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FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

APR 28 2006

Federal Communications Commission
Office of Secretary

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| In the matter of |) | |
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| Application of The Boeing Company for |) | File Nos. SES-LIC-20060228-00326 |
| Blanket Authority to Operate Earth Stations |) | SES-AMD-20060321-00473 |
| Onboard Vessels in the Ku Band |) | |
| |) | |

COMMENTS OF VIASAT, INC. IN SUPPORT

ViaSat, Inc. ("ViaSat") submits the following comments in support of the above-referenced application of The Boeing Company ("Boeing") for blanket authority to operate earth stations onboard vessels ("ESVs") in the Ku band.¹ Specifically, ViaSat supports Boeing's requests for limited waivers of Sections 25.222(a)(1)-(4), 25.222(a)(7), and 25.202(a)(8) of the Commission's rules, which apply to ESV operations. ViaSat provides and develops Ku band services and equipment. Thus, ViaSat has an interest in the Commission's licensing decisions that impact the development of new technologies that expand the capabilities of Ku band systems.

I. Introduction & Background

In its Application for its Connexion by Boeing Maritime System ("CBBM"), Boeing seeks waivers from ESV rules (i) to permit the use of CDMA modulation techniques with dynamic power control, (ii) to cover brief instances where CBBM ESV terminals may not comply strictly with the 100 millisecond automatic shut-off requirement, and (iii) to allow

¹ Application of The Boeing Company for Blanket Authority to Operate Earth Stations Onboard Vessels in the Ku Band, File Nos. SES-LIC-20060228-00326; SES-AMD-20060321-00473, Public Notice, Report Nos. SES-00804 (rel. Mar. 22, 2006), SES-00806 (rel. Mar. 29, 2006) (the "Application"). References herein to the Application are to the attachments to Boeing's amendment filing.

Boeing to operate earth stations on U.S. flagged vessels outside the U.S. at power levels and on frequencies that are conventional for FSS operations in other parts of the world.

Boeing requests a waiver of Section 25.222(a)(1)-(4) of the Commission's rules to allow the use of code division multiple access ("CDMA") technology in an actively managed network of ESV terminals. Boeing asserts that although its CBBM system would meet the appropriate off-axis power density limit on an aggregate basis, the $10\log(N)$ factor in the rules would constrain the efficiency of the network.²

Additionally, Boeing seeks a limited waiver of Section 25.222(a)(7), which provides that all emissions from an ESV shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna exceeds 0.5° , and that transmissions will not resume until such angle is less than 0.2° .³ Boeing requires a waiver to cover any instances where an ESV antenna may be mispointed at an angle greater than 0.5° and emissions do not cease within 100 milliseconds, which may occur if the total time remaining in the antenna polling process plus the amount of time necessary for the shut down process exceeds 100 milliseconds.⁴

Finally, Boeing seeks limited waivers of Sections 25.222(a)(1)-(4) and 25.202(a)(8) of the Commission's rules in order to operate its CBBM system outside of the U.S. in accordance with the conventional FSS parameters in Regions 1 and 3. Section 25.222(a)(1)-(4) provides the off-axis EIRP density limits for ESV operations.⁵ Boeing seeks a limited waiver of this rule to operate in excess of the off-axis spectral density limits in regions of the world

² See 47 C.F.R. § 25.222(a)(1)-(4); Application at 24-25.

³ 47 C.F.R. § 25.222(a)(7).

⁴ Application at 28.

⁵ 47 C.F.R. § 25.222(a)(1)-(4).

outside of the U.S., where satellites are typically spaced greater than two-degrees apart.⁶ Boeing also seeks a limited waiver of Section 25.202(a)(8) to use the 12.2-12.75 GHz frequency band for ESV downlink operations outside of the U.S.⁷ Section 25.202(a)(8) limits ESV downlinks to 10.95-11.2 GHz, 11.45-11.7 GHz, and 11.7-12.2 GHz in the Ku band.⁸ However, outside of the U.S., the 12.2-12.75 GHz band is allocated for standard Ku band FSS operations.

ViaSat supports Boeing's waiver requests because each is necessary to operate an ESV network that uses CDMA modulation technology and that can compete effectively in the provision of international maritime satellite services. Based on information in Boeing's Application, ViaSat believes that the requested waivers would not increase the potential for interference into adjacent satellites or undermine the Commission's rules. Thus, the Commission should grant Boeing's request for waivers of the above-referenced rules.

II. The Commission Should Grant a Waiver To Allow The Use of Dynamic Power Control Technology

ViaSat supports Boeing's request to waive the $10\log(N)$ factor in Section 25.222(a)(1)-(4) of the rules, which limits the power density into individual ESV terminals to a uniform level. As Boeing explains in its Application, the proposed CBBM system will employ a CDMA modulation technique, which allows multiple co-frequency ESV transmissions to the same satellite.⁹ The CBBM system can dynamically control power into each individual ESV antenna such that the aggregate off-axis EIRP density of the system is maintained within a specified limit.

⁶ Application at 21.

⁷ *Id.* at 29.

⁸ 47 C.F.R. § 25.202(a)(8).

⁹ Application, Annex A at 13.

ViaSat agrees with Boeing's assessment that the $10\log(N)$ factor severely limits the spectrum efficiency and capacity of the entire system if individual antennas are limited to a fixed level. As ViaSat explained in the context of aeronautical mobile satellite services ("AMSS"), CDMA modulation technology increases spectrum efficiency because it allows the operator to control the power into all transmitters such that each transmitter uses the minimum power necessary to communicate with the satellite at the desired quality of service.¹⁰ For instance, terminals in a CDMA network operating at different data rates require varying power levels.¹¹ By taking into account the different technical characteristics of each terminal operating within the network and the environment in which each terminal operates, the network operator can maximize system efficiency by allocating the necessary power into each individual ESV antenna, while maintaining the collective off-axis power density levels within the aggregate limit.¹² A waiver of the $10\log(N)$ factor in the context of a CDMA network such as Boeing's proposed CBBM system would advance the public interest because it would allow the use of technology that increases the efficiency of spectrum use.

ViaSat and other satellite system operators employ aggregate power density control technology and have demonstrated the ability to alleviate the impact of variations in individual antenna performance by maintaining the aggregate power level to coordinated limits.¹³ Through its Connexion AMSS operations, Boeing has demonstrated that it is capable of

¹⁰ ViaSat, Inc. Comments, *Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service*, IB Docket No. 05-20 at 8 (filed July 5, 2005) ("ViaSat AMSS Comments").

¹¹ *Id.* at 10-11; *see also*, Application at 10-11.

¹² ViaSat AMSS Comments at 9.

¹³ ViaSat, Inc. Reply Comments, *Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service*, IB Docket No. 05-20 at 14-15 (filed Aug. 3, 2005) ("ViaSat AMSS Reply Comments").

successfully controlling the power density of aeronautical mobile antennas on an aggregate basis. Boeing states that its maritime system will rely on the same technology as its Connexion AMSS system.¹⁴ ViaSat is unaware of any complaints of interference arising from Boeing's aeronautical Connexion system, which currently operates without the individual antenna limit. Based on ViaSat's experience operating networks using spread spectrum contention protocols and aggregate network power control, as well as the excellent track record of Boeing's MSS operations, ViaSat believes that grant of Boeing's requested waiver would not likely result in harmful interference into adjacent satellite operations.

III. Boeing's Proposed System Would Adequately Protect Adjacent Satellite Operations Without Strict Compliance With the 100 Millisecond Transmission Control Requirement

ViaSat agrees that a waiver of the precise transmitter control requirements in Section 25.222(a)(7) is warranted because strict application of the 100 millisecond shut off time is unnecessary to protect adjacent satellites from harmful interference. Boeing asserts that any instances of transmissions that are not inhibited within 100 milliseconds would be the result of the amount of time required for the shut off procedure (95 milliseconds), plus the time remaining in the 100 millisecond polling period, exceeding the 100 millisecond limit. Thus, any transmissions outside of the transmitter control requirements would be brief.

Moreover, due to the beam characteristics of individual ESVs and the aggregate power control used in Boeing's system, adjacent satellite operations would be adequately protected from interference during any brief periods of mispointing before the transmitter is inhibited. Because the CBBM system uses a CDMA modulation scheme to allow transmissions by multiple ESVs, the individual ESV terminals in the proposed system would operate at power

¹⁴ Application at 26.

levels that are significantly lower than the limits in Section 25.222(a)(1)-(4).¹⁵ Thus, any brief periods of mispointing of an individual antenna would likely be undetectable to adjacent satellites. As discussed above, Boeing has demonstrated that it can control the off-axis EIRP density of its Connexion system on an aggregate basis using dynamic power controls. Therefore, adjacent satellites would be adequately protected.

Additionally, because the ESV terminals in Boeing's proposed network will operate in a dynamic environment, the aggregate emissions from the network measured at a specific point are always changing. The aggregate off-axis power density of the system is comprised of multiple cumulative off-axis power densities of individual antennas. At any given time, the aggregate off-axis power density in any given direction depends on the number of ESV terminals transmitting and the cumulative effect of pointing errors of all terminals. As a practical matter, the random locations of transmitting ESVs and the variation in pointing errors of all ESV terminals would prevent the aggregate transmissions from aligning toward an adjacent satellite. Due to the variation in the direction and power of mispointed antennas, the aggregate affect of the pointing errors would not likely increase the power into an adjacent network.¹⁶

IV. Boeing Should Be Able To Operate Its CBBM System Outside of the United States On Equal Footing With Non-U.S. Systems

While in international waters, the Commission requires U.S.-licensed ESV operators to operate in accordance with the Commission's technical rules, or with the laws of the foreign jurisdiction if those laws are more constraining.¹⁷ Thus, U.S.-licensed ESV operators are

¹⁵ Application, Annex A at 10.

¹⁶ See ViaSat AMSS Comments at 18; ViaSat AMSS Reply Comments at 12-13, Exhibit A.

¹⁷ *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*, Report and Order, 20 FCC Red 674, ¶ 121 (2005) (“*ESV Order*”).

subject to the limits in the U.S. Table of Frequency Allocations even when operating in other parts of the world. Therefore, Boeing requests waivers to allow operations outside of the U.S. at power levels and on frequencies that are conventional for FSS operations in Regions 1 and 3. ViaSat supports Boeing's request for a waiver of requirements that would limit its ability to offer competitive services outside of the U.S.

Boeing requests a waiver of the Section 25.222(a)(1)-(4) off-axis power density limits to operate at higher power densities outside of the U.S. ViaSat is in favor of allowing operators to have the flexibility to coordinate with adjacent satellite operators to operate at higher power density than the off-axis EIRP density limits set forth in the Commission's rules.¹⁸ Coordinating operations at levels higher than the Commission's limits is particularly important outside of the U.S., where foreign systems often operate at higher routine power levels than U.S. systems because satellites are typically spaced greater than 2 degrees apart. Therefore, the Commission should permit Boeing to operate outside of U.S. waters at higher coordinated power density levels. Grant of a waiver of the power density limits would allow Boeing to compete effectively with foreign operators, who are not constrained by U.S. limits.

Likewise, ViaSat supports Boeing's request to operate using Ku band frequencies that the Commission has not specifically designated for use by ESVs. Section 25.202(a)(8) limits ESV Ku band downlinks to 10.95-11.2 GHz, 11.45-11.7 GHz, and 11.7-12.2 GHz. In order to compete effectively with ESV operators licensed outside of the U.S., and to provide service in territorial waters outside of the U.S., U.S.-licensed ESV operators should be permitted to operate on Ku band frequencies that are customarily used in regions outside of the U.S. While the 12.5-12.75 GHz band is allocated to broadcast satellite service use in the U.S., this band has

¹⁸ ViaSat Reply Comments at 16.

an international allocation for Ku band FSS downlinks.¹⁹ As Boeing notes, typical U.S. Ku band downlink frequencies (i.e., 11.7-12.2 GHz) are generally not available for use outside of the U.S.²⁰

ESV operations are international in nature. Thus, without a waiver, Boeing's operations in foreign jurisdictions, and U.S.-registered vessels' choice of ESV providers, would be severely limited. ViaSat agrees that waivers of Sections 25.222(a)(1)-(4) and 25.202(a)(8) are necessary to allow Boeing to compete in the global market, and to prevent a reduction in system capacity and diminished service quality. Strict adherence to the rule would undermine the purpose of the Commission's goal in the *ESV Order* to expand Ku band operations to include maritime applications and to promote market-driven deployment of broadband technologies.²¹ Because Boeing agrees to comply with coordinated limits for its operations outside of the U.S., the waiver of these rules would not increase the potential for interference into adjacent satellites. Thus, the Commission should grant Boeing's requested waivers of Sections 25.222(a)(1)-(4) and 25.202(a)(8).

¹⁹ See 47 C.F.R. § 2.106.

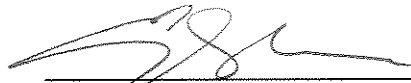
²⁰ See *id.*; Application at 30.

²¹ *ESV Order* at ¶¶ 3, 4.

IV. Conclusion

For the foregoing reasons, the Commission should grant Boeing's waiver requests and authorize the ESV operations in the Application.

Respectfully submitted,



Elizabeth R. Park
LATHAM & WATKINS LLP
555 Eleventh Street, N.W.
Suite 1000
Washington, D.C. 20004
Telephone: (202) 637-2200

Counsel for ViaSat, Inc.

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ENGINEERING INFORMATION CERTIFICATION

I hereby certify that I am the technically qualified person responsible for reviewing the engineering information contained in the foregoing submission, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this pleading, and that it is complete and accurate to the best of my knowledge and belief.



Daryl T Hunter

Daryl T. Hunter, P.E.
ViaSat, Inc.
6155 El Camino Real
Carlsbad, CA 92009-1699

Dated: April 28, 2006

CERTIFICATE OF SERVICE

I, Elizabeth R. Park, hereby certify that on this 28th day of April 2006, served a true copy of the foregoing Comments of ViaSat, Inc. in Support by by first class mail, postage pre-paid upon the following:

Carlos M. Nalda
Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, PC
701 Pennsylvania Avenue, NW
Suite 900
Washington, DC 29994



Elizabeth R. Park