Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
LightSquared Subsidiary LLC	)	
	)	
Request for Modification of its Authority for an Ancillary Terrestrial Component	)	IB Docket No. 11-109
	)	
	)	

COMMENTS OF THE BOEING COMPANY

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SUMMARY

The Boeing Company ("Boeing") has substantial interests in this proceeding. Boeing installs global positioning system ("GPS") equipment on every aircraft it manufactures, constructs next generation GPS satellites, constructed LightSquared Subsidiary LLC's ("LightSquared") SkyTerra 1 satellite, and, as a user of broadband wireless equipment, recognizes the important need for the additional wireless broadband infrastructure that would be made available by LightSquared's proposed network.

Boeing participated and contributed to the efforts of the Technical Working Group ("TWG") and makes the following recommendations regarding the Final Report. First, the Commission should promptly require the initiation of additional testing and analysis focused on the feasibility of LightSquared's proposal to limit the operations of its terrestrial base stations to the lower ten megahertz of the 1.5 GHz L-band (1526-1536 MHz).

Second, the Commission should continue to monitor related issues, such as the coordination required between LightSquared's proposed operations in the lower portion of the 1.5 GHz L-band with critically-important flight test telemetry operations in the immediately adjacent spectrum and also the retrofit or replacement, as necessary, of satellite transceivers used for aviation communications.

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The Boeing Company ("Boeing"), by its attorneys, hereby submits the following comments on the Final Report of the Technical Working Group ("TWG") that was co-chaired by LightSquared Subsidiary LLC ("LightSquared") and the United States Global Positioning System ("GPS") Industry Council ("USGIC").[1]

Boeing applauds the cooperative and constructive efforts of numerous representatives of private industry and the U.S. government that resulted in the expeditious production of the Final Report and the detailed testing and analysis that formed the basis of its recommendations. Boeing also applauds LightSquared for acknowledging that, although results vary among devices, the proposed operation of terrestrial base station transmitters in the upper 10 MHz of the 1525-1559 MHz band (the "1.5 GHz L-band") would adversely affect the performance of GPS reception equipment.[2]

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[1] *See* Public Notice, *Comment Deadlines Established Regarding the LightSquared Technical Working Group Report*, IB Docket No. 11-109 (June 30, 2011).

[2] *See Recommendation of LightSquared Subsidiary LLC*, IB Docket No. 11-109 at 1 (June 30, 2011) ("*LightSquared Recommendation*").

LightSquared has concurrently proposed an alternative approach to its terrestrial use of its authorized 1.5 GHz L-band spectrum, which includes three elements – initially limiting base station transmitters to the lower 10 MHz of the band (1526-1536 MHz), restricting base station transmitter power to 32 dBW, and limiting transmissions in the upper 10 MHz of the band to satellite downlink transmissions while working with the Commission and NTIA to explore options to protect GPS receivers and use a full complement of terrestrial frequencies at appropriate power levels.[3] Boeing encourages the Commission to facilitate the prompt assessment of LightSquared's new proposal by requiring additional testing and analysis focused on the feasibility of LightSquared's three self-imposed conditions.

The Commission should also monitor closely the coordination work of the Aerospace and Flight Test Radio Coordinating Council ("AFTRCC") and LightSquared in the aircraft flight test telemetry spectrum in order to ensure that the parties address any potential harmful interference to Mobile Aeronautical Telemetry ("MAT") receivers arising from LightSquared's segregation of its base stations in the lower portion of the 1.5 GHz L-band.[4]

I. INTRODUCTION

Boeing has a number of interests represented in this proceeding. LightSquared's proposed network offers a solution to the current shortage of wireless broadband infrastructure in the United States, a major goal of the Commission's National Broadband

[3] *See id.* at 24.

[4] Similarly, the Commission should also monitor the retrofit or replacement, as necessary, of satellite communications transceivers used for aviation communications.

Plan. At the same time, the accuracy, integrity, availability and functionality of GPS must be protected.

Boeing is a major user of wireless equipment, employing tens of thousands of portable devices to ensure employee communication, integration and safety. Boeing therefore recognizes the pressing need for additional and competitively-available wireless broadband capacity in the United States. In fact, Boeing takes pride in its own contribution to the LightSquared network, having constructed LightSquared's SkyTerra 1 satellite, which was launched in 2010 and placed into service in February of this year.

At the same time, Boeing, its colleagues and customers in the aviation and aerospace industries depend each day on the accuracy and availability of GPS for their operational integrity, efficiency and safety. Boeing is currently constructing for the U.S. Air Force twelve next-generation GPS satellites, the second of which was launched successfully earlier this month. Boeing also installs precision GPS navigation equipment on every aircraft that it manufactures. Boeing's commercial aviation customers have expressed strong concerns about the potential implications to GPS functionality of LightSquared's build-out plans, in particular flight safety ramifications and the impact of any retrofits required to accommodate LightSquared's operations.

Boeing therefore concurs with the consensus of all parties in this proceeding that the accuracy, integrity, availability and functionality of GPS must be protected. With this background, Boeing provides the following recommendations to the Commission.

II. THE COMMISSION SHOULD REQUIRE ADDITIONAL TESTS AND ANALYSIS ON LIGHTSQUARED'S NEW CONDITIONS ON ITS OPERATIONS

LightSquared has acknowledged that the results of the TWG's tests and analysis indicate that the operation of terrestrial base stations in the upper 10 MHz of the 1.5 GHz L-band will adversely affect the performance of GPS reception equipment.[5] LightSquared therefore proposed to initially limit its base station transmissions to the lower 10 MHz of the 1.5 GHz L-band and reduce its maximum power.

Although LightSquared raised the possibility of this approach prior to the conclusion of the TWG process,[6] some TWG Subgroups were unable to study this option sufficiently. For example, the Aviation Subgroup, on which Boeing actively participated, indicated that "[c]ompatibility of aviation GPS operations with a single lower 10 MHz channel could not be determined definitely without additional study."[7] The additional study called for by the Aviation Subgroup should appropriately be completed by the FAA, through the RTCA, which assisted the Aviation Subgroup in its analysis.

The TWG Subgroup addressing High Precision, Timing and Network devices found that harmful interference would result from base station operations by LightSquared in the lower 10 MHz band. The Subgroup, however, also concluded that mitigation techniques may be available to address such interference, indicating that "[t]he viability of proposed future concepts to accommodate high precision GPS and [Mobile Satellite Service ("MSS")] augmentations in the presence of interference from

[5] *See LightSquared Recommendation* at 1.

[6] *See* Final Report of the Technical Working Group ("TWG"), IB Docket No. 11-109 at 13 (June 30, 2011) ("*Final Report*").

[7] *Id.* at 15.

LightSquared terrestrial operations only in the lower 10 MHz band has not been tested or validated as part of this study."[8] The Subgroup further indicated that "[w]e believe more study is required on the feasibility of building future wideband High Precision, Network, and Timing receivers and augmentation systems that would be compatible with LightSquared terrestrial signals and which would provide the same performance as today's receivers and systems."[9]

The TWG Subgroup addressing Space-based Receivers also found a need for additional study on LightSquared's alternative proposal, stating "[i]n NASA's view, there was not sufficient time to adequately evaluate the effectiveness of [LightSquared's proposal], or any other mitigation technique, for space-based or terrestrial high precision science receivers."[10]

Given this consensus of opinion from the TWG, as well as the National Telecommunications and Information Administration's recommendation for additional tests,[11] it is logical for the Commission to require additional study and analysis on LightSquared's alternative proposal. In doing so, the Commission should facilitate the further work of the interested parties with additional instruction and guidance.

First, the Commission should assist in resolving disagreements that developed within certain Subgroups regarding the appropriate definition of harmful interference and

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[8] *Id.* at 23.

[9] *Id.* at 22.

[10] *Id.* at 26.

[11] Letter from Lawrence E. Strickling, Assistant Secretary for Communications and Information, NTIA, to The Honorable Julius Genachowski, Chairman, Federal Communications Commission (July 6, 2011).

the general test parameters that should be employed for such analysis. At least two Subgroups, including the Aviation Subgroup, concluded with unresolved issues regarding the necessary interference margins for GPS receivers and the level of increased noise that constitutes harmful interference.

Second, the Commission should require the identification of any mitigation techniques that could reduce interference into existing GPS devices and prevent harmful interference into future devices. In this regard, significant disagreement has been expressed regarding the appropriate treatment of High Precision GPS devices that were designed intentionally to receive and process MSS signals in the 1.5 GHz L-band to augment GPS location information.[12]

III. THE COMMISSION SHOULD ALSO ENSURE THAT LIGHTSQUARED'S PROPOSED OPERATIONS IN THE LOWER PORTION OF THE L-BAND DO NOT CAUSE HARMFUL EMISSIONS INTO ADJACENT FLIGHT TEST SPECTRUM

When the Commission adopted the rules for MSS ancillary terrestrial components ("ATC"), it acknowledged the significant potential for harmful interference to critically-important flight test operations in the adjacent spectrum allocation for the Mobile Aeronautical Telemetry ("MAT") service.[13] To address the potential for harmful interference, the Commission required MSS licensees employing ATC "to take all practicable steps to avoid locating ATC base stations within radio line of sight of MAT

[12] *See Final Report* at 23.

[13] *See 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*, Report and Order and Notice of Proposed Rulemaking, 18 FCC Rcd 1962, ¶ 179 (2003).

receive sites."[14] In addition, the Commission required operators of MSS ATC networks to coordinate with the Aerospace and Flight Test Radio Coordinating Council ("AFTRCC") the placement of ATC base stations located within radio line of sight of non-government MAT receivers.[15]

Subsequent to the Commission's decision on these matters, coordination discussions have been held between AFTRCC and LightSquared and a draft agreement was produced, but the discussions have not resulted in the adoption of a final agreement on the measures that will be taken to ensure that LightSquared's terrestrial operations do not pose a risk to flight test telemetry receivers in the spectrum immediately adjacent to the 1.5 GHz L-band. Further, these discussions were held prior to the release of LightSquared's proposal to segregate its base station transmitters in the lower portion of the 1.5 GHz L-band.

Flight test maneuvers and protocols have become much more sophisticated and far greater amounts of data must be collected and analyzed in real time to protect the safety of flight crews and efficiently bring aircraft to market. Given the critical nature of flight test operations, the Commission should continue to monitor the work of AFTRCC and LightSquared in order to ensure that the efforts of the parties address adequately any potential harmful interference to MAT receivers arising from LightSquared's segregation of its base stations in the lower portion of the 1.5 GHz L-band.

The Commission should also continue to monitor efforts to retrofit or replace satellite communications transceivers used on aircraft for air traffic control and other

[14] *Id.*

[15] *See id.*

safety communications services. This retrofit or replacement process has not yet begun pending further studies and design efforts by manufacturers of such transceivers and, if the modification or replacement of such transceivers cannot be avoided, is likely to take several years to complete.

IV. CONCLUSION

The Final Report of the TWG provides irrefutable evidence that, although the results vary among devices, the operation of terrestrial base stations in the upper 10 MHz portion of the 1.5 GHz L-band spectrum would adversely affect the performance of GPS receivers. LightSquared has acknowledged this and has proposed an alternate approach for its initial operations. The Commission should require additional study and analysis regarding LightSquared's alternate approach and whether interference mitigation measures can enable LightSquared to move forward with its alternative build out plan.

The Commission should also continue to monitor the efforts of AFTRCC and LightSquared to protect critically-important flight test telemetry operations in the spectrum immediately adjacent to the lower portion of the 1.5 GHz L-band. Finally, the Commission should monitor efforts to determine whether satellite communications

transceivers used by the aviation industry require modification or replacement to ensure that they do not suffer harmful interference from LightSquared's terrestrial operations.

Respectfully submitted,

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