

**Testimony of
Mr. Karl Nebbia
Associate Administrator, Office of Spectrum Management
National Telecommunications and Information Administration
U.S. Department of Commerce**

Before the

**Subcommittee on Strategic Forces
Committee on Armed Services
U.S. House of Representatives**

**Hearing on
“Sustaining GPS for National Security”**

September 15, 2011

I. Introduction.

Chairman Turner, Ranking Member Sanchez, and members of the subcommittee, thank you for the opportunity to testify today on behalf of the National Telecommunications and Information Administration (NTIA). NTIA, an agency within the Department of Commerce, is the President’s principal advisor on telecommunications and information policy matters and manages federal agencies’ use of radio spectrum. As Associate Administrator for NTIA’s Office of Spectrum Management, I oversee NTIA’s federal spectrum management operations, including all engineering, frequency assignment, IT and spectrum policy, emergency planning, and strategic planning functions. I am pleased to appear today to discuss NTIA’s efforts to ensure that federal agencies’ mission-critical operations, including Global Positioning System (GPS) services, continue without disruption or harmful interference.

II. NTIA's Role in Maximizing Efficient and Effective Use of Spectrum by Federal Agencies and Expanding Broadband Availability.

In implementing its spectrum management objectives, NTIA is intently focused on enabling federal agencies to perform their missions while ensuring, to the greatest extent possible, that those agencies use and share spectrum efficiently and effectively. To do so, NTIA concurrently:

- manages frequency assignment and coordination, with a strong focus on mitigating and preventing interference;
- leads and manages the Interdepartment Radio Advisory Committee (IRAC), which is comprised of representatives from 19 federal agencies that provide advice to NTIA on spectrum policy matters;
- reviews and certifies spectrum support for new federal systems;
- coordinates satellite operations;
- conducts border coordination and international negotiations; and
- performs spectrum engineering and analysis.

In managing spectrum use by federal agencies, NTIA works very closely with the Federal Communications Commission (FCC), which has the authority to regulate non-federal uses of spectrum, as well as interstate and foreign telecommunications under the Communications Act of 1934.

Last summer, President Obama directed NTIA to collaborate with the FCC to identify and make available over the next decade an additional 500 megahertz of spectrum for fixed and mobile wireless broadband by either reallocating or creating opportunities to share spectrum

currently used by commercial or federal users.¹ The goal is to nearly double over the next decade the amount of spectrum that is currently available for commercial wireless broadband. By doing so, the NTIA and FCC will help spur innovation, expand economic growth and job creation, and preserve America's global technology leadership. To date, NTIA has identified 115 megahertz of federal spectrum for reallocation and is currently evaluating another 95 megahertz of spectrum with the goal of making a recommendation on that band by next month.

III. NTIA's Role in Addressing Concerns Related to LightSquared's Proposed Network.

The current situation that has led to today's hearing involves the use of frequencies in two adjacent spectrum bands. GPS satellites operate in the 1559-1610 MHz band, where they transmit signals used by government, business and consumers to obtain location and timing information for myriad purposes. On either side of the GPS spectrum sits two frequency bands used by providers of Mobile Satellite Services (MSS). As originally envisioned by the FCC, MSS providers would utilize satellites to provide users with mobile communications services around the world and especially in areas where fixed line services did not exist or were extremely expensive to provide.

In 2003, the FCC granted MSS providers flexibility in how they could deliver their communications offerings by enabling them to integrate an Ancillary Terrestrial Component (ATC) into their MSS networks.² As envisioned, the ATC would augment MSS services by

¹ See National Telecommunications and Information Administration, *Plan and Timetable to Make Available 500 MHz of Spectrum for Wireless Broadband* (Nov. 15, 2010), available at http://www.ntia.doc.gov/files/ntia/publications/tenyearplan_11152010.pdf; see also Memorandum for the Heads of Executive Departments and Agencies, *Unleashing the Wireless Broadband Revolution*, (Presidential Memorandum), released June 28, 2010, 75 Fed. Reg. 38387 (July 1, 2010), available at <http://www.whitehouse.gov/the-press-office/presidential-memorandum-unleashing-wireless-broadband-revolution>.

² See Federal Communications Commission, *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands*, IB Docket Nos. 01-185, 02-364, 18 F.C.C. Rcd. 1962, 1964-65 (2003).

utilizing ground stations and mobile terminals that re-use frequencies assigned for satellite communications in order to enhance MSS coverage. By granting providers flexibility to integrate MSS and ATC, the FCC sought to maximize spectrum efficiency and expand communications capabilities in the United States by filling in the “gaps” in satellite coverage. However, the FCC stated that in order to meet its “integrated service rule,” the added terrestrial component had to remain ancillary to the principal MSS offering. This ancillary requirement was particularly important to users of the GPS since emissions from terrestrial base stations represent a significantly different interference threat to GPS than the far weaker signals emitted from satellites to the ground.

In November 2004, the FCC’s International Bureau granted a predecessor company to LightSquared Subsidiary LLC (LightSquared)³ the authority to operate ATC facilities providing voice and data communication for users equipped with dual-mode MSS/ATC devices (*i.e.*, handsets that could communicate both with orbiting satellites and terrestrial base stations). Additionally, in subsequent *Orders* in 2005 and 2010, the FCC afforded LightSquared additional flexibility for the technical design of its ATC network.⁴

On November 18, 2010, LightSquared submitted to the FCC an application for modification of its existing ATC authorization to enable it to deploy, on a wholesale basis,

³ For the purposes of this testimony, “LightSquared” refers to various entities that have held the license for this mobile satellite service (MSS) spectrum since 1989, including SkyTerra Subsidiary LLC, Mobile Satellite Ventures Subsidiary LLC, Motient Services Inc. and American Mobile Satellite Company.

⁴ See Federal Communications Commission, Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, IB Docket No. 01-185, 20 F.C.C. Rcd. 4616 (2005); see also, Federal Communications Commission, SkyTerra Communications, Inc., Transferor and Harbinger Capital Partners Funds, Transferee Applications for Consent to Transfer Control of SkyTerra Subsidiary, LLC, IB Docket No. 08-184, Memorandum Opinion and Order and Declaratory Ruling, 25 F.C.C. Rcd. 3059 (March 25, 2010); Federal Communications Commission, SkyTerra Subsidiary LLC Application for Modification Authority for an Ancillary Terrestrial Component, File No. SAT-MOD-20090429-00047, Call Sign: AMSC-1, File No. SAT-MOD-20090429-00046, Call Sign: S2358, File No. SES-MOD-20090429-00536, Call Sign: E980179, Order and Authorization, 25 F.C.C. Rcd. 3043 (March 26, 2010).

nationwide 4th generation (4G) terrestrial wireless broadband network with handsets that do *not* include the satellite service.⁵ LightSquared's proposal presented the very appealing possibility of significantly increasing terrestrial wireless broadband capacity and choice for Americans all across the country, offering greater consumer benefits and convenience, as well as seeking to promote innovation and job creation at a time of critical need. At the same time, however, LightSquared's 2010 proposal generated a significant number of concerns from the GPS industry and from GPS users; namely, that the terrestrial ATC network would present a threat of intolerable interference to GPS receivers, which both commercial and government interests use to provide services and to perform missions of great utility and benefit to millions of Americans.

Consistent with NTIA's mission to ensure efficient and effective use of spectrum while protecting critical federal government operations, NTIA consulted with affected federal agencies through the IRAC to determine if radio frequency emissions from proposed LightSquared base stations could cause harmful interference to GPS receivers, adversely impact GPS-dependent operations of federal agencies, and/or harm other federal uses of this MSS band. The IRAC, a standing committee of 19 spectrum-using agencies, provides advice on an ongoing basis to NTIA regarding policies, programs, procedures, and technical criteria pertaining to the allocation, assignment, management, and use of the spectrum.

NTIA's review indicated that LightSquared's system, as originally proposed, raised significant interference concerns for federal agencies. For the most part, these concerns arose from the fact that either: (a) GPS receivers do not contain filters adequate to avoid harmful impact from emissions from the proposed LightSquared network; or (b) certain high-precision

⁵ See Federal Communications Commission, LightSquared Subsidiary LLC Request for Modification of its Authority for an Ancillary Terrestrial Component, SAT-MOD-20101118-00239 (Nov. 18, 2010).

GPS receivers – including but not limited to those that improve their accuracy by taking advantage of satellite signals transmitted from other MSS systems that share LightSquared’s spectrum – could be degraded.

It is worth noting that some of the federal agencies also expressed concern that emissions from the proposed high-power LightSquared base stations also would interfere with the primary communications function of these other MSS systems, particularly Inmarsat, which is a system used by a number of federal agencies for national security and homeland security communications.⁶

Accordingly, on January 12, 2011, NTIA advised the FCC that the LightSquared proposal raised significant interference concerns that warranted a full evaluation to ensure that LightSquared’s proposed terrestrial network would not adversely impact GPS and other critical federal systems, including Global Navigation Satellite System (GNSS) receivers, maritime and aeronautical emergency communications systems, and Inmarsat receivers used by federal agencies.⁷ Specifically, NTIA raised concerns that LightSquared’s proposal:

- Could lead to an increase in interference to GPS receivers, such as Enhanced-911 (E-911) capable cellular handsets and consumer navigation and location devices;
- Could degrade or limit spectrum used by aeronautical emergency communications during oceanic flights, and maritime emergency communications used by the U.S. Coast Guard;

⁶ The federal agencies are working with Inmarsat to address potential interference to MSS communication systems from ATC operations.

⁷ Letter from Lawrence E. Strickling, Assistant Secretary for Communications and Information and NTIA Administrator, U.S. Department of Commerce, to Julius Genachowski, Chairman, Federal Communications Commission (Jan. 12, 2011), available at <http://www.ntia.doc.gov/fcc-filing/2011/letter-regarding-lightsquareds-application-provide-mssatc-service>.

- Risked interfering with certain Department of Defense and other federal agencies' MSS earth stations using Inmarsat commercial services; and
- By allowing wholesale customers to offer terrestrial-only plans, could result in such a large increase in terrestrial RF emissions that it could create new and more challenging interference issues.

In light of the concerns raised by multiple federal agencies, NTIA urged that if the Commission did grant LightSquared's application, it do so only on condition that the interference issues would be resolved before LightSquared would be permitted to commence commercial operations. NTIA also urged the FCC to motivate all parties to move expeditiously and in good faith to resolve those issues.

On January 26, 2011, the Commission granted LightSquared a conditional waiver of the ATC integrated service rule, but conditioned the waiver by ruling that LightSquared could not commence offering commercial service on its MSS L-Band⁸ frequencies until the resolution of interference concerns relating to GPS.⁹ Specifically, the Commission required LightSquared to organize and participate in a GPS interference technical working group (Technical Working Group) that included the GPS community and appropriate federal agencies. The mission of the TWG was to study the potential for interference to GPS devices and to identify measures necessary to prevent harmful interference to GPS receivers. The *Waiver Order* stated that the process will be complete "only once the Commission, after consultation with NTIA, concludes

⁸ The frequency range for the MSS L-Band is from 1525 MHz to 1559 MHz.

⁹ LightSquared Subsidiary LLC; Request for Modification of its Authority for an Ancillary Terrestrial Component, SAT-MOD-2010118-00239; Call Sign: S2358, Order and Authorization (Order), 26 F.C.C. Rcd. 566 (2011).

that the harmful interference concerns have been resolved and sends a letter to LightSquared stating that the process is complete.”¹⁰

IV. Commercial and Federal Testing for Potential Interference with GPS.

Between January and June 2011, a number of groups undertook testing to determine the extent of interference of the proposed LightSquared network base stations with GPS receivers. These groups included the TWG co-chaired by LightSquared and the United States GPS Industry Council (USGIC), which is comprised principally of commercial entities. Separately, the National Space-Based Positioning, Navigation, and Timing Systems Engineering Forum (NPEF), on behalf of the National Executive Committee for Space-Based Positioning, Navigation, and Timing (ExCom), and RTCA Incorporated, in support of the Federal Aviation Administration, conducted independent tests. The NPEF includes federal users such as the Department of Defense and the Department of Transportation. It is important to note that these tests were based on LightSquared’s original operational plan under which its 4G base stations would use both the upper and the lower 10 megahertz signals of the MSS band.

On July 6, 2011, NTIA submitted to the FCC the report describing the NPEF testing, which demonstrated that LightSquared’s original proposed plan for terrestrial operations would introduce harmful interference to both government and commercial GPS applications.¹¹ Among its findings, the report indicated that the transmissions from the LightSquared network base stations would “result in degradation or loss of GPS function (ranging, position) at standoff distances of a few kilometers extending to space operations.” In its transmittal letter, NTIA

¹⁰ *Id* at ¶ 43.

¹¹ Letter from Lawrence E. Strickling, Assistant Secretary for Communications and Information and NTIA Administrator, U.S. Department of Commerce, to Julius Genachowski, Chairman, Federal Communications Commission (July 6, 2011), available at <http://www.ntia.doc.gov/fcc-filing/2011/ntia-letter-transmitting-lightsquared-assessment-report>.

stated that additional tests should be performed and recommended that the FCC continue to withhold authorization for LightSquared to commence commercial operations until all valid concerns had been resolved.

At the same time, LightSquared filed the report of the TWG co-chaired by LightSquared and the GPS Industry Council, which reached similar conclusions as to the impact on GPS receivers of LightSquared transmissions throughout the MSS band.¹² Several federal agencies participated in the TWG, including the Federal Aviation Administration, the National Aeronautics and Space Administration (NASA), and the U.S. Air Force. The report identified significant technical issues with the proposed LightSquared operations in the upper portion of the MSS Band, which is closest to the spectrum used by GPS. The tests also identified some interference issues in the lower 10 megahertz portion of the band. As a result, LightSquared proposed on June 30, 2011 to modify its deployment to use only the lower 10 megahertz signal of the MSS spectrum in its initial deployment and operate its base stations at lower power. In addition, LightSquared agreed to a temporary “standstill” in the terrestrial use of the upper 10 megahertz signal immediately adjacent to the GPS band, and committed to coordinate and share the cost of underwriting a workable solution to mitigate interference to the precision measurement devices that experienced unacceptable overload even from the modified operating proposal. LightSquared has not yet clearly explained its definition of “temporary standstill” and if or when the standstill would cease.

This modification came too late to be fully evaluated in the NPEF tests. Accordingly, NTIA and the federal agencies have been evaluating test data to determine whether use of the

¹² See LightSquared Subsidiary LLC (LightSquared) Final Report of the Working Group co-chaired by LightSquared and the United States Global Positioning System (GPS) Industry Council (USGIC), to the Federal Communications Commission (June 30, 2011).

lower 10 megahertz signal of the band, combined with other operating restrictions, would eliminate harmful interference to GPS receivers and whether additional testing and analysis needs to be performed before reaching any conclusions.

On September 9, 2011, NTIA requested the ExCom to work with LightSquared to develop a test plan to resolve all remaining concerns with respect to cellular and personal/general navigation receivers by November 30, 2011 (see Exhibit 1, attached hereto). In addition, NTIA's letter noted that LightSquared has acknowledged that its modified operating proposal to use only the lower 10 megahertz signal would cause unacceptable interference to high-precision receivers. Accordingly, LightSquared is proceeding to procure the design and manufacture of a filter to mitigate these impacts. LightSquared has agreed that it will not commence commercial operations unless and until the federal agencies test the filter and conclude that it is effective at eliminating unacceptable overload without degrading the precision performance of the receivers. With respect to timing receivers, LightSquared has identified the PCTEL antenna as a possible solution to mitigate interference. LightSquared has acknowledged that the federal agencies need to perform a more rigorous review of the effectiveness of this antenna in mitigating interference without degrading the performance of timing receivers.

The FCC established a formal pleading cycle to solicit comments on both the TWG report and LightSquared's new recommendations, as well as any alternative proposals that would enable GPS and L-Band mobile broadband to co-exist. Initial comments were due on July 30, 2011, and reply comments were due on August 15, 2011. At the appropriate time, the FCC, guided by the record it has established in this proceeding and upon consultation with NTIA, has the responsibility to make a final determination as to whether the harmful interference concerns relative to GPS receivers have been resolved, such that it can authorize to commence commercial

operations. However, given the need, recognized by LightSquared, to solve the issue of the precision receivers through the development of new filtering technology, the FCC cannot authorize the commencement of commercial operations by LightSquared until it brings forward a solution that is accepted by the federal agencies after testing and analysis.

V. Conclusion.

The Administration intends to protect existing GPS users from disruption of the services they depend on today and ensure that innovative new GPS applications can be developed in the future. At the same time, recognizing the need for additional spectrum to support innovative new mobile broadband services, it is vital that we try to resolve the interference issues between GPS and terrestrial broadband use of MSS frequencies as quickly as we can. Therefore, in the short run, we will, in coordination with the FCC, work to complete the requested further testing or analysis required to establish whether there are any mitigation strategies that can resolve the GPS interference issues. We await LightSquared's delivery of a filter solution for the high-precision receivers and will endeavor to have the federal agencies test and analyze that solution promptly.

NTIA appreciates that the FCC has taken very seriously the concerns raised by NTIA on behalf of federal agencies in this matter, as well as its commitment to ensure that these concerns are resolved before permitting LightSquared to begin commercial operations. We look forward to providing thorough, expert input to the Commission as it moves toward a final decision in this matter. As always, we hope to reach a solution that ultimately allows the American public to extract the greatest possible benefit out of the radio spectrum.

Thank you again for the opportunity to testify. I am pleased to take your questions.

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Attachment



UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Communications
and Information
Washington, D.C. 20230

SEP 9 2011

The Honorable William Lynn
Deputy Secretary
U.S. Department of Defense
1010 Defense Pentagon
Room 3E944
Washington, D.C. 20301-6000

The Honorable John Porcari
Deputy Secretary
U.S. Department of Transportation
1200 New Jersey Ave., SE
Washington, D.C. 20590

Dear Secretaries Lynn and Porcari:

On behalf of the National Telecommunications and Information Administration (NTIA), I would like to request that the Executive Steering Group of the interagency National Executive Committee for Space-Based Positioning, Navigation and Timing (ExCom) work with LightSquared to develop as expeditiously as possible a joint testing plan to validate data on the performance of cellular and personal/general navigation Global Positioning System (GPS) receivers in light of LightSquared's modified proposal to confine its operations to the lower 10 MHz signal (1526-1536 MHz) of the Mobile-Satellite Services (MSS) frequency band.

For reasons discussed below, NTIA requests that the program be limited largely to cellular and personal/general-navigation receivers and that the program be designed to allow for completion of testing and analysis by November 30. Based on the data collected to date, NTIA expects that limited further testing (i) will confirm the validity of the prior measurements collected in testing by the Technical Working Group (TWG) evaluating LightSquared's modified operating proposal and (ii) will provide NTIA and the federal agencies with the necessary data to determine what, if any, additional operating restriction is necessary in order to mitigate remaining interference issues related to cellular and personal/general-navigation receivers. As described below, there will later need to be a second phase of testing to evaluate proposed mitigation plans for high-precision and timing receivers which would commence once LightSquared develops a filtering solution to avoid interference with those classes of devices.

Before setting out the parameters of this testing program, I first want to update you on our recent activities to evaluate the potential impacts of LightSquared operations on GPS receivers. NTIA has held several meetings with representatives from the federal agencies and LightSquared to discuss these impacts, focusing on the potential impacts to high precision, timing, aviation, space, cellular, and personal/general navigation GPS receiver applications. Taking each of these categories in turn, here is the current status of our review of the potential impacts.

All parties, including LightSquared, have agreed that LightSquared's operations in the lower 10 MHz signal will cause unacceptable interference to the **high-precision receivers** tested by the TWG. Accordingly, LightSquared is undertaking to procure the design and manufacture of a filter to mitigate these unacceptable impacts. LightSquared has acknowledged in meetings with NTIA that it will not commence commercial operations unless and until the federal agencies test the filter and conclude that it is effective at eliminating unacceptable overload without degrading the precision performance of the receivers. Given this commitment, we see no reason for any further testing of high-precision receivers until LightSquared presents its filtering solution to the Federal agencies for testing and evaluation. At that time, the federal agencies will need to develop and execute a plan to test and analyze LightSquared's proposed mitigation.

The TWG performed measurements assessing the potential impact of the lower 10 MHz signal on **timing receivers**. As part of this work, LightSquared identified the PCTEL antenna as a possible solution to mitigate interference to timing receivers. Although the PCTEL antenna showed promise in mitigating interference, the TWG did not examine the impact it would have on timing receiver performance. Also, the PCTEL antenna which employs a narrowband filter may not mitigate interference to wideband precision timing receivers used by the federal agencies without severely impacting their performance. LightSquared acknowledges that the federal agencies need to perform a more rigorous review of the effectiveness of the PCTEL antenna in mitigating interference to timing receivers without degrading their performance.

LightSquared and the U.S. Department of Transportation have informed us that LightSquared has continued to discuss and analyze data regarding impacts to **aviation receivers** with the Federal Aviation Administration (FAA). We see no reason to request additional testing of these devices by ExCom at this time and recommend that the FAA continue to work this issue directly with LightSquared. Of course, once FAA concludes its work, we would expect that it would share its analysis and conclusions with the ExCom.

National Aeronautics and Space Administration (NASA) has performed testing on its current and future **space-based receivers**. These tests indicate that current receivers are not impacted by the lower 10 MHz signal but that newer receivers may be affected. NASA is doing additional work to determine whether it can make modifications in the design of these not-yet-deployed receivers to mitigate this potential interference without impacting their mission. As with the aviation devices, we see no reason for ExCom to undertake any testing of these devices given the work already underway at NASA subject to later review by ExCom.

Without waiting for the interference issues to be resolved relating to high-precision and timing receivers, we would like to move forward to reach resolution of any remaining federal agency concerns with respect to the **cellular and personal/general-navigation receivers**. The TWG performed measurements to determine the power level at which interference occurred from the lower 10 MHz signal to around 70 of these receivers. We understand that some of the federal agencies believe those measurements were limited in time and scope. Accordingly, we request that the test plan include a retest of the minimum number of devices from the original test necessary to prove statistically that the earlier test results are valid.

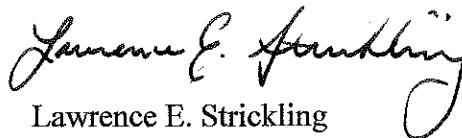
In addition, the TWG tests demonstrated that some receivers were more resistant than others to the lower 10 MHz signal. We request that the test plan include a retest of the 10 devices that were shown by the TWG testing to be more susceptible to the lower 10 MHz scenario. That data, combined with information the FCC is collecting on receiver design and specifications, will allow us to understand more completely the interference interaction and causation and provide the necessary information to determine whether we need to propose any additional operating condition on LightSquared to mitigate overload from LightSquared base stations to these types of devices.

Beyond these requests, we understand that the federal agencies may wish to include other cellular or personal/general-navigation devices for testing. For example, if there is a receiver available that utilizes the L1C signal, testing of which would yield results the federal agencies would find authoritative, we would urge that it be included in the test plan. The same is true if there are receivers available that are designed to use multiple radionavigation-satellite service signals, e.g., Galileo. As a practical matter, the ExCom can include other receivers in the test plan provided the testing and analysis can be completed by November 30. We want to do what is necessary so that our recommendations to the FCC regarding cellular and personal/general navigation GPS receivers can be conclusive and final. To that end, I want to make it clear that our recommendations will be based on NTIA standard definitions and methodologies for assessing interference. We will not accept conclusions or analysis based on propagation models and other tools that depart from our standard methodologies. Our technical experts are available to explain our tools to the extent our methodologies are not already clearly understood.

In addition, as previously indicated, the federal agencies will want to perform an analysis of the effectiveness of the PCTEL antenna in mitigating interference to timing receivers used by the agencies. We suggest that the ExCom consider moving forward now with that analysis but, given the open issues that remain with respect to precision and timing receivers, this work need not be completed by November 30.

Please submit all final test reports to NTIA. If you have any questions regarding this request, please do not hesitate to contact me or Karl Nebbia, NTIA Associate Administrator of the Office of Spectrum Management.

Sincerely,



Lawrence E. Strickling

cc: Teri Takai, DOD
Joel Szabat, DOT