



# LIGADO AMENDMENT PUBLIC COMMENTS HIGHLIGHTS

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In recent public comments, in response to Ligado's new filing, stakeholders from across the GPS, aviation, transportation, and telecommunications industry agree that Ligado has addressed concerns and is ready for approval.

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## Safeguarding America's GPS and Aviation Devices.

Ligado has never wavered from our commitment to protecting GPS, and our recent filing protects aviation safety by reducing the power level at which certain downlink connections will operate.

### Competitive Carriers Association (CCA)

"Ligado's Amendment adopts the Federal Aviation Administration's ("FAA") recommendations and exemplifies Ligado's ongoing commitment to minimizing the possibility of interference with adjacent spectrum users."

### American Tower Corporation

"This amendment, coupled with Ligado's previous efforts to address the concerns of the GPS community, such as its co-existence agreements with major GPS manufacturers, should clear the way to approve Ligado's application."

### Wireless Infrastructure Association

"Federal agencies have worked with Ligado to ensure that the spectrum can be utilized and Ligado has specifically committed on-the-record to provide specific mitigation measures to protect U.S. government systems. Given the extraordinary efforts by all parties to resolve the issues presented, the time is ripe for the Commission to provide a final seal of approval and provide an additional pathway for 5G deployment."

### JHW Unmanned Solutions LLC (James Williams)

"It is my opinion that the model-based analysis conducted by Ligado, the FAA, the Department of Transportation, and other various experts demonstrates that Ligado's proposed operations will not create a safety risk to aircraft using certified GPS devices manufactured in compliance with an applicable FAA Technical Standard Order...the FCC can therefore act confidently, bases on the data it has now, and grant Ligado's license modification applications, because it is extremely improbable that Ligado's proposed network will cause harmful interference to FAA-certified GPS devices."

### Free State Foundation

"Ligado's May 2018 amendment to its modification applications advises the Commission of the latest steps it has taken to safeguard aviation Global Positioning System (GPS) devices from claimed signal interference. This is yet another in

a series of steps that Ligado has taken over the last several years to constructively resolve potential interference issues that so far have kept valuable L-band spectrum from being put to productive use."

### Metro Aviation

"Ligado's network operations will not interfere with the safe operation of helicopters. ... Ligado's proposed operations will assist the aviation industry—specifically, helicopters—by providing much-needed specialized services that facilitate aviation operations. For instance, when patients are being transported to hospitals by aircraft, Ligado's proposed operations will facilitate the delivery of key patient data to hospitals while the aircraft is en route."

### Roberson and Associates

"Based on the dramatic reduction in transmission power that they have proposed in the Amendment, any remaining technical concerns about the deployment of Ligado's proposed terrestrial network should no longer be warranted. Based on significant testing effort conducted by the National Advanced Spectrum and Communications Test Network (NASCTN) and our own test results, no GPS devices should experience harmful interference based on Ligado's deployed system. ... The reduced power proposed in Ligado's amended modification applications also will further protect GPS equipment beyond the certified aviation category."

### 3C Systems Company

"Ligado system in conformance with the Modification Application Amendment will not result in harmful interference to space-based receivers or certified aviation receivers."

On 1dB: "If GPS/GNSS receivers became unpredictable when experiencing a 1 dB drop in C/N0 (or equivalently 25% higher N0 + I0 level), there would be no GPS industry because fluctuations of 1 dB in C/N0 happen so frequently with GPS devices that they are simply assumed as a given."

## Spectrum Financial Partners, LLC

“It is problematic; to say the least, that receive-only devices such as GPS receivers can establish prior-use rights in bands that are not allocated to their use. In other contexts, this is referred to as “squatting,” and is considered akin to theft. In the present instance, the highest quality GPS receivers have long been implemented with the widest band front-end filters that inevitably have the least selectivity and are now seen as having the greatest sensitivity to interference from the changing use of nearby spectrum. This has obviously placed the FCC in the awkward position of having to essentially grant squatter’s rights to tens of millions of GPS users, particularly to safety of life users with the most sensitive devices.”

“Ligado has evidently scaled back on its operating parameters to such a degree that it has been able to return to the FCC with proposed operating parameters that reflect its agreements with GPS industry members and concession to the DOT Analysis, thus solving the awkward conundrum that time and tide forced upon the Commission.”

## Inmarsat, Inc.

“Inmarsat is keenly interested in this proceeding. It employs L-Band spectrum to provide critical services and capabilities to users in the maritime, aviation, military, public safety, media, energy, and other sectors.”

“Throughout this process, Ligado has collaborated with the interested parties and made substantial modifications to its proposal to accommodate the legitimate concerns of the GPS community, Inmarsat, and others. This issue is now ripe for decision, and the Commission should act promptly on Ligado’s Modification Applications.”

## Inmarsat, Inc. (Reply Comment)

“In initial comments, a commenter suggested that Ligado’s proposed operations could interfere with Inmarsat’s operations and asked for details as to how Ligado or Inmarsat would address this issue. Ligado’s Modification Applications and the present amendment make clear Ligado’s commitment to resolving interference. Inmarsat shares that commitment. The proposed operations will comply with the Commission’s rules. Additionally, the ATC system will be deployed subject to an inter-operator cooperation agreement with Inmarsat, which provides a basis to address the inter-

ference concerns about Inmarsat transceivers going forward. ... Inmarsat urges the Commission to grant Ligado’s amended Modification Applications promptly.”

## Technology Policy Institute

“The most recent license modification proposal to lower the maximum power of transmissions in the Lower Downlink Band adopts the FAA’s recommended power level. In addition, Ligado has agreed to relinquish use of part of the Lower Downlink Band, creating a 23 MHz guardband for satellite navigation systems.”

## Information Technology & Innovation Foundation

“Ligado has worked to address the various concerns around potential sensitive receivers in adjacent bands. The collaboration with the FAA to protect certified aviation GPS is the latest in a long line of work with GPS device manufacturers to restructure the band and allay concerns.

“We are not talking about a massive deployment of base stations like a new mobile carrier, but targeted supplements to a largely satellite-based IoT system. This allows for valuable technological advancement that will contribute to the economy and U.S. competitiveness while avoiding the risk of interference from a larger, broadband-focused model.”

## The Boeing Company

“Ligado continues to make progress toward achieving a comprehensive solution to the challenging coordination problems posed by its ambitious proposal to operate a wireless terrestrial broadband network in spectrum allocated for satellite services. As both a major user of wireless equipment and a world-leading manufacturer of commercial aircraft, avionics, and airborne communications systems, Boeing is pleased to support Ligado’s efforts in this regard, and to encourage the Commission to continue to move forward with Ligado’s proposal.”



## Reclaiming American Leadership in 5G and Benefitting Consumers.

Ligado is doing its part to ensure that the United States remains competitive in the race to 5G and is the best place for wireless innovation and investment while improving consumer experience.

### Competitive Carriers Association (CCA)

“CCA urges the Commission to grant the Amended Applications to ensure the United States is at the forefront of the race to 5G. Freeing up 35 MHz of mid-band spectrum will benefit consumers, whose demand for advanced wireless services underscores the need for efficient, productive spectrum use, while adding billions of dollars to the United States economy.”

### American Tower Corporation

“Approving Ligado’s application and permitting use of this valuable spectrum will help ensure the timely deployment of commercial IoT applications of 5G through Ligado’s innovative business plan. ATC agrees with commenters that Ligado’s balanced proposal ‘allows for valuable technological advancement that will contribute to the economy and US competitiveness.’”

### Transportation Products Sales Company, Inc.

“We also see terrestrial L-band use as a viable spectrum resource that could provide yet further benefits for our industry. For Instance, it could help augment the rail industry’s ability to enable technology aimed at ensuring rail network and worker safety as well as the efficient moving of raw materials and finished goods across the country. ... We support Ligado’s continued efforts to pursue development of this terrestrial network and urge the FCC to move forward in granting Ligado’s Application so that this promising opportunity can become a reality.”

### Free State Foundation

“There is no gainsaying that the deployment of advanced mobile wireless services like those Ligado proposes should provide substantial public interest benefits. Ligado’s proposed satellite/terrestrial mobile hybrid-network is positioned to provide IoT connectivity that can significantly reduce the time and costs of equipment inspections and improve enterprise operational efficiencies. The new network promises to provide “enhanced precision location

services” with centimeter-level accuracy for manufacturing and industrial functions. Transportation, energy, electric utility, and public safety industry sectors would be primary users of Ligado’s network and other enterprises would benefit as well.”

Acceleration of 5G mobile broadband network deployment is another key public benefit likely to occur if Ligado’s modified applications are approved. Ligado would be able to repurpose 40 MHz of its licensed spectrum for terrestrial commercial mobile use. That mid-band spectrum could complement low-band spectrum, yielding improved spectrum efficiencies and capacities, and thereby be ideally suited for 5G.

### TeleWorld Solutions

“Granting the License Modifications as amended would maximize the potential of the prime mid-band spectrum for which Ligado holds licenses. This type of “green-field” spectrum is exactly the sort of spectrum that can expedite the deployment of new wireless services, including in particular, 5G. Importantly, optimizing this spectrum would help not just a single company but players across the wireless ecosystem, which could benefit from the new opportunities Ligado’s broadband deployment would generate.”

### Apium Swarm Robotics

“Ligado’s terrestrial network will greatly expand Apium’s vehicle management capabilities. Their combined networks will bring together high-bandwidth communication, improved location capability, and the redundancy of satellite connectivity. This dynamic system is crucial for the real-time operation of autonomous vehicles across the country.”

“Emerging applications such as Apium’s have much to gain from Ligado’s networks. These networks will facilitate the growth of creative, state-of-the-art technologies and help companies like ours capitalize on our innovations.”

## Technology Policy Institute

"The 35 MHz of mid-band Ligado spectrum represents a significant potential contribution to U.S. leadership in 5G. The Commission, together with the National Telecommunications and Information Administration, have been attempting to move more spectrum into the private sector, particularly by freeing up government spectrum. Failure to approve the Ligado license modifications would have the opposite effect, transferring a large block of spectrum from the commercial sector back to the government."

The need for additional spectrum for mobile broadband and emerging 5G technologies is well established. Allowing the Ligado spectrum to lie fallow represents a waste of a valuable resource that could provide substantial benefits for consumers in the form of new Internet of Things and other uses.



## A Regulatory Approach that Spurs Innovation.

Ligado will serve the industrial Internet of Things and the emerging 5G markets, particularly in critical infrastructure industry sectors such as rail, trucking, utilities, public safety, and oil and gas. Next-generation wireless networks – connecting an entire new category of IoT-enabled devices, sensors, and machines —are projected to create three million new jobs and give the economy a \$500 billion boost.

## Public Knowledge and X-Lab

"The Commission owes Ligado either a grant of its request or a denial that it can appeal to court. This endless process of application modification for new wireless services discourages investment and innovation and is contrary to the spirit, if not the letter, of Section 7 of the Communications Act."

## Free State Foundation

Ligado's license modification was filed at the Commission back in December 2015. The valuable mid-band spectrum at issue has gone unused since that time, resulting in tremendous lost opportunity cost... Once NTIA has provided input regarding Ligado's proposed network, the Commission should do all it can to reach a final decision on the application modifications in a timely manner.

## Public Knowledge and X-Lab

"The increased commercial interest in autonomous vehicles creates an emerging market for a national IOT network independent of other cellular services. Grant of Ligado's application (and scheduling of the subsequent auction) would allow Ligado to develop this network in time to meet this demand, compete with existing mobile networks in the IOT market, and stimulate broader deployment of Release 15."

## Marine Advanced Research, Inc. (WAM-V)

"By approving the license modification applications, the Commission would significantly increase network support for new technologies, such as the Wave Adaptive Modular Vessel (WAM-V®) technology that our company has developed. ... This is the type of powerful, pervasive network that we need to manage autonomous device technology. We urge the Commission to approve Ligado's amendment license modification applications. By doing so, the Commission will be supporting the development of our technology and the many critical industries it serves."

## Spectrum Financial Partners, LLC

"That Ligado was able to overcome the problems that the FCC found itself enmeshed in should be recognized as a heroic response to such regulatory conundrums and can serve as an example of regulators encouraging compromise and creative problem solving by impacted parties in such disputes. For such disputes are bound to happen again in other fields."

## CTIA

"The Commission should act promptly on Ligado's license modification request, which has remained pending for more than two and a half years, and provide clarity and certainty to the market."