Time To Move

Final report delayed, but tests show severe GPS interfence from broadband network

GRAHAM WARWICK/WASHINGTON

With evidence stacking up that a planned U.S. broadband-wireless service will interfere severely with GPS satellite-navigation receivers in markets from aviation to agriculture, the battle is shifting to how the problem can be mitigated, or avoided altogether.

At stake is the performance of millions of GPS receivers now in commercial and government use, ranged against privately held LightSquared's $15 billion plan to parlay its mobile satellite communications service into a nationwide network of 40,000 high-power base stations using the same frequencies.

In January, the U.S. Federal Communications Commission (FCC) gave LightSquared a conditional waiver to use satellite frequency spectrum adjacent to GPS to deploy a terrestrial wireless network, provided it could resolve interference issues. The FCC gave the company until June 15 to report on the extent of interference and present mitigation options.

LightSquared and the U.S. GPS Industry Council, representing manufacturers and users, formed a technical working group on March 3 to test the susceptibility of receivers to interference. On June 15, citing late-arriving data, LightSquared requested and received a two-week extension to the deadline to file the report, but independent tests have already shown the effects will be extensive.

"The working group results show devastating interference to GPS and no proven method of mitigation. Delay will not change these results," says Jim Kirkland, vice president and general counsel of GPS manufacturer Trimble Navigation, a founding member of the Coalition to Save Our GPS. "It's time for LightSquared and the FCC to stop squandering resources and move on to spectrum that does not impact GPS."

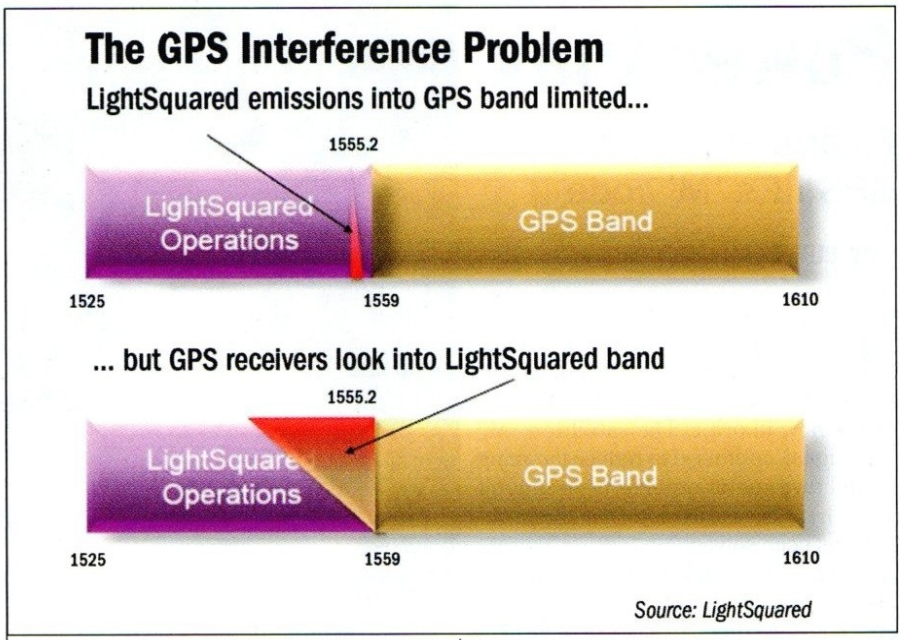
All GPS receivers tested by the government's National Position, Navigation and Timing Engineering Forum (NPEF) were affected by the high-power transmissions, says the FAA's Deane Bunce, forum co-chair. The testing showed degradation or loss of GPS function at distances from the transmitters ranging from a few kilometers to 300 km (185 mi.) for space-based receivers, he says.

Simulations of aviation operations conducted for the FAA by avionics standards developer RTCA, and based on LightSquared's base-station deployment plans for the Northeast U.S., concluded that "GPS is likely to be unavailable over the whole region" at normal aircraft altitudes, says Robert Frazier of the FAA's spectrum planning and international office.

Testing shows the problem is not LightSquared transmissions leaking into GPS frequencies, but GPS receivers looking into the adjacent band. Interference filters on existing receivers were designed assuming there would only be low-power satellite signals in that part of the spectrum. LightSquared's terrestrial transmissions will be a billion times more powerful than GPS satellite signals.

LightSquared plans to operate in two frequency bands, the lower of which is farther from GPS, and initial tests suggest interference is less at the low band. According to Kirkland, the company is seeking the extra time to conduct additional testing to see if this would enable it to begin commercial service using the lower band rather than, as planned, the higher band.

Tests show the interference issue is receiver overload caused by powerful signals outside the GPS band.



But while both the NPEF and RTCA found minimal interference with aviation receivers from LightSquared's lower 5-mhz-wide channel, Frazier says simulations suggested that the company's lower 10-mhz-wide channel would interfere with initial signal acquisition, but not tracking. Additionally, NPEF tests showed that even lower-band transmissions would interfere with high-precision GPS receivers used in construction and agriculture.

Potential solutions being aired range from moving LightSquared to frequencies away from low-power satellite signals to requiring GPS receivers to be retrofitted with filters to reduce the interference. But redesigning receivers and re-equipping aircraft "will take a minimum of 7-8 years, and possibly up 15 years, and would not necessarily buy back the performance lost because of the filter," Bunce says.