Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Office of Engineering and Technology to Treat	)	
Ex Parte Comments of GE Healthcare as	)	ET Docket No. 08-59
Petition for Rule Making and Seeks Comment	)	
	)	
	)	
To: The Commission	)	

COMMENTS OF THE BOEING COMPANY

Kathleen H. Wong
The Boeing Company
P.O. Box 2201
Seal Beach Blvd.
M/C 110-SB33
Seal Beach, California 90740
(562) 797-1062

Joseph P. Markoski
Bruce A. Olcott
Joshua T. Guyan
Squire, Sanders & Dempsey L.L.P.
1201 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
(202) 626-6615

Its Attorneys

May 27, 2008

SUMMARY

The Commission should not institute a rulemaking to consider GE Healthcare's ("GEHC") proposal to allocate spectrum on a secondary basis in the 2360 – 2400 MHz band for the operation of wireless medical body sensor networks ("BSNs") because the secondary service would cause harmful interference to primary operations.

The Commission has recognized that the 2360 – 2390 MHz aeronautical mobile telemetry ("AMT") band is heavily used by Boeing and other aerospace manufacturers, and that bandwidth requirements continue to increase significantly. Spectrum shortages are already causing testing delays for new aircraft and components, resulting in significant expense to aircraft manufacturers and their customers.

Transmissions from aircraft to flight test ground stations would interfere with BSN signals. Contention based protocol techniques would not allow BSNs to avoid interference because in some regions of the country the band is being used "wall-to-wall." Further, BSN transmissions would interfere with AMT ground stations because flight testing is not limited to remote areas of the United States. AMT ground stations are often located in heavily populated areas and receive transmissions at low elevation angles and low power from distant aircraft. BSNs would not detect transmissions from distant aircraft, would not switch channels being used for AMT, and would interfere with AMT ground stations. Such interference would impose a major financial burden on aerospace manufacturers and their customers. More importantly, such interference raises critical safety concerns for pilots and citizens, as well as patients using BSNs. Therefore, GEHC should identify alternative spectrum for the operation of BSN and the Commission should cease consideration of a secondary allocation for BSN in the 2360 – 2400 MHz band.

TABLE OF CONTENTS

I. BOEING AND OTHER AEROSPACE MANUFACTURERS USE THE 2360 – 2390 MHZ BAND HEAVILY FOR AERONAUTICAL MOBILE TELEMETRY 2

A. The Amount of Bandwidth Required by Boeing and Other Aerospace Manufacturers for AMT Continues to Increase Significantly 2

B. The Financial Costs of Testing Delays Due to Unavailable Spectrum are Substantial 4

II. BODY SENSOR NETWORKS AND AERONAUTICAL MOBILE TELEMETRY OPERATIONS WOULD INTERFERE WITH EACH OTHER 5

A. Transmissions from Aircraft to AMT Ground Stations Would Interfere With BSN Signals 6

B. Transmissions from BSNs Would Interfere With AMT Ground Stations 6

C. BSN Interference to AMT Communications Would Have Major Repercussions 8

III. CONCLUSION 10

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Office of Engineering and Technology to Treat	)	
Ex Parte Comments of GE Healthcare as	)	ET Docket No. 08-59
Petition for Rule Making and Seeks Comment	)	
	)	
	)	
To: The Commission	)	

COMMENTS OF THE BOEING COMPANY

The Boeing Company ("Boeing"), by its attorneys and pursuant to Section 1.415 of the Commission's Rules, 47 C.F.R. § 1.415, hereby submits the following comments in response to the above-referenced *Public Notice*[1] regarding the Commission's proposal to institute a rulemaking proceeding regarding the GE Healthcare ("GEHC") proposal to allocate spectrum on a secondary basis in the 2360 – 2400 MHz band for the operation of wireless medical body sensor networks ("BSNs"). Boeing fully supports the comments of the Aerospace and Flight Test Radio Coordinating Council ("AFTRCC")[2] and opposes GEHC's proposal due to the existing heavy use of the band and likelihood of interference to both BSNs and aeronautical mobile telemetry ("AMT"). The Commission should not institute a rulemaking to consider GEHC's proposal because it proposes a secondary

[1] *Office of Engineering and Technology to Treat Ex Parte Comments of GE Healthcare as Petition for Rule Making and Seeks Comment*, ET Docket No. 08-59, Public Notice, DA 08-953 (rel. Apr. 24, 2008) ("*Public Notice*").

[2] *See* Comments of Aerospace and Flight Test Radio Coordinating Council, ET Docket No. 08-59 (filed May 27, 2008) ("AFTRCC Comments").

service that would cause harmful interference to primary operations in the 2360 – 2390 MHz band. Such incompatible use should not be considered.

I. BOEING AND OTHER AEROSPACE MANUFACTURERS USE THE 2360 – 2390 MHZ BAND HEAVILY FOR AERONAUTICAL MOBILE TELEMETRY

Boeing's contributions to this proceeding reflect Boeing's status as a global leader in the design and manufacture of commercial and military aircraft. Boeing relies on spectrum resources for a variety of manufacturing, operational and flight test purposes. Flight test spectrum is utilized to ensure the safety and reliability of new and current aircraft. Boeing conducts critical testing necessary to validate new and derivative aircraft to meet certification requirements of the Federal Aviation Administration ("FAA") and international and foreign aeronautical regulatory agencies, as well as to comply with the requirements of U.S. government customers. Boeing conducts flight testing in urban and rural areas throughout the United States.

A. The Amount of Bandwidth Required by Boeing and Other Aerospace Manufacturers for AMT Continues to Increase Significantly

The Commission has recognized that "aeronautical telemetry bandwidth requirements have significantly increased in recent years as aircraft manufacturers collect increasing amounts of data and video concerning the performance of prototype aircraft."[3] This increase in bandwidth use by aerospace manufacturers in recent decades is due to

[3] *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems*, ET Docket No. 00-258; *Amendments to Parts 1, 2, 27 and 90 of the Commission's Rules to License Services in the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, and 2385-2390 MHz Government Transfer Bands*, WT Docket No. 02-8, Fourth Notice of Proposed Rulemaking, 18 FCC Rcd 13235, 13260, ¶ 52 (2003).

increased system complexity, greater use of high definition video, larger testing footprints, and shorter acquisition cycles for aircraft.

Aircraft are using increasingly complex technology, which requires more testing, and therefore, increased demand for spectrum. The flight testing that was required in 1995 to complete the FAA certification process for Boeing's 777 aircraft included the electronic monitoring of approximately 64,000 test points. The flight testing that will be required to certify Boeing's new 787 aircraft is expected to include the electronic monitoring of well over 125,000 (and continually increasing) test points. In contrast, the certification process that was required in 1954 for Boeing's 707 aircraft included the monitoring of only about 300 electronic test points.

Not only has the total number of measurements vastly increased, but these measurements must also be undertaken with much greater frequency and precision. As a consequence, the data rates required by each individual sensor have increased several fold, often requiring digital outputs of 12, 16 and sometimes 32 bits per sample.[4]

High definition video is likely to be used in the coming years to monitor airframe components, cockpit instrumentation, and personnel condition and actions.[5] This will cause an order-of-magnitude increase in data capacity demand in the next ten years.[6] In addition, aircraft testing footprints are increasing in size due to the higher altitudes and

---

[4] *See Spectrum Requirement for Aeronautical Mobile Telemetry*, United States of America, Document 8B/143-E at 2 (31 March 2005) ("Document 8B/143-E").

[5] *See* Darrell Ernst, Carolyn Kahn, and David Portigal, "The Economic Importance of Adequate Aeronautical Telemetry Spectrum," The MITRE Corporation, MTR 060202, 4-1, February 2007 ("MITRE Report").

[6] *Id*.

faster speeds of new aircraft, which requires testing at greater distances.[7] Increased footprints reduce geographic reuse of spectrum (a spectrum efficiency technique), which requires more spectrum as well as lower take off elevations for the ground station antenna to track the test aircraft.[8] Finally, market forces demand reduced design, production, and testing cycles to speed the time it takes to bring new aircraft to market.[9] One way to reduce acquisition cycles is to do more real-time testing, for which AMT is essential.[10]

These trends in the aerospace manufacturing and testing industry have caused exponential growth in the demand for spectrum and have resulted in heavy use of the 2360 – 2390 MHz band. As discussed in more detail in the AFTRCC Comments, in some areas of the country operations in the band are conducted "wall-to-wall."[11]

B. The Financial Costs of Testing Delays Due to Unavailable Spectrum are Substantial

Maintaining full use of the 2360 – 2390 MHz band for AMT is critical to the aerospace industry. The shortage of spectrum is already causing delays in the testing of some new aircraft and aircraft components, resulting in significant expense to aircraft manufacturers and their customers. The magnitude of this problem was detailed by the United States in its submissions to ITU-R Working Party 8B, which considered the issue in advance of the 2007 World Radiocommunication Conference (WRC-07). Boeing contributed to the U.S. submissions to WP 8B. The U.S. contributions observed that

---

[7] *Id*. at 4-1 – 4-2.

[8] *Id*. at 4-2

[9] *Id*.

[10] *Id*.

[11] *See* AFTRCC Comments at 18-19.

between 15 and 20 percent of all aeronautical test flights are delayed or cancelled as a result of shortages in telemetry spectrum availability.[12]

Such delays can result in tremendous costs for aircraft development programs, costs that must be assumed by commercial and governmental purchasers of aircraft and, indirectly, the flying public. One estimate places the annual cost of testing delays due to spectrum shortages at $60 million.[13]

II. BODY SENSOR NETWORKS AND AERONAUTICAL MOBILE TELEMETRY OPERATIONS WOULD INTERFERE WITH EACH OTHER

Boeing agrees with and fully supports the AFTRCC Comments with respect to the interference that would be caused to both AMT and BSNs if BSNs were granted a secondary allocation. This consideration, however, deserves additional explanation due to the protected nature and importance of AMT and the life-critical nature of BSNs. GEHC states that "BSNs must be capable of *reliably* conveying unprocessed life-critical monitoring data to devices that are responsible for processing and primary alarming."[14] The fact that secondary BSNs would interfere with AMT ground stations and AMT aircraft would interfere with BSNs raises significant safety of life concerns and the prospect of substantial financial costs to aeronautical manufacturers.

---

[12] *See* Document 8B/143-E at 3.

[13] *See* MITRE Report at 6-7.

[14] *Ex Parte* Comments of GE Healthcare, ET Docket No. 06-135, RM-11271, ET Docket No. 05-213, ET Docket No. 03-92 at 7 (filed Dec. 27, 2007) ("GEHC Ex Parte") (emphasis added).

A. Transmissions from Aircraft to AMT Ground Stations Would Interfere With BSN Signals

GEHC proposes that unrestricted contention-based protocol techniques be employed to allow the BSNs to sense aircraft on one AMT channel and quickly switch to another channel. As discussed above, in some regions of the country there would be no channel for the BSN to switch to because the band is being used "wall-to-wall." Therefore, the BSN would have to either cause harmful interference to primary AMT operations or cease operating. This is true whether or not the BSN is near the AMT ground station. Aircraft being tested flying over BSNs would interfere with the BSN and, if there is no available channel to switch to, the BSN must cease operating. Such issues would arise both in urban areas where hospitals are located near where aircraft to be tested are taking off and landing and in remote areas where much of the flight testing occurs due to the proposed ubiquity of BSNs (in nursing homes, ambulances and the homes of individual patients).[15]

B. Transmissions from BSNs Would Interfere With AMT Ground Stations

GEHC makes several erroneous assumptions in claiming that BSNs would not interfere with AMT operations. One such assumption is that flight testing takes place only in remote areas of the United States and BSNs would not be located close enough to AMT operations to cause interference.[16]

As stated by AFTRCC and contrary to the claims of GEHC, flight testing is not limited to remote areas of the United States. The aircraft being tested frequently fly over

[15] *Id*. at 14.

[16] *Id*. at 15.

remote areas, but flight testing also frequently occurs during take-off and landing. The ground stations and aircraft take-off and landing locations are often in or near urban and heavily populated areas. In fact, Boeing conducts flight testing in this manner in Southern California and in the areas of Seattle, Washington; Eugene, Oregon; Mesa, Arizona; Wichita Kansas (extending into northern Texas and including Greenville, Texas); St. Louis, Missouri; and Salisbury and Leonardtown, Maryland.

The Wichita, Kansas flight test footprint includes several hospitals. In Maryland, there are four hundred hospital beds at St. Mary's Hospital in Leonardtown and at the Peninsular Regional Medical Center in Salisbury, Maryland that are within the footprint of the Patuxent River flight test range. Boeing has not attempted to determine the number of potentially affected hospitals, nursing homes and in-patient care medical facilities in its Pacific Northwest flight test areas or its Southern California test areas due to the large populations and geographic scope.

The AMT ground stations located in the populated areas discussed above track the aircraft being tested by receiving constant transmissions from the aircraft. These transmissions are often at low elevation angles (often two degrees or less) and extremely low receive power levels due to the distance of the aircraft from the ground station (frequently 150-200 miles) and the resultant path losses from the terrain and manmade structures.[17] Therefore, contrary to GEHC's claims, BSNs transmitting near AMT ground stations would interfere with the transmission of signals from the test aircraft to those ground stations.

[17] GEHC claims that AMT communications are high power, however, the great distances at which the aircraft transmit and receive AMT communications results in weak signals. *See* AFTRCC Comments at 14-15.

When an aircraft is a significant distance from the AMT ground station, the use of contention based protocols would not prevent harmful interference to AMT operations from BSNs as claimed by GEHC.[18] A BSN would not detect the transmissions from an aircraft due to its distance from the BSN and therefore would not switch channels. The BSN would continue transmitting and cause interference to the AMT ground station, necessitating a full restart of the acquisition process and possibly a re-test. In some test locations several aircraft are often tested simultaneously, in which case the BSN may sense the communications from an aircraft ("Aircraft 1") to a ground station on a channel ("Channel 1") and switch to another channel ("Channel 2") that is being used by another aircraft ("Aircraft 2") and another ground station. If Aircraft 2 is far enough away, the low sensitivity BSN would not sense the AMT communications between Aircraft 2 and its ground station using Channel 2. The BSN would continue to transmit on Channel 2, the ground station would pick up the closer BSN signal, and it would drop the transmission from Aircraft 2. This would again necessitate a full restart of the signal acquisition process for Aircraft 2 and possibly a re-test at significant additional cost.

C. BSN Interference to AMT Communications Would Have Major Repercussions

Failed flight tests resulting from interference from BSNs would result in safety concerns for pilots and citizens, and substantial financial burdens for aerospace manufacturers such as Boeing. The public safety concerns are described in detail by AFTRCC.[19] The financial impact depends on the complexity of the aircraft being tested

[18] *See* GEHC Ex Parte at 11.

[19] *See* AFTRCC Comments at 7-9.

and will therefore continue to increase in a corresponding manner with the complexity of aircraft systems and testing requirements.

Aircraft testing is an expensive endeavor. For example, the flight test budget for the Boeing X-43 was $250 million for three flights. Obviously re-testing necessitated by interference from BSNs would be expected to be equally expensive. The added costs of these additional tests must ultimately be borne by consumers, either as airline passengers or as taxpayers.

Aircraft manufacturers would also have no effective recourse if BSNs repeatedly disrupt flight test operations. GEHC claims that BSN can operate on a secondary basis, but GEHC has offered none of the requisite signal cessation measures that would be needed to address interference complaints.

Since GEHC is proposing that BSNs be permitted on an unlicensed and geographically unrestricted basis, aircraft manufacturers would be unable to contact BSN operators or users to request that interfering transmissions cease. Even if such contacts could be made, the interference to AMT communications and disruption of flight tests would have already taken place. Further, it is impractical to direct medical and other patient care facilities to shut down BSNs that are being used for the critical purpose of monitoring the health of patients.

These problems highlight the fallacy of proposing to operate critically-important health care monitoring systems on a secondary basis in a heavily used spectrum band. In its *ex parte* comments, GEHC acknowledged that it had "identified a number of bands as candidates for allocation to a new service supporting BSNs."[20] Arguably, GEHC and its

[20] GEHC Ex Parte at 2.

customers would best be served if GEHC further explored the identification of a BSN spectrum allocation in a less-heavily used spectrum band. In any event, the Commission should not issue a notice of proposed rulemaking and further consider the adoption of a secondary allocation for BSNs in the 2360 – 2400 MHz band.

III. CONCLUSION

Boeing fully supports the comments filed by AFTRCC and opposes GEHC's proposal to operate BSNs on a secondary basis in the 2360 – 2400 MHz band. The Commission should not institute a rulemaking on the proposal for the reasons described above.

Respectfully submitted,

THE BOEING COMPANY

By: _____

Kathleen H. Wong
The Boeing Company
P.O. Box 2201
Seal Beach Blvd.
M/C 110-SB33
Seal Beach, California 90740
(562) 797-1062

Joseph P. Markoski
Bruce A. Olcott
Joshua T. Guyan
Squire, Sanders & Dempsey L.L.P.
1201 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
(202) 626-6615

Its Attorneys

May 27, 2008