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National Academies of Sciences, Engineering, and Medicine Report on Ligado Networks and the Interference Debate

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On April 19, 2020, the Federal Communications Commission (FCC) approved an application by Ligado Networks, a U.S. telecommunications company, to deploy a terrestrial network within the United States using segments of L-Band spectrum—spectrum typically used for satellite services. Federal agencies such as the Departments of Defense (DOD), Homeland Security, and Transportation and several Members of the House and Senate Armed Services committees objected to the decision. They contend "loud" signals from Ligado's terrestrial transmitters will overpower the reception of "soft" signals from Global Positioning System (GPS) satellites and other mobile satellite services (MSS), potentially impacting DOD operations near Ligado transmitters, as discussed during a May 2020 Senate Armed Services Committee hearing. Members of Congress, GPS experts, GPS device manufacturers, the aviation industry, weather organizations opposed the decision, citing interference concerns. The FCC said its decision, which requires Ligado to mitigate interference, would enhance U.S. leadership in advanced wireless services and was supported by Members of Congress and Trump Administration officials.

Petitions for Stay and Reconsideration

On May 22, 2020, the National Telecommunications and Information Administration (NTIA), an agency in the Department of Commerce, filed one petition with the FCC, an independent regulatory agency, on behalf of the executive branch to stay the order and another petition to reconsider the decision. On January 19, 2021, the FCC declined to stay the order. Eight other entities filed petitions for reconsideration, all of which are pending.

Congress Mandates Review of FCC Decision

In the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (P.L. 116-283), enacted January 1, 2021, Congress required DOD to enter into an agreement with the National Academies of Sciences, Engineering, and Medicine (NASEM) for an independent technical review of the

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FCC's decision and recommendations on which interference assessment method most effectively mitigates DOD risks.

NASEM Report

In its September 9, 2022, report, NASEM found "most commercially produced general navigation, timing, cellular, or certified aviation GPS receivers will not experience significant harmful interference from Ligado emissions," but that "some high-precision receivers, used for applications such as farming, geodesy, and surveying and sold before about 2012, can be vulnerable to significant harmful interference." It also found certain Iridium Communications Inc. receivers used by DOD and others would experience harmful interference, under certain conditions.

In P.L. 116-283, Congress directed NASEM to compare two approaches the FCC considered in evaluating interference—one based on a signal-to-noise interference protection criterion and the other based on device-by-device measurement of GPS position error—to determine if they effectively mitigate interference risk. NASEM found neither approach effective. It concluded that interference evaluation is complex, and varies by device type and use. It noted multiple non-quantifiable definitions of harmful interference and lack of consensus about which definitions to use.

According to NASEM, neither approach provides an "engineerable, predictable standard that new entrants can readily use to evaluate impact." In the absence of definitive receiver standards, "a new applicant for emissions in an adjacent channel will have great difficulty in determining the emitter power levels and stand-off distances that will be guaranteed not to cause Harmful Interference to [existing] GPS receivers. A GPS receiver designer will be unable to design a receiver that will be guaranteed to tolerate unknown potential future allowed levels of adjacent-band power." NASEM found "all GPS receiver manufacturers could field new designs that could coexist with the authorized Ligado signals and achieve good performance even if their existing designs cannot." It recommended the FCC work with industry to develop receiver standards and with NTIA to resolve spectrum issues, conduct joint studies and testing, define receiver performance standards, and set adoption timelines.

Responses to NASEM Report

DOD, NTIA, and Ligado released separate statements indicating the report validated their positions.

DOD stated that NASEM's findings supported its testing approach, confirmed Ligado emissions could harmfully interfere with DOD's high-precision GPS receivers and MSS, and concluded that FCC mitigation requirements were "impractical, cost prohibitive, and possibly ineffective." The NTIA issued a similar statement and urged the FCC to reconsider its decision.

Ligado Networks noted that NASEM found most GPS receivers will not experience harmful interference, stating "a small percentage of very old and poorly designed GPS devices may require upgrading," and that it is ready to assist agencies with outdated devices. In a September 12, 2022, letter to the FCC, Ligado announced it would not move forward with its trial deployment and would work with NTIA on the issue.

On April 24, 2023, citing the NASEM report, over 90 organizations signed and sent a letter to Congress urging it to work with the FCC to stay the Order. On October 12, 2023, Ligado filed a complaint in the U.S. Court of Federal Claims, stating the U.S. government and agencies have prevented Ligado from using its licensed spectrum, amounting to an unlawful taking of its licensed spectrum.

Considerations for Congress

As demand for mobile data increases, spectrum disputes increase as well. Some Members have called for increased interagency coordination on spectrum decisions and voiced support for agency-driven efforts such as the FCC's and NTIA's recent Spectrum Coordination Initiative. Others proposed strengthening interagency coordination through legislatio (H.R. 3565, H.R. 1341, H.R. 4513).

Congress in the past has supported initiatives to study receiver performance, which could lead to more efficient spectrum use. While the FCC typically focuses its rules on transmitters, it acknowledges receiver performance also affects spectrum use. Thus, in April 2022, the FCC issued a Notice of Inquiry examining receiver performance for nonfederal uses. Some industry organizations oppose fixed federal standards, saying flexibility supports innovation. NTIA submitted comments describing its efforts to improve federal receiver performance. While adoption of receiver standards could expand spectrum use, standards may require entities, including federal agencies, to replace older receivers, which may impose costs. On April 20, 2023, the FCC adopted a Policy Statement on receiver performance that recognized the potential for interference in a crowded spectrum environment, shared responsibilities for transmitters *and* receivers to help mitigate interference, and called for "data-driven regulatory approaches to promote coexistence."

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