

**U.S. House of Representatives
Committee on Science, Space, and Technology**

Questions for the Record

“Impact of the LightSquared Network on Federal Science Activities”

Thursday, September 8, 2011
2:00 p.m. - 4:00 p.m.
2318 Rayburn House Office Building

**Questions for Mr. Jeffrey J. Carlisle,
Executive Vice President, Regulatory Affairs and Public Policy, LightSquared**

Questions Submitted by Rep. Ralph Hall, Chairman

1. Given that LightSquared has clearly shown that it intends to ultimately utilize both the upper and the lower portion of its spectrum, even with its new business proposal to start with just the lower portion, how is the new proposal really any different than the original proposal?

Our new proposal is entirely different from our old business plan and is a significant concession to the use of our spectrum by GPS manufacturers. Importantly, it eliminates the need for replacing hundreds of millions of GPS devices used by consumers and the aviation industry.

We respectfully disagree with the premise of the question. Eventually, LightSquared will need to add additional capacity to its network, assuming retailers using the network bring enough subscribers to require such capacity. We do not expect to need such capacity for 5 to 6 years at least. When needed, this additional capacity could be added by bringing the upper portion of our spectrum online. However, it could also be met by (1) adding more towers in the lower part of our spectrum, (2) using the upper portion in ways that are substantially different from the old plan (lower power, etc.), and (3) using alternative spectrum. Moreover, it must be borne in mind that our customers are retailers who can reasonably be expected to have alternatives in the marketplace by the time we would need to add more capacity.

Accordingly, our intent is exactly what we proposed to the FCC: to move forward with deployment on the lower portion of the spectrum, while setting aside the upper portion in order to allow a further discussion of how safe deployment of that spectrum could be achieved within a commercially reasonable timeframe. The above alternatives must be explored in an objective way, but there is no need for that process to delay the deployment of an urgently needed network on the lower portion of spectrum.

Implementing this proposal will cost the company \$100 million. This is a significant cost to LightSquared, particularly in light of the fact that the interference problem at issue is caused by GPS receivers looking into the spectrum licensed to LightSquared. This proposal, however, allows us to

move forward with a network deployment while removing the need for anyone to replace cellular, personal navigation, timing or aviation devices.

2. I understand there are now other companies exploring a similar terrestrial broadband business plan but in an entirely different part of the spectrum that would not interfere with the GPS signal. If we can accommodate the President's goals for the Broadband Initiative using spectrum that doesn't interfere with GPS, why should we risk the taxpayer investment in GPS?

LightSquared's proposals eliminate the need to replace all but a small portion of precision GPS devices. As discussed in further detail below, GPS manufacturers are already stepping forward with solutions for the remaining number of precision devices – estimated to number about 750,000 devices total but those requiring replacement or retrofit are likely to be far fewer. Thus, it is not accurate to say that development of our spectrum puts the taxpayer investment in GPS at risk in any way. Taxpayers will continue to have access to a robust GPS system and also have the substantial benefits of a competitive nationwide wireless broadband network.

With respect to alternatives, while all alternatives should be pursued, the U.S. cannot afford to turn its back on a privately funded network that will bring significant amounts of spectrum to market and invest \$14 billion in the U.S. economy. Even though there are initiatives underway to make more spectrum available, it will be some number of years before any of this spectrum will actually be made available to consumers. The National Broadband Plan identified 300 MHz of spectrum that should be made available for mobile broadband within five years, and 500 MHz within ten years. LightSquared's spectrum is included in that 300 MHz, along with all other spectrum that could reasonably be made available. Yet more than a year and a half after release of the Plan, *only* the LightSquared spectrum is on the verge of deployment. None of the other spectrum identified has any clear timetable for deployment.

- The 700 MHz “D Block” has not been auctioned as planned and may be needed for the national public safety broadband network.
- Little progress has been made in preparing the “AWS” spectrum for auction, in part because of the difficulty of reallocating government spectrum, which required relocating government users.
- The companies that held the MSS S-band spectrum in 2009 have been through bankruptcy and the buyers of that spectrum are awaiting approval from the FCC.
- Although the WCS spectrum has been licensed, none of the owners have announced any plans to deploy it.
- The FCC does not have authority to reclaim and auction television broadcast spectrum, as the National Broadband Plan proposed. Even if Congress grants authority, it appears that perhaps 60 to 84 MHz of broadcast spectrum could be made available at most, rather than the 120 MHz originally planned. Auction of that spectrum is many years away.

Moreover, deployment of much of this spectrum will be delayed by the inevitable presence of existing users and nearby operators who deploy inefficient receivers (like GPS manufacturers). In the meantime, Americans will continue to live and work at a significant disadvantage to other countries – the U.S. is currently 15th in the world in terms of broadband adoption. Additional spectrum and competitive networks are desperately needed to address this situation, and LightSquared could start providing service next year.

Finally, it is important to understand that this is not the first technology GPS has threatened and it will not be the last. GPS receivers are, in some cases, so poorly designed that they can be sensitive to transmissions many tens of megahertz to either side of the frequencies actually authorized for GPS. The only spectrum suitable for mobile wireless broadband network is at frequencies of 3 GHz or less, and GPS sits square in the middle of that range at 1.6 GHz. The threat to taxpayers thus comes from the insistence of a few GPS manufacturers on selling inefficient receivers that have the effect of blocking needed services in other bands. Our network is threatened by this inefficiency, and proposed future spectrum is close enough to GPS to conceivably raise interference issues. Given that the interference problem can be solved, it should be, as otherwise GPS manufacturers will continue to delay or even stop beneficial technologies from reaching the public.

3. Will the filters proposed by JAVAD GNSS and LightSquared mitigate the interference problem to wideband and high precision GPS receivers? If so, what testing has been done to demonstrate their effectiveness? Who should pay for this testing?

The new Javad device eliminates potential overload interference to wideband and high precision GPS devices, and shows that all manufacturers can quickly and inexpensively deploy such solutions. The Javad solution was accomplished simply by upgrading the components and signal processing in an existing product. Prior to this, many in the GPS industry had claimed that it was impossible to design a high precision GPS receiver that could operate in this environment. Javad is expected to have units ready for testing as early as November 14, 2011. These can be tested by the government by the terms prescribed by NTIA in its letter of September 9 to PNT ExCom. Alternatively, LightSquared has also engaged an independent laboratory for testing if necessary. To be clear, LightSquared is happy to pay for any testing necessary to validate this or any other solutions.

4. In your testimony you state that LightSquared's "ground network will provide over 260 million people with wireless broadband service." Can you meet that goal by only utilizing the lower portion of your spectrum, as you recently proposed?
 - Have no other companies proposed developing spectrum for 4G Broadband?

Yes. We can meet the FCC coverage requirement of reaching 260 million people by the end of 2015 utilizing the lower portion of our spectrum. As discussed in response to question 1, above, adding the upper portion is one way of addressing the eventual need for capacity assuming subscribers (and data usage) increases, but not the only way.

As of this date, the only companies that have proposed deploying nationwide 4G networks are AT&T, Verizon Wireless, Clearwire, and Sprint (building out both their own and our spectrum). There are no other nationwide networks currently proposed. Moreover, as mentioned in response to question 2, there are no alternatives for spectrum that could be deployed for the next several years. The United States, then, cannot afford a "not in my back yard" approach to spectrum. There are no "clear" portions of spectrum proposed to be brought online in the foreseeable future – there will always be transition costs given that spectrum is extremely crowded and will remain so. Accordingly, it is crucial that the U.S. resolve all spectrum issues – such as the current one – in ways that (1) promote coexistence and (2) prevent inefficient users of spectrum from blocking infrastructure investment.

5. The media has reported that LightSquared believes its move to the lower part of the Mobile Satellite Service band resolves GPS interference problems for 99.5% of receivers. Can you explain to us how you arrived at that 99.5% number? Is your analysis of that data consistent with industry standards for analyzing interference?

These numbers were derived based on the testing that was conducted by the members of the GPS community and LightSquared as part of the Technical Working Group. LightSquared estimates that there are over 400 million GPS units currently in use in the United States. Of these, approximately 300 million reside within cellular phones, 100 million reside in general location/navigation (GLN) devices, 500 thousand in high precision devices and another 500 thousand used in timing and aviation devices.

Representative samples of all classes of devices were tested by the TWG and LightSquared's assessment of the efficacy of its mitigation plan is based entirely on the results attained in the TWG testing, and for aviation devices on the results of an analysis of existing minimum performance standards and testing of some aviation devices.

Cellular

Every cellular device tested by the TWG showed no degradation of operation according to established industry and regulatory standards. Thus, LightSquared was able to conclude that none of the 300 million cell phones in use would be impacted by its operation on the lower 10 MHz channel.

General Location/Navigation (GLN)

The results of the testing of the GLN devices also showed that they would be unaffected by LightSquared's operation on the Lower 10 MHz channel. There was initially disagreement between GPS manufacturers and LightSquared on the appropriate interference threshold and on propagation models to predict LightSquared's on-the-ground signal strength. The LightSquared commitment to initially limit its measured power to a power level of -30 dBm eliminates any basis for disagreement. Even though TWG testing showed that there were two outlier devices that did experience a slight rise in the noise floor at this signal strength, there was no indication whatsoever that this would impact the normal performance of the devices tested. Thus the TWG results confirm that none of the 100 million GLN devices would be impacted by LightSquared's proposed operating parameters.

Timing

Timing devices showed similar results, with all but one tested showing no impact from LightSquared's proposed operation even using the GPS industry's very conservative interference criteria. The confidentiality requirements imposed by the TWG prevent LightSquared from disclosing specific information about the one outlier device, but LightSquared believes this device to be in very limited use and has already identified mitigation options which it can address directly with the manufacturer and users of the device in question.

Aviation

The limited number of aviation devices tested by the TWG showed complete resilience to LightSquared's lower 10 MHz operation. However the FAA and aviation industry have previously indicated that the preferred approach for determining potential impact to aviation uses of GPS is through an analysis of LightSquared's operating parameters in the context of existing minimum performance standards for GPS devices used in Aviation. The TWG report concluded that additional study was needed to determine whether LightSquared's proposed operations were compatible with existing

aviation standards. That work is ongoing and LightSquared is optimistic that it will be able to reach a mutually acceptable conclusion with the FAA on the analytical parameters and ultimate determination.

High Precision

The sole area that the TWG report identified that was not automatically solved by LightSquared's proposed mitigation plan is for high precision GPS units. A significant percentage of these devices showed in tests that they could operate with no perceptible interference from LightSquared's operation on its Lower 10 MHz. There are an estimated 500,000 high precision GPS devices in use, with some estimates as high as 1 million devices. Even using the upper bound of 1 million high precision GPS devices and assuming all the devices would be adversely affected, LightSquared's mitigation proposal would resolve interference for 400 million devices, which yields a measure of 99.75%.

6. We have seen in the public comments filed at the FCC a discussion about possible interference from, not only the LightSquared grid network, but also the LightSquared handsets. It is my understanding that no handsets were available to be tested. When will LightSquared make their handsets available so they can be tested? Do you think it is a major oversight that no handsets are available? There could potentially be hundreds of thousands or millions of LightSquared handsets in circulation – should this issue be tested now before they are on the market?

The unavailability of LightSquared handsets in no way limited the TWG in its testing protocol. First, it should be noted that the test procedures for most of the sub-teams simulated LightSquared's base station signal, even though actual base stations were available to the TWG. This is normal practice as the design of the anechoic chamber test environment often makes it impractical to utilize production equipment. Additionally, using signal generators tuned to the exact parameters of the expected transmission produce more reliable test results by allowing the setting of very precise parameters and varying such parameters according to the test methodology. This type of flexibility is often not afforded when production devices are used. It is for this reason that most sub-teams chose to simulate base station signals.

The sub-team that tested high precision devices in fact used a simulated signal in order to test the potential impact of user devices operating in proximity to high precision receivers. This sub-team, which included representatives from Trimble and John Deere, among others, did not raise any issues with the simulation of user device transmissions, nor would one expect them to do so as this is consistent with quality testing practices. Other sub-teams could have employed a similar test setup, but chose not to perform tests including LightSquared simulated user devices.

The recent letter from NTIA to PNT ExCom does call for testing to include configurations simulating a LightSquared user device. LightSquared is confident that, as was done in the TWG, this signal can be accurately generated in the laboratory environment.

7. LightSquared has argued that the GPS industry has been developing defective equipment because it produced receivers that "look" into LightSquared's spectrum. When did you become aware that high-precision GPS receivers used part of LightSquared's spectrum? Has LightSquared ever been compensated for the use of this spectrum? If so, how much? If so, when did it first receive compensation? Did any of LightSquared's predecessor company's ever receive compensation for the use of their spectrum? If so, when, and how much?

High-precision GPS devices, which as we note above represent a small fraction of the total GPS devices in use, are generally designed to receive two signals: (1) the signal from GPS satellites and (2) an “augmentation” signal. The devices listen to the GPS signal across the widest possible bandwidth in order to increase their accuracy and use the augmentation signal to provide additional information to boost accuracy even further. The augmentation signal can come from a number of sources, such as a satellite signal in a number of different spectrum bands, including the L-band (LightSquared’s spectrum) or a terrestrial network.

Many high precision receivers were designed by GPS manufacturers without the filtering needed to prevent their listening to the far ends of the GPS signal all the way into the LightSquared spectrum. LightSquared did not learn of this design decision until late 2010 when GPS manufacturers first raised it with LightSquared. LightSquared and its corporate predecessors have never received compensation for this use of its spectrum -- such as a royalty paid by the GPS manufacturers -- by GPS devices. With respect to high-precision GPS devices that receive an augmentation signal from an L-band satellite, LightSquared was aware of such receivers from the time that it first began providing this service to resellers that offer this service.¹ LightSquared’s predecessors began offering this service in 1997, and the annual revenue has been approximately \$500,000.²

In this respect, it is important to note that LightSquared has received nothing from any of the high precision manufacturers that use other L-band augmentation services, and it has received nothing from manufacturers of GPS devices that look into the upper portion of our spectrum and do not rely on our satellite signal for augmentation. Effectively, these manufacturers use LightSquared’s licensed spectrum for free, and are trying to establish a continuing right to do so.

LightSquared has never dictated or been aware of the design choices made by manufacturers of high precision GPS devices, including those that use an L-band augmentation signal. Despite ample notice, the GPS manufacturers have had more than sufficient time to make appropriate design decisions to ensure that their devices were compatible with LightSquared’s planned network. LightSquared continues to believe that such devices can be designed to be compatible with its terrestrial network.

The results of the Technical Working Group confirm that the GPS “interference” issue is caused by the design choices made by GPS device manufacturers.³ The TWG confirmed that this incompatibility is not caused by LightSquared’s emissions “bleeding” into the GPS spectrum – it is solely a matter of GPS receiver design. In 2002 and 2003, LightSquared and the GPS industry reached agreement to limit strictly such emissions – known as “out of band emissions” -- to ensure that LightSquared’s network did not interfere with GPS devices.⁴ The GPS industry raised other concerns along the way, including as

¹ We have also been aware that Inmarsat provides a similar augmentation signal to GPS manufacturers.

² Since 1997, LightSquared (and its predecessors) have sold satellite capacity to a company called, Omnistar, which resold that capacity to supply augmentation services to GPS manufacturers, including Trimble Navigation Limited. Omnistar was purchased by Trimble in March 2011. We understand that the GPS manufacturers charge a significant mark up on their subscriptions to end users for augmentation signals. For instance, we understand that a typical annual subscription can range from \$800 to several thousands of dollars a year.

³ As one GPS manufacturer conceded to the FCC, “[a]ll GPS receivers use filters that overlap in the MSS band.” http://www.saveourgps.org/pdf/fcc/Deere_Co_Ex_Parte.pdf

⁴That same GPS manufacturer noted that “[out of band emissions] is not a problem in the GPS band if LightSquared filters their signals as they have committed.” http://www.saveourgps.org/pdf/fcc/Deere_Co_Ex_Parte.pdf

late as 2009, all of which LightSquared resolved. The GPS industry never raised any concerns about “overload” at any of those times.

Apparently, GPS manufacturers designed high precision GPS devices to use a single, open front-end (which consists of antennas, amplifiers, and filters) to receive both GPS and augmentation signals. The GPS manufacturers could have designed their high-precision GPS devices to separate the GPS signal from the satellite augmentation to avoid the overload issue. As one commentator has noted, “the common analog front end amplifies the [LightSquared] allocation when it should be filtered, a very bad design indeed and one that blatantly violates design guidelines issued by the DoD’s 2008 Global Positioning System Standard Positioning Service Performance Standard.”

<http://www.itif.org/publications/itif-comments-lightsquaredgps-testing>.

As we discuss in response to Representative Neugebauer’s first question, the GPS industry has been on notice as a result of the FCC proceedings and decisions since 2003 that LightSquared intended to build an integrated terrestrial and satellite network. In addition, OmniSTAR’s customers, including presumably Trimble, should have known since 2008 that their operations would have to change to accommodate changes in the service that LightSquared was providing to Omnistar. For example, in February 2008, OmniSTAR was told by LightSquared that after 2011, “OmniSTAR must have converted its network to MSV’s next-generation service . . . moved to another operator, or shut down its network.”

In short, the GPS manufacturers made deliberate design decisions that created the potential for overload by LightSquared’s network terrestrial network. Since 2003, the GPS manufacturers were on notice that they needed to review their design decisions to ensure that they were compatible with LightSquared’s network. In addition, with respect to those GPS manufacturers that purchased an augmentation signal from LightSquared, they received further notice since 2008 about LightSquared’s transition to an integrated terrestrial and satellite network.

8. Agencies that use high-precision GPS have indicated that the use of the upper band of LightSquared’s spectrum will never be able to be used without interfering with high-precision GPS. Will LightSquared commit to never using that upper band of spectrum that is closest to the GPS signal?

Please see our answers to question 1 and 4. We take the concerns expressed by federal agencies seriously. They must be taken into account as we engage in the discussion of whether the upper portion of our spectrum could be safely deployed in a commercially reasonable timeframe.

Please note, however, that regardless of use of the upper portion of the spectrum for a ground network, the upper portion of this spectrum can continue to be used for satellite services, which have been provided for 15 years without any interference with GPS receivers.

9. When will you submit filters for high-precision GPS for testing? Who will conduct this testing? How long will it take? Will federal agencies be able to conduct their own independent testing, similar to the TWG and the NPEF, prior to LightSquared operations?

On its own initiative, LightSquared has recently completed a request for information (RFI) process that requested filter suppliers to deliver filters meeting the specifications defined by the GPS industry. In

less than 30 days from issuing the RFI, LightSquared began receiving shipments of filters and testing on these filters can begin immediately. LightSquared intends to conduct its own testing of these filters using respected, independent laboratories. These filters are also available for testing according to the terms outlined by NTIA in its September 9, 2011 letter to the PNT ExCom.

Questions Submitted by Rep. Eddie Bernice Johnson, Ranking Member

1. What can Congress do to protect the future value of spectrum and ensure user receivers do not bleed into spectrum not assigned to them? What are the challenges associated with establishing receiver standards to preclude devices from picking up unintended spectrum?

Spectrum will become much more intensively used in the next few years as more and more Americans use smartphones – which use 24 to 25 times the data as cellphones – and businesses begin to take advantage of the capabilities of new wireless infrastructure. But there is no spectrum available that does not already have existing users. Accordingly, new networks and existing users will have to find ways of coexisting, as otherwise the U.S. will never be able to bring sufficient spectrum to meet increasing demand. The losers in that scenario will not be the companies arguing over spectrum – it will inevitably be the American consumer, who will pay more for worse service.

Coexistence should be a question of technology and economics: how do you fix it and who pays? These are questions that can normally be solved by agreement of new networks and existing users, and we strongly believe that should continue to be the model.

The current issue, however, shows what happens when a powerful entrenched industry decides that it would rather take the chance that it cannot be stopped from deploying inefficient technology. We believe that this issue can be solved, and are more confident in this belief with each passing week as more manufacturers announce solutions. However, to the extent some continue to try to hold out, there are three things Congress should do:

- Instead of taking sides, Congress should encourage parties to work these issues out as success means benefits to all Americans from new uses of spectrum while retaining and strengthening old uses.
 - The current regulatory regime – Part 15 – makes clear that devices that look outside their authorized bands are not entitled to interference protection. Indeed, I have attached hereto an excerpt from a Garmin GPS receiver manual that provides standard language to this effect. Accordingly, the FCC today has the tools in its hands to allow networks to move forward, simply by allowing them to do so and thus making clear that device manufacturers have to innovate and adapt. Congress should encourage FCC to stand by this rule and its own longstanding precedent.
 - Finally, in order to avoid future situations where the current tools may prove insufficient, Congress should explicitly authorize the FCC to apply receiver standards that would protect authorized adjacent band operations. Many countries apply receiver standards today, and if limited to these specific issues, the effect of such requirements would be to maximize efficient use of spectrum while minimizing regulatory burden.
2. LightSquared claims that its service has been beneficial to federal, state, and local governments and first responders in times of national emergencies as it provides an interoperable network for first responders to utilize when cell phone service is not an option.

Can you elaborate on the services provided by LightSquared to our first responders? Does this service require use of your mobile satellite assets? In what way is the terrestrial network used?

LightSquared, and its predecessor companies, has a long history of providing satellite-based communication services to federal, tribal, state, and local governments on a continuing basis and during times of emergencies. The company currently has hundreds of federal, tribal, and state and local government accounts representing thousands of end users and offers a broad variety of satellite services including telephony voice, two-way radio, push-to-track and mobile data. LightSquared also offers Satellite Mutual Aid Radio Talkgroups (“SMART”) nationwide and regionally that enable critical and interoperable communications among homeland security officials, law enforcement, emergency responders, and public safety officials from various departments and agencies across the United States. LightSquared’s satellite-based communication services have facilitated critical emergency communications among nationwide and local first responders during disasters such as Hurricane Katrina, Hurricane Ike, Hurricane Irene, the Kentucky ice storms in 2009, the California wild fires and the earthquake in Haiti – for US-based first responders operating in Haiti following that disaster.

While LightSquared’s current network is satellite based, such a network involves some terrestrial equipment such as earth stations to receive and transmit signals. When a satellite-initiated telephone call is connected to an earth based, traditional cellular or wireline telephone, the call also transits another carrier’s terrestrial network.

3. Former lawmakers, now lobbyists for LightSquared, recently wrote an Op-Ed claiming that tests indicate LightSquared’s new wireless service would not cause any interference for 99.95 percent of all GPS users.
 - What is the basis for the 99.95 percentage figure?
 - Are there tests and analysis to support this claim?
 - Were these tests conducted using federal agency equipment and observed by federal agency personnel?

Please see our answer to Chairman Hall’s question number 5, above, for the basis for our 99.5% figure, which in the worst case is actually 99.75%.

To our knowledge, LightSquared has never claimed that our proposal would protect 99.95% of all receivers. If you have an example of such a claim, however, we would be happy to review it and provide a response.

The Technical Working Group (TWG) tests included the participation of representatives from the Department of Defense, the Federal Aviation Administration and NASA. These participants had full access to all of the deliberations of the TWG, test methodologies, and testing data. Testing was performed on commercial receivers, some of which are used by federal agencies. Information regarding the types of facilities and resources utilized is as follows:

- Testing for the Cellular and General Location/Navigation categories were performed by engineers at independent laboratories, with all costs paid for by LightSquared.

- Testing for the High Precision, Networks and Timing categories occurred at the US Navy’s NAVAIR facility, for which LightSquared paid the facility’s standard commercial rate; testing of these devices was performed by employees of the manufacturers of the devices tested.
 - Testing for the Space-Based device category was conducted at the Jet Propulsion Laboratory by NASA and JPL employees.
 - Testing of aviation devices was performed at Zeta Associates, Inc. (ZAI) by ZAI employees, under the terms of a then-existing contract with the FAA.
 - Additionally, the U.S. Air Force, Space Command conducted testing of certain classified and unclassified special purpose receivers, though this testing was not part of the work undertaken by the TWG.
4. How long would LightSquared operate its network using only the lower portion of the spectrum allocated to it by the FCC? If FCC granted you permission to build out a broadband system in your lower 10 MHz portion of the spectrum band, would you expect to need to go back to the FCC for approval to expand your build out into your upper 10 MHz portion of the band—those that sit next to GPS?

As stated in response to Chairman Hall’s question number 1, above, we expect to be able to operate our network on the lower portion of the spectrum for at least 5 to 6 years. Under our current proposals, we would want to have a further discussion of how safe deployment of the upper portion of the spectrum could be achieved within a commercially reasonable timeframe. In any event, however, we would not be able to deploy that spectrum unless we were specifically authorized by the FCC, which would consult with NTIA, the Department of Defense, and other government agencies before taking any action.

Questions Submitted by Rep. Randy Neugebauer

1. LightSquared continuously makes claims that the GPS community knew this was coming, but I would venture to say it is the other way around. The FCC has always firmly opposed a ground-based network in this spectrum band (and the FCC’s allowance of an ancillary terrestrial network does not indicate willingness to allow a plan like LightSquared’s), and LightSquared’s attempts are clearly against the grain. Since years and years of explicit FCC precedent has reserved the spectrum band in question for only ancillary terrestrial use because of the obvious impacts on GPS technology, why did LightSquared invest so much money in this plan to severely expand a ground-based system in the first place? Why did your company not look for other spectrum that would not impact GPS systems at all?

LightSquared’s plan – to build an integrated satellite and terrestrial broadband network in its spectrum – is fully consistent with FCC precedents and has been fully authorized by the FCC since 2003. The FCC, under both the current and prior Administrations, has confirmed this view. As recently, as April 6, 2011, the FCC noted that “[i]n the case of GPS, we note that extensive terrestrial operations have been anticipated in the L-band for at least 8 years (emphasis added).”

http://fjallfoss.fcc.gov/edocs_public/attachmatch/FCC-11-57A1.pdf. In addition, in October 2008, the FCC further stated that:

[T]he integration of an ATC into MSS systems would have several benefits, including the filling of gaps in MSS coverage, increasing MSS network capacity, and the development of new and innovative service offerings that satellite-only MSS systems cannot offer, including, e.g., ubiquitous digital telecommunications and broadband services and other services that take advantage of the unique coverage and capacity characteristics of ATC-enabled MSS (emphasis added).

http://licensing.fcc.gov/myibfs/download.do?attachment_key=678085

LightSquared (and its corporate predecessors) worked for almost a decade with the GPS industry to ensure that its plans for a terrestrial broadband network could co-exist with GPS devices. The kind of interference that GPS manufacturers now complain of – overload interference – should have been just as much of a concern then as it is now, but the GPS manufacturers failed to raise the overload issue until late 2010. The only exception is Deere, which raised the issue briefly in 2001 and then without explanation failed to raise it again until late 2010. Under the circumstances, LightSquared had every reason to believe that GPS manufacturers were designing their devices so that their only concern was LightSquared emissions into the GPS band (the “out-of-band emission” or “OOBE” issue), and not overload.

- In 2002, LightSquared and the GPS industry submitted a voluntary agreement under which LightSquared would limit its emissions to avoid interference with GPS devices. When it submitted that agreement, the GPS industry stated that “[LightSquared’s] proposed terrestrial augmentations are also well known.” <http://fjallfoss.fcc.gov/ecfs/document/view?id=6513283601>
- In 2003, the GPS industry trade association requested that the FCC approve this voluntary agreement because these limits “to protect GPS represent a ‘win-win’ for [LightSquared], for the Commission’s reliance on OOBE to limit interference, and for GPS safety of life and public safety use.” <http://fjallfoss.fcc.gov/ecfs/document/view?id=6515082621>
- In July 2009, the GPS industry raised concerns about possible interference with GPS devices, but, as the FCC itself recently noted, “[o]ne month later . . . the [GPS industry association] filed a joint letter with LightSquared agreeing that the GPS interference issues *had been resolved* (emphasis in original).” <http://fjallfoss.fcc.gov/ecfs/document/view?id=7021686751>

Not only has the GPS industry fully participated in all regulatory proceedings, known about potential interference issues, and worked with LightSquared to resolve those issues – it actually applauded LightSquared’s efforts and urged the FCC to approve its application to build an integrated satellite and terrestrial broadband network. In a March 24, 2004 letter from the GPS trade association to the FCC, which is worth quoting in full, they stated:

The US GPS Industry Council (“the Council”) . . . urges the Commission to grant the above-referenced applications of [LightSquared] and to do so as soon as possible. [T]he Council and [LightSquared] worked diligently to develop out-of-band emission (“OOBE”) limits from MSV ancillary terrestrial component (“ATC”) base stations and terminals into the GPS band, which are intended to protect GPS receivers and at the same time allow [LightSquared] to maximize the utility of its ATC service to its users.

[LightSquared] proposes to operate at OOB levels that are even more stringent than those set out in its agreement with the Council. We believe that [LightSquared] is to be commended for its proposal to use its spectrum in a responsible manner that ensures the continued utility of GPS receivers operating in the vicinity of [LightSquared] ATC stations. The major issues raised in its application have been before the Commission and fully briefed since at least mid 2003 and, in many cases, for far longer. Thus, the Commission's granting [LightSquared's] applications expeditiously would validate [LightSquared's] adherence to best commercial practices and advance the public and national interests in promoting the responsible use of spectrum (emphasis added).
http://licensing.fcc.gov/myibfs/download.do?attachment_key=366878

We note that some in the GPS industry have recently attempted to deny this extensive regulatory record and their own words in asserting that "FCC rules also did not allow the terrestrial-only broadband services LightSquared now wants to provide."
http://www.amerisurv.com/index.php?option=com_content&task=view&id=9208&Itemid=2. This is simply revisionist history for the following reasons:

- **The GPS industry told the FCC in 2003 that it knew of the extent of LightSquared's plans.** In a filing to the FCC in 2003, the GPS industry noted that LightSquared's network would have "increased user density from potentially millions of MSS mobile terminals operating in ATC mode in the 1626.5-1660.5 MHz bands will transmit back to potentially tens of thousands of ATC wireless base stations in the 1525-1559 MHz bands . . . (emphasis added)."
<http://fjallfoss.fcc.gov/ecfs/document/view?id=6515082621>.
- **The GPS industry warned its own investors as early as 2001 about possible interference issues.** For example, in 2001, Trimble Navigation Limited, in its Form 10-K stated that: "[E]missions from mobile satellite service and other equipment operating in adjacent frequency bands or inband may materially and adversely affect the utility and reliability of our products, which could result in a material adverse effect on our operating result."
http://files.shareholder.com/downloads/TRMB/1422870148x0x34031/919048BF-0668-4353-97B5-7EFDF7718E64/2001_10K.pdf.
- **The undisputed regulatory record shows that, as early as 2003, LightSquared was intending to build, and the FCC had approved, an extensive integrated satellite and terrestrial broadband network.** This chart summarizes the regulatory history of the number of base stations and the power levels that those base stations that LightSquared was authorized to operate:

Milestone	Total No. of Base Stations Approved or Proposed	Power Levels
2003: ATC Order	12,075 ⁵	23.9 dBW
2004: LightSquared ATC License	16,905	31.9 dBW
2005: ATC Reconsideration Order	Unlimited	31.9 dBW
2010: Transfer of Control and ATC Modification Order	36,000	42 dBW
2011: LightSquared Current Proposal	36,000	32 dBW

- **Contrary to the suggestions of the GPS industry, the FCC’s rules do not require that satellite service be the “predominant” or “primary” use of LightSquared’s licensed L-band spectrum.** Indeed, such a requirement -- as well as other restrictions, such as limiting base stations to areas without satellite coverage and requiring user devices to first look to the satellite before connecting to the terrestrial network -- was explicitly rejected by the FCC in 2003 and 2005 as spectrally inefficient, unnecessarily costly, and operationally inefficient.⁶
- **The GPS industry’s argument -- that the January 2011 conditional waiver of the integrated services rule represented a fundamental change in LightSquared’s network – is wrong.** As the chart above illustrates, it has been well-known for nearly eight years that LightSquared had the authority to build an integrated satellite and terrestrial network consisting of over ten thousand base stations at power levels that are as high as or exceed LightSquared’s current plans.

⁵ In 2003 and 2004, the FCC did not directly address the limits on the total number of base stations LightSquared was permitted to deploy, but instead established limits (1725 and 2415, respectively) on the number of *base station carriers on a single 200 kHz frequency*. At the time, the baseline deployment case involved the use of the Global System for Mobile Communications (“GSM”) air interference standard. Assuming the use of a typical GSM reuse factor of 7 (i.e. the use of 7 distinct 200 kHz frequency channels for a base station “cluster”), the FCC’s rules meant that the upper limit on the total number of base stations that could be deployed was $7 \times 1725 = 12,075$ and $7 \times 2415 = 16,905$, respectively. A reuse factor of 7 means that there would be a cluster of 7 adjacent base stations (or base station sectors) where each base station (or base station sector) would use a different 200 kHz carrier, and the cluster could be repeated up to 1725 or 2415 times.

⁶ These FCC’s conclusions completely rebut Dr. Scott Pace’s written testimony at the Committee’s hearing that LightSquared was only authorized to build a “fill in” terrestrial network for gaps in satellite coverage. http://science.house.gov/sites/republicans.science.house.gov/files/documents/hearings/0908011_Pace.pdf. Dr. Pace also grossly errs in his recitation of the regulatory history, stating that LightSquared was limited to the construction of only 1725 base stations in 2003 and 2145 base stations in 2004. This is plainly and demonstratively wrong, as explained in the footnote above.

As the FCC itself noted recently, “[t]he [conditional waiver of the FCC integrated services rule] was not the trigger to permit LightSquared access to the spectrum in the band adjacent to GPS. LightSquared’s predecessors have had access to this L-Band satellite spectrum since 1995 and have been authorized to provide terrestrial service since 2004. (emphasis added).”

<http://fjallfoss.fcc.gov/ecfs/document/view?id=7021686751>

- **The GPS industry has never offered that LightSquared could begin to operate under its pre-January 2011 authorizations.** If the January 2011 conditional waiver represented a fundamental change in LightSquared’s network, as the GPS industry argues, they should be comfortable in allowing LightSquared to deploy its network under its earlier authorizations. They have never offered that compromise because they know that the technical characteristics approved by the FCC from 2003 to 2005 and blessed by the GPS industry are the same as the network that LightSquared intends to deploy today.

In summary, LightSquared chose to invest \$14 billion in private capital to build an integrated satellite and terrestrial network in its own spectrum because:

- Over the course of eight years, it had the undisputed legal and regulatory authorization to build its integrated satellite and terrestrial network. Those FCC authorizations occurred in 2003, 2004, 2005, and 2010.
 - Over that same period, it worked extensively with the GPS industry to resolve any interference issues. The GPS industry itself has characterized that cooperation as a “win-win,” “intended to protect GPS receivers and at the same time allow [LightSquared] to maximize the utility of its ATC services to its users,” and in “the public and national interests in promoting the responsible use of spectrum.”
 - LightSquared does not need to find new spectrum farther away from GPS receivers because it has the legal right to build and operate an integrated satellite and terrestrial network in its own spectrum. While LightSquared is fully committed to finding technical solutions to co-exist with the GPS industry, as a legal matter, it has no obligation to move from its spectrum to accommodate GPS devices that were intentionally designed to look into LightSquared’s spectrum.
2. LightSquared has claimed that your new plan resolves interference problems for 99.5 percent of GPS receivers. I have not seen this claim substantiated. Could you please provide evidence for this claim? Also, have you estimated the economic impacts of the supposedly small percentage of receivers that *will* be affected by your current plan? It seems to me, from the testimonies of the experts at the hearing and from various studies, that the most economically valuable and critically important GPS users will be the ones still affected by LightSquared’s use of the lower half of the spectrum.

With regard to the first part of the question, substantiation of the 99.5% figure, please see our answers to Chairman Hall’s question number 5 and Ranking Member Johnson’s question number 3, above.

With regard to the second part of the question regarding economic impact on precision receivers, LightSquared's position is that there should be no economic impact on any users, as manufacturers should be responsible for providing their users devices that can operate consistent with rules the FCC issued years ago, which as discussed above in response to Chairman Hall's question number 3, has been shown to be completely feasible with a minimal investment of time and resources. As explained in response to your question 1, above, the public record clearly shows that LightSquared's planned use of its network was anticipated for years. GPS manufacturers, however, have repeatedly tried to focus debate on how *LightSquared* will impact *GPS users* in order to distract policymakers and the public from the real question of their own responsibility for replacing or retrofitting devices.

It is important to note in this respect that while use of precision devices is important, the hundreds of millions of devices LightSquared's proposals address contribute significantly to the economy. Hundreds of millions of smartphones and personal navigation devices – used by consumers but also used by business, government and public safety – will not need to be replaced. Devices used in aviation – the economic importance of which is clear – will not need to be replaced. And timing devices – used in wireless and other critical networks that contribute tens of billions of dollars of value every year to the U.S. economy – will not need to be replaced. This is the result of an investment by LightSquared of over \$100 million to solve the problem for these devices, thus absolving the GPS manufacturers of responsibility to do so.

What is left is something less than the estimated 500,000 – 1,000,000 precision devices used largely in agriculture, surveying and construction. There will be no impact from our deployment for a significant number of these devices for three reasons:

- Testing has demonstrated that, even using the most restrictive definitions of harmful interference proposed by the GPS manufacturers, 10 out of 38 precision devices – 26% -- did not suffer harmful interference.
- Assuming LightSquared is operating in the spectrum farthest from GPS, harmful interference for the remaining devices would be limited to a relatively close distance from our base station, meaning that many precision receivers used in remote areas and for agriculture will never be close enough to our network to suffer any effect.
- Our network will be deployed over five years, meaning that some portion of devices would have been traded out for new devices in the ordinary course of business.

After accounting for these factors, what is left is a portion of the total number of devices, which could be as few as 100,000-200,000, but under any set of reasonable assumptions will not be as many as 1 million.

For these devices, we have recently demonstrated, together with our partners, Javad and Partron America, that filters for precision receivers could be developed within days and would cost as little as \$6.⁷ This proves three concepts: that the interference issue can be solved; that it can be solved quickly; and that it can be solved inexpensively.

⁷ LightSquared News Release, October 13, 2011, *LightSquared Shows Filtering Technology*: "In addition to receivers developed by Javad GNSS, several other high-tech companies have also created LightSquared compatible components that can be integrated into receivers. For example, PCTEL has developed LightSquared compatible chip sets, and Partron

In this respect it is important to compare this with a recent recall of GPS devices by Garmin. Issued in August, 2010, Garmin recalled 1.2 million devices because of battery issues. This is one manufacturer. The present situation involves only a portion of this number, spread out over a GPS industry that is manifestly capable of bearing the cost. Not only do GPS manufacturers enjoy the use of government spectrum for free, but they are well funded, with John Deere alone carrying over \$3 billion in cash, Garmin over \$1.5 billion, and Trimble over \$250 million.

Given the limited scope of the remaining receivers – the receivers not already protected by the investment LightSquared is making – there is simply no reasonable argument as to why this cannot be solved. LightSquared will invest \$14 billion of private funds in the American economy, support 15,000 jobs a year for each year of our build out, and create an unprecedented integrated network that will allow dozens of retail competitors to offer broadband across the U.S. The economic cost of solving this last portion of devices should not stand in the way of bringing this investment at a time when jobs, infrastructure, and innovation are sorely needed in the U.S. economy.

If we fail to solve it because certain GPS manufacturers are allowed to continue to avoid responsibility for addressing the issue, the economic consequences to the country will be extremely damaging. Companies and investors will have serious doubts about the ability of the U.S. government to bring more spectrum to market. They will also doubt the government's willingness to enforce longstanding license rights in spectrum. The combined effect will push the value of spectrum down, and therefore reduce significantly the receipts the federal government can expect from the auction of licensed spectrum. Investors will direct investment to countries where spectrum rights are enforced, and where operators can expect to be able to deploy networks as authorized. The United States has long drawn private investment in wireless telecommunications because it has stood by these principles, and must continue to do so.

America has created a filtering component that only costs \$6.” <http://www.lightsquared.com/press-room/press-releases/lightsquared-shows-filtering-technology/>

Attachment 1

Screen shot from the Garmin G900X Integrated Cockpit GPS Navigation device manual with the Part 15 disclosure.



NOTE: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
