

Implications of the FCC-Approved Ligado Network for the Department of Defense

October 6, 2022

On April 20, 2020, the Federal Communications Commission (FCC) [unanimously approved](#) an application by Ligado Networks LLC (Ligado) to “deploy a low-power [9.8 decibel watts (dBW)] terrestrial nationwide network in the 1526-1536 MHz, 1627.5-1637.5 MHz, and 1646.5-1656.5 MHz bands [of the electromagnetic spectrum] that will primarily support Internet of Things (IoT) services.” The U.S. military and other national security organization traditionally use these frequency bands [for satellite operations](#). (For an in-depth discussion of the electromagnetic spectrum, see CRS Report R46564, *Overview of Department of Defense Use of the Electromagnetic Spectrum*.) DOD, along with agencies represented by the National Telecommunications and Information Agency (NTIA), [opposed](#) this decision. That opposition related to [the prospect that](#) Ligado’s proposed network could interfere with signals from satellites to Global Positioning System (GPS) receivers and from other satellite communications providers. DOD [notes](#) that GPS is “widely and heavily integrated throughout [the department]” (e.g., in precision weapons; air, land, and sea navigation; communications and network synchronization) and is “critical to the lethality of the department’s forces.”

Congress, in Section 1663 of the William M. (Mac) Thornberry [FY2021 National Defense Authorization Act](#) (P.L. 116-283), directed the Secretary of Defense to seek an independent technical assessment of the FCC’s Ligado authorization order (FCC 20-48) from the National Academies of Sciences, Engineering, and Medicine (NASEM). This assessment was to evaluate the potential for harmful interference to GPS receivers and other mobile satellite services; to review potential methods for mitigating harmful interference with DOD GPS devices or with devices “relating to or with the potential to affect the operations and activities of the Department”; and to provide associated recommendations to DOD. NASEM released [this study](#) on September 9, 2022.

DOD Concerns and Previous Studies on GPS Interference

In both its formal response to FCC 20-48 and its [May 6, 2020, testimony](#) before the Senate Armed Services Committee (SASC), DOD cited two studies that shaped its belief that the Ligado network “would cause unacceptable operational impacts and adversely affect the military potential of GPS”: a [2018 Department of Transportation \(DOT\) study](#) and a [2016 classified study conducted by the U.S. Air Force](#). Based on the DOT study findings for certified aviation, Ligado submitted an [amended](#) application

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to the FCC, reducing its proposed power levels. Per the [FCC ruling](#), Ligado also agreed to maintain a 23-MHz guard-band of unused spectrum designed to separate its transmissions from GPS, thus attempting to mitigate potential interference.

DOD and the FCC additionally disagree about the definition of and method of determining “harmful interference” to GPS. While the FCC used a “performance-based” standard in assessing and approving the Ligado network, DOD used the International Telecommunication Union [standard of a 1 decibel](#) increase in noise within the respective GPS frequency range.

FY2021 NDAA-Mandated NASEM Study on Potential GPS Interference

The FY2021 NDAA-mandated [NASEM study](#) on potential GPS interference first assessed these competing methods of determining “harmful interference” and determined that neither “[provides] an engineerable, predictable standard that new entrants can readily use to evaluate impact.” Furthermore, the study concluded that, while DOD’s method is “the more comprehensive and informative” of the two, it may represent an “overly conservative” approach to the protection of GPS devices. NASEM then examined the potential for harmful interference to GPS receivers and found that most commercially produced GPS receivers—with the exception of some high-performance receivers—“will not experience significant harmful interference from Ligado emissions as authorized by the FCC.” In contrast, NASEM concluded that Iridium satellite systems, which provide mobile satellite services for the U.S. military, “will experience harmful interference on their downlink [1617.775-1626.5 MHz] ... while those Iridium terminals are within a significant range of a Ligado emitter—up to 732 meters.” This conclusion “assumes a single user; the situation will be both more likely and more severe as the spatial density of the users increases.” A classified annex contains additional details about NASEM’s assessment of the impact of Ligado emissions on DOD systems. Finally, the NASEM study reviewed “the feasibility, practicality, and effectiveness of [FCC 20-48’s] proposed mitigation measures” (e.g., “enacting exclusion zones for Ligado emitters”; “enabling a ‘kill switch’ mechanism for Ligado to turn off emitters in some geographic locations”). NASEM concluded that, *in some cases*, these measures “may not be practical at operationally relevant time scales or at reasonable cost.” Congress may consider the circumstances in which such measures may be effective.

DOD, NTIA, and Ligado Response

On September 29, 2022, DOD [stated](#), “[the NASEM study] conclusions are consistent with DOD’s longstanding view that Ligado’s system will interfere with critical GPS receivers and that it is impractical to mitigate the impact of that interference.” NTIA similarly [stated](#) that “Ligado’s terrestrial operations would cause harmful interference to GPS devices and that a number of the FCC’s mitigations would be practically unworkable,” while Ligado [stated](#) that the NASEM study confirmed a previous FCC finding that only “a small percentage of very old and poorly designed GPS devices may require upgrading.” On September 12, 2022, Ligado [notified the FCC](#) that it planned to pause a trial deployment of its network, as Ligado works with NTIA “to resolve in a fair and reasonable manner issues relating to the government’s ongoing use of Ligado’s terrestrial spectrum.”

Potential Issues for Congress

Congress has passed additional legislation related to FCC 20-48 (see “Legislative Activity” in the appendix of CRS Report R46564, *Overview of Department of Defense Use of the Electromagnetic Spectrum*) and has continued to express interest in the order’s implementation. For example, on August 17, 2022, eight Senators, including Senators Reed and Inhofe (the Chairman and Ranking Member, respectively, of the Senate Armed Services Committee), sent [a letter](#) to the FCC requesting that the FCC stay and reconsider FCC 20-48. The letter notes that the Senators “remain gravely concerned that the

Ligado Order fails to adequately protect adjacent band operations—including those related to GPS and satellite communications—from harmful interference impacting countless military and commercial activities.”

As Congress continues to evaluate federal agency concerns regarding FCC 20-48, including DOD concerns related to military operations, it may consider the conclusions of the NASEM study. For example, Congress may consider NASEM’s proposals for “ways to mitigate further controversies,” including the implementation of receiver standards or the development of “common receiver assumptions, which could provide a common point of departure for analytic efforts.” Congress could also consider whether or not to require greater [interagency coordination](#) to ensure that the executive branch appropriately evaluates and accounts for commercial and national security interests—as well as the rights of both current and future users—within spectrum allocation processes.

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