

# GPS and LightSquared: Down to the Wire

BY BLANDING SLOAN

**“The consequences for aviation of a green light for LightSquared’s original (and ultimate) plan could cost the aviation industry billions of dollars and a six-to-eight-year development, test and certification process.”**

**BOBBY STURGELL,**  
Rockwell Collins  
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Washington operations

As the GPS-LightSquared drama moves to the final acts, the suspense and absurdity of this political theater mount. The well-connected, hedge fund-backed newcomer is gambling that its political clout will trump engineering data and international standards, all the while claiming to be victimized by the other side.

In response to rumblings from Congress, a head slap from the Federal Aviation Administration – which labels the potential spectrum change a killer – outcry from European authorities and data from its own technical working group showing the unworkability of its plan, LightSquared has stood by its guns. Its latest proposal cedes none of its long-term goals; it only revises the order of its frequency rollouts.

The revised strategy offers to launch fourth-generation wireless Internet services in LightSquared’s lower 10-MHz band (1526-1536 MHz) – reserving the right to commence service in the upper 10-MHz band (1545.2-1555.2 MHz) in 2014. This may reflect the company’s sense that its original plan to

launch in the upper band is dead in the water, based on tests and analyses to date. So, the question for the Federal Communications Commission may be whether to allow LightSquared’s launch in the lower 10.

The GPS coalition appears to have the data that proves LightSquared potential devastation of GPS applications, if it is allowed to operate in the upper 10-MHz band. Tests and analyses also have cast doubt on the workability of operations in the lower 10-MHz band. There is enough evidence to argue for comprehensive testing of transmissions in the lower band before LightSquared operations could be approved there.

But, this prognosis may change in a hurry, since the comment period for the revised proposal expired on Aug. 15. If the FCC green-lights the high-power, terrestrial wireless broadband application in the mobile satellite services spectrum adjacent to GPS, politics will have trumped engineering, although not, of course, for the first time. As Van Ruggles, Garmin’s director of

quality assurance, puts it, the GPS industry and LightSquared have known for a long time that there are interference issues associated with the telecom company's plan. "The problem is, this is not a technical question," Ruggles said. "It's a political question. How much interference will the public tolerate?"

### Lower 10, Anyone?

Garmin and others also make the case against operations in the lower band. "It is absolutely a non-starter, especially since the latest proposed plan is to use the upper 10 MHz in the not too distant future," Ruggles said. As part of the TWG report and work by RTCA, an FAA advisory group, four aviation receivers had limited tests in the lower band, said John Foley, Garmin project engineer for aviation GPS solutions. "They all showed interference, although the receivers tested were less susceptible (in) the lower band than the upper band," Foley said.

According to Garmin, the test results from the small sample of only four aviation receivers are not sufficient to determine that Light-

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# KILLER APP?

An extraordinary, leaked FAA "Aviation Impacts" report effectively said that if the FCC approves LightSquared's original plan, it would have blood on its hands. The aviation agency report said that LightSquared operations in the upper band "would result in the complete loss of GPS aviation capabilities." Moreover, it would jeopardize the planned air traffic control redesign and reduce the FAA to "dependency on ground-based radio navigation aids."

The report assumes, based on LightSquared's revised plan and testimony, that it would commence transmissions in the lower 10-MHz channel in 2012 and any use of the upper 10-MHz channel in 2014. "It would take 10 years to design, develop, certify and install modified equipment in the civil aviation fleet," the report added. During the 10-year retrofit period, 2014-2023, the FAA report estimates 794 deaths could occur as a result of GPS loss – 730 in general aviation and 64 in the air carrier category.

The FAA report also argued against operations in the lower band. Initial operations there, even at "reduced" power levels, "would impact the aviation use of high-precision GPS receivers."

"Based upon existing data," the report continued, "operations at the lower channel would preclude... critical capabilities that rely upon high-precision GPS receivers, (such as) airfield and flight procedure surveys, flight test tracking, space weather monitoring, and GPS timing for computing resources and many mission critical systems." Affected FAA GPS timing applications, the report continued, include: multiple terminal, en route and oceanic automation systems and subsystems; surveillance systems; voice communications and voice recording systems; and maintenance support systems. □

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Squared's proposed deployment in the lower band is OK. Based on the FAA's performance standards for airborne GPS receivers, RTCA and the TWG were not able to conclude that the lower 10 MHz was compatible with aviation use.

Foley agreed that LightSquared transmission in the lower band "is not compatible with GPS initial signal acquisition." Based on the LightSquared deployment plan and agreed upon propagation models, he explained, "We got a level of interference in excess of what the receiver is required to withstand."

Rockwell Collins, meanwhile, in its Aug. 1 FCC comment points out that "current international standards... do not accommodate the modified deployment plan." While LightSquared's revised plan may meet FAA performance standards for L1 GPS tracking, "international standards call for a... 6-dB margin for GPS acquisition, which cannot be achieved" by the new plan. GPS acquisition is more susceptible to interference than is GPS tracking, Collins explained.

Garmin also warns about risks to the GPS wide area augmentation system. Foley said that in tests of interference in the upper band, investigators found that, at a 1-dB degradation of the signal-to-noise ratio, the aviation receivers failed FAA requirements for WAAS message error rate. He thinks that the results would be similar for WAAS in the lower band, if the receivers experience the same 1-dB degradation of the signal-to-noise ratio.

## International Impact?

Unconditional operational approval, even in the lower band, might be too much for the FCC, given the uncertainties of LightSquared's effects, the basic question of GPS signal acquisition and treaty obligations to protect Europe's GPS-like Galileo signal.

LightSquared seems to be hedging its bets, as well, by pursuing a parallel path to a higher, international authority. The company has been pushing its MSS agenda for adoption by the International Telecommunication Union. This effort is thought to involve gaining approval of complementary ground components globally in the MSS band.

International approval of CGCs in the MSS band would escalate the potential U.S. GPS problem to a global level. CCGs are the same as what the FCC calls ancillary terrestrial components. They are the ground stations that FCC allows MSS operators to create in order to fill coverage gaps in primarily satellite-based networks.

The FCC's waiver back in January – which set off the current crisis – allowed LightSquared to duck the provision of dual-use handsets – phones that have both satellite and ground-based capability. Because LightSquared no longer needs to protect its MSS signal from ATC interference, the FCC decision potentially transforms LightSquared from a low-power MSS operator with gap-filler ATCs to a high-power, primarily terrestrial network in GPS's neighboring band.

As long as MSS ATC providers had to protect their own satellite sig-

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nals from interference by adjusting signal strength or filtering, the GPS community could reasonably expect that there would also be sufficient protection for the GPS signals in the adjacent band, explained Bobby Sturgell, Rockwell Collins senior vice president for Washington operations. When the requirement for integrated service was waived, however, GPS advocates realized that this could have a devastating impact on the GPS spectrum. Numerous comments were filed last year in opposition to LightSquared's proposal, all to no avail.

The manner in which this CGC/ATC issue is ultimately handled by the FCC in the U.S. will set a precedent for CGC/ATC-based, 4G services in the MSS band across the world, Sturgell warned.

The irony is that, for years, the FCC had insisted on integrated space/ground services. In a 2005 memorandum opinion and order, the FCC proclaimed: "We will not permit MSS/ATC operators to offer ATC-only subscriptions, because ATC systems would then be terrestrial mobile systems separate from their MSS systems." In this same order, the FCC said MSS ATC operators were required to "control their self-interference sufficiently to maintain satellite service."

In the past, the FCC made clear that it was preserving a "quiet" spectrum environment to the benefit of both MSS and GPS, Sturgell said. Such a policy was necessary because GPS receivers, especially those with high accuracy, are built with a wide front-end and look outside the spectrum in order to pick up the weak GPS signals. As long as the adjacent spectrum is preserved for MSS, there are no interference issues.

## LightSquared-Centric Process

The FCC's applicant-based rather than issue-based approach to a fundamental change in spectrum-use policy also offends GPS advocates. Instead of a rulemaking process, there was a proposal, and when that proposal was shown to be unworkable, there was a tweaked proposal. The issue of spectrum change is being handled "piecemeal," Sturgell said.

Short of moving LightSquared out of the MSS band, the FCC needs to formalize this application process, Sturgell said, and require further testing of GPS receivers in the lower 10-MHz band and at specified power levels. The RTCA report clearly states that not enough testing was done in the lower 10 MHz of the spectrum to determine the extent of interference or compatibility. Specifically, more testing and analysis for both GPS signal acquisition and signal tracking need to be done in the lower 10 MHz, he said. "We are very willing to work with the government in this area, as we have done in the prior testing."

Further, there is continued uncertainty about future power levels and the future use of the upper band of spectrum, Sturgell noted. Although the use of the upper-channel spectrum clearly would cause complete loss of GPS receiver functionality, it has not yet been ruled out by the FCC. The consequences for aviation of a green light for LightSquared's original (and ultimate) plan could cost the aviation industry billions of dollars and a six-to-eight-year development, test and certification process, Sturgell said. "It's incomprehensible that that would be the result of a single applicant." □