Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	IB Docket No. 02-10
Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands	)	

To: The Commission

COMMENTS OF THE BOEING COMPANY

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SUMMARY

At least two principles should guide the Commission's development of licensing and service rules for Ku-band ESV operations. First, the Commission must afford Ku-band ESVs primary status as networks communicating in the FSS, while ensuring adequate protection to co-frequency operations in the band. Second, the Commission must use lessons learned in analogous satellite proceedings to adopt a streamlined Ku-band ESV regulatory regime.

Affording Ku-band ESVs primary status to the entire 11.7-12.2 GHz and 14.0-14.5 GHz bands is consistent with decisions reached at WRC-03 and would allow ESVs to be considered a recognized application within FSS networks during the inter-system coordination process. Such a designation is critical to the implementation of ESV services that do not otherwise fall within the previously coordinated parameters of a serving satellite. Affording primary status to Ku-band ESV operations also ensures that ESVs operating on U.S. flagged vessels will have an equal regulatory footing with foreign-licensed ESVs. Moreover, because Ku-band ESVs and secondary MSS systems operate in accordance with the licensed and coordinated parameters of the FSS satellites through which they provide service, there should not be any potential for harmful interference among co-frequency ESV, MSS or FSS providers.

Given the extremely limited use of Local Television Transmission Service ("LTTS"), the possibility of harmful interference to ESVs from LTTS operations, and the alternative frequencies that exist for such operations, Boeing supports the elimination of the LTTS allocations in the 11.7-12.2 GHz and the 14.2-14.4 GHz bands. In addition, there is no need for licensed LTTS operations to be grandfathered in the Ku-band. The FCC should, at a minimum, decide that secondary LTTS operations are not entitled to claim interference protection from primary Ku-band ESV operations.

Although Boeing supports an NTIA coordination requirement to protect Space Research and Radio Astronomy Service stations in the 14.0-14.2 GHz and 14.47.14.5 GHz bands, respectively, such a requirement need only be a condition of the Ku-band ESV authorization that must be satisfied prior to commencing operations. This way, required NTIA coordination discussions would not necessarily delay the grant of Ku-band ESV authorizations.

Boeing agrees with the Commission that blanket licensing is essential in the context of Ku-band ESV operations. ESV operators will employ large numbers of technically identical ESVs operating on vessels in U.S., foreign and international waters throughout the world, making licensing of ESVs on an individual basis impractical. The Commission must consider the unique technical and operational characteristics of Ku-band ESVs in developing an appropriate blanket licensing regime for the service. Such a blanket licensing regime need only be based on compliance with the off-axis e.i.r.p. limits, antenna pointing accuracy, minimum antenna size requirements, power limits towards the horizon, and the coordination requirements for Ku-band ESVs included in Resolution 902 (WRC-03).

The Commission should also permit U.S. Ku-band licensees to communicate with ESVs on board foreign registered vessels whose operations within 125 km of the United States have previously been coordinated with the United States or on a non-harmful interference basis, subject only to compliance with the Commission's ESV technical and service rules. The Commission's ESV licensees would be responsible for ensuring that all Ku-band ESVs operating on their networks (including those on foreign-registered vessels) comply with the Commission's rules and would have the capability to inhibit operations and/or terminate service to ESVs that cause interference or otherwise fail to comply with the Commission's rules. A foreign-flagged ESV would be temporarily associated with a U.S. ESV licensee when it is operating within 125

km of the United States. For this temporary period, the U.S.-licensed ESV operator shall assume responsibility for the ESV as if it were regularly licensed to it.

In addition, it is imperative that the Commission license Ku-band ESVs to operate in international waters more than 125 km from the U.S. coastline. Such licensing would be consistent with the relevant ITU requirements and the Commission's jurisdiction. To the extent that a U.S. licensed ESV causes interference to another station outside of the United States, the Commission should proceed to address those concerns with the appropriate licensing administration of the other station.

Boeing supports a requirement to maintain real-time location information for Ku-band ESVs operating within a network for a period of at least 90 days, however, such information should only be used internally or made available to the Commission on request in the context of resolving reports of interference or Commission enforcement activities. Boeing opposes a blanket restriction on Ku-band ESV operations by large vessels as it is neither necessary nor appropriate given the current limited use of terrestrial radio stations in the Ku-band

The FCC should also extend its "ALSAT" designation to permit Ku-band ESV licensees to communicate with all U.S.-licensed Ku-band FSS satellites and foreign-licensed Ku-band satellites on the Permitted Space Station List. Extending ALSAT authority to Ku-band ESV licensees is entirely appropriate given the operational characteristics of Ku-band ESV operations. In addition, extending the ALSAT designation to Ku-band ESV licensees would have important public interest benefits, such as affording Ku-band ESV operators significant operational flexibility. Lastly, so long as the off-axis e.i.r.p. is below the blanket licensing level, the Commission should not mandate the use of uplink power control.

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COMMENTS OF THE BOEING COMPANY

The Boeing Company ("Boeing"), by its attorneys, hereby files these comments in the above-captioned proceeding.[1] Boeing supports the Commission's efforts to establish rules and procedures to govern the use of earth stations onboard vessels ("ESVs") in the Ku-band Fixed-Satellite Service ("FSS") spectrum,[2] and to implement domestically the results of the 2003 World Radiocommunication Conference ("WRC-03") with respect to ESVs. As discussed herein, adopting rules to permit ESV operations in the Ku-band would facilitate the deployment of innovative maritime broadband technologies and promote more efficient use of the Ku-band, thereby strongly serving the public interest.

I. INTRODUCTION

As the Commission is aware, Boeing is the leading proponent of advanced broadband satellite communications services to commercial, government and private aircraft customers

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[1] *See* Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands, *Notice of Proposed Rulemaking*, IB Docket No. 02-10, FCC 03-286 (rel. Nov. 24, 2003) ("*NPRM*").

[2] Boeing's comments in this proceeding are limited to issues associated with Ku-band ESV operations.

through its Connexion by Boeing[sm] ("Connexion") Aeronautical Mobile-Satellite Service ("AMSS") offering.[3] The Connexion system operates in Ku-band spectrum allocated to the FSS on a primary basis.[4] Boeing protects primary FSS operations in the 14.0-14.5 GHz band and ensures compatibility with the Commission's two-degree spacing regime by managing the Connexion network using such techniques as limiting the off-axis e.i.r.p. produced by its aircraft earth stations ("AES") to no more than that produced by routinely licensed Ku-band VSAT terminals.

Boeing already has achieved significant commercial progress in launching this new broadband service, with the signing of several international airline carriers, such as Lufthansa, Scandinavian Airlines System ("SAS"), Japan Airlines ("JAL") and All Nippon Airways ("ANA") to install the Connexion service on their long-haul aircraft,[5] and has teamed with Rockwell Collins to bring high-speed connectivity to the business aviation market.[6] In addition,

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[3] *See The Boeing Company,* Order and Authorization, 16 FCC Rcd. 22645 (Int'l Bur./OET 2001) ("*Transmit-Receive Order*"), *modified* Radio Station Authorization, Call Sign E000723, File No. SES-MOD-20020308-00429 (granted Aug. 16, 2002), *further modified* Radio Station Authorization, Call Sign E000723, File No. SES-MOD-20030512-00639 (granted Nov. 14, 2003).

[4] The *Transmit-Receive Order* requires Boeing to operate its AESs on a non-harmful interference basis. *Id.* Consistent with the outcome of WRC-03, the Commission recently added a secondary AMSS allocation to the 14.0-14.5 GHz band. *See* Amendment Of Parts 2, 25, And 87 of the Commission's Rules to Implement Decisions from World Radiocommunication Conferences Concerning Frequency Bands Between 28 MHz And 36 GHz and to Otherwise Update the Rules in this Frequency Range, *Report and Order*, 30 Communications Reg. (P&F) 1236 (rel. Nov. 4, 2003).

[5] *See* The Boeing Company, *News Release* (Jan. 15, 2004) (available at <http://www.boeing.com/ news/releases/2004/q1/nr_040115j.html>).

[6] *See* The Boeing Company, *News Release* (Oct. 7, 2003) (available at http://www.boeing. com/news/releases/2003/q4/nr_031007j.html>).

Boeing has recently entered into agreements with several satellite operators to extend the Connexion service around the world.[7]

Boeing has also announced its intent to expand the Connexion service offering to include broadband satellite communications services for the maritime industry.[8] Boeing has successfully tested high-speed data communication and video teleconferencing in the maritime environment utilizing the Connexion network pursuant to an experimental authorization issued by the Commission.[9] Applying the broadband capabilities of the Connexion system to maritime communications is a natural complement to Boeing's commercial AMSS service, and leverages the existing satellite and ground-based network of the Connexion system to provide these innovative new services.

As the Commission noted in the NPRM, ESV networks will provide significant public benefits by delivering broadband services to vessels at sea and in port.10 ESVs offer crew and passengers on commercial, government and private vessels high-speed access to the Internet and corporate intranets; broadband data, voice and videoconferencing capabilities; and satellite-delivered video programming. These communications capabilities can, among other things,

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[7] *See* The Boeing Company, *News Release* (Jan. 15, 2004) (available at <http://www.boeing. com/news/releases/2004/q1/nr_040115j.html>) (SES AMERICOM); The Boeing Company, *News Release* (Sept. 12, 2003) (Intelsat) (available at <http://www.boeing.com/news/ releases/2003/q3/nr_030912j.html>); The Boeing Company, *News Release* (Aug. 28, 2003) (SCC) (available at <http://www.boeing.com/news/releases/ 2003/q3/nr_030828j.html>); The Boeing Company, *News Release* (Aug. 26, 2003) (Eutelsat) (available at <http://www.boeing.com/news/releases/2003/q3/ nr_030826j.html>).

[8] *See* The Boeing Company, *News Release* (Jan. 14, 2004) (available at < http://www.boeing.com /news/releases/2004/q1/nr_040114j.html>).

[9] *See id., see also* The Boeing Company, Experimental Special Temporary Authorization, File No. 0347-EX-ST-2003, Call Sign WD2XFK. A separate experimental application remains pending before the Commission. *See* File No. 0194-EX-PL-2003, Call Sign WD2XFK.

[10] *See generally NPRM* at ¶ 23.

enhance the travel experience on cruise ships and other passenger vessels, enable remote monitoring of vessel cargo and systems, and provide critical communications capabilities for all types of vessels. In addition, establishing licensing procedures for ESV networks would advance the Commission's efforts to maximize the efficient and flexible use of the limited spectrum resource by permitting new and innovative services, while protecting incumbent operations in the Ku-band.

Given the substantial public benefits of permitting innovative broadband ESV operations in Ku-band FSS spectrum, the Commission should promptly implement licensing and service rules that facilitate the deployment of ESV operations in the band. At least two fundamental principles should guide the Commission's development of licensing and service rules for Ku-band ESV operations: (i) afford Ku-band ESVs primary status as networks communicating in the FSS, while ensuring adequate protection to co-frequency operations in the band; and (ii) use lessons learned in analogous licensing and rulemaking proceedings to adopt a streamlined Ku-band ESV regulatory regime. Boeing addresses these principles more fully below in its comments on some of the specific proposals made by the Commission in the *NPRM*.

II. THE COMMISSION SHOULD PROMPTLY ADOPT KU-BAND ESV LICENSING RULES THAT AFFORD PRIMARY STATUS TO THE SERVICE

The licensing of ESV operations has been before the Commission for more that a decade. In December 1991, Crescomm Transmission Services, Inc. ("Crescomm")[11] filed a petition for rulemaking to license ESVs to communicate with land-based earth stations in the C-band and

[11] Crescomm subsequently changed its name to Maritime Telecommunications Network, Inc. ("MTN").

Ku-band.[12] In the 1996 *Crescomm Order*, the Commission granted waivers of the Commission's rules to Qualcomm, Inc. ("Qualcomm")[13] and MTN to provide maritime Mobile-Satellite Service ("MSS") using C-band and Ku-band frequencies.[14] Since that time, the Commission generally has authorized ESV operations on a waiver/special temporary authorization ("STA") basis.[15] For example, the Commission recently granted MTN's renewal STA request to operate ten ESVs on U.S.-flagged vessels in the Ku-band on a non-harmful interference basis.[16] The Commission has also granted other ESV authorizations,[17] and a number of ESV applications remain pending before the Commission.[18]

The Radiocommunication Sector of the International Telecommunication Union ("ITU-R") recently adopted recommendations pertaining to ESV operations using C-band and Ku-band

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[12] *See* Crescomm Transmission Services, Inc., Petition for Rule Making and Request for Pioneer Preference, RM-7912 (filed Dec. 12, 1991).

[13] Qualcomm filed a request for waiver of the Table of Frequency Allocations to allow it to provide satellite-based communications to ships in the Ku-band via its OmniTRACS system. *See* Mobile Satellite-Based Communications Services by Crescomm Transmission Services, Inc., and Qualcomm Incorporated, *Order*, 11 FCC Rcd. 10944, 10946-47, ¶ 7 (Int'l Bur./OET, 1996) ("*Crescomm Order*").

[14] *See id.*, ¶ 9.

[15] *See generally NPRM* at ¶ 9.

[16] *See* Maritime Telecommunications Network, Inc., File No. SES-STA-20031209-01841 (effective 12/22/03 through 6/17/04). The Commission has indicated that it lacks authority to license ESVs on ships of foreign registry. *See* 47 U.S.C. § 306. Thus, ESV operators providing service to foreign-registered vessels are not licensed by the Commission.

[17] *See e.g.*, FCC File No. SES-LIC-20020326-00543 (FCC Call Sign E020095) (application of BJ Services Company, U.S.A.); *see also* Public Notice, Report No. SES-00400 (rel. June 12, 2002) (announcing grant of authority).

[18] *See e.g.,* FCC File Nos. SES-MOD-20031008-01387 (FCC Call Sign E950135) (application of Stratos Offshore Services Company); SES-LIC-20011130-02259 (FCC Call Sign E010332) (application of Maritime Telecommunications Network, Inc.); SES-LIC-20021028-01926 (FCC Call Sign E020303) (application of Data Marine Systems, Inc.).

FSS frequencies.[19] These requirements led to the WRC-03 decision to add a footnote to the International Table of Frequency Allocations that authorized the use of ESVs with space stations in the FSS in the 5925-6425 MHz and 14.0-14.5 GHz bands,[20] and that established technical requirements and minimum distances from coastal states beyond which ESVs can operate without the prior agreement of potentially concerned administrations.[21]

A. Consistent with WRC-03 Decisions, the Commission Should Afford Ku-Band ESV Operations Primary Regulatory Status

The Commission proposes to allow ESVs to operate on a primary basis in the Ku-band.[22] Boeing agrees that Ku-band ESV operations should be afforded primary status and supports adoption of proposed footnote NGyyy in the 11.7-12.2 GHz and 14.0-14.5 GHz bands. Such regulatory status is consistent with decisions reached at WRC-03 and would permit ESVs to be considered a recognized application within FSS networks during inter-system coordination, which is critical to the implementation of ESV services that do not otherwise fall within the previously coordinated parameters of a serving satellite.

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[19] *See* Recommendations ITU-R M.1648 (2003), M.1649 (2003) and M.1650 (2003).

[20] *See* ITU RR 5.457A (WRC-03).

[21] The minimum distances are 300 km in the 5925-6425 MHz band and 125 km in the 14.0-14.5 GHz band, and are conditioned upon technical limitations such as antenna size and off-axis e.i.r.p. limits. *See* ITU-R Resolution 902 (WRC-03); *id.* at Annex 1 and Annex 2. ESV transmissions within the minimum distances are subject to the prior agreement of the concerned administration(s). ITU-R Recommendation 37 (2003) provides operational procedures for ESVs to facilitate such agreements.

[22] *NPRM* at ¶ 30. Specifically, the Commission proposed to add the following non-Federal Government footnote NGyyy to the U.S. Table of Allocations for the 11.7-12.2 GHz and 14.0-14.5 GHz bands: "NGyyy In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), earth stations on board vessels (ESVs) may communicate with space stations of the fixed-satellite service on a primary basis. ESV operators shall take all practical steps to comply with ITU Resolution 902 (WRC-03)." *Id.*

The decisions taken at WRC-03 establish that ESV operations in the Ku-band should be treated as a primary service under the Commission's rules. Footnote 5.457A, which permits ESV operations in Ku-band FSS spectrum in accordance with Resolution 902, is associated with the FSS primary allocation in the International Table of Frequency Allocations. Although Annex 1 of Resolution 902 states that ESV receivers "in motion" shall not claim protection, the resolution also states that the procedures of Article 9 of the international Radio Regulations apply to ESVs "operating at specified fixed points"[23] and Annex 1 confirms that ESVs are subject to prior agreement from a foreign administration only where fixed or mobile services are allocated on a primary basis.[24]

Furthermore, affording primary status to Ku-band ESV operations ensures that U.S. ESVs can operate on an equal regulatory footing with foreign-licensed ESVs. For the same reasons, Boeing opposes treating Ku-band ESV operations as secondary or authorizing such operations on a non-harmful interference basis only.

B. The Commission's Licensing Regime Should Reflect the Primary Status of ESV Operations in the Entire Ku-band for Both Uplinks and Downlinks

Although the Commission has tentatively concluded that ESV operations should be on a primary basis in the 11.7-12.2 GHz downlink band, it has proposed to adopt domestically Resolution 902's provision that ESVs "in motion" shall not claim protection from terrestrial services.[25] The Commission has also questioned whether a Ku-band ESV should be entitled to claim interference protection when not in motion, and whether there is a need to distinguish

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[23] *See* ITU-R Resolution 902 (WRC-03), at *noting b)*. Article 9 is used for the international coordination of primary FSS earth stations.

[24] *See* ITU-R Resolution 902 (WRC-03), Annex 1, Nos. 4 and 5.

[25] See *NPRM* at ¶ 32.

between "in motion" and "stationary" Ku-band ESVs.[26] Implicit in the Commission's inquiry is whether, despite their primary status, Ku-band ESVs should be afforded any interference protection from any other services in the 11.7-12.2 GHz band.

Boeing believes there is no need to distinguish between "in motion" and "stationary" ESVs in the Ku-band. Since receive operations are just as critical to the successful provision of two-way ESV service as transmit operations, ESVs should be afforded protection from harmful interference in both the 11.7-12.2 GHz and 14.0-14.5 GHz bands. Resolution 902 establishes regulatory and operational provisions for ESVs in bands shared with *co-primary* fixed and mobile services, and does not afford protection to ESVs "in motion" because of the difficultly of protecting mobile receivers. In contrast, terrestrial services in the 11.7-12.2 GHz band in the United States operate on a secondary basis only and, pursuant to the Commission's rules, must protect primary services in the band.. Although the likelihood of harmful interference is remote given limited terrestrial use of the 11.7-12.2 GHz band, ESV operators should still be permitted to claim protection from such interference consistent with their primary regulatory status whether or not they are in motion or stationary.

With respect to the 14.0-14.5 GHz uplink band, Ku-band ESVs should be permitted to use the entire 500 MHz of available FSS uplink spectrum on a primary basis. In this regard, the Commission noted that the 14.4-14.5 GHz band is used for certain secondary Federal Government fixed and mobile operations,[27] and requested comment on whether ESV services

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[26] *Id.*

[27] According to the Commission's records, there are several fixed point-to-point stations and a limited number of fixed stations used by the Federal Government for terrestrial telecommand; and several aeronautical mobile and land mobile stations. The band is also used to transmit air traffic control video links, closed circuit television, and range test data (including airborne downlink data transmissions). *See NPRM* at ¶ 38.

should be excluded from the 14.4-14.5 GHz band or should be otherwise limited to protect secondary Federal Government terrestrial operations.[28] Boeing believes that access to the 14.4-14.5 GHz band is also critical for Ku-band ESV operators and that no additional restrictions on ESVs are necessary to permit continued government use of this portion of the band.

First, the 14.4-14.5 GHz is essential to the implementation of Ku-band ESV services. This 100 MHz band represents a full 20% of the Ku-band spectrum available for ESV uplink transmissions. Because much of the Ku-band satellite capacity available today is already being utilized for traditional FSS and secondary MSS services, elimination of this portion of the band for ESV use would unnecessarily constrain the implementation, operational flexibility and expansion of Ku-band ESV services. Second, no additional restrictions on ESVs are necessary in this band because geographic separation of maritime ESV transmissions and most Federal Government terrestrial operations will minimize the potential for harmful interference.[29]

In sum, consistent with the international community's decision to afford primary status to Ku-band ESV operations in the FSS, Ku-band ESVs should have access to the entire 11.7-12.2 GHz and 14.0-14.5 GHz on a primary basis, subject only to the other spectrum sharing requirements discussed below.

III. ESV OPERATIONS IN THE KU-BAND ARE CONSISTENT WITH OTHER USES OF THE SPECTRUM

Pursuant to the decisions taken at WRC-03, Ku-band ESVs operate as networks under the primary FSS allocation in the 11.7-12.2 GHz and 14.0-14.5 GHz bands. In addition, Resolution

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[28] *Id.*

[29] Restricting primary ESV operations in the 14.4-14.5 GHz band to protect secondary terrestrial operations also would be fundamentally inconsistent with the regulatory status of the two services.

902 includes operational provisions and technical limitations to ensure the compatibility of Ku-band ESVs with FSS operations, as well as with other co-frequency terrestrial services.[30] The Commission's proposed regulatory regime for Ku-band ESVs recognizes their compatibility with other Ku-band FSS operations, but the Commission sought comment on the ability of ESVs to share spectrum with secondary MSS services in the band.[31]

Ku-band ESVs use FSS satellite transponders to provide service and protect co-frequency FSS operations by controlling the aggregate off-axis e.i.r.p. spectral densities to a level no greater than that accepted by neighboring FSS satellites for VSAT operations. Ku-band MSS operators also use FSS satellite transponders to provide service and protect primary FSS operations in the same way. As a result, ESVs are *necessarily* compatible with both primary FSS and secondary MSS operations. In other words, because Ku-band ESVs and secondary MSS systems operate in accordance with the licensed and coordinated parameters of the FSS satellites through which they provide service, there should not be any potential for harmful interference among co-frequency ESV, MSS or FSS providers.

Other band-specific spectrum sharing issues raised by the Commission in the *NPRM* are addressed below.

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[30] *See* ITU-R Resolution 902 (WRC-03), at Annex 1 and 2. The provisions in Resolution 902 are designed to ensure compatibility with co-primary fixed and mobile terrestrial services in the 14.0-14.5 GHz band, including the 125 km minimum coordination distance, and are inapplicable to Ku-band ESV operations in and around the United States because Ku-band frequencies are not allocated to terrestrial services on a primary basis.

[31] *See NPRM* at ¶ 35. MSS operations in the 14.0-14.5 GHz band include AMSS services provided by Boeing's Connexion system, as well as land mobile-satellite service ("LMSS") provided by the OmniTRACS system.

A. 11.7-12.2 GHz Band

In addition to primary FSS downlink operations, the 11.7-12.2 GHz band is also used on a limited basis by the Local Television Transmission Service ("LTTS") for television pickup stations, television non-broadcast pickup stations and television studio-to-transmitter links.[32] The Commission requested comment on whether the Local Television Transmission Service ("LTTS") allocation in the 11.7-12.2 GHz band should be eliminated because there are only 44 authorizations for LTTS use in the band, and because all but 10 of these authorizations cover multiple bands (including several that are more commonly used for LTTS operations).[33] In light of the limited use of LTTS in the 11.7-12.2 GHz band, Boeing supports the removal of this allocation. Boeing further believes that there is no need to grandfather currently licensed LTTS operations in the band. Elimination of this allocation will help protect ESV operations from harmful interference from terrestrial transmissions, without unduly burdening LTTS operations that may operate in a range of other frequencies.

Boeing recognizes, however, that the potential for interference from LTTS operations is remote given the temporary nature of LTTS transmissions at any given location and the typical geographic separation between land-based LTTS and maritime ESV operations.[34] Thus, to the extent the Commission concludes that it should retain the LTTS allocation at 11.7-12.2 GHz or

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[32] *See* 47 C.F.R. §§ 101.101, 101.147(a), 101.803(a) and (d).

[33] *See NPRM* at ¶ 31. In addition, the Commission stated that "[g]iven the near ubiquitous deployment of VSAT operations in this band, it is doubtful that many LTTS operations make use of the fixed and mobile allocations at 11.7 GHz." *Id.*

[34] Although LTTS links would often be geographically separated from maritime ESV operations, it is conceivable that Ku-band ESVs operating in coastal regions, lakes and inland waterways could be within the transmission paths of LTTS links or otherwise affected by such transmissions.

otherwise grandfather existing licensees, it should nevertheless confirm secondary LTTS transmissions may not cause harmful interference to primary ESVs operating in the band.

B. 14.0-14.5 GHz Band

In addition to the primary FSS uplink allocation included throughout the 14.0-14.5 GHz band, the U.S. Table of Frequency Allocations includes a primary (secondary with respect to the FSS) allocation to the Radio Navigation Service in the 14-14.2 GHz band,[35] and provides for the protection of RAS operations in the 14.47-14.5 GHz band.[36] In addition, the U.S. Table of Frequency Allocations includes secondary allocations in the 14.0-14.5 GHz band, such as mobile (except aeronautical mobile), MSS, Space Research Service, and government-only terrestrial fixed and mobile services. Boeing has already addressed general spectrum sharing issues associated with the primary status of Ku-band ESVs with the MSS allocation in particular, *supra.* The remaining services are addressed below.

The 14.0-14.2 GHz band is allocated for the Space Research Service, and the 14.0-14.05 GHz portion of this spectrum is used by two U.S. Government space research Tracking and Data Relay Satellite System ("TDRSS") facilities located in White Sands, New Mexico and Guam.[37] Given the maritime nature of ESV operations and the locations and limited number of

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[35] The Commission has proposed to remove the radionavigation allocation from the 14.0-14.2 GHz band because it is not significantly used and could potentially conflict with various satellite operations in the band. *See NPRM* at ¶ 34.

[36] *See* 47 C.F.R. § 2.106; *see also id.* at n. 5.149 and n. US 203.

[37] There are plans to add another government TDRSS space research station in this portion of the Ku-band in either Langley, Virginia, or Wallops Island, Virginia. *See NPRM* at ¶ 34. Boeing would expect that the new TDRSS earth station planned for a site in Virginia, which would be very close to navigable waters in either the Chesapeake Bay or the Atlantic Ocean, would be designed to accommodate other services similar to existing space research stations, thereby minimizing the impact to other services in the band.

government space research facilities, the Commission proposes (i) that Ku-band ESVs must be coordinated through the National Telecommunications and Information Administration ("NTIA") Interdepartment Radio Advisory Committee ("IRAC") before a license may be granted; and (ii) that a footnote be added to the U.S. Table of Allocations that states, in part, that ESVs operating in this band must ensure the protection of Space Research operations.[38] Although Boeing supports an NTIA coordination requirement and related footnote to protect the TDRSS operations in the 14.0-14.05 GHz band, the requirement for NTIA coordination should not be a prerequisite to granting an ESV license, but rather should be a condition of any Ku-band ESV authorization that must be satisfied prior to commencing operations. In this way, required NTIA coordination discussions would not necessarily delay the grant of Ku-band ESV authorizations.

The 14.47-14.5 GHz band is used for Radio Astronomy Service ("RAS") observations at various locations in the United States and its possessions, and the Commission similarly proposes to adopt an NTIA coordination requirement and associated footnote requiring protection of RAS sites observing in the band.[39] In this case, however, existing Footnote US 203 in the Table of Allocations already provides for the protection of RAS operation in the band.[40] Accordingly, while Boeing supports an NTIA coordination requirement to protect potentially affected RAS facilities as a condition of commencing operations within line-of-sight of such observatories, there is no need to reference the RAS or RAS frequencies in another proposed footnote.. Furthermore, to ensure that ESV operators are not unnecessarily constrained when

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[38] *NPRM* at ¶ 42 (Footnote USxxx).

[39] *NPRM* at ¶ 39.

[40] *See* 47 C.F.R. § 2.106.

RAS stations are not observing in the 14.47-14.5 GHz band, where practicable, RAS observatories should be required to provide advance notice to ESV operators regarding observation schedules similar to the rules currently in effect for other RAS-MSS sharing situations.[41]

In addition, the 14.2-14.4 GHz band may be used on a limited basis for LTTS service.[42] As with the LTTS allocation in the 11.7-12.2 GHz band, the LTTS allocation at 14.2-14.4 GHz should be eliminated given the limited use of the band and the availability of alternative spectrum for such operations. To the extent that the Commission retains this allocation or grandfathers existing LTTS operations in the band, however, it should confirm that secondary LTTS operations are not entitled to claim protection from primary Ku-band ESV operations.\

IV. THE COMMISSION SHOULD ADOPT SERVICE-SPECIFIC BLANKET LICENSING PROCEDURES FOR KU-BAND ESV OPERATIONS

Blanket licensing of Ku-band ESVs is essential for this service to succeed. ESV operators will employ large numbers of technically identical ESVs operating on vessels in U.S., foreign and international waters throughout the world, which makes it impractical to license ESVs on an individual basis. However, rather than relying on inapposite VSAT requirements, the Commission must consider the unique technical and operational characteristics of Ku-band ESVs in developing an appropriate blanket licensing regime for the service.

Although ESV operations in the Ku-band present unique regulatory and technical issues, the international community has addressed many of these concerns in the context of ITU-R

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[41] *See* 47 C.F.R. § 25.213(a)(1)(vi).

[42] The Commission's database reveals that there are only 25 LTTS licenses that include the 14.2-14.4 GHz band, but it is unclear whether any LTTS operations actually exist in this band. *See NPRM* at ¶ 37.

technical studies and recent decisions taken at WRC-03. In particular, Resolution 902 includes regulatory and technical provisions to facilitate the compatibility of ESV operations with co-frequency services.[43] In addition, the Commission has addressed similar issues in recent licensing and rulemaking proceedings for ESVs and other satellite services that implicate analogous technical and regulatory questions. In particular, the Commission's authorization of Ku-band ESV and AMSS services on a non-interference basis, as well as the blanket licensing rules adopted for next-generation Ka-band earth stations, provide an appropriate technical and regulatory precedent upon which to develop a Ku-band ESV licensing regime. As discussed below, however, in certain respects the *NPRM* fails to consider this relevant Commission precedent and thus proposes licensing provisions that are not well-suited to the operational characteristics of Ku-band ESVs.

A. A Ku-Band ESV Licensing Regime Must Be Updated to Reflect for the Current State of Technology

The Commission proposes that Ku-band ESVs be authorized under blanket licensing requirements applicable to Ku-band VSAT networks.[44] The Commission's Ku-band VSAT licensing provisions are set forth in Section 25.209 of the Commission's rules, which provides minimum antenna performance requirements, including antenna size and antenna gain standards; [45] and Section 25.134 (a) (1) and (b) of the Rules, which specify the power levels required to qualify for "routine processing."[46] If a Ku-band VSAT antenna does not comply with these

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[43] *See* ITU-R Resolution 902 (WRC-03) at Annex 1 and 2.

[44] *See generally NPRM* at ¶¶ 48-51.

[45] *See* 47 C.F.R. § 25.209.

[46] *See* 47 C.F.R. § 25.134(a) (1), and (b).

Rules, it may still be licensed by the Commission provided the applicant submits additional information such as a detailed interference analysis and affidavits from potentially affected satellite operators acknowledging that they do not object to the non-conforming operations.

These VSAT licensing rules were developed in the mid-1980s to facilitate streamlined blanket licensing of large numbers of relatively inexpensive Ku-band VSAT earth stations, while at the same time protecting adjacent satellite operations in a 2-degree spacing environment.[47] Mandating antenna performance and input power was an effective means to control off-axis e.i.r.p. of VSAT networks, particularly since VSAT antennas can experience significant pointing error.[48]

More recently, however, the Commission has moved away from mandating specific antenna performance (size and gain) and input power requirements, and instead has adopted off-axis e.i.r.p. limits to control adjacent satellite interference. For example, the Commission's blanket licensing rules for next-generation Ka-band networks are based on the acceptable off-axis e.i.r.p. levels, thereby affording Ka-band operators the flexibility to trade-off antenna performance and power without adversely affecting adjacent satellite operators.[49] Similarly, in authorizing Boeing's AMSS operations in the 14.0-14.5 GHz band and consistent with an ITU-R

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[47] *See* 47 C.F.R. §§ 25.209(b). Specifying VSAT antenna input power and performance requirements serves two fundamental purposes. First, the combination of these factors defines the off-axis e.i.r.p. directed towards adjacent satellites for uplink transmissions. Second, the antenna performance requirement defines the minimum permissible susceptibility to interference from adjacent satellites on the downlink path. By limiting interference into adjacent satellites from VSAT transmissions, and protecting VSAT receivers from adjacent satellite downlink interference, large numbers of VSAT terminals can be deployed without operator-to-operator coordination in a 2-degree spacing environment.

[48] Boeing understands that typical VSAT antenna pointing errors due to mispointing during installation, wind loading or other factors can be on the order of 0.5 degrees.

[49] *See* 47 C.F.R. § 25.138(a) (off-axis e.i.r.p. limits in Ka-band blanket licensing rules).

technical recommendation for Ku-band AMSS services, the Commission required Boeing to design and operate its AMSS system so that the aggregate off-axis e.i.r.p. produced by all co-frequency aircraft earth stations are no greater than the interference levels that would be produced by routinely licensed VSAT terminals.[50]

Like Boeing's innovative Ku-band AMSS service, Ku-band ESV systems will employ sophisticated antenna pointing mechanisms, advanced network control technologies, and other means to monitor and control accurately the off-axis e.i.r.p. of transmitting ESVs. Thus, unlike the low-cost ubiquitous VSAT earth stations of 20 years ago, the manufacture, installation and operation of Ku-band ESVs are sufficiently advanced to employ an off-axis e.i.r.p. limitation to protect adjacent FSS satellites from harmful interference. Indeed, that is precisely the approach adopted at WRC-03 and incorporated into Resolution 902 to ensure ESV compatibility with Ku-band FSS networks.[51] The Commission should likewise adopt this approach in its Ku-band ESV blanket licensing rules.

B. ITU-R Resolution 902 Provides the Foundation for Establishing ESV Blanket Licensing Rules

Resolution 902 provides operational and technical limitations on Ku-band ESV operations to ensure compatibility with co-frequency operations, including a pointing accuracy requirement and a maximum off-axis e.i.r.p. density on ESV emissions to limit interference into other networks in the FSS, as well as a minimum antenna diameter, power limits towards the

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[50] *See generally The Boeing Company,* Order and Authorization, 16 FCC Rcd. 22645 (Int'l Bur./OET 2001).

[51] *See* ITU-R Resolution 902 (WRC-03) at Annex 2.

horizon and minimum distances beyond which an ESV may operate without prior agreement of a potentially affected administration to limit interference into terrestrial services.[52]

Specifically, to ensure compatibility with other FSS networks, Resolution 902 specifies a maximum off-axis e.i.r.p. spectral density for Ku-band ESV transmissions.[53] In addition, Ku-band ESVs are required to maintain a pointing accuracy within +/- 0.2 degrees.[54]

To protect primary fixed and mobile services operating in the 14.0-14.5 GHz band, Resolution 902 limits the maximum e.i.r.p. spectral density towards the horizon of Ku-band ESV transmissions to 12.5 dB(W/MHz) and the maximum e.i.r.p. towards the horizon to 16.3 dBW, and specifies a minimum antenna diameter of 1.2 meters.[55] However, Resolution 902 specifically provides that "licensing administrations may authorize the deployment of smaller antenna sizes down to 0.6 m at 14 GHz provided that the interference to the terrestrial services is no greater than that which would be caused with an antenna size of 1.2 m . . . ."[56] Finally, Ku-band ESV operations within the minimum distance of 125 km from the coastline of a concerned

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[52] *See* ITU-R Resolution 902 (WRC-03) at *considering i) and j).*

[53] *See id.* at Annex 2. These values were developed for implementation globally for Ku-band satellites with 3-degree spacing (rather than 2-degree spacing adopted by the Commission for Ku-band satellites serving the United States), and are equivalent to the limits establish by the ITU for the maximum permissible level of off-axis e.i.r.p. density from Ku-band VSATs. *See* Recommendation ITU-R S.728-1 at *Recommends 1.* As a result, they are 8 dB higher than the maximum allowable off-axis e.i.r.p. for routinely licensed Ku-band VSAT terminals. (Reference bandwidth differences between the Ku-band VSAT routine licensing values and the off-axis e.i.r.p. spectral density mask included in Resolution 902 (4 kHz versus 40 kHz) account for the other 10 dB difference in values.)

[54] *See* ITU-R Resolution 902 (WRC-03) at Annex 2.

[55] *See id.*

[56] *See id.*

administration are subject to the specific agreement of concerned administrations, as set forth in Resolution 902, Annex 1.

These requirements should form the foundation of the Commission's Ku-band ESV licensing regime.

C. Blanket Licensing Rules for Ku-band ESVs

As indicated above, the Commission has authorized on a number of occasions earth station operations in the Ku-band subject to aggregate off-axis e.i.r.p. levels being maintained below those caused by routinely licensed VSAT terminals.[57] Ku-band ESV operations similarly should cause no more interference to adjacent FSS satellites than a VSAT terminal that is compliant with the Commission's routine processing rules. Guided by this fundamental principle, analogous Commission precedent and the provisions of Resolution 902, an appropriate Ku-band ESV blanket licensing regime need only be based on compliance with the off-axis e.i.r.p. limits, pointing accuracy and minimum antenna size requirements, power limits towards the horizon, and the coordination requirements for Ku-band ESVs included in Resolution 902.[58]

1. Off-Axis E.I.R.P. Limits

Boeing proposes that the aggregate off-axis e.i.r.p. limits along the geostationary arc for co-polarized signals of Ku-band ESVs should not exceed the following values, which are

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[57] *See* 47 C.F.R. §§ 25.134(a) (1), and (b), 25.209; *see also Crescomm Order*, 11 FCC Rcd. 10944, (Int'l Bur./OET, 1996); *The Boeing Company*, Order and Authorization, 16 FCC Rcd. 5864 (2001); *The Boeing Company,* Order and Authorization, 16 FCC Rcd. 22645 (Int'l Bur./OET 2001).

[58] Of course, the Commission can authorize Ku-band ESVs that do not comply with one or more of these ESV blanket licensing requirements proposed below pursuant to a waiver or on a non-harmful interference basis under Article 4.4 of the international Radio Regulations.

consistent with those for routinely licensed Ku-band VSAT terminals and 8 dB below the values set forth in Resolution 902 (adjusted for reference bandwidth):

Angle off-axis	Maximum e.i.r.p. in any 4 kHz band
$1.0° \leq \theta \leq 7.0°$	15 - 25 log θ dBW
$7.0° < \theta \leq 9.2°$	-6 dBW
$9.2° < \theta \leq 48°$	18 - 25 log θ dBW
$\theta > 48°$	-24 dBW

As with its current Ku-band and Ka-band earth station licensing rules, the Commission should not view these off-axis e.i.r.p values as absolute, but rather should permit minor fluctuations to account for variations in antenna performance where such variances would not adversely affect adjacent satellite operators.[59] In addition, like Ku-band VSAT operators, Ku-band ESV systems should have the flexibility to coordinate transmissions in excess of these e.i.r.p. limits, up to the levels included in Resolution 902, subject to an additional technical showing and the rights of future Ku-band licensees to require compliant operations in certain circumstances.[60]

For Ku-band ESVs communicating with FSS satellites relying on operator-to-operator coordination to address adjacent satellite interference (*i.e.*, for international operations where 2-degree spacing may not be the norm and the Commission's Part 25 Rules do not necessarily apply), applicants should be able to demonstrate compliance with the ESV blanket licensing rules by demonstrating compliance with the off-axis e.i.r.p. limits set forth in Resolution 902, rather than the more restrictive values proposed for Ku-band ESV operations in and around the

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[59] *See* 47 C.F.R. § 25.209(a) (allowing a 10 percent or 3 dB exceedance in the required Ku-band antenna performance, whichever is less, for angles greater than 7.0 degrees); *see also* 47 C.F.R. § 25.138(a)(3) (allowing a 3 dB exceedance in the required Ka-band off-axis e.i.r.p. values for angles greater than 10 degrees).

[60] The Commission's Ka-band earth station blanket licensing rules contain similar provisions regarding the coordination of higher off-axis e.i.r.p. values. *See* 47 C.F.R. § 25.138(b), (c).

United States, and obtaining a certification from their satellite providers that the aggregate off-axis e.i.r.p. density levels produced by all co-frequency ESVs communicating with the relevant satellite will be no greater than the interference levels that have been accepted by adjacent satellite systems through the operator-to-operator coordination process.

2. Minimum Antenna Diameter

The Commission should adopt a minimum antenna size of 0.6 meters in its Ku-band ESV blanket licensing rules, the same minimum size noted in Resolution 902. The Resolution expressly provides that administrations may authorize the deployment of 0.6 meter Ku-band ESVs so long as the interference to terrestrial services (*i.e.*, the most significant factor being maximum power towards the horizon) is no greater than that of a 1.2 meter ESV.[61]

3. ESV Antenna Pointing Accuracy

Boeing also supports adopting an ESV antenna pointing accuracy requirement of +/- 0.2 degrees, although the intent of this requirement -- limiting interference into adjacent FSS satellites -- is essentially addressed through compliance with the off-axis e.i.r.p. limits (assuming pointing error is factored into the off-axis e.i.r.p. produced by the system). This requirement is consistent with the pointing accuracy requirement set forth in Resolution 902.

4. Power Limits Towards the Horizon

Resolution 902 imposed e.i.r.p. and e.i.r.p. spectral density limits towards the horizon to protect co-primary fixed and mobile services. Although there are no such services operating in the United States, Ku-band ESVs operating in international waters should be required to comply with this ITU-R requirement.

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[61] ITU-R Resolution 902 (WRC-03), Annex 2 at note * to the table.

In the *NPRM,* the Commission sought comment on whether to adopt the U.S. proposal developed under WRC-03 Agenda Item 1.26 regarding the 2.4 MHz bandwidth limitation.[62] In addition, the Commission sought comment on whether to require a minimum ESV elevation angle with the minimum distances from the U.S. coast, and if so what that minimum angle should be.[63] The Commission should not adopt as operational restrictions portions of out-dated U.S. WRC-03 proposal on ESVs that are no longer needed to protect other services. The power limits towards the horizon should replace previously considered limitations such as minimum elevation angle and maximum bandwidths. The limitations on maximum e.i.r.p. spectral density and maximum e.i.r.p. towards the horizon adopted by WRC-03 are sufficient to protect other services.

5. Requirement To Obtain Agreement for Operation Within Minimum Distance of a Coastline

Resolution 902 provides that Ku-band ESV operations within the 125 km minimum distance of a potentially concerned administration are subject to specific agreement with that administration, and specific operational procedures to facilitate such agreement are set forth in ITU-R Recommendation 37 (WRC-03).[64] To the extent any U.S. ESV operator seeks to operate within 125 km of a potentially concerned administration, the Commission should require the operator as a condition of its license to obtain the specific agreement of that administration prior to commencing commercial operations within the proscribed limits.[65]

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[62] *See NPRM* at ¶ 16.

[63] *See id.* at ¶ 89.

[64] ITU-R Recommendation 37 (WRC-03).

[65] Potentially concerned administrations are those with fixed or mobile services allocated on a primary basis and listed in the international Radio Regulations as specified in Resolution

In this connection, the *NPRM* suggests that Ku-band ESV licenses will only be issued for ESV operations within 125 km of the U.S. coastline.[66] This suggests that the Commission does not intend to authorize Ku-band ESV operations in international waters beyond the 125 km minimum distance from the United States, and that such operations would either not be permitted or would be unlicensed.

Clearly, the Commission must license Ku-band ESVs to operate in international waters more than 125 km from the U.S. coastline. Such licensing would be consistent with the relevant ITU requirements and the Commission's jurisdiction. A licensing administration is responsible for the operation of a radio station regardless of its location. In the context of maritime ESVs, Resolution 902, Recommendation 37 and the international Radio Regulations plainly contemplate ESV operations beyond the minimum distances of a licensing administration's coastline. Furthermore, Section 301(e) of the Communications Act grants the Commission jurisdiction to license the operation of radio stations "upon any vessel or aircraft of the United States."[67] The Commission's jurisdiction over vessels of the United States under Section 301(e) is in no way limited by the geographic location of the vessels.

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902 (WRC-03). *See id.* at Annex 1. Because discussions with a potentially concerned administration may last for a considerable period of time, may vary from country to country and may not even be initiated absent an ESV authorization from a licensing administration, the Commission should impose this coordination requirement as a license condition rather than as a prerequisite to filing an application or being awarded a license.

[66] *See NPRM* at Appendix A §25.134 (a)(3) and (a)(4). Conversely, the Commission should permit U.S.-licensed ESVs to operate within the minimum distance of the coastline of a foreign administration on a non-harmful interference basis.

[67] *See* 47 U.S.C. § 301(e).

D. Foreign Licensed ESV Operations

As the Commission properly notes, it does not have the authority to license ESVs on foreign-flagged ships.[68] The Commission does have authority, however, to adopt regulations to protect its licensed radiocommunication systems, including terrestrial fixed FS and other services, from receiving harmful interference from ESVs on foreign-flagged vessels.[69] The Commission seeks comment on whether to permit U.S. Ku-band ESV hub licensees to communicate with (i) licensed ESVs on board vessels of foreign registry that have been the subject of an agreement between that nation and the United States and that are real-time tracked; and (ii) vessels of foreign registry that have been authorized by foreign administrations to operate on a strictly non-harmful interference basis within the minimum distance, provided that all of the Commission's technical rules are met where there is no bilateral agreement with a particular foreign nation.[70] The Commission also seeks comment on whether to hold responsible the hub earth station licensee that controls the ESV network for resolving any harmful interference that may be caused by serving non-U.S.-flagged vessels.[71]

The Commission should permit U.S. Ku-band ESV hub licensees to communicate with ESVs on board foreign registered vessels under the two circumstances noted above (prior coordination or on a non-harmful interference basis) so long as both are subject to compliance with U.S. ESV rules. The Commission's ESV hub licensees would be responsible for ensuring

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[68] *See* 47 U.S.C. § 306; *see also Maritime Telecommunications Network, Inc.*, Order, 15 FCC Rcd. 23210 (Int'l. Bur., 2000).

[69] Section 306 of the Communications Act states that radio communications and signals from radios on foreign ships must be transmitted in accordance with U. S. regulations designed to prevent interference. *See* 47 U.S.C. § 306.

[70] *See NPRM* at ¶ 100.

[71] *See id.* at ¶ 101.

that all Ku-band ESVs operating on their networks (including those on foreign-registered vessels) comply with the Commission's rules and would have the capability to inhibit operations and/or terminate service to ESVs that cause interference or otherwise fail to comply with the Commission's rules. A foreign-flagged ESV would be temporarily associated with a U.S. ESV licensee when it is operating within 125 km of the United States. For this temporary period, the U.S.-licensed ESV operator shall assume responsibility for the ESV as if it were regularly licensed to it. Such an approach is similar to the Commission's treatment of MSS transceivers designed to operate with U.S.-licensed systems,[72] and is appropriate in the context of transborder Ku-band ESV operations given the global maritime nature of the service.

The Commission also seeks comment on the treatment of ESVs that operate within a network where the hub is located outside of the United States and is licensed by a foreign country.[73] To the extent those ESVs are on ships of foreign registry, the Commission seeks comment on how they should be treated when they operate within the minimum distances of the U.S. coastline.[74] Boeing believes that foreign-licensed ESVs should be allowed to operate within the minimum 125 km range of the United States so long as those operations are on a non-interference basis and are otherwise in compliance with FCC rules. To the extent that such an ESV causes interference, of course, the Commission should proceed to address those concerns with the appropriate licensing administration.

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[72] *See* 47 C.F.R. § 25.136(c); *see also Big LEO Report and Order*, 9 FCC Rcd. 5936, ¶ 208 (1995) ("[A] roaming user's transceiver operations would fall within the blanket license of the satellite operator or the service vendor."); *see also* 47 C.F.R. § 25.135(d).

[73] *See NPRM* at ¶ 103.

[74] *Id.*

V. OTHER OPERATIONAL CONSIDERATIONS FOR KU-BAND ESV NETWORKS

In the NPRM, the Commission raises a number of other operational issues relating to Ku-band ESV licensing which are addressed below.

A. The Commission Should Adopt ESV Tracking and Control Requirements

The Commission proposes that Ku-band ESV operators should make available, on a real-time basis, vessel tracking information in a secure fashion.[75] In connection with this tracking proposal, the Commission requests comment on, among other things, (i) whether providing this information will assist in resolving interference and aid in enforcement; (ii) how this information could be provided to the Commission and interested parties (*e.g.*, a password protected website); and (iii) the kinds of security concerns this requirement would pose, particularly to federal government ESV users.[76]

Boeing supports the general proposition that Ku-band ESV operators should be able to provide identification and location information that will assist in resolving reports of interference and aid the Commission in enforcing its rules, however, such information should only be used internally to resolve interference reports or made available to the Commission. The provision of such real-time location information on a platform accessible via the Internet, although technically possible, raises extremely serious security concerns that cannot be overlooked even if access is password protected or secured by other means. For example, many existing and future Ku-band ESV customers will be government vessels that may not want to have their exact positions known to others under any circumstances. In addition, private commercial customers

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[75] *See NPRM* at ¶ 47.

[76] *See id.*

could be sensitive to revealing such information both for competitive reasons and for the security of sensitive cargo.

While real-time location information regarding a Ku-band ESV may be needed to resolve reports of harmful interference, such information should only be used internally and need not be made available to any third party, except the Commission. Accordingly, Boeing supports a requirement for ESV licensees to maintain real-time location information for Ku-band ESVs operating within a network for a period of at least 90 days. Such information, however, should only be used internally by the licensee in resolving reports of interference or provided to the Commission in response to Commission enforcement activities.

The Commission also proposes that Ku-band ESV operators have the capability to inhibit operations and/or terminate service to ESVs operating within their networks, including any ESVs operating on ships that are foreign-flagged; as well as automatic mechanisms to terminate transmissions whenever the station operates outside its authorized geographic area or operational limits.[77] Boeing agrees that Ku-band ESV systems should be equipped with these types of control mechanisms to ensure that U.S. licensees are able to control remotely the operations of associated ESVs.

B. Ku-Band ESV Services Should Not Be Limited to Vessels Larger Than 300 Gross Tons

The Commission requested comment on whether it should limit Ku-band ESV operations to only large vessels above 300 gross tons.[78] According to the Commission, vessels of this size are restricted to traveling in bodies of water of a certain depth, which could help keep ESVs

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[77] *See NPRM* at ¶¶ 54-55.

[78] *See id.* at ¶ 54.

away from existing in-land Ku-band operations.[79] Boeing opposes such a blanket restriction because it is neither necessary nor appropriate given the current limited use of terrestrial stations in the Ku-band.

Although a minimum vessel size requirement may be necessary in FSS bands shared on a co-primary basis with the terrestrial fixed service to ensure that ships follow sea lanes and channels to facilitate coordination, the Ku-band is allocated for terrestrial services on a secondary basis only and is lightly used by such services. As a result, there is no need to limit the geographic scope of Ku-band ESV operations in the United States.

Indeed, it is the primary status of Ku-band ESV operations in the United States and the limited use of the spectrum by other services that make the Ku-band ideal for domestic and coastal ESV operations. Ku-band ESVs are well suited to provide services to vessels operating on U.S. rivers, lakes and inland waterways, as well as international waters with Ku-band satellite coverage, because there are few terrestrial coordination concerns that must be addressed.

Although Ku-band ESV services should not be limited to areas in and around the United States, there are obvious advantages to permitting such operations within the United States without regard to vessel size. Indeed, because Ku-band ESVs tend to be smaller than their C-band counterparts, they may be more easily deployed on smaller vessels to meet the growing demand for maritime broadband services.

C. The Commission Should Authorize Ku-Band ESVs to Operate Pursuant to an ALSAT Designation

In view of the unique characteristics of Ku-band ESV operations, the Commission should extend its "ALSAT" designation[80] to permit Ku-band ESV licensees to communicate with all

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[79] *Id.*

U.S.-licensed Ku-band FSS satellites and foreign-licensed Ku-band satellites on the Permitted Space Station List.[81] Under an ALSAT earth station license, an earth station operator providing FSS services in the conventional C- and Ku-bands could access any U.S.-licensed satellite without additional Commission action, provided that those communications fall within the same technical parameters and conditions established in the earth station license.[82] The *DISCO II First Reconsideration Order* expanded ALSAT earth station licenses to permit ALSAT-designated earth stations to access any satellite on the Permitted Space Station List.[83]

Ku-band ESVs operate under the FSS allocation in the 11.7-12.2 GHz and 14.0-14.5 GHz, and thus may be afforded the right to communicate with ALSAT satellites consistent with the Commission's existing policy of limiting ALSAT authority to Ku-band FSS services. Even if ESVs are deemed to fall outside of the services traditionally permitted to obtain an ALSAT designation as an authorized point of communication, however, extending ALSAT authority to Ku-band ESV licensees is entirely appropriate given the operational characteristics of Ku-band ESV operations.

Importantly, Ku-band ESV systems are specifically designed to operate with Ku-band FSS satellites in the well-defined interference environment of that service. As a result, Ku-band ESVs can operate in full compliance with the Commission's 2-degree spacing rules (*i.e.*, operate

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[80] Originally, "ALSAT" was an abbreviation for "all U.S.-licensed satellites."

[81] This action would not require a specific rule change, but rather would be effected by allowing a Ku-band ESV licensee to obtain an "ALSAT" designation as an authorized point of communication on its blanket license.

[82] *See Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Service in the United States, First Order on Reconsideration*, 15 FCC Rcd. 7207, 7210-11 (1999) ("*DISCO II First Reconsideration Order*").

[83] *See id.* at 7215-16.

within the off-axis e.i.r.p. levels of routinely authorized VSATs or other coordinated parameters), and thus do not have the potential to cause harmful interference to adjacent satellite operators. As a result, there is no technical reason to prohibit Ku-band ESV systems from operating pursuant to an ALSAT designation, so long as other Commission rules applicable to Ku-band ESV operations are satisfied.

Extending the ALSAT designation to Ku-band ESV licensees also would have important public interest benefits. For example, the ability to communicate with all U.S.-licensed Ku-band satellites and foreign-licensed satellites on the Permitted Space Station List would afford Ku-band ESV operators significant operational flexibility in providing advanced broadband connectivity to vessels in and around the United States. In addition, the ability to utilize numerous FSS satellite capacity providers would enhance competition and reduce costs in providing these innovative new services. From the Commission's perspective, extending ALSAT authority would further the interests of administrative convenience and reduce unnecessary regulation of ESV systems because the Commission would not be required to process an earth station modification application each and every time a Ku-band ESV licensee sought to add an authorized satellite point of communication. Such a designation would also promote the flexible use of spectrum in a manner that would in no way increase the potential for interference to other authorized users of the band.

Accordingly, the Commission should extend its "ALSAT" designation in the context of Ku-band ESV licensing to permit communication with all U.S.-licensed Ku-band FSS satellites and foreign-licensed Ku-band satellites on the Permitted Space Station List.

D. The Commission Should Not Mandate the Use of Uplink Power Control

The Commission requested comment on what methods should be used to prevent adjacent satellite interference, particularly in situations in which ESVs are located in the fringe areas of satellite coverage.[84] In addition, the Commission asked whether it should require ESV networks to employ uplink power control.[85]

Boeing submits that the primary criteria for preventing adjacent satellite interference is the off-axis e.i.r.p. density limitation discussed above. So long as the off-axis e.i.r.p. is below the blanket licensing level, the Commission should not mandate the means by which ESVs comply with the required off-axis limits. Because ESVs may satisfy the off-axis e.i.r.p. requirements simply by operating at an uplink power that produces off-axis e.i.r.p. levels at or below the limit, there is no need to require uplink power control. Furthermore, the off-axis e.i.r.p. limitations apply independently of the location of the ESV within its satellite's beam, which makes the gain of the satellite towards the ESV a non factor and ESVs employing uplink power control could not exceed the limits.

E. Boeing Supports 15-Year License Terms for Ku-Band ESV Networks

In the *NPRM*, the Commission tentatively concludes that 15-year license terms for Ku-band ESV networks is reasonable and seeks comment on its tentative conclusion.[86] In the interest of regulatory parity and because there is no reason to diverge from the standard 15-year

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[84] *See NPRM* at ¶ 53.

[85] *See id.*

[86] *See id.* at ¶ 58.

license terms applicable to other licensed networks of earth stations, Boeing supports a 15-year license terms for Ku-band ESV networks.[87]

VI. CONCLUSION

For the foregoing reasons, Boeing respectfully requests that the Commission promptly adopt Ku-band ESV licensing and service rules that are consistent with these comments.

Respectfully submitted,

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[87] *See* 47 C.F.R. § 25.121.