Narrative Statement

Through this application, The Boeing Company ("Boeing") requests that the Commission expand Boeing's existing experimental special temporary authority ("STA") to operate two Norsat SecureLink terminals for testing purposes associated with Boeing's Connexion by Boeing ("Connexion") Aeronautical Mobile-Satellite Service ("AMSS") system (Call Sign WC9XLV, File No. 0136-EX-ST-2006) to include two (2) Norsat GlobeTrekker 1.0 meter terminals. In addition, Boeing requests that the expiration date for the authority be extended to December 31, 2006. Boeing otherwise seeks to operate the new antenna model under the same terms and conditions include in its existing experimental STA.

As the Commission is aware, Boeing has created a Connexion Remote Antenna Test Equipment ("CRATE") portable test platform to test transponder coverage at remote locations.[1] The system consists of a portable satellite dish coupled with CBB Maritime modem, server and router, and has become necessary because the aircraft Boeing had been using to test the Connexion system has been decommissioned. Test locations include Kent, Washington to verify the equipment operates properly, as well as other locations in the United States. The antenna will be deployed internationally subject to appropriate regulatory approvals.[2]

Boeing seeks to utilize the Norsat GlobeTrekker terminal for CRATE testing because it is highly portable. Like the Norsat 1.2 meter SecureLink terminal, the Norsat 1.0 meter GlobeTrekker terminal will operate in Ku-band Fixed-Satellite Service ("FSS") frequencies and in a manner that is compliant with the Commission's two-degree spacing policies. Indeed, the GlobeTrekker terminal will operate with the same frequencies, power levels and emission designators as the authorized SecureLink terminal.

To demonstrate compliance with the Commission's two-degree spacing policies, antenna patterns are attached demonstrating that the power levels at which Boeing will operate will not cause unacceptable levels of interference and will be within the off-axis e.i.r.p. gain envelopes mandated by 47 C.F.R. § 25.209. Therefore, ALSAT (Ku-band) authority is appropriate for the uplink frequency band (14.0-14.5 GHz) and the 11.7-12.2 GHz downlink frequency band. For the downlink frequencies outside of the 11.7-12.2 GHz band, the points of communications will be the AMC-23 satellite for international services.

Boeing seeks to commence testing with this new antenna as soon as possible. Accordingly, Boeing respectfully requests that the Commission grant Boeing authorization to conduct the testing and experimentation described herein at the earliest possible time.

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[1] CRATE testing consists of setting up the equipment at a ground location, aligning the system to point at the desired satellite, verifying forward link ("FL") data transmission, enabling return link ("RL") data transmission at 256 kbps, and measuring transmit and receive power levels for approximately 48 hours. EIRP and EbNo will be collected over time.

[2] Boeing will obtain all necessary authorizations from foreign governments before operating in foreign territories.

Co-Polarization Gain and Cross Polarization Gain of the CRATE1 Antenna

Co-polarization and Cross-polarization gain

§25.209(a)(1) of the Commission's rules gives maximum levels of off-axis gain for FSS earth stations for off-axis angles of 1° to180°. The following chart lists each of the documentation requirements from §25.132(b)(1) and the page number in the attached Test Report # 5090 which addresses each requirement. For each requirement, 3 page numbers are given corresponding to measurements at 3 different frequencies. The antenna data has been corrected in accordance with EIA-411 as shown in Attachment 1.

	Vertical Polarization Pattern (page #)	**Horizontal Polarization Pattern (page #)**	**Margin to §25.209(a)(1) or (2) limits (dB)**
(i) Co-polarized patterns for each of two orthogonal senses of polarizations in two orthogonal cuts of the antenna.			
(A) In the azimuth plane, plus and minus 7 degrees	34, 35, 36	10, 11, 12	-7.2
and plus and minus 180 degrees.[3]	46, 47, 48	22, 23, 24	-6.[4] -3. (<10% of sidelobes)
(B) In the elevation plane, zero to forty-five degrees.	40, 42, 44	16, 18, 20	-4.
ii) Cross-polarization patterns in the E- and H-planes, plus and minus 9 degrees.	30, 31, 32	6, 7, 8	+5

As shown in the above table, the maximum amount by which the CRATE2 antenna exceeds the §25.209(a)(1) or (2) criteria is 7.2 dB. For this calculation, the FCC limits plotted on the figures were extended to include1 degree off-axis

To maintain compatibility, Boeing will reduce its maximum power density below the -14 dBW/4kHz of §25.134(b) by 11.6 dB, for a power density level of -25.6 dBW/4kHz. This will meet the equivalent VSAT criteria e.i.r.p. mask with a margin of 4.4 dB.

[3] Actual azimuth travel to 180 degrees was not possible due to range limitations. The referenced figures give gain to 170 degrees, which includes the spill-over region near 150 degrees.
[4] Excludes region from 0 to 7 degrees

Attachment 1
Antenna correction factors per EIA-411

14. For those instances in which azimuth patterns are measured using a satellite located at an elevation angle above true horizon, the indicated azimuth scale needs to be modified using the following expression:

$$Az_{corrected} = 2 \sin^{-1} \left[\sin \left(\frac{\Delta Az}{2} \right) \cdot \cos El \right]$$

where:

ΔAz = Indicated azimuth angle from boresight

El = Indicated elevation angle above true horizon.

Note: No correction is necessary for elevation patterns.