

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554**

In the Matter of	)	
	)	
Utilities Telecom Council and Winchester Cator, LLC	)	RM - 11429
	)	
Petition for Rulemaking to Establish Rules Governing Critical Infrastructure Industry Fixed Service Operations in the 14.0-14.5 GHz Band	)	

To: The Commission

**OPPOSITION OF  
THE BOEING COMPANY**

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June 26, 2008

## SUMMARY

Boeing opposes the petition filed by the Utilities Telecom Council and Winchester Cator, LLC (“UTC-Winchester”) to add a new secondary fixed service allocation in the 14.0 – 14.5 GHz band because of the harmful interference that would be caused to existing satellite services in the band. Boeing’s contributions to this proceeding reflect Boeing’s diverse interests in the satellite manufacturing and services industry. Boeing provides aeronautical mobile satellite services (“AMSS”) to critical U.S. Government aircraft. Boeing also provides vehicle mounted earth station (“VMES”) services in the band pursuant to experimental authority.

The UTC-Winchester proposal’s interference analysis admittedly does not address secondary or experimental mobile services in the band and would not protect them from harmful interference. UTC-Winchester’s operations propose to increase the noise floor by 6%, which would cause a shutdown of Boeing’s AMSS network, unless Boeing reduced its data rate. Such data rate reductions would quickly eliminate the utility of Boeing’s aeronautical broadband service, which is used by its government customers for high data rate services such as Internet access and video conferencing. Further, UTC-Winchester proposes millions of transmitters in the band that would be difficult for primary fixed satellite service providers to locate. Therefore, such primary services may demand that Boeing shut down its AMSS network to reduce interference even though the AMSS network was not the cause of the interference.

The UTC-Winchester services would also receive harmful interference from services such as Boeing’s AMSS network. UTC-Winchester’s dismissal of this interference concern is based on erroneous assumptions made by UTC-Winchester about

the satellite services in the band. UTC-Winchester's interference mitigation techniques assume exclusive use of narrowband signals, low power, intermittent transmissions, and limited (20 km) separation distances. On the contrary, Boeing's AMSS signals are wide-band, operate at higher power levels, transmit constantly, and require separation distances of 400 km due to high altitudes.

Finally, the Commission should address the pending AMSS and VMES proceedings regarding existing satellite services in the 14.0 – 14.5 GHz band before any consideration is given to a new secondary allocation in the band. As the UTC-Winchester's Technical Report acknowledges, the outcome of these proceedings will dictate the interference environment that must be taken into account when assessing its proposal.

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**OPPOSITION OF  
THE BOEING COMPANY**

The Boeing Company (“Boeing”), by its attorneys and pursuant to Section 1.405 of the Commission’s Rules, 47 C.F.R. § 1.405, hereby submits the following opposition in response to the above-referenced *Public Notice*<sup>1</sup> regarding the petition for rulemaking filed by Utilities Telecom Council and Winchester Cator, LLC (“UTC-Winchester”) to amend Parts 2 and 101 of the Commission’s Rules to add a new secondary fixed service allocation in the 14.0 – 14.5 GHz satellite band.<sup>2</sup> The proposed use of the spectrum would include a commercial service to be provided by Winchester.

Boeing’s contributions to this proceeding reflect Boeing’s diverse interests in the satellite manufacturing and services industry. Boeing is a global leader in the design, manufacture and launch of satellite communications networks for governmental and

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<sup>1</sup> *Consumer and Government Affairs Bureau, Reference Information Center, Petition for Rulemakings Filed*, Public Notice, Report No. 2868 (May 27, 2008).

<sup>2</sup> Utilities Telecom Council and Winchester Cator, LLC, Petition for Rulemaking to Establish Rules Governing Critical Infrastructure Industry Fixed Service Operations in the 14.0 – 14.5 GHz Band (filed May 6, 2008) (“Petition”).

commercial customers. In addition, Boeing is the world's largest manufacturer of commercial jetliners and military aircraft.

Boeing opposes UTC-Winchester's proposal due to the harmful interference that would be caused to critically important satellite services in the 14.0 – 14.5 GHz band. Boeing fully endorses the opposition of the Satellite Industry Association.<sup>3</sup> In particular, the Commission should not institute a rulemaking to consider UTC-Winchester's Petition because it proposes an incompatible use of the band, namely a secondary service that would cause harmful interference to incumbent primary, secondary and experimental services that operate in this band. Moreover, the Commission should address the pending aeronautical mobile-satellite service ("AMSS") and vehicle mounted earth station ("VMES") proceedings before giving any consideration to a secondary allocation for terrestrial services in the 14.0 – 14.5 GHz satellite band.

**I. THE PROPOSED UTC-WINCHESTER SERVICES WOULD CAUSE HARMFUL INTERFERENCE TO IMPORTANT SATELLITE SERVICES IN THE BAND**

The proposed UTC-Winchester services would cause harmful interference to critical Fixed Satellite Service ("FSS") operations in the 14.0 – 14.5 GHz band. A complete technical analysis of this interference is being filed on this date as an attachment to the SIA Opposition. Boeing participated in the development of this analysis. Boeing also separately addresses herein the important interference raised by the

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<sup>3</sup> See Opposition of the Satellite Industry Association, RM-11429, (filed June 26, 2008) ("SIA Opposition").

UTC-Winchester proposal with respect to the operation of AMSS and other mobile-satellite services in the band.<sup>4</sup>

**A. AMSS Networks Are Particularly Susceptible to Harmful Interference From the Proposed UTC-Winchester Services**

The interference analysis accompanying UTC-Winchester's proposal does not address secondary or experimental mobile services in the band, such as AMSS and VMES, but considers only the issue of interference to primary FSS operations. The reason for this exclusion appears clear. The UTC-Winchester Technical Report asserts that "MSS usage is not implemented" in the 14.0-14.5 GHz band.<sup>5</sup>

UTC-Winchester is simply incorrect. Commercial MSS has existed in the 14.0-14.5 GHz band since 1989.<sup>6</sup> The first MSS network in the band provided land mobile-satellite services, and still does today.<sup>7</sup> Boeing later introduced AMSS in the band through the development of its Connexion by Boeing service.

Although the Connexion by Boeing service is no longer available to commercial airlines, Boeing continues to provide its aeronautical broadband communications services to critical U.S. Government aircraft pursuant to a contract with the U.S. Air Force

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<sup>4</sup> This discussion applies equally to Boeing's VMES services, which are currently provided pursuant to experimental licenses, but which will operate similarly to AMSS for purposes of the interference that would occur from the proposed UTC-Winchester service.

<sup>5</sup> Petition, Technical Report at 20-21.

<sup>6</sup> See *QUALCOMM, INC. Application for Blanket Authority to Construct and Operate a Network of 12/14 GHz Transmit/Receive Mobile and Transportable Earth Stations and a Hub Earth Station*, Memorandum Opinion, Order and Authorization, 4 FCC Rcd 1543, FCC 89-24 (1989).

<sup>7</sup> See *id.*

Materiel Command. Pursuant to the contract, Boeing provides advanced broadband services to more than a dozen Very Important Personnel/Special Air Mission aircraft operated by the U.S. Air Force Air Mobility Command to transport senior leadership of the U.S. Government and Department of Defense.<sup>8</sup>

Boeing initially provided its aeronautical broadband service pursuant to a blanket earth station license issued by the Commission's International Bureau in December, 2001.<sup>9</sup> Boeing now provides this service exclusively to federal government customers pursuant to an experimental license issued by the Office of Engineering and Technology ("OET") (Call Sign WC2XVE).

Other operators are introducing their own commercial AMSS offerings. In 2005, ARINC, Inc. was authorized to operate its SKYLink<sup>SM</sup> AMSS system in the Ku-band.<sup>10</sup> Last month, Row 44, Inc. filed an application for authority to operate an AMSS network to provide broadband services to passengers and flight crew.<sup>11</sup> Many airlines have recently expressed renewed interest in broadband services on airplanes and several

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<sup>8</sup> Typical applications for this contract include Internet, E-mail, video teleconferencing, server access, and access to Direct Broadcast Satellite television service compatible with the Boeing system.

<sup>9</sup> *The Boeing Company Application for Blanket Authority to Operate Up to Eight Hundred Technically Identical Transmit and Receive Mobile Earth Stations Aboard Aircraft in the 14.0-14.5 GHz and 11.7-12.2 GHz Frequency Bands*, Order and Authorization, 16 FCC Rcd 22645 (2001).

<sup>10</sup> See ARINC Incorporated, order and Authorization, File Nos. SES-LIC-20030910-01261 and SES-AMD-20031223-01860, DA 05-1016 (rel. Apr. 6, 2005).

<sup>11</sup> See *Satellite Communications Services, Satellite Radio Applications Accepted for Filing*, Public Notice, Report No. SES-01036 (May 28, 2008).

companies, including Panasonic Avionics and Thales Avionics, have been marketing aeronautical broadband services to the airlines.<sup>12</sup>

Importantly, many AMSS, VMES and earth stations onboard vessels (“ESV”) networks that are operating or are under development in the 14.0 – 14.5 GHz band are doing so pursuant to experimental authority issued by the OET.<sup>13</sup> Indeed, many such services provided under federal government contract are authorized this way. Rather than operate on a secondary basis, such operations exist in the 14.0 – 14.5 GHz band on a non-interference/non-protected basis.<sup>14</sup>

In contrast, the UTC-Winchester Petition proposes only to refrain from causing “harmful interference to primary and *existing secondary licensees*.”<sup>15</sup> UTC-Winchester makes no mention of the need to protect experimental satellite services and future secondary AMSS and VMES licensees.

Any consideration of the UTC-Winchester proposal must take into account the important services provided by Boeing and other operators pursuant to experimental and

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<sup>12</sup> Peter Pae, *Airlines Revise Plans for In-Flight Web Connections*, Wash. Post, June 21, 2008, at D1.

<sup>13</sup> See, e.g., FCC File Numbers 0640-EX-ST-2004, 0123-EX-PL-2005, 0390-EX-ST-2005 and 0117-EX-ML-2005 (authorizing General Dynamics to provide experimental VMES operations in the 14.0-14.5 GHz band); FCC File Number 0011-EX-PL-2006 (authorizing Hughes Network Systems to conduct experimental VMES operations); FCC File Number 0048-EX-PL-2007 (permitting Viasat to conduct experimental AMSS operations in the 14.0-14.5 GHz band); *Mobile Satellite-Based Communications Services by Crescomm Transmission Services, Inc. and Qualcomm Incorporated*, Order, DA 96-650, 11 FCC Rcd 10944, 10948, ¶ 9 & 10949-50, ¶ 12 (Int’l Bur./OET 1996) (authorizing Crescomm to provide ESV services on a non-conforming basis in the 14.0-14.5 GHz band).

<sup>14</sup> See 47 C.F.R. § 5.111(a)(2).

<sup>15</sup> Petition at 12-13 (*emphasis added*).

secondary authorizations. These developmental services are critical to the continued growth of the FSS industry by responding to the evolving needs of commercial and government customers.

The operations proposed by UTC-Winchester would not protect AMSS and VMES operations in the 14.0 – 14.5 GHz band. The UTC-Winchester Petition contemplates raising the noise floor by 6%.<sup>16</sup> Such an increase in the noise floor would interrupt transmissions between aircraft using Boeing's service and the target satellites, causing a shut down of Boeing's AMSS network. This is because Boeing's AMSS network employs spread spectrum CDMA technology, which, because of the dynamic data rate, can be operated with very little or no link margin. Even a few dozen UTC-Winchester transmitters in the band would begin to degrade AMSS data rates to Boeing's AMSS customers, and UTC-Winchester has proposed millions per 50 MHz.<sup>17</sup>

In order to avoid a shut down, Boeing would have to reduce significantly the data rate of its AMSS transmissions. In other words, to ensure the same performance the system will need to operate at a lower data rate using the same transmit power level.

Boeing's government customers use the aeronautical service as a broadband service for, among other things, Internet and video teleconferencing. Boeing's customers require an extremely high level of reliability and availability for the service at a high data rate. Therefore, the utility of the service would be quickly eliminated through reductions in data capacity or interruptions in transmissions.

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<sup>16</sup> See Petition, Technical Report at note 2.

<sup>17</sup> See *id.*, Technical Annex at 7 (unnumbered) (proposing 1,350,000 Temporary Fixed Terminals per 50 MHz in the band).

Boeing's AMSS network cannot increase its uplink transmit power to compensate for UTC-Winchester's proposed increase in the noise floor because that would cause Boeing's transmissions to exceed the off-axis e.i.r.p density limits imposed by the Commission's rules to protect adjacent satellite networks.<sup>18</sup>

The limitations on Boeing's service, and its significant susceptibility to interference from terrestrial services, are characteristic of broadband satellites services provided in the 14.0 – 14.5 GHz band using relatively small terminals and CDMA spread spectrum transmissions to service mobile and highly portable applications. The same is true for the VMES services provided by Boeing and others. UTC-Winchester's proposal would likely preclude the continued operation of Boeing's AMSS network and comparable MSS systems. Further, AMSS and VMES networks cannot operate without the continued existence of a robust, interference-free FSS service. Therefore, the Commission should not permit terrestrial services to operate on a secondary basis in the 14.0 – 14.5 GHz band.

**B. The UTC-Winchester Transmitters Would be Difficult to Locate and AMSS Networks Could be Requested to Cease Operation**

The UTC-Winchester proposal also raises concerns about identifying the source of interference that results from terrestrial operations in the band. If the proposed UTC-Winchester service were permitted, with the proposed millions of transmitters in the band, primary FSS services would have extreme difficulty locating the exact source of the harmful interference that would occur. There would simply be too many transmitters in the band. Such difficulties could lead to demands that Boeing cease its AMSS

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<sup>18</sup> See 47 C.F.R. § 25.209.

transmissions to reduce interference to primary FSS signals, again causing disruption of service to Boeing's important government customers. This might occur even though Boeing's AMSS network was not the cause of the interference.

Such interference concerns would be particularly pronounced during emergencies when the use of both UTC-Winchester services and satellite services would be at their peak. Satellite services in general, and Boeing's AMSS network in particular, are heavily utilized during emergencies when terrestrial communications are often unavailable. Interference to either service at such times, or a requirement to cease transmission for UTC-Winchester service or AMSS, would be devastating for the customers of either service and for public safety.

## **II. THE PROPOSED UTC-WINCHESTER SERVICES WOULD RECEIVE HARMFUL INTERFERENCE FROM INCUMBENT SATELLITE SERVICES IN THE BAND**

UTC-Winchester claims that its proposed services "have to be highly reliable (99.999%)." <sup>19</sup> In claiming that it can achieve such high reliability, however, UTC-Winchester relies on several erroneous assumptions about satellite services in the band, and the interference that would result to UTC-Winchester's proposed services.

First, the UTC-Winchester interference mitigation techniques are predicated on the exclusive use of narrowband signals by FSS operations in the band. UTC-Winchester's Technical Report states that the key to sharing under these circumstances is to "take advantage of the fact that the interference is narrowband" <sup>20</sup> and assumes

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<sup>19</sup> Petition, Technical Annex at 1 (unnumbered).

<sup>20</sup> *Id.*, Technical Annex at 21.

bandwidths ranging from 1 to 4 MHz.<sup>21</sup> Many FSS and MSS networks in the band, however, transmit spread spectrum signals. Boeing's AMSS and VMES services are wide-band services, using spread spectrum technology to meet the applicable Commission restrictions. Services operating using FSS networks can have spreading bandwidth of the transmit signal in the 14.0 – 14.5 GHz band ranging from 3.75 to 32.4 MHz. This means that an AMSS terminal on an aircraft 400 km away could prohibit the use of at least 32.4 MHz of spectrum by the UTC-Winchester services.

Second, the UTC-Winchester Technical Report makes incorrect assumptions regarding the power levels and transmission intervals of services operating using FSS networks. Section 4 of the Technical Report assumes power levels of 1 watt, and intermittent transmissions, such as credit card transactions over VSATs.<sup>22</sup> In reality, AMSS and VMES terminals operate at power levels up to 6.7 dB watts and transmit constant broadband data over CDMA links.

Third, the UTC-Winchester Technical Report is incorrect regarding the separation distances needed to avoid harmful interference to UTC-Winchester's proposed operations. Figures 4-1 and Figure 4-2 in Section 4 of the UTC-Winchester Technical Report indicate interference levels that would be received by fixed terminals operating in the band as a function of the distance between the fixed terminal and a VSAT. Figure 4-2 shows extremely high levels of interference at 20 km separation between the VSAT and the Temporary Fixed Terminal ("TFT") when the VSAT is in the main beam of the TFT.

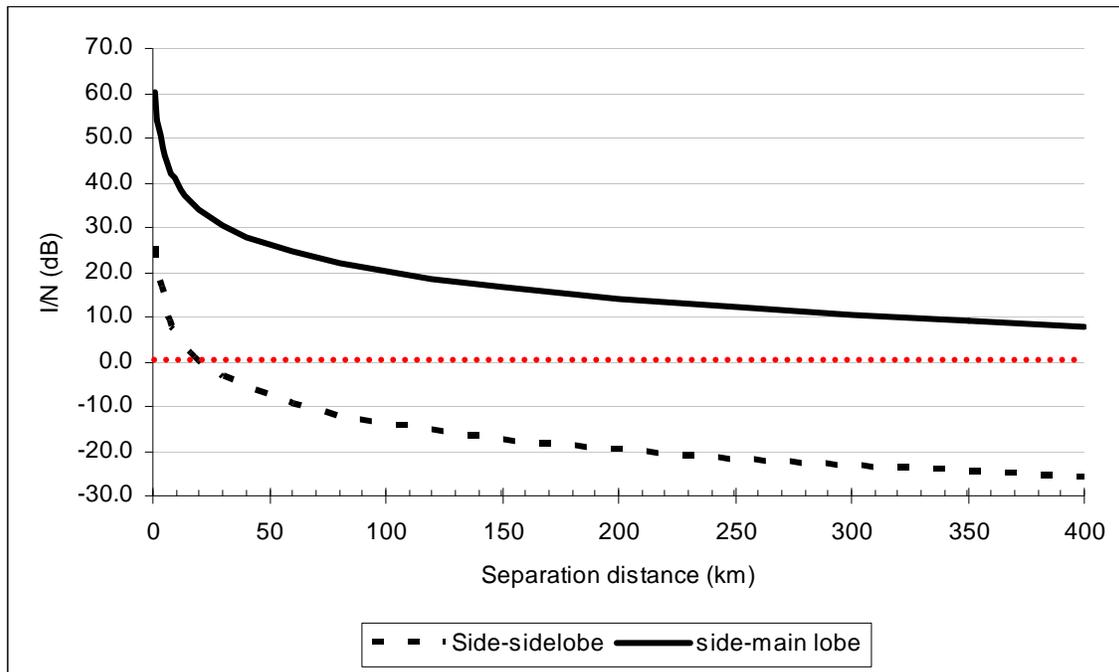
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<sup>21</sup> *Id.*, Technical Annex at 19.

<sup>22</sup> *Id.*

The curve was stopped at 20 km, apparently assuming that 20 km is the limit of the radio horizon.

UTC-Winchester’s curve does not take into account the presence of AMSS terminals in the band, which can have altitudes up to 40,000 feet with a radio horizon of 400 km. For example, the International Telecommunication Union (“ITU”) has established a minimum coordination distance of 100 km for land to land interference paths and 400 km for land to aeronautical interference paths. Figure 1 below shows the same curves as Figures 4-1 and 4-2 in UTC-Winchester’s Technical Report, but extended out to a 400 km radio horizon. The interference for main lobe-to-side lobe antenna coupling exceeds the interference criteria of 0 dB (assumed by UTC-Winchester in Section 4 of the Technical Report) even at the extreme distance of 400 km.



**Figure 1. Interference received by fixed stations as a function of separation distance**

Therefore, the FSS, AMSS and VMES networks that are already operating in the band will cause significant interference to UTC-Winchester’s proposed services. This

interference will worsen as new mobile applications of FSS networks become more prevalent in response to the needs of federal government and commercial customers.

### **III. THE COMMISSION SHOULD ADDRESS PENDING PROCEEDINGS REGARDING IMPORTANT GOVERNMENT AND COMMERCIAL SATELLITE SERVICES IN THE BAND BEFORE CONSIDERING A SECONDARY TERRESTRIAL ALLOCATION**

There are two outstanding proceedings pending at the Commission regarding existing satellite services in the 14.0 – 14.5 GHz band that should be addressed before any consideration is given to UTC-Winchester’s Petition. First, in 2003, Boeing petitioned the Commission to create a secondary allocation and service rules for AMSS in the Ku-band.<sup>23</sup> Boeing is currently providing aeronautical broadband services to government customers as described above, however, service rules are still pending. Also unresolved is whether AMSS should remain a secondary allocation, or should be treated as a primary mobile application of the FSS, similar to earth stations on board vessels. Second, last year, the Commission instituted a rulemaking proceeding to consider a petition to designate VMES a primary application of the FSS in the 14.0 – 14.5 GHz band.<sup>24</sup> Boeing has tested VMES applications pursuant to experimental licenses and is working with the federal government regarding VMES broadband applications that its government customers may need to support military and civilian operations. Boeing and SIA support the proposed designation for VMES concurrent with the designation of

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<sup>23</sup> See Amendment of Parts 2 and 25 of the Commission’s Rules to Allocate Spectrum in the 14-14.5 GHz Band to the Aeronautical Mobile-Satellite Service (“AMSS”) and To Adopt Licensing and Service Rules for AMSS Operations in the Ku-Band, The Boeing Company, *Petition for Rulemaking*, IB Docket No. 05-20 (filed July 21, 2003).

<sup>24</sup> See Amendment of Parts 2 and 25 of the Commission’s Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Certain Frequency Bands Allocated to the Fixed-Satellite Service, IB Docket No. 07-101, *Notice of Proposed Rulemaking*, FCC 07-86, (rel. May 15, 2007).

AMSS (renamed aircraft-mounted earth stations (“AMES”)) as primary FSS applications.<sup>25</sup>

The outcome of these proceedings will have important implications for the reliability and availability of Boeing’s AMSS and VMES services in the 14.0 – 14.5 GHz band. These proceedings will also dictate the interference environment that must be taken into account when assessing UTC-Winchester’s proposal to operate on a secondary basis in the band.

UTC-Winchester’s Technical Report acknowledges the difficulties in assessing the impact of existing and future MSS networks on its proposed services, stating “it is difficult to determine exactly how often the interference will occur.”<sup>26</sup> UTC-Winchester is correct in observing that the interference analysis will likely remain difficult as long as the service rules for VMES and AMES remain unsettled. Therefore, the Commission should address the pending satellite service proceedings before attempting to consider the impact of the terrestrial services proposed in the Petition.

Boeing and SIA have demonstrated that UTC-Winchester’s claim that its service can protect “existing secondary licensees” in the band is inaccurate. UTC-Winchester’s proposed service does not offer adequate interference mitigation techniques to avoid interference to experimental and secondary VMES and AMSS networks. UTC-Winchester has failed to demonstrate that its proposed secondary allocation for fixed service in the 14.0 – 14.5 GHz band would not cause harmful interference to primary

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<sup>25</sup> See Comments of the Boeing Company, IB Docket No. 07-101 (filed August 17, 2007); Comments of the Satellite Industry Association, IB Docket No. 07-101, at 4 n.5 (filed Aug. 17, 2007).

<sup>26</sup> Petition, Technical Report at 20-21.

services and could share with secondary and experimental services. The Commission should therefore forego any further consideration of UTC-Winchester's proposal. At the very least, the Commission should first finalize the regulatory status of AMSS and VMES in the band before considering the introduction of a secondary terrestrial service in this heavily used spectrum.

#### **IV. CONCLUSION**

For the reasons expressed in the SIA Opposition and herein, Boeing opposes UTC-Winchester's proposal to add a secondary allocation for fixed service in the 14.0 – 14.5 GHz band. The proposed UTC-Winchester services would cause harmful interference to AMSS networks in the band, and would be subject to harmful interference from AMSS due to its wide-band signal and high-altitude, mobile nature. The Commission should not institute a rulemaking on the UTC-Winchester proposal. Further, any additional consideration should await conclusion of the pending AMSS and VMES proceedings regarding the status of important MSS operations in the band.

Respectfully submitted,

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