzqAIe_fNgClwCfa-Zl4qp8vWkaJsRgI&loadFrom=DocumentDeeplink&ts=1286.57)):

So if there's any interruption, and this is something people may not realize unless they're pilots, if there's an interruption of the GPS during approach, the guidance will stop, and the landing has to be aborted. In other words, they have to increase their power and fly away if the runway is not already visible.

Dr. Brad Parkinson ([00:21:48](https://www.rev.com/transcript-editor/Edit?token=IfkI2yfJlgdjnhfG3aE-hhoMYjp-BuZRfFCCVkpBsmiS8qrTwmh6wJkPDUv3GdC8-FUwvAxvnZ24wRfzg64Dg1Axlps&loadFrom=DocumentDeeplink&ts=1308.71)):

Another factor is that the FAA has spent billions on the next generation air traffic control system, and it's massively dependent on GPS. A critical example is something called ADS-B, that stands for automatic dependent surveillance broadcast, and what it means in a nutshell is that such an equipped airplane, and virtually all of them will be or are, finds out where it is in three dimensions using GPS and then broadcasts that for air traffic control and nearby users. So if that's interrupted, it is destroying the fundamental measurement that is used for many of these operations, and oh by the way, ADS-B is also used for critical ground control operations. So you worry about runway incursions and the potential impacts of the SCC Ligado experiment are missed approaches, emergency diversions to alternates, unmonitored ground runway incursions, all great problems, in my opinion.

Dr. Brad Parkinson ([00:22:57](https://www.rev.com/transcript-editor/Edit?token=EMOKkBbguAiCKiHV63Z0qROa7nvvg8MbAN-rXo8eOVD0IDsJuvdSEkvM02eXFwy-XRjc4unacKTSENVkfwechjNtpIg&loadFrom=DocumentDeeplink&ts=1377.93)):

Let's rapidly turn to agriculture. This has created a revolution in the whole farming industry. Without GNSS, just like when you're doing fertilizing your lawn, you put in a healthy overlap, perhaps eight to 10%. With GNSS or GPS as we call it, there is no overlap required. You can meet the previous row within inches. The automatic steering that goes on, it can run day, night, or in fog, less overlap, lower fuel and labor costs, and the potential savings per year, there are 18 billion dollars worth of chemicals spread on our farms, and if that would save us eight to 10%, the number is very, very substantial, of course that's for the United States only.

Dr. Brad Parkinson ([00:23:56](https://www.rev.com/transcript-editor/Edit?token=OgR4Vq0VWuA9AvYlhmpNl88HZoeDf1HGu1tlNYfZ3Xs5p2zb4UgOQbH_SADzKnDzJ4Uum6Y10G0KiDhRpKLuV0eomqs&loadFrom=DocumentDeeplink&ts=1436.74)):

What's happened? Well, there is a world wide market that is selling over a billion dollars of GPS auto-farming equipment per year. It turns out it is motivated by the fact that a $50,000 GPS system will pay for itself in as little as four months. In the upper left there is a precision planter. And you can sense that if it's going to work, it's got to have accuracies down on the order of an inch, and availability near 100%. But Ligado has advertised, they're going to go in and service the rural areas, which would result in auto-farming being within the degradation radius of a Ligado signal. So the FCC-Ligado experiment threatens both availability and continuity of operations.

Dr. Brad Parkinson ([00:24:51](https://www.rev.com/transcript-editor/Edit?token=5sC8Y5NSlvlifyrAmy6R2tzmx9LQ4h0U438Y4Ic8DeijsyR1QYGStLts8mcgn77_FycN9wskM6SaBPzhqlVnly7w7HE&loadFrom=DocumentDeeplink&ts=1491.16)):

My last example, where's your child? GPS is used to track a lot of things. Children, animals, Alzheimer's victims, criminals, some of them have to have ankles that rely on GPS for tracking. So here is one example, and this is an app that allows a family to find out where their young son or daughter might be, and it clearly is going to be within harms way, as far as Ligado's signal is concerned. Matter of fact, virtually everything does, and because all of these tracking applications are going to be within the degradation radius, it again highlights a very grave problem.

Dr. Brad Parkinson ([00:25:35](https://www.rev.com/transcript-editor/Edit?token=ko17iic-ygbajLg-IXJSC_RprxFNITCa9WulS-7Jh06DC9fitc7slLZXBj7GcJ5nb7dZT3seRoOMtLbcqFvVeyzNweo&loadFrom=DocumentDeeplink&ts=1535.82)):

Here's a quick example of over 60 applications in 12 areas. I'm not going to walk through them, but the ones in red are particularly vulnerable to the GPS interference that will occur with the FCC-Ligado experiment. I would suggest that this points out that this is a great problem, and if we look ahead, there are even more problems. We are in an explicit phase of unmanned aerial systems in our national air space. Most of those vehicles are low altitude and in harms way for this experiment.

Dr. Brad Parkinson ([00:26:19](https://www.rev.com/transcript-editor/Edit?token=B_-WRsFYAm0W2tNJl99jyg5y34hlF0lffCX5E2Hc2Cs-hrMFIQl8WkMR2kPujreWzpMpV17Rh34e1EKyDED2UGzbEds&loadFrom=DocumentDeeplink&ts=1579.09)):

Here's an example of a delivery drone, clearly it's going to be low altitude and well within the signal pattern of Ligado. Here's an autonomous air taxi that's being tested now in cities, and expanding on how these are being used, power line inspection, agricultural inspection, of course the media has been using them for some time, used in security, and it is needed not just to control the vehicle itself, but also to manage an airspace, the air traffic monitoring is going to depend on GPS.

Dr. Brad Parkinson ([00:26:58](https://www.rev.com/transcript-editor/Edit?token=z882nFEjb1Ece56Wi0r6RSacoUXTEYGd4aDaWDjmbfx6hz9qdJZlxvcgSEfpkMyPjQY0Ugc3pRPRj7AT92cVuEJJlkI&loadFrom=DocumentDeeplink&ts=1618.05)):

So sort of summarizing, all positioning operations from aviation to emergency providers to cell phone towers are clearly at risk. The low band that Ligado is going to be allowed to use if this continues adds less than 3% to the available spectrum, and it can't even do it in the near term because there is no hardware or standards to use it. The costs, if you have to modify GPS equipment would be borne by the GPS user, and ultimately by the US tax payer, and by the way, take years to put in place. You as tax payers have already spent millions to measure the effects of this proposal. The big beneficiary would be a single company, and apparently they knew the proposal was deeply flawed before the first submittal. This is according to a group of early investors in LightSquared.

Dr. Brad Parkinson ([00:28:01](https://www.rev.com/transcript-editor/Edit?token=PuuWUZhioB4X5KWxoVglBLXtgknKFHHr1j8_UK9q3pW0QrR7Kbf3jP9hHcrit2bAy9yjR43Oz4Z5zl4sL0Gs_K88G_o&loadFrom=DocumentDeeplink&ts=1681.87)):

Bottom line, the FCC should rescind this decision. If they wish to persist, at a minimum they should recognize the grave implications of a major change to this MSS band and use the required rule making procedure. There are nine further takeaways that are in the backups and on the web, and they point out the very fundamental errors in the FCC order.

Dr. Brad Parkinson ([00:28:29](https://www.rev.com/transcript-editor/Edit?token=Ldyyhaoz0V9AGXIOD4CWueudTu1IVSvzmiZF4WAcPVNR0SG9Bt2wE6p-juA5voarnVkzLRavOWpJ1JJ0yE4FSEgyDZs&loadFrom=DocumentDeeplink&ts=1709.3)):

So with that, thank you for your attention, and I would like to turn it back to stop sharing, and turn the microphone over to Admiral Allen. Admiral Allen?

Adm. Thad Allen ([00:29:07](https://www.rev.com/transcript-editor/Edit?token=oqgpj-QUQIC-b8J6tw9ISpF7AjqdMA-D4whSd6KKjps_hG58lNCZhVhw7F50znBNqXrs0KkpWVJds65ARj0DSBxtVRg&loadFrom=DocumentDeeplink&ts=1747.32)):

Can everybody hear me okay? I'll go ahead and proceed. My comments are going to be brief. Brad has done an excellent job of explaining the technical details of what's at stake with this decision by the FCC. I want to talk a little bit about the process that was used to arrive at this decision, and make the case that the FCC has not followed the process they should in making this decision, nor has it taken into account the proper content of information on which the decision should be based.

Adm. Thad Allen ([00:29:39](https://www.rev.com/transcript-editor/Edit?token=gEhAzIgt3l2z8JYMmt8LIlfjDt6DBpCMZFaynbm_aJkcS2WFM5nKVcSfo598n3XKW479YO6FiCKguzEsJyjTez5Qqqs&loadFrom=DocumentDeeplink&ts=1779.61)):

Let me start by letting everybody know I've got a history of being involved in operations which were detailed in my introduction, however I hold an advanced degree from George Washington University in Executive Legislative and Regulatory Management, and have been involved in regulatory issues my entire career, which now is spanning 50 years. I've been extensively involved in rule making and independent regulatory agencies.

Adm. Thad Allen ([00:30:05](https://www.rev.com/transcript-editor/Edit?token=sjGgwx63guosGDzMaDYWe8OAFoXlLXMnlC3mPR6eI1fl2BjwruDY8XglLOI0wVOSQfmy2EYB1DvMIzwD8haWXi4kZrs&loadFrom=DocumentDeeplink&ts=1805.18)):

The FCC is an independent regulatory agency, created by congress to supposedly deal with public issues regarding regulation in an unbiased, neutral manner. That's based on something called the Administrative Procedures Act 505 US Code. And it's supposed to take into account public input when they make a decision, and in the case of the Ligado decision by FCC, they are lacking significant informed consent by the public, the public that uses GPS services. Given the ubiquity of receivers, including all global navigation satellite systems, the foreign systems as well, there's hardly a person in the United States who's not impacted by GPS as a utility, as Brad put it.

Adm. Thad Allen ([00:30:55](https://www.rev.com/transcript-editor/Edit?token=3NRl6IrD8vUATuEyUKNEmVDeMrw4e7ctAG9MDbCXQHevuBYftplLQdLneTHk3mSGWNIl0yMvrTXrdsBqWhQRvw2jWH4&loadFrom=DocumentDeeplink&ts=1855.92)):

The decision by Ligado has two flaws, and there's two classic ways to challenge a regulatory action one is on process, the other one is on content. On process, Ligado on several cases has failed to get public comment prior to making a decision. And because of that, there has not been a proper platform for the public, especially the civilian user community to provide input on the implications of their decision. Secondly, the content that's been involved. There was a significant amount of technical content testing that has been done and made available that the FCC has refused to take into account in making their decision, and place on the record for the public. The combination of this has created a situation where despite the universal recommendation by the inner agency structure of the federal government acting through the space based position navigation and timing executive committee to reject this application, the FCC acted anyway.

Adm. Thad Allen ([00:32:08](https://www.rev.com/transcript-editor/Edit?token=NvAY9JIe_vhPYVaq7oMBop0vXGCbqMX9SAB2cZKdwLsnIXBc5w2vxRm85ickF5CkIsqFp_2syr4fK9Ht4AF6PmY974g&loadFrom=DocumentDeeplink&ts=1928.27)):

It is difficult for me to understand that they could be acting in the public interest, and not following the existing processes under the administrative procedures act for public input on this decision, nor accepting content which was critical to establishing there would be harmful interference if these terrestrial transmitters were allowed.

Adm. Thad Allen ([00:32:30](https://www.rev.com/transcript-editor/Edit?token=rfdwRZzKvvBnHPjEqjaf8sVDu6q671nWNK7CRFAQy3ai6cbDP35DhkKICjQe795QUOICW-2MDPvX1-zMd3rR0yDzszA&loadFrom=DocumentDeeplink&ts=1950.63)):

Further, there are multiple global navigation satellite receivers and chips embedded in these networks. We do not know what the international implications are, though harmful interference in the spectrum as it relates to the other systems, and sooner or later there's going to have to be some kind of an integration of all these different systems that are out there internationally, and I fear we are in a position to do ourselves harm as a nation in relation to the other systems that are being developed and deployed out there.

Adm. Thad Allen ([00:33:07](https://www.rev.com/transcript-editor/Edit?token=oXIKuKX64BUK1lXJ7XaTsqDj0C0VsFlU4s5RuRn8EKBcBitqrXPPfqSoCr9TDU6_HQKe13CMH3F36ql6bev_tp2cx8s&loadFrom=DocumentDeeplink&ts=1987.32)):

My major pitch here today is this is not good government, this is not transparency, and this is not in the best interest of the public, especially the civil users of GPS. And with that I'm happy to pass the microphone to Sully.

Capt. Chelsey "Sully" Sullenberger ([00:33:27](https://www.rev.com/transcript-editor/Edit?token=YAzzOZmXUc1ULn5g1gh1a-mpg-V4xbwxiurkzj3OpTQvFIwdf_pPjaCV13g02U1eF-7skgNo4kjNxTW98e_XLs5A-bA&loadFrom=DocumentDeeplink&ts=2007.84)):

Thank you, Admiral Allen. I've been flying airplanes now for 53 years, so let me tell you from my first hand experience why this matters. The FCC's flawed decision to allow high power terrestrial transmitters in the quiet band of frequencies that includes GPS is wrongheaded, astonishing, and dangerous. There is widespread and intense outcry against the FCC's grave error because the FCC has failed to protect GPS, an incredibly valuable national treasure. The commission's ruling benefits investors in one company, Ligado, but would do irreparable harm to millions of American GPS users. This is a sad replay of Ligado's previous incarnation, LightSquared.

Capt. Chelsey "Sully" Sullenberger ([00:34:18](https://www.rev.com/transcript-editor/Edit?token=0z-jYlxFDiqiLnp4PAG8LET3V-dlPtsWu7e7WFHoD-HyB1dVghBVP7pWB0LrZI1AvTqZE9_cF_xvSxkZgseypFId_lc&loadFrom=DocumentDeeplink&ts=2058.48)):

Extensive US transportation department testing demonstrated that virtually all civil applications would be threatened, not only by the new 10 watt transmitters located on nearly every other street corner, but potentially by millions of Ligado's mobile devices, both segments raised the GBS signal noise floor. Their transmitters would be billions of times more powerful than the GPS signals for a GPS user, equivalent to trying to hear a whisper with 100 jets taking off.

Capt. Chelsey "Sully" Sullenberger ([00:34:50](https://www.rev.com/transcript-editor/Edit?token=y89j-oBnj_JqfWK8GlKdLG4P-v_x_o-XS-qUPvm6x3dUIvby9fgnWMbSBHH1zpHLUsMt-HwvXF8tJrhuRcgisrDbuzM&loadFrom=DocumentDeeplink&ts=2090.63)):

A particular concern is the impact on aviation, including unmanned aerial systems, or unmanned aerial vehicles, or UAVs, helicopters, ADSB, terrain avoidance and warning systems, TAWS, and commercial aircraft communications and air traffic control. This degradation could markedly increase the risk of mid air collisions, control flight into terrain and runway incursions.

Capt. Chelsey "Sully" Sullenberger ([00:35:16](https://www.rev.com/transcript-editor/Edit?token=q2OhHlJ9fKMP-hDuzl1ssIHkkFsan-EHw2QNTsLBrGg0qtjBfUTiUddftOYirlXJqJau2r-cBcpDWsVR5KF7suYqrfw&loadFrom=DocumentDeeplink&ts=2116.04)):

GPS has stealthily crept into every corner of our society, from agriculture, to banking, to emergency responders. The Department of Transportation and the Department of Homeland Security has noted GPS is an essential part of our infrastructure and underpins virtually every critical sector. Value to the military is clearly massive. GPS is also at the heart of FAA's next gen air traffic control system. Opposition to the FCC order is wide spread and consistent. The list of GPS manufacturers, companies, and user groups that oppose the FCC decision is over 100 and growing.

Capt. Chelsey "Sully" Sullenberger ([00:35:56](https://www.rev.com/transcript-editor/Edit?token=6ID41uGKJW8CTkJkUnZFfFnWVW-QnSXYkJwHp1tF6ArdiGSwh-rebp3ZspK6BL3slpyOXF6UcUxZS3yrPqT5_TvU_1s&loadFrom=DocumentDeeplink&ts=2156.52)):

I know of no aviation organizations supporting Ligado that don't have a financial relationship with them. Who else opposes this FCC order? Virtually every department of the US government with any stake in or use of GPS. Virtually every organization with a stake in aviation. Virtually every scientific organization that uses GPS. This FCC decision shatters the precedent of allocating only quiet space to ground signals in this mobile satellite service band to avoid any risks of cross interference.

Capt. Chelsey "Sully" Sullenberger ([00:36:33](https://www.rev.com/transcript-editor/Edit?token=2d8hpJUCAHSJfgNhLnxS4p-wqegOsmuF-FoQVKI7CQtX5c6AlJ924X4AUhRPILj2bdjoo1JVbGZINWdVm13_MDNvyso&loadFrom=DocumentDeeplink&ts=2193.28)):

Moreover, it violates an explicit promise by the FCC in 2003, "We do not intend, nor will we permit a terrestrial component to become a standalone service." GPS equipment was manufactured assuming that the FCC would keep it's word.

Capt. Chelsey "Sully" Sullenberger ([00:36:53](https://www.rev.com/transcript-editor/Edit?token=aOgu6LjcI70gVH3rAJO3-Cm5EnvcGZTxdQSRg6lAiOyYx8e09WwAqHZOQ3vAa7rR28UhKqD7TkUdJujLxwtoVUYCSUA&loadFrom=DocumentDeeplink&ts=2213.43)):

The threats to aviation are many. Here is just a partial list. GPS is the primary means of navigation for most aircraft. Loss of GPS navigation signals at low altitude is obviously a serious threat that clearly is unacceptable. GPS instrument landing procedures now outnumber traditional approaches by at least two to one at airports located all over the US. The final approach would typically lie well within the interference range of many Ligado interference sources. If guidance is lost, and the runway is not in sight, the landing must be aborted. This will lead to last minute diversions to other airports, perhaps to airports that are also experiencing Ligado interference.

Capt. Chelsey "Sully" Sullenberger ([00:37:45](https://www.rev.com/transcript-editor/Edit?token=Tr0XX2_8tN89UvnbkSlBYKs1oZLlQfklstdTgyS_-YmRX0Ukdf4LO7XKwfgVom620lAiiUByw9WcY9ZTASP66ey2Wvo&loadFrom=DocumentDeeplink&ts=2265.26)):

Furthermore, GPS is the basis for important aviation safety systems such as terrain avoidance and warning systems, TAWS, which depends on GPS for position information. The instillation of TAWS in airliners has eliminated controlled flight into terrain accidents that previously were the leading accident cause. Loss of TAWS capabilities due to interference with GPS signals cannot be tolerated. The threat to helicopters is very great because they typically fly at very low altitudes and would therefore be closer to Ligado's transmitters, risking loss of GPS navigation and TAWS protection from collision with terrain. This threat is especially great for emergency medical evacuation flights, which are often necessary at night and in poor weather. And helicopters are allowed to fly with uncertified GPS receivers that department of transportation testing shows are more susceptible to interference from Ligado transmitters, and it will be effected farther away from them.

Capt. Chelsey "Sully" Sullenberger ([00:38:47](https://www.rev.com/transcript-editor/Edit?token=JnNmw5ZxJJg5fn6_tHV7E3CAJkBHqob6cV0gSEFqMvClOtsTVqtJ7YZb-T6CKA8HSA7b5n8SEORzXiV64FTUtx2mvd8&loadFrom=DocumentDeeplink&ts=2327.74)):

Ligado mobile devices will operate on frequencies adjacent to satellite communications, sat com, including those for air traffic control communications. A handset that was inadvertently left on and transmitted during a flight would knock out sat com. Sat com provides the aviation community with critical communications capabilities including air to ground telephony and data communications used for position reporting, emergency tracking, weather information, electronic flight path updates and airline operational communications. Sat com service is used by tens of thousands of aviation subscribers, including general aviation and commercial aviation, business jets, UABs, and rotocraft used for law enforcement and emergency response.

Capt. Chelsey "Sully" Sullenberger ([00:39:34](https://www.rev.com/transcript-editor/Edit?token=FN4I3sEpC-qxofM55huSWBYkYjpWxlisHWRvEPRSMPhU-iSM0xgzQwTjb07Odg0PzeZg2WLlAJWcCbEooZf5R4IUem8&loadFrom=DocumentDeeplink&ts=2374.2)):

Sat com is also heavily used by the department of defense for communications services for the US military and by the US government for a variety of satellite based services. And of course, the US military has extensive use of GPS for navigation and position information.

Capt. Chelsey "Sully" Sullenberger ([00:39:51](https://www.rev.com/transcript-editor/Edit?token=fVBpl1IRTbIJptDxedramDId0WUaR8VpmfTKD43b8hX1gwajmknXExd7z6QG2AIG1SPuQIK4RPeQOZtV1JFVgydYa8s&loadFrom=DocumentDeeplink&ts=2391.94)):

Another concern is that a UAB, a drone, or general aviation aircraft could lose GPS navigation signals and blunder into controlled airspace used by airliners, creating a collision hazard. And this is not a theoretical concern, it has already happened with UABs and tests have shown that even a small UAB [inaudible 00:40:14] with an airliner at a typical speed could do significant damage and cause an accident, especially if it hit the cockpit windscreen or it was injected into an engine. And UABs as well as many general aviation aircraft like helicopters, are allowed to fly with uncertified GPS receivers that DOT testing shows are more susceptible to interference from Ligado transmitters and effect it farther away.

Capt. Chelsey "Sully" Sullenberger ([00:40:39](https://www.rev.com/transcript-editor/Edit?token=jooqIcTZ6PIP8S_cT2qsrAez7LmRsLuk5Nxv8ylvheCW34pMdNjUtDc5J4gw8zCgXBL1QeujCetx1AuBmgP28Cc9T60&loadFrom=DocumentDeeplink&ts=2439.18)):

As I stated previously, FAA has spent billions of dollars on air traffic control modernization which depends massively on the ubiquity and reliability of GPS. ADSB requires GPS as a position input. Use for separating aircraft by air traffic control and for critical ground control of surface movement of aircraft and vehicles, for years FAA has been decommissioning ground based radio and navigational aids and relying more and more on GPS. This reduction in ground based nav aids has meant that there are fewer backups for navigation and position information, if GPS signals are interfered with or fail. The ATC system also depends on GPS to provide network timing. Any degradation of GPS affects the entire system.

Capt. Chelsey "Sully" Sullenberger ([00:41:32](https://www.rev.com/transcript-editor/Edit?token=g2rNQw13jLfLAujTa95XUKDELPzjQRfCf2tmsX-FkIvsYinRmoU2exP-ouWoxt7m6cyatFIKB8skVziP6uDsE1ny7oU&loadFrom=DocumentDeeplink&ts=2492.07)):

This is a great concern. That's why there is great concern that Ligado signals would interfere with weather satellite transmissions to users which of course effects nearly everyone, not just aviation. And it gets even worse. When a GPS receiver loses it's signal due to interference, it may not return to normal operation when the interference goes away. It may lock up. The receiver may need to be restarted while stationary on the ground, the effective navigation and safety systems are inoperable for the remainder of the flight. While the FCC order requires Ligado to maintain a database of tower locations of their transmitters for pilots to use, there is currently no FAA approved mechanism in place for a pilot to check for the location of up to 80,000 potential Ligado towers and plan to avoid them. This would be an unprecedented intrusion on flight operations from outside of aviation.

Capt. Chelsey "Sully" Sullenberger ([00:42:32](https://www.rev.com/transcript-editor/Edit?token=Ju3TAQBKNh6oVd12TuX49b3gB05HjE9apToIRIe6w3DZejYs8EsiWaMGNWbpBh1LBtReif8pMLfNPcaGcoYpIa9uP3E&loadFrom=DocumentDeeplink&ts=2552.18)):

The Ligado order also suggests that is sufficient for Ligado to accept the points of interference on operations it takes steps to reduce interference. The pilot's first job is to fly the aircraft, not troubleshoot signal loss. Additionally, it's unlikely the pilot would even be able to identify that the loss of flight instruments is due to GPS interference, much less identify the source of the interference. A built out Ligado network of ground stations would create the potential for continuous interruptions of service in a dense urban environment, denying GPS information to helicopters and UABs everywhere over cities.

Capt. Chelsey "Sully" Sullenberger ([00:43:11](https://www.rev.com/transcript-editor/Edit?token=MisL0ENsVKERPYxPfaEGfqGEG97UbCFQk63c0vnVb3a__mh5UqOUWMPnJkP5xwz1moRHXJTANw_VTl4xkpcJYW0mOTE&loadFrom=DocumentDeeplink&ts=2591.38)):

If this FCC order is not reversed, large numbers of GPS users and aircraft and UAB operators would have to buy and install new GPS receivers, what would have to been made more tolerant of Ligado's interference. The cost estimates are astronomical. For sat com providers and users, the economic and legal effects are not only large, they are uncertain. In the absence of FCC rescinding it's order, congress must ensure that we do not place a major foundation of our critical infrastructure at risk, for the United States and the American people the damage is too great.

Capt. Chelsey "Sully" Sullenberger ([00:43:53](https://www.rev.com/transcript-editor/Edit?token=k1kIAY1mMxVzurQqZa1I5DPl6LrAnUnTNTXZoWCMrYMP1LgGBZpusnrxAXlJe8nC_zcLQdohgpthBy6HezEliP6G5Wc&loadFrom=DocumentDeeplink&ts=2633.84)):

Thank you. And Ellen, back to you.

Ellen Satterwhite ([00:43:58](https://www.rev.com/transcript-editor/Edit?token=yRYu1_sn2PCtnwa6eq1Dz-eFrVoI0M2p85tcRQSnrg-w2LCJOq16cQRhk3_16LUPkN8_-NDtmsWozZ98PXXAf7gb-bY&loadFrom=DocumentDeeplink&ts=2638.56)):

Thank you very much. Thank you so much to Dr. Parkinson, Admiral Allen, and Captain Sullenburger. We're just floored by your advocacy and we appreciate you so clearly describing what we're looking at here. I'm Ellen Satterwhite, I work with the Satellite Safety Alliance, and I'm not joined by a panel of experts who represent organizations and users who care very deeply about this issue, and they face potential harm if indeed Ligado carries through with it's plans. I'm joined by Andy Roy from Aviation Spectrum Resources Inc, Captain Steve Jangelis of the Airline Pilots Association, Karen Van Dyke of the Department of Transportation, Mary Glackin who's president of the American Meteorological Society, Dan Henry of the National Emergency Number Association, or NENA, and Rob McDowell.

Ellen Satterwhite ([00:44:56](https://www.rev.com/transcript-editor/Edit?token=5G7KkHOYcbxx6pc6xw0To2aurHxSQc6mBDD9f0r9YdesbOf3MFeAhSh9ErUHfWufLpyD66CNPNuyXA9xbTnsn7UDKKk&loadFrom=DocumentDeeplink&ts=2696.35)):

So I will just make sure that all of our panelists have shown themselves. And I see you all and that's great, by the magic of internet. So thank you all. After having listened to these amazing keynote speakers in front of us, what I'm going to do is just jump into questions and I will ask you to talk a little bit about yourselves and I'll probably give a woefully short bio. So I'll start with you, Commissioner McDowell, turning back to the order of Captain Sullenburger ended his remarks on the issue of interference concerns and protections and really left us with a question of what is our recourse, so what are the recourse avenues available to folks. Can you elaborate a bit on those interference protections in the order and whether they're enough?

Rob McDowell ([00:45:53](https://www.rev.com/transcript-editor/Edit?token=rfAui4X2hf4edrPxszjJRLqZMDH4DCYUuoLT82gdojdgt0aKdmMlK20HycyNtMcuWWaFzyPUuM3RhZOkzqnmV2mxe9o&loadFrom=DocumentDeeplink&ts=2753.54)):

Sure. Thank you Ellen, thank you for putting this great panel together and those were fabulous remarks. So as Captain Sullenburger said, there really are tremendous risks regarding harmful interference here as a result of the FCC's order. There are some mild and meek alleged protections on the GPS part of the spectrum, that's down the block from Iridium, but for Iridium there are no new projections. Iridium would have to tolerate 60 db higher, that's a noise volume level of harmful interference than would GPS. There is no obligation by Ligado to have the burden of working out these harmful interference concerns, so to kind of rewind back to my opening remarks, which is it's longstanding, a century of spectrum jurisprudence where the FCC has said, the newcomer to a neighborhood of licensees has to make sure that they are compliant with the noise levels, et cetera, of that neighborhood. And what the FCC did is it turned that upside down, broke it's own rules, and these are all the subjects of what we call petitions for reconsideration at the FCC. But to say, especially for satellite communications, just work it out. Ligado and Iridium will just have to talk to each other.

Rob McDowell ([00:47:18](https://www.rev.com/transcript-editor/Edit?token=-rv8KABvLOtIankF_kUhTTJ8YPehfVRO49nv7utW62FNSHvrLRKicLcwlRc0Oug2h3HJM5A7cHZc4OZqC7DUguvqudU&loadFrom=DocumentDeeplink&ts=2838.77)):

So it violated it's own rules. It did not conduct it's own interference analysis, I think that's another important point to understand, it relied only on third party interference analysis and the one it relied the most heavily on was sponsored by Ligado itself. Now the FCC is perfectly capable of conducting it's own harmful interference tests, I have a wonderful lab for instance up in Columbia, Maryland, where it does that kind of thing all day, but chose not to do so here. And then also I think it's important for folks to note, I don't want to take up all the oxygen so I'll conclude in a minute and we can always come back to this important issue, but that after years of all of us being in the dark as to what the FCC might do if it was going to do anything regarding the Ligado petitions, all the sudden the order jumped out. And this was after federal inter agency review group called the [inaudible 00:48:15], these are radio frequency experts from many different federal agencies, looked at it and said this was a problem, this was very problematic.

Rob McDowell ([00:48:26](https://www.rev.com/transcript-editor/Edit?token=S82QZgJ8hZL0ibz0qTdo64uhgaxnZ68VqzCUURRl4p14g_FsqrS4DKqVCQrLzG6aJ6V76BHKBs-GnjPZBkcWTXiV9bI&loadFrom=DocumentDeeplink&ts=2906.09)):

So you have almost every other aspect, every other part of the federal government saying this is going to cause harmful interference, but keep in mind, virtually all, other than NOAA, are licensees in L-band are private sector. The federal governments customers of these private sector actors, whether it's Iridium or GPS. So the FCC broke a lot of it's own rules and didn't give us a chance to comment on what it was actually doing. We had no idea because it was in radio silence, no pun intended, until the order came out, and it was approved very, very quickly just in a matter of really two business days. It came out on a Thursday, and it was approved by Sunday night.

Rob McDowell ([00:49:05](https://www.rev.com/transcript-editor/Edit?token=QfkIgueHlyMDURdQJB5yY5PV1OhsjcAPnBc5CdPpIxHjYALFCCbDuu3SeFC_UxzmsITu5eG27P56TkM9mTyLUhFaEYw&loadFrom=DocumentDeeplink&ts=2945.5)):

So there are a whole host of problems here, and the FCC really needs to take a step back and reconsider it's own role here.

Ellen Satterwhite ([00:49:13](https://www.rev.com/transcript-editor/Edit?token=-QEpJ4pd3PWC957JEj9nE_R246zA3bwIWjAqISfmI9yrw6knissvMvpA0CTqGghYIPrt9QBX42QxSxkO1s089tJrYYE&loadFrom=DocumentDeeplink&ts=2953.6)):

Thanks Rob, thanks for kicking us off. I'd like to turn Andy Roy to you. Andy's the director of engineering services at Aviation Spectrum Resources Inc, and that's really the focal point for US airlines and other commercial aviation operators on spectrum engineering and regulatory considerations. Andy, you're in the spot, can you tell us what kind of specific concerns the aviation industry has with regard to the Ligado proposal and interference, and really summarize from your viewpoint.

Andy Roy ([00:49:48](https://www.rev.com/transcript-editor/Edit?token=DCDD0j5kwa7Kdb--DvxLHGz6-SXwEtkdXfDcerh53xJ8qZqExBFoglgrK5R8w3ab6_DhIhtxffCsjatDsVAfOHaSLrQ&loadFrom=DocumentDeeplink&ts=2988.84)):

Certainly. And Captain Sully gave an excellent introduction there so I'll try to fill that in if I can. From my company's perspective, we're owned by the aviation community, so we get a lot of input from the industry stakeholders on this issue. We are very concerned as an entire industry for what this could actually mean to us, because the indicators are very strong that Ligado is going to have a wide ranging impact to multiple aviation systems that we use on a day to day basis for primarily safety, but also efficiency and other operational purposes as well.

Andy Roy ([00:50:17](https://www.rev.com/transcript-editor/Edit?token=R6DBdQ176l9f1Os1splU4xqzqUDRM4VSS5u6bU8IP_8NdjeGTvgKJFSjjvE0qmaCKpu3k_4OAjMhlwtmDNio3yjMA10&loadFrom=DocumentDeeplink&ts=3017.05)):

GPS is obviously the main focus, and it has been for a while now with this proceeding, it has become a fundamental capability to how many systems we use, where they're not just position and navigation, but many others as well. And that's helped lead many developments for safety and efficiency that we pretty much take for granted for in modern aviation now. Of that in the GPS side, to split it down is two flavors effectively of GPS. We have what is called certified GPS, and that is the FAA produced a standard that the manufactured equipment will meet, and that is used for navigational and many other safety systems as well and as Captain Sully pointed out, TAWS, the terrain awareness and warning system's a key one for that. That helps pilots avoid the ground and obstacles and it's been a major contribution to safety over the last several decades.

Andy Roy ([00:51:01](https://www.rev.com/transcript-editor/Edit?token=sUBk8R5ah7WtktrH2XipFlVGRlZ8GWkeWnnDkm-KVAk4PV1qrLL8UMp2JYXOujS-KTpeoVtBcFfGeo6vC_URn22EzJk&loadFrom=DocumentDeeplink&ts=3061.92)):

We also then group what we call uncertified GPS into a whole bigger bucket effectively. That's equipped to an estimated 350,000 general aviation aircraft, and also electronic flight bags and other equipments as well that we use on behalf to support what we're doing for situational awareness and other safety systems as well. We also have as other industries have ground equipment, obviously an airport is a busy environment, we need to track that equipment, make sure it's going where it needs to. And then other systems that other industries use as well, system tracking, timing for IT networks, all those systems are a key input that we need to operate effectively as a modern aviation industry.

Andy Roy ([00:51:37](https://www.rev.com/transcript-editor/Edit?token=7MMbY6sjrFMVhDHSaYYrhMbJsLpfH14GDNhMMbVbn4D1pwJphcxRz_Bvv4oGqIxS-8t9O3rywZTCfy-FiSnV3fBYYpg&loadFrom=DocumentDeeplink&ts=3097.29)):

Unfortunately, if that wasn't enough, as we discovered, we're looking at this in depth, the way that Ligado is changing this quiet satellite spectrum neighborhood, as commissioner McDowell talked about at the start there has really changed what we're going impact with sat com systems as well. And we have two sat com systems, the only two that are certified by the FAA for air traffic control communications, Iridium and [inaudible 00:51:59], and both of those systems will be effected for aviation use either near or on the ground, and that's a big concern both for operational safety and the efficiency that we use those for.

Andy Roy ([00:52:09](https://www.rev.com/transcript-editor/Edit?token=uQMIt52O6Sg9mxsb-e2I9WN8czKv-OVPPcC2UiR8pVGEpDv4lFJI3Ipvp9IvlvSCJDAv4Jg4uwImRoAWIiiIJE_Sjq8&loadFrom=DocumentDeeplink&ts=3129.57)):

And then lastly but not least is the weather, although that's not part of this docket that the FCC has recently approved, it's a sort of sister docket that the FCC's got under consideration from Ligado now, it has a critical function to flight planning and safety, and we have some major concerns about what that will mean for the aviation industry going forward.

Andy Roy ([00:52:27](https://www.rev.com/transcript-editor/Edit?token=PS0TtKUhHuzbW8FdWmwM3XIchKoCGA1qPtN1DQemGyoZdBS-fI7y1W55YdHSA3OmVjUIYKQONTAxBs47or_OSjRs_Tk&loadFrom=DocumentDeeplink&ts=3147.49)):

So as you can see, there is a wide range of impact to aviation systems and the industry as a whole. I'll be honest, when this started coming out and we started looking at it more, we didn't think the commission would ever approve this, because it was almost indubious belief that this would cause so many impacts to our industry, why would this go forward? But unfortunately we're in that position now, and it's really not helping, especially with the current economic distress that the aviation industry is feeling from COVID-19, to have this on top and the uncertainty that it will generate for our industry is a real big unknown that we could quite frankly do without at this point in time.

Ellen Satterwhite ([00:53:01](https://www.rev.com/transcript-editor/Edit?token=-pU7HKw3CTYgnyYY497J4ts5fjSak6xKWAb4a8XU3611mTCv-h7Aj92kYVStG3VJy6vavCTN48srwr8XhvvaEHMDn2U&loadFrom=DocumentDeeplink&ts=3181.79)):

Wow, thanks Andy. You've set up perfectly my next question which is for Mary Glackin of the American Meteorological Association. Mary, we heard a little bit about how Ligado's plans could impact the NOAA weather satellites and our nation's ability to predict major natural hazards and disasters. Can you talk a little bit about the weather community's interest and what you're facing?

Mary Glackin ([00:53:33](https://www.rev.com/transcript-editor/Edit?token=KxsJMvFcQ_6b57-B3-dw-7SJAea5Q8TFBdnRnLZ3WbUR0D5GDcasWqSprV6QXt7QOZVhhu2klYNEnnhkIKXjMaYCdeg&loadFrom=DocumentDeeplink&ts=3213.95)):

Yeah. What I would say is we've talked a lot today about the GPS impacts, but it's almost like the twin of this is the impact on weather. The two Ligado proposals, the one that was approved and the one that now sits in front of the commission which is for 1675 to 1680 megahertz, combined they're going to impact what our sensors are able to sense and then also communicate back. And that will translate into risks if you look at something like Louisiana that's had seven hurricanes this year, our ability to deal with things like storm surge and all will be directly impacted from that. Our ability to communicate how much water there is in streams. We've had great success this terrible wildfire season in providing early detection of forest fires, and that is in danger of being impacted for this.

Mary Glackin ([00:54:33](https://www.rev.com/transcript-editor/Edit?token=tW1t34jhqW5eIBDv5CNL5pnhsjTldeF_Lp_VLZMZTi_6w553t9cIvY_k9JxM-wy0UjSlkAqqTVlrb1qB9xxYroufbx0&loadFrom=DocumentDeeplink&ts=3273.85)):

So I think that like GPS this will be visible to virtually every American if it goes forward, a degradation in these services. So we're extremely concerned.

Ellen Satterwhite ([00:54:45](https://www.rev.com/transcript-editor/Edit?token=0Hg8nt0z1OPUJP8Qa4WWjn7zoGY_3P695ixR2_H3s-IPmQv4ITyeac1S_HvXGBjGIMjLg1vAQrbaHH3I83l7ISvcn48&loadFrom=DocumentDeeplink&ts=3285.15)):

Thank you Mary. I want to turn to the government's perspective, and we're lucky enough to have Karen Van Dyke join us from the Department of Transportation. Karen's the director for PNT and Spectrum management at the Department of Transportation. Karen, I read a lot about it, but people have been writing and talking about how DOT's analysis is different than what Ligado is saying. So can you talk about what the Department of Transportation found and what they filed at the FCC and really the department's interest in this issue?

Karen Van Dyke ([00:55:30](https://www.rev.com/transcript-editor/Edit?token=Q3RVrNeTC4nlm0jzul2GAJkr9uzkZt9vUY8nGWWXBBRXa5-wGZT_iOE_lbclBsXfMN0BjPERDxwVOlK7W-SDJQjXzY0&loadFrom=DocumentDeeplink&ts=3330.3)):

Yes. Thank you Ellen. So the US Department of Transportation serves as the civil lead for GPS. So we take that role very seriously in working to coach here the national space base PNT executive committee with the Department of Defense. So after the LightSquared issue in 2012, Department of Transportation initiated a multi year inter agency effort to really understand those maximum tolerable power levels in the adjacent band to GPS. So this really did emphasize not only all of the transportation impacts, but we had six different categories of receivers that Dr. Parkinson did a great job describing in his presentation. So that ranged from the general location and navigation, general aviation, the high precision of receivers, timings, space based, and cellular.

Karen Van Dyke ([00:56:27](https://www.rev.com/transcript-editor/Edit?token=Cx1_9Sdlh6SDoUIG1IaSeU936bjX7Gxv1BXsp_6WJiCqo3VGDudL-iuIclw446Quo85VWxlv6FQir3z2mpU99XXFbQE&loadFrom=DocumentDeeplink&ts=3387.35)):

So this study was known as the GPS adjacent band compatibility assessment, sometimes referred to as the ABC assessment, and it really provided that framework for the analysis and testing to understand those tolerable power limits that Dr. Parkinson described and is based on the distance from a Ligado [inaudible 00:56:47] station.

Karen Van Dyke ([00:56:50](https://www.rev.com/transcript-editor/Edit?token=HIj6Sn5JW9M7Ce9N8kTCnNc_h46TXBTlZfRwbfqEvS2EHUHNEop3Sn4OqlqgMO5bnOGmkZnR_9giCyerGYSk485SnVI&loadFrom=DocumentDeeplink&ts=3410.16)):

Our study used the 1DB CNR degradation interference protection criteria. So just as it's name suggests, the intent is to protect. So safety is the top priority for the Department of Transportation, so it's really important to use a protection criteria that preserves the accuracy and the integrity of the timing and positioning information coming from GPS, not only for all of our transportation applications, but for those high precision applications that Dr. Parkinson did such a great job describing.

Karen Van Dyke ([00:57:28](https://www.rev.com/transcript-editor/Edit?token=P7PRKnTZQeCEAP_WJokPXYsY3bib7C04XZzleBiekiAIz7Vxw7nVyRR7xrKHQ77Y86VKy44Kv1KoakpwMXO_H3CZRFY&loadFrom=DocumentDeeplink&ts=3448.35)):

So this is a long standing measure that it has been used, it predates this proceeding, through a number of the workshops that the Department of Transportation held in preparing to conduct the adjacent band compatibility assessment. We had a lot of good stakeholder feedback from industry that really did indicate that that was the right engineering measure to use, again, with the goal of protecting GPS from that interference.

Ellen Satterwhite ([00:58:01](https://www.rev.com/transcript-editor/Edit?token=KVhQgGgmcMeQ6Mxn-KyR2lacKH5cZjZlAH5L1ktTIdufHqXAvsHn_NW9DkhsdzO_h_KgROSd4LjP0CFO2doYADrFjmg&loadFrom=DocumentDeeplink&ts=3481.63)):

Thank you Karen. Thanks for sharing. Dan, I want to turn to you, Dan Henry is the Director of Government Affairs for NINA, the 911 association. Dan, your members talk to people often on the worst day of their lives, and they play such a critical role in emergency situations. Can you talk a little bit more about the role that GPS plays in 911?

Dan Henry ([00:58:26](https://www.rev.com/transcript-editor/Edit?token=5qWyCt4xaff-8MrwCs4O1Y6FFTtU-YJGspZMuJ8K_gTxsv7EfJ_ao5GJrVWXru7NFntxpWt9_AFvugoQm_eewLUoPhs&loadFrom=DocumentDeeplink&ts=3506.95)):

Sure. I'd be happy to. And thanks for having me on, it's an honor to be here with such distinguished guests. You said that our members talk to people who are going through the worst days of their lives. Oftentimes they aren't able to talk to those people. And possibly the most important, most necessary piece of information that a 911 caller can get to 911 is that caller's location. More important even then the nature of the emergency, because without location, we can't send anyone, because we don't know where to send them. But if we have location, we can at least send someone to help. So I think what I want to emphasize is the degree to which GPS is used by the 911 community. And there's a couple of key facts there.

Dan Henry ([00:59:18](https://www.rev.com/transcript-editor/Edit?token=JTUM65AWBDanupWYXtwedVIsXNiYx1qF6KTWNUcvvgm9rVpHoXq3FSLDic6qX0eq98hd0tqxot4hZsgn_TfKjsSv9rc&loadFrom=DocumentDeeplink&ts=3558.33)):

So first of all, we're up to about 80% of the 300 million or so 911 calls that get made every year, about 80% of those come from wireless devices. So we're not in a wire line age anymore, right? People don't pick up their home phones to call 911. They call 911 from their car, they call 911 from the park, from the trails, from anywhere. And GPS remains the fundamental, most important, most used location technology for determining the location of a 911 caller dialing from a smartphone. There's a lot of other new fangled technologies that augment GPS and that help make location estimations more precise, and get them turned around quicker from a cold start when you make a 911 call, but at the end of the day, GPS remains the sort of foundation for all of these location estimates, and of course that gets even more important outside of dense urban areas where you don't have wifi access points or Bluetooth beacons or nano cells and things like that, other ways that a smartphone can use to triangulate it's location.

Ellen Satterwhite ([01:00:31](https://www.rev.com/transcript-editor/Edit?token=0Vm4KQl3Ni3unNkQjyGSdgfqCUk3YOibbvTQcH3yYidzIxk1Doio4YU4bvqNq04Aku1lPuqj4y1zTVX0gLbii-b6Ud0&loadFrom=DocumentDeeplink&ts=3631.78)):

Thanks Dan. I want to go back to aviation for a second. We are lucky to be joined by Captain Steve Jangelis who is a representative of the Airline Pilots Association. Captain Jangelis, can you tell us even a little bit one level deeper about the impact of these proposed terrestrial transmitters on the safety of sat navigation and communication services?

Capt. Steve Jangelis ([01:00:59](https://www.rev.com/transcript-editor/Edit?token=TX67lyKh1ZtlsMpT7RYdgiiQ4P-32e9zZGKI6ORLV0IWeZRm3IrAMkfApc-G24X_6k1IgTfVldUPnL_ygyF9NKcZFUw&loadFrom=DocumentDeeplink&ts=3659.07)):

Absolutely Ellen, thank you for the invitation and I'm glad to be around these great professionals here advocating for a safe integration of these 5G networks. My organizations, the Airline Pilots Association, represents 54,000 pilots and 34 airlines on both sides of the US-Canada border. Airlines like United, Jet Blue, Frontier, Spirit, FedEx, we have a number of airlines that we represent, and we have been opposed to this Ligado application when it was Light Speed years ago, because of some of the issues that were laid out great by Dr. Parkinson, by Captain Sullenburger, as well as Mr. Roy. There are definitely risks out there, and I'm also a [inaudible 01:01:47] investigator as well, and one thing when we've talked about terrain avoidance and TAWS system as it's called.

Capt. Steve Jangelis ([01:01:57](https://www.rev.com/transcript-editor/Edit?token=BuocnV6JFzIuaFbmvbbsxEk75_gOR7s5-JSind2TCdLqa9n4V4WcQPXccC6SKMzqEeeOaTO0NUytAmjwNncW7Eso_u0&loadFrom=DocumentDeeplink&ts=3717.4)):

It was a system that basically revolutionized aviation. One of the leading causes of fatalities on board airplanes was controlled flight into terrain, otherwise known as CFIT. And controlled flight into terrain was because the pilots were disoriented, did not know that they were anywhere near a mountain or a hillside, and eventually we know the results, ends in fatalities.

Capt. Steve Jangelis ([01:02:22](https://www.rev.com/transcript-editor/Edit?token=YMT5rO-6D8Cu0OHlXtCYkoUPxOfkjV4Z6ib6VHFk4eurg_tXBuaEV-IVIj0ie78_xlZjGRwDvBN-Itq9NQMWihrx0cU&loadFrom=DocumentDeeplink&ts=3742.23)):

So the industry got together with all the stakeholders and said let's come up with a better system than just using onboard equipment, let's use a system where we take a look at the database, we map the earth, and we put that onboard the airplane, and we use our GPS position to fix that, and then we know where every antenna, every mountain, every hillside is, and that's loaded into the database that's onboard our aircraft, so as I am flying I can basically, whether there's clouds or no clouds, I can see the mountains that are out there, and that's because we use an enhanced ground proximity warning system attached to the TAWS which is the terrain warning system, and we have basically taken down the fatality risk to zero of airplanes in the United States and Canada of flying into known terrain.

Capt. Steve Jangelis ([01:03:12](https://www.rev.com/transcript-editor/Edit?token=122wDvQquYD_QeU_EFn7jlraHjDHtpanq3GjutP06kIrUDUu_yOeqklaUgwqfH27oqSRZMHUpRoaYwCOiXUY_NE5rS0&loadFrom=DocumentDeeplink&ts=3792.54)):

So that's a big safety win for the industry, and for the traveling public, and it took a lot of folks to get together and come up with that system. So the Ligado networks technically have proven to disrupt the GPS fix for us and we would not be able to see terrain that's out there. So the increased risk of a collision into terrain is a big concern.

Capt. Steve Jangelis ([01:03:41](https://www.rev.com/transcript-editor/Edit?token=g8PM4H-rg4AXDrr3SSgjoSJrsiJJlPapUU51KQcXLOUQUWQxsQG7IIhRQQQQ0jNidJOpNGPT88z9J2zni8hTNAVlsrU&loadFrom=DocumentDeeplink&ts=3821.52)):

Also another big win for the aviation industry which made things a lot safer was the introduction of satellite communications. Up until just about a decade ago, I flew international for nine years, I'm currently a domestic pilot flying the airbus A320, but when I was flying a wide body aircraft overseas, we used to have to use a system in place called high frequency HF radios, which is basically talking through a tin can, bouncing waves off of the clouds, and a ground based station having to receive that over static, interference, just it's not a great communication tool. It's the same tools we used prior to World War II. And we were just using that up until about 10 years ago, we started to get sat com installed on our aircraft, so now when we cross the ocean, it's as if I'm standing in the next room with the air traffic controller.

Capt. Steve Jangelis ([01:04:38](https://www.rev.com/transcript-editor/Edit?token=bBngiAg-x2kxmcKJLyWK16uiLAZcU264Ooo3VDQk3P-1vDhhqlfttXJJ_9S-PVvX85Bvqrk_T4hOqBHyULTOJU4FHHs&loadFrom=DocumentDeeplink&ts=3878.47)):

Now why is that important? The good thing is that we're now able to basically put airplanes closer together because we're able to communicate much quicker, and much easier. But we've all done this, how many of you have left your phone on on board the airplane, even though it tells you to put it on airplane mode or turn it off? Folks, we've all done it. And here's the issue. So now you get a receiver, a phone on board your air craft that was left on in that frequency range, will blank out my satellite communications capabilities, and I'd be none the wiser, wouldn't know where it was coming from, and it would just not work, or I wouldn't be able to transmit.

Capt. Steve Jangelis ([01:05:21](https://www.rev.com/transcript-editor/Edit?token=XGBMqrUyUD46XfeyNmZafqe7LsyJCtWu1713mvesLXgyP1WkFARj5ZxieqXcly8l45gLrNCoj5NrsdHQut3Iki3kH5U&loadFrom=DocumentDeeplink&ts=3921.55)):

So that is two very important issues to us. And I think another issue that Captain Sullenburger brought up that is very important to us is the fact that we are concerned with the drone population that's out there flying right now. I am a license drone pilot, I've operated them for hire, and basically drones operate off of GPS fixes at low altitudes, below 400 feet mostly, which is where the range of interference is to come from a Ligado tower. So what we're concerned about is that these off the shelf drones that use just a simple GPS system like what's on your phone currently will blank itself out and it will not know where it's at, it doesn't know where home base is, and it will just continue to press on, and it could land at an airport, we've had drones land on taxi ways that no one could find the owner to because it just flew away, and that's not a fault of the drone industry. It was a GPS failure that led to that. But this is a real threat, and if those drones stray into our airspace when we're flying into and out of an airport, it can become a bad day.

Capt. Steve Jangelis ([01:06:42](https://www.rev.com/transcript-editor/Edit?token=LhmROIccSkPrcGq025g-KhpRnr-Lc6Q10y4kPdluJeujMZehstHtxKkYrDNO39d6LjzPhLmTAZoK7CsRnfRSV4wZ1sk&loadFrom=DocumentDeeplink&ts=4002.25)):

We all know the story about what happens when multiple birds fly into an airplane, but imagine if it's a drone. Imagine if it's composites, electric batteries, metal, plastics. It does not bode well for the aircraft that collides with one of those objects. So we want to make sure that those vehicles, the drones, have proper navigation and geo fencing so that they can safely integrate and work with us because there are a lot of socioeconomic benefits to using unmanned air nautical vehicles. But we always, in my organization, are very happy to say that it takes a good pilot to make sure you have a safe landing.

Ellen Satterwhite ([01:07:25](https://www.rev.com/transcript-editor/Edit?token=zVNGfEVGgeABR3oSGyqc-bYEsVrjgnfVlz6P05Yd0tUaAIo0PGVDsTegSpw75aiAoNasXjmkKLk3kh2fo_rhKnqrNzA&loadFrom=DocumentDeeplink&ts=4045.46)):

Thank you. Thinking about drones also leads me to think about helicopters, which we haven't talked a lot about, our keynote speakers did, Andy I might go back to you and ask if you could talk about interference concerns with services like Medevac helicopters and those kinds of related aircraft.

Andy Roy ([01:07:49](https://www.rev.com/transcript-editor/Edit?token=16cfNh3anc9hLCytyqGioyw5LZB9poxY6u69I5I2mx8A0xFwsBbVkkEkvHFrNnzvQdcCsbwXp5KYiv44X43iLnFgf6U&loadFrom=DocumentDeeplink&ts=4069.44)):

Certainly. To put some more detail on the Ligado proposal, Ligado's proposal is based on the premise that within a 500 foot cylinder around each Ligado cell tower, that certified GPS would not be able to function, would not be assured of it's function at least. And the premise for that was that in that close proximity to towers, manned aviation, obviously unmanned is a different case, but manned aviation should not be using their instruments to fly, they should be using their eyes to fly, mark one eyeball as we call it. Which is technically true, when you're that close, when you're within 250 feet of an obstacle, pilots do need to be looking out and seeing what's going on, and not obviously looking down looking at their instruments.

Andy Roy ([01:08:27](https://www.rev.com/transcript-editor/Edit?token=WWNTtniX_CmK6_oGtUEubABUOz572KJOQ0_mMdXOPLuXX001TCRN8oV_dWI5XFSDatExB0u_iIhEJJDeJYLS-qUEgi4&loadFrom=DocumentDeeplink&ts=4107.75)):

However, it avoids a lot of fundamental other systems that we use within aviation to operate in those sort of environments, and TAWS has already been extensively talked about, this terrain awareness and warning system, but for a system that's supposed to warn you when you're close to obstacles on the ground, is the exact system that you're going to need when you're within 250 feet of an obstacle near the ground. The improvement that TAWS has given us both from a fixed wing community with a big commercial aircraft down to helicopters, private aviation, and so forth, these low level operators are really key.

Andy Roy ([01:08:58](https://www.rev.com/transcript-editor/Edit?token=wQwsqLjDaEUALWQIj9jDK2ESoKI3TPuwI_i4hUbQNah4Pxk4HxcBBPOJu3mRLDsqJavZpy__0DbBhtK2ESQC0AJVw9Y&loadFrom=DocumentDeeplink&ts=4138.06)):

For Medevac as well, a lot of helicopters have ADSB functionality, as talked about earlier in the keynote, that provides position data to coordinate with other airspace users and air traffic control, and if you think about it for accidents with a Medevac helicopter going in at short notice and unknown area, they may have police helicopters, they may have media helicopters, and now drones operating as well. Coordination of that position is key, so GPS is needed to let everyone know where you are at all times.

Andy Roy ([01:09:24](https://www.rev.com/transcript-editor/Edit?token=N7zNy9g8aEGzIyMjY0i_fnrJM63ZSap2G2xwdixJ4ptEeY4yAGzAKVDUKhS6TC6MVev1tI0xDDOe204yOR7JwIlABm0&loadFrom=DocumentDeeplink&ts=4164.78)):

And then lastly, it sounds like a minor issue for people who are not familiar with the industry, but pilot workload is a real significant component here as well. You really do not want to distract a pilot when they're trying to land in an unknown area, at short notice, in difficult flying conditions such as nighttime or bad weather. It is a bad idea, full stop. And from the interference that an aircraft will receive, it's not some sort of system that says okay, it's over here at 2 o'clock out the window, is this sort of system that's interfering with you and gives you details. For the pilot for most air frames, all they're going to get is a warning alarm that says GPS is not functioning as it's intended. And that could be from Ligado interference, it could be other issues, it could even be the GPS system itself has a fault condition and it can't clear and it basically tells the pilot I'm sorry, I can't work as you need me to.

Andy Roy ([01:10:10](https://www.rev.com/transcript-editor/Edit?token=bA0cLOHPwvyZK-rGC-MzOhQ_SSacSn3Oq25UJ8gaYmdHU_I89JjpLAwRLVliTe9DFVr2BwLs5imbrTG92vT1r73O3NM&loadFrom=DocumentDeeplink&ts=4210.55)):

A pilot in those conditions does not have time to start figuring out what's going on and deal with it, they need to fly the aircraft and maintain safety at all times. So it's not really an ability to figure out is it Ligado or not at that point. Even if they did know it was Ligado, it's not really a good time to try to make a phone call to a help line and say I've got an issue, I think it's you, I'm [inaudible 01:10:29] here, sort of, my GPS is not working, can we resolve this, and that backwards and forwards. By the time that happens, it is already too late, and this needs to be resolved in advance, and that's what the aviation community as a whole has been telling the FCC and Ligado, this is not something that can be done after an incident happens. This needs to be done beforehand and mitigated in a way that doesn't cause this interference. Not just a helpline or other issues.

Andy Roy ([01:10:53](https://www.rev.com/transcript-editor/Edit?token=ZFIPuMJZ_zlgx1l0EPUI4rh6XPjRdfm6uprh0No_YVCdMNHxFZnAjtkS3oHzuWITDA16kUm8JDnN4hEFH1dqh7UXRrM&loadFrom=DocumentDeeplink&ts=4253.22)):

I would also note that the federal government themselves has also commented on the FCC record and have confirmed that concerns remain with both TAWS and UAS from Ligado's operations in these close environments.

Ellen Satterwhite ([01:11:07](https://www.rev.com/transcript-editor/Edit?token=oEDf8Ia-WMZGcV5tKxujKkjnfpHm9R6VKFXYfDH9IN8Gia5rNRMuvz1ttDyh6nGXtpmQZcecr7zd-j07eXFR8I_JGwM&loadFrom=DocumentDeeplink&ts=4267.69)):

Thanks Andy. I know we are at time, we are over time, and I really appreciate folks sticking around. I'd like to ask our panelists if they have closing remarks or thoughts about where we go next. Anyone can jump in, I might pick on the commissioner to start.

Rob McDowell ([01:11:30](https://www.rev.com/transcript-editor/Edit?token=njh8B-am38mlWbQb07dj8t2CI0naxWmn7M2ieYqfdNsPEYTSE2H2tFOkm3yUg1uWe23ompiDABL56tnsCY271dXC12A&loadFrom=DocumentDeeplink&ts=4290)):

[inaudible 01:11:30] first of all, very informative, incredible experts here. I think it's important for the audience to understand that the people speaking here today, these aren't potential competitors of Ligado. When I was a commissioner, the most frequent request I would get from third parties, if you really boiled it down to what they're really saying, would be please regulate my competitor, but not me. That's not what's happening here. The private sector licensees, the other thing that's not happening, these are private sector licensees. This is not a fight between the FCC and the Department of Defense. We see a lot of press to that effect, and that's simply false, because Department of Defense does not have any license here. They are customers of private sector entities, such as satellite communications and GPS for their pilots, for their special operations war fighters, et cetera.

Rob McDowell ([01:12:25](https://www.rev.com/transcript-editor/Edit?token=KITrROd4YGJOyOK8ZJYFB5cd44O6EylIT0EoqxAGVH2i-VDNE5t2fVRFBBrajNJwB4kMXCpRJs1gmahEsIcud1NOnM4&loadFrom=DocumentDeeplink&ts=4345.71)):

But what you're seeing here, a letter which I think Safe Satellite tweeted out earlier, signed by 70 some odd private sector entities across all sorts of industries that you may not expect, which we tried to tee up for you here, concerned about the harmful interference this FCC order is likely to cause to fundamental, life supporting functions in aviation and navigation and other communications that are absolutely vital.

Rob McDowell ([01:13:00](https://www.rev.com/transcript-editor/Edit?token=LILzLKTpRxPFksdUV-rcwurXb-7AX_2qrshFxHJ8lH8IB45QTuLaM8oBdqSCrcGGiruLKYw4eP1XHyE9JB9FIFY8Y18&loadFrom=DocumentDeeplink&ts=4380.34)):

So I would hope that to those listening in today would understand that context. This is not one competitor trying to knock out another competitor at all. This is something completely different. There are 14 federal agencies, as Andy alluded to earlier, the spectrum arm of the federal government, the Department of Commerce NTIA filed a petition for staying, meaning the FCC should freeze this order, as well as a petition for reconsideration to say FCC got it wrong, start it over. There might be a workable solution here, but you're very far away from that right now. So I would hope that the FCC would do just that, stay it's order and start a new proceeding so that we can all get together and try and figure this out. And if that's not possible, then congress has to step in, and there are very few legislative days left in this congressional year. But that is the ultimate fix for this.

Rob McDowell ([01:13:56](https://www.rev.com/transcript-editor/Edit?token=O8SVL00O1sZpcX6reYmnFT3zSR9gc2dCrXuVvAFAvzFALNye-8cbvhf_h6E4lal3ZYxDkkPXZB0HdV00JaLT_2X2gw4&loadFrom=DocumentDeeplink&ts=4436.08)):

So this is very real, and all for what? Right? For 35 megahertz worth of spectrum when the FCC has repurposed just in the past four years about 5500 megahertz worth of spectrum that have been repurposed. So this is a tiny rounding area, so the cost benefit analysis makes no sense.

Ellen Satterwhite ([01:14:16](https://www.rev.com/transcript-editor/Edit?token=UfXJ9bPMRPAFloIANOUvvov2V7g4cKaeNxnJva5ZoisTGhaZyDKIpEBHQTclz616ztsFD6sIls0_ucslS7NBzOTMM9Y&loadFrom=DocumentDeeplink&ts=4456.69)):

Well I think you did my job for me, and yes, Mary, please. Because you have something else happening on the weather side, please.

Mary Glackin ([01:14:26](https://www.rev.com/transcript-editor/Edit?token=Z1vKW85JZdWyfpt8_gDbXe8y_-y78w17LfpMb55VoUXOp8KHNmu6NANE9WR-PInc7RdXl2RmVtJIV9ESfPDFTbkwt1w&loadFrom=DocumentDeeplink&ts=4466.05)):

Yeah, I was going to say, I just want to jump in, that there is another piece that Ligado needs approved by the FCC to be able to go forward, and that is in front of the commission right now. So clearly we want to not only reverse that, but also kill the other piece that's there. But what I worry about listening to the Thursday night Sunday night thing is that can be being done right now for all we know, given how lack of transparency. And I just want to also reinforce, I loved your comments, Commissioner, about how this is such a broad community, it's not competitors. The weather community has really been used to having conflicts in allocation of spectrum, and has frequently changed to accommodate them. But there's just no way to do that for this one. If there were a simple solution there we would have moved on and taken it. We just have nothing, and the public is going to be in peril because of that.

Ellen Satterwhite ([01:15:30](https://www.rev.com/transcript-editor/Edit?token=5XOfT4CjWu98dPxXQ_58BP41Z173_jQLcr5Da5jbzxN3Pd42MtU9QYAyRCR-CpG7mHkXSaXcP8nnIp8xnVB3qjGQ364&loadFrom=DocumentDeeplink&ts=4530.37)):

Thank you. Thank you very much for your comments, and thank you on behalf of the Satellite Safety Alliance and the GPS Innovation Alliance to the folks who have joined us and stayed with us to learn about this issue, to our esteemed keynoters and to our panelists today, I hope this is not the last word. So if you have questions about things that you've heard today, please contact us at the safesatellites.org, follow us on Twitter, #safesatellites, and more to come we hope. But thank you again and thanks to our panelists.