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Congress of the United States

U.S. House of Representatives

Committee on Small Business

2361 Rayburn House Office Building

Washington, DC 20515–6315

Memorandum

To: Members, Committee on Small Business
From: Committee Staff
Date: October 12, 2011
Re: Full Committee Hearing: *LightSquared: The Impact to Small Business GPS Users*

The Committee on Small Business will conduct a hearing titled *LightSquared: The Impact to Small Business GPS Users*. The hearing will occur on October 12, 2011 at 1:00 p.m. in 2360 Rayburn House Office Building.

The purpose of the hearing is to examine the impact on small businesses that may result from LightSquared's plan to provide broadband service using its spectrum that is adjacent to or near the spectrum utilized by the Global Positioning System (GPS). Small businesses, including farmers, construction contractors, surveyors, and the general aviation industry, rely on the accuracy of GPS for their operations. Potential interference with GPS raises significant concerns to these small businesses.

I. Background

LightSquared Subsidiary LLC [1](LightSquared) is a Mobile Satellite Service (MSS)[2] telecommunication company that plans on providing wireless broadband coverage through its

[1] LightSquared was established in July 2010 and owned by Harbinger Capital Partners Fund. The Federal Communications Commission approved the transfer of spectrum from predecessor entities (the list of which is not relevant for this memorandum) on March 26, 2010. *In Re Sky Terra Communs., Inc.*, IB Docket No. 08-184, Memorandum Opinion and Order, 25 FCC Rcd 3059 (2010).

[2] Mobile Satellite Service is defined as a radio communication service between 1) mobile earth stations and one or more space stations, or between space stations used by this service; or 2) mobile earth stations by means of one or more space stations. 47 C.F.R. § 2.1 (c).

satellite and an ancillary ground-based communication network. The goal is to provide a wholesale, nationwide wireless broadband service that will cover at least 260 million Americans by 2015. LightSquared will sell wireless network services to retailers that will sell directly to consumers in both urban and rural areas.[3]

To achieve this goal, LightSquared plans to combine their current satellite system with a ground based wireless network consisting of approximately 40,000 network base stations. They plan to invest over $14 billion in the next eight years, which company executives estimate will support over 15,000 jobs a year for the five-year infrastructure development.[4] Their ground-based network will utilize the same spectrum band as their satellite service, which is directly adjacent to the GPS spectrum on the "L-band."[5]

The proposal raises a number of concerns from those entities that rely on GPS. In particular, given the adjacency of the LightSquared's spectrum to that utilized by the GPS, there is a growing concern about possible interference and disruption of an accurate GPS signal.[6] The combination of high-powered ground-based transmissions[7] and the proximity to the GPS spectrum could flood the signal, causing many GPS receivers to fail. Technical experts compare the variation in signal strength to Niagara Falls (LightSquared) versus a teaspoon of water (GPS). The LightSquared proposal, according to these experts, simply is too powerful to coexist without proper filter

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[3] LIGHTSQUARED, OUR VISION, *available at* http://www.lightsquared.com/about-us/our-vision.

[4] *Impacts of LightSquared Network on Federal Science Activities: Hearing Before the Committee of Science, Space and Technology*, 112th Cong. (2011) (statement of Jeffrey Carlisle, Executive Vice President, LightSquared), *available at* http://science.house.gov/sites/republicans.science.house.gov/files/documents/hearings/090811_%20Carlisle.pdf. (hereinafter "Science Committee Hearing")

[5] The "L Band" is a general designation for the entire frequency range from one to two Gigahertz (1000 to 2000 Megahertz or MHz). In this memorandum , the term "L Band" more specifically denotes the so-called "upper L Band" (1545-1559 MHz and 1646.5-1660.5 MHz) and "lower L Band" (1525-1544 MHz and 1626.5-1645.5 MHz), which are internationally allocated for MSS. 47 C.F.R. § 2.106.

[6] List of comment letters to the FCC is available at http://licensing.fcc.gov/cgi-bin/ws.exe/prod/ib/forms/reports/related_filing.hts?f_key=-216679&f_number=SATMOD2010111800239.

[7] The current allocation of spectrum to the predecessors of LightSquared did not create an interference problem because the services provided did not use significant number of ground-based transmission facilities and did not use high-powered transmission (either from satellite to earth or on any ancillary ground-based transmission). As transmission power of radio-based communication increases, the potential for interference with adjacent spectrum increases.

technology.[8] Unfortunately, these same experts contend there is limited (if any) filtering technology available for high precision GPS users that could handle LightSquared's transmission power.[9]

The key issue for small businesses is how to replace or retrofit new GPS equipment if the LightSquared network impairs their current device. The GPS devices used by many small businesses such as surveyors, farmers and pilots require a substantial investment. For example, some aviation units may cost up to $80,000 and have a lifespan ranging from 5-10 years.[10]

II. Importance of GPS

The GPS is a constellation of orbiting satellites that provide precise navigation data to both military and civilian users in the world. The satellites orbit the earth every 12 hours and emit continuous navigation signals that can be used to calculate time, location and velocity. These signals can calculate a time within a millionth of a second, velocity within a fraction of a mile per hour, and location up to 100 feet.[11]

Launched over 30 years ago, GPS has evolved from a defense-only resource into a critical part of the United States infrastructure and economy. In 1996, a Presidential Decision Directive expanded the use of GPS to civilian and commercial markets.[12] Since then, small businesses from all industries have utilized GPS to increase their efficiency, productivity and safety of their business operations. Family farmers use precision GPS equipment for field mapping to understand where to apply fertilizer and pesticides enabling them to increase yields while reducing waste. Logistics companies utilize GPS to track shipments and increase supply chain efficiencies. GPS also allows construction companies to accurately survey and measure the project to comply with land records.

The chart below is a snapshot of the growth of commercial GPS in the past five years.

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[8] Science Committee Hearing, (statement of Anthony Russo, Director of National Coordination Office, Space-Based Positioning Navigation & Timing (PNT) Executive Committee). The PNT Executive Committee consists of nine federal agencies whose charter is to oversee and improve the GPS. PNT EXECUTIVE COMMITTEE, CHARTER (2004), *available at* http://www.pnt.gov/charter/.

[9] *Id.*

[10] *Internal cost estimate to replace civilian GPS systems*, by the Space-Based Positioning Navigation and Timing (PNT).

[11] UNITED STATES AIR FORCE, GPS FACT SHEET, *available at* http://www.af.mil/information/factsheets/factsheet.asp?id=119.

[12] Presidential Decision Directive, NSTC-6 (March, 1996), *available at* http://www.fas.org/spp/military/docops/national/gps.htm.

Table 1b. GPS Equipment Units Sold by Segment, 2005-2010 (in millions)[8]

	2005	2006	2007	2008	2009	2010	Growth
Commercial	1.909	3.054	5.335	6.804	7.287	7.738	305%
Ground transport.	0.612	1.183	2.895	3.998	4.836	4.828	689%
Aviation	0.042	0.050	0.052	0.060	0.045	0.054	30%
Machine control	0.016	0.020	0.025	0.030	0.032	0.042	163%
Marine	1.100	1.650	2.200	2.530	2.151	2.530	130%
People-tracking	0.019	0.022	0.025	0.029	0.059	0.100	427%
Precision Agi.	0.024	0.028	0.031	0.034	0.032	0.038	58%
Railway	0.000	0.000	0.000	0.000	0.000	0.000	0%
Surveying/mapping	0.060	0.063	0.067	0.074	0.070	0.083	39%
Timing/Synchron.	0.036	0.037	0.038	0.049	0.062	0.062	73%
Noncommercial (consumer)	65.239	72.340	83.037	91.597	97.165	109.925	68%
Automobile	2.551	6.057	14.238	18.854	18.553	20.210	692%
Converged	60.942	64.213	66.342	69.604	75.422	85.761	41%
Recreational	1.747	2.070	2.457	3.140	3.190	3.955	126%
Military	2.674	3.045	3.528	4.030	3.828	4.688	75%
TOTAL	69.822	78.438	91.899	102.432	108.280	122.351	75%

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The commercialization of GPS has grown into an integral part of the operations for small businesses. Moreover, a recent study has shown that over 3.3 million jobs are supported by GPS.[14]

III. Role of the Federal Communications Commission (FCC) and Recent Regulatory Activity

The FCC was established by the Federal Communications Act of 1934.[15] The FCC is responsible for regulating interstate and international communications by radio, television, wire, satellite, cable and GPS in the United States.[16]

LightSquared's authority to pursue a nationwide satellite and ground-based network came from a series of FCC orders. It began in 1989, when LightSquared, then known as American Mobile Satellite Company, obtained a license to operate on the upper L-Band.[17]

Since then, there have been a number of regulatory changes concerning the MSS and integrated ground service systems known as Ancillary Terrestrial Component (ATC). In 2003, the FCC adopted rules allowing commercial satellite services, including MSS service by LightSquared's predecessors, to operate with a ground network, intended to "fill the gaps" in rural and dense urban

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[13] NDP CONSULTING, ECONOMIC BENEFITS OF COMMERCIAL GPS USE IN THE U.S. AND THE COST OF POTENTIAL DISRUPTION 6-10 (2011), *available at* http://www.saveourgps.org/pdf/GPS-Report-June-22-2011.pdf.

[14] *Id.*

[15] The FCC operates as an independent collegial body agency with five commissioner, three from the majority party of the President and two from the party other than the President's party. Decisions are made on a simple majority vote. Except for certain limited types of malfeasance (such as the perpetration of a felony), the President has little ability to remove an individual commissioner.

[16] 47 U.S.C. § 152.*See FCC v. Midwest Video Corp.*, 440 U.S. 689, 699-700 (1979); *MetroPCS Cal., LLC v. FCC*, 644 F.3d 410, 412 (D.C. Cir. 2011).

[17] *See Aeronautical Radio, Inc. v. FCC*, 983 F.2d 275, 277 (D. C. Cir. 1993).

areas.[18] The FCC stated their intention was to strengthen the MSS capabilities, increase efficiencies and competition, while ensuring that the satellite provider remains a foremost satellite-based operation; and not develop into a terrestrial-only service.[19] In 2004, the FCC granted another LightSquared predecessor licensee, Mobile Satellite Ventures, the first ever authority to operate ATC facilities to provide voice and data communication for users with dual mode handsets subject to certain conditions.[20] The most recent order issued by the FCC on January 26, 2011 granted LightSquared a conditional waiver of the ATC "integrated service" rule, therefore allowing consumers to utilize terrestrial-only services instead of both satellite and terrestrial.[21] The FCC order also required LightSquared to develop a Technical Working Group (TWG) and to conduct an assessment test of GPS interference.[22]

Currently, the FCC – the federal agency charged with licensing and regulating private use of spectrum (including LightSquared's) – is working with the PNT Executive Committee and National Telecommunications Information Administration (NTIA) – the agency in the Department of Commerce charged with managing the federal government's spectrum – to accurately test LightSquared's proposals. The aim of such testing is to determine potential interference and identify any technologies that might limit or eliminate such interference.

IV. Interference Test Results and Federal Concerns

On June 30, 2011, the TWG submitted the final assessment report on GPS interference. The technical working group identified "potentially significant interference" between LightSquared's use of the upper portion of the upper L Band and GPS reception devices.[23] Test results also

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[18] *In the Matter of 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; Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands*, IB Docket Nos. 01-185 and 02-364, Report and Order, 18 FCC Rcd 1962 (2003).

[19] *Id.* at 1964-66.

[20] *In the matter of Mobile Satellite Ventures Subsidiary LLC; Application for Minor Modification of Space Station License for AMSC-1; Minor Amendment to Application for Authority to Launch and Operate a Next-Generation Replacement MSS Satellite; Application for Minor Modification of Blanket License for Authority to Operate Mobile Earth Terminals with MSAT-*Order and Authorization, DA 04-3553, 19 FCC Rcd 22,144, 22,144 (2004). The designation of DA means that the decision was made on delegated authority from the Commission itself to one or more of its bureaus which is a fairly common and typical procedure.

[21] *In the Matter of LightSquared Subsidiary LLC; Request for Modification of its Authority for an Ancillary Terrestrial Component*, Order and Authorization, DA 11-133, 26 FCC Rcd 566, 566-67 (2011).

[22] *Id.* at 586-87.

[23] *In Re LightSquared Technical Working Group*, Public Notice, IB Docket No. 11-109, DA 11-1133, 26 FCC Rcd 9284, 9285 (2011).

revealed some interference on the lower portion of the upper L Band that would affect all types of GPS receivers including aviation, cellular phones, high precision networks, and timing devices.[24]

In addition, the U.S. Space-Based Positioning Navigation & Timing (PNT) National Executive Committee conducted an independent assessment of LightSquared's interference on the GPS system. Similar to the TWG results, the PNT assessment identified significant interference of the GPS signal on all 33 of the tested high-performance GPS sets. As a result, the PNT strongly encouraged the FCC to rescind the conditional waiver granted to LightSquared; and suggested more testing.[25]

The test results spurred a number of concerns from federal agencies and Members of Congress. Recent testimony from agency officials at congressional hearings reinforced the potential devastating impact on U.S. national security, aviation security, geological and weather surveying, and maritime infrastructure. General William Shelton, Commander of the United States Air Force Space Command, recently testified before the House Armed Service Committee, stating LightSquared's "signals interfered with all of the types of receivers in the test...."[26]...General Shelton went on to explain that there would be "significant costs involved in re-designing, manufacturing, testing, fielding and integrating new or modified GPS receivers in our military equipment and weapons systems."[27]

General Shelton's remarks are limited to military retooling to compensate for potential GPS interference. Other federal agencies, as noted, also have significant qualms about the operation of LightSquared's system and the costs associated with reconfiguring systems to ameliorate those adverse effects. If the federal government does not believe that it can absorb the cost of reconfiguring its systems to avoid potential interference problems, such revamping of systems is certainly beyond the financial ken of small businesses.

V. Next Steps for FCC

On September 9, 2011, the NTIA sent a letter to FCC Chairman Julius Genachowski strongly encouraging more tests of LightSquared's impact on the GPS signal before they are allowed to fully

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[24] *Id.*

[25] PNT, ASSESSMENT OF LIGHTSQUARED TERRESTRIAL BROADBAND SYSTEM EFFECTS ON GPS RECEIVERS AND GPS-DEPENDENT APPLICATIONS 3, 12 (2011), *available at* http://www.pnt.gov/interference/lightsquared/2011-06-NPEF-lightsquared-report.pdf.

[26] *Sustaining GPS for National Security: Hearing Before the Subcomm. on Strategic Forces of the House Armed Services Committee*, 112th Cong. (2011) (statement of General William Shelton, United States Air Force at 6).

[27] *Id.* at 9. *Sustaining GPS for National Security: Hearing Before the Subcomm. on Strategic Forces of the House Armed Services Committee*, 112th Cong. (2011) (statement of General William Shelton, United States Air Force).

operate on the L-band.[28] The tests will analyze a new proposal from LightSquared to operate on the lower portion of the upper L Band in an effort to reduce interference.[29]

On September 13, 2011, the FCC issued a Public Notice prohibiting LightSquared, under its ATC waiver, from operating in a terrestrial broadband service until the Commission and NTIA determine the GPS interference concerns have been "satisfactorily resolved."[30] The PNT Executive Committee and NTIA have set November 30, 2011 as a target date to complete the testing of LightSquared's network. The results and recommendations will then be submitted to the FCC for full consideration to reinstate the ATC waiver.

VI. Conclusion

If the FCC approves LightSquared's proposal without resolving all possible GPS interference for all types of devices, thousands of small businesses will be left to bear the costs of replacing or retrofitting their current GPS systems. This would be an enormous burden on small businesses. While the Committee believes that increased deployment of broadband infrastructure, especially in rural areas, is beneficial to small businesses, it should not come at the expense of the GPS industry and small businesses that rely on such service.

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[28] Letter from the Hon. Lawrence E. Strickling, Assistant Secretary of Commerce for Communications and Information to the Hon. Julius Genachowski, Chairman, Federal Communications Commission, Enclosure at 1 (September 13, 2011), *available at* http://fjallfoss.fcc.gov/ecfs/document/view?id=7021708329.

[29] LIGHTSQUARED, LLC, RECOMMENDATION OF LIGHTSQUARED SUBSIDIARY, LLC 4-7 (2011), *available at* http://fjallfoss.fcc.gov/ecfs/document/view?id=7021690470. The new LightSquared proposal still operates within spectrum adjacent to GPS. This stems from the original allocation of spectrum in 1989 to LightSquared's predecessors to operate MSS in the upper portion of the L Band.

[30] *In the Matter of LightSquared Subsidiary LLC; Request for Modification of its Authority for an Ancillary Terrestrial Component*, IB Docket No. 11-109, Public Notice at 1, *available at* http://transition.fcc.gov/Daily_Releases/Daily_Business/2011/db0913/DA-11-1537A1.pdf.