Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

Application of **THE BOEING COMPANY** For Modification of Authority For Use of the 1990-2025/2165-2200 MHz and Associated Frequency Bands for a Mobile-Satellite System	)	File Nos. _____ & SAT-MOD-20030711-00128

AMENDMENT TO APPLICATION FOR MODIFICATION

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The Boeing Company ("Boeing"), by its attorneys and pursuant to Sections 308 and 309 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 308 and 309, hereby requests authority to amend its pending application for modification of Boeing's Mobile-Satellite Service ("MSS") system license. This amendment is being filed in order to request access to additional feeder link spectrum for Boeing's 2 GHz MSS network.

I. INTRODUCTION

Boeing is currently authorized by the Commission to launch and operate a 2 GHz MSS network using 125 MHz of paired spectrum in the Planned Ku-band for its feederlinks and telemetry, command and control ("TT&C").[1] Boeing herein requests authority to use up to an additional 355 MHz of paired spectrum in the Planned Ku-band for its feederlinks and TT&C in order to accommodate a significant increase in the

[1] The Planned Ku-band includes the 10.7-10.95 GHz and 11.2-11.45 GHz bands for downlinks and the 12.75-13.25 GHz band for uplinks.

number and density of services that will be provided to consumers using Boeing's 2 GHz MSS network.[2]

When Boeing first designed its 2 GHz MSS network, Boeing intended to use its satellite system solely to provide communication, navigation and surveillance ("CNS") services for the aeronautical industry. Since that time, a downturn in the economy, and in the aviation industry in particular, prompted Boeing to expand the service offerings that could be made available to consumers using its 2 GHz MSS system.

More recently, the Commission made significant changes in the regulatory environment for 2 GHz MSS networks, which prompted further modifications in Boeing's system design. The Commission authorized MSS licensees to incorporate an ancillary terrestrial component ("ATC") in the satellite services that they provide to consumers.[3] The Commission also increased the 2 GHz MSS service link spectrum available to licensees.[4]

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[2] In support of Boeing's request for additional feederlink spectrum, Boeing requests in Section 8.2 of this application an additional waiver of Footnote NG104 of Section 2.106 of the Commission's rules.

[3] *See Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands*, Report and Order and Notice of Proposed Rulemaking, FCC 03-15 (Feb. 10, 2003) ("*Flexibility Order*")

[4] *See Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems; The Establishment of Policies and Service Rules for the Mobile-Satellite Service in the 2 GHz Band*, Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order, FCC 03-16, ¶ 32 (Feb. 10, 2003) ("*2 GHz Reallocation Order*"); *The Boeing Company, For Modification of Authority For Use of the 1990-2025/2165-2200 MHz and Associated Frequency Bands for a Mobile-Satellite System; For Authority to Launch and Operate a Non-Geosynchronous Medium Earth Orbit Satellite System in the 2 GHz Band Mobile-Satellite Service and in the Aeronautical Radionavigation-Satellite Service*, DA 03-2073, ¶ 38 (Int'l Bur., June 24, 2003) ("*Boeing Modification Order*").

In response to these changes, Boeing filed an application with the Commission on July 11, 2003, requesting authority to make relatively minor technical changes to its 2 GHz MSS system. The changes included increasing the spacecraft antenna size and signal power in order to communicate seamlessly with dual-mode handheld user terminals. The changes also included adjustments to the satellite beam pattern in order to significantly increase the overall capacity of the network.

Boeing now seeks authority for access to additional feeder link spectrum in order to utilize fully the increased capacity and capabilities of Boeing's 2 GHz MSS system. Specific changes that have resulted in the need for additional feederlink spectrum include:

- Boeing's authorized access to 5 MHz of paired service link spectrum, as opposed to the 3.5 MHz that Boeing was previously authorized;
- Boeing's use of four cell frequency reuse in its service link beam structure, rather than seven cell reuse, which nearly doubles the channelization capacity of each beam; and
- Boeing's narrowing of its service link beam size from 0.7° to 0.24°, which will require Boeing to increase the total number of beams that are operated continuously in order to maintain the geographic coverage of the network.

In addition to the above-discussed changes, Boeing requested authority in its July 11, 2003 modification application to use two spot beams for its space-to-Earth feeder links, rather than a single beam covering the continental United States ("CONUS"). The use of two spot beams will permit Boeing to increase the spectral efficiency of its satellite network by reusing some of its authorized feeder link spectrum to communicate with each of its two proposed feeder link gateway facilities.

In employing two gateway facilities, however, Boeing anticipates that it will be necessary to shift traffic loading regularly between Boeing's gateway facility on the east

coast and the west coast in order to accommodate time differences. Furthermore, in order to accommodate the reliability requirements of aviation, homeland security and public safety services, Boeing intends to make its two feederlink gateway facilities sufficiently redundant so that each facility can operate most of the entire network in the event of the loss of the other facility. Boeing's request for additional feederlink spectrum takes into consideration these traffic loading and reliability issues.

Finally, a significant likelihood exists that Boeing will be able to enter into a joint agreement with another 2 GHz MSS licensee in order to operate on a secondary basis in each other's 2 GHz MSS service link spectrum. The Commission authorized each 2 GHz MSS licensee to coordinate with any other 2 GHz MSS operator,[5] permitting them to increase the efficiency of their spectrum use and provide additional services to consumers.

Boeing had previously indicated to the Commission that operating on a secondary basis in the home spectrum assignment of other 2 GHz MSS licensees would be incompatible with Boeing's proposed aeronautical CNS services. Now that Boeing is expanding the scope of its service offerings, however, Boeing is in a position to operate portions of its network on a shared basis with other 2 GHz MSS licensees. In order to accommodate such shared spectrum use, Boeing will need access to increased feederlink frequencies. Boeing's request for access to an additional 355 MHz of spectrum in the Planned Ku-band fulfills this requirement.

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[5] *In the Matter of The Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band*, Report and Order, FCC 00-302, ¶ 19 (Aug. 25, 2000) ("*2 GHz MSS Service Rules Order*").

In requesting access to additional feederlink spectrum, Boeing is not proposing any technical change to the design of Boeing's 2 GHz MSS satellite. Furthermore, Boeing is not suggesting that its 2 GHz MSS network design is incapable of providing service to consumers using its currently authorized 125 MHz of paired feeder link spectrum.

Boeing's 2 GHz MSS spacecraft is already designed with the capability of operating feederlinks and TT&C over a 125 MHz portion, a 250 MHz portion, or a 480 MHz portion of paired spectrum in the Planned Ku-band. The flexible nature of Boeing's feederlink design is consistent with the Commission's requirement that 2 GHz MSS licensees must design their networks with sufficient frequency agility to operate over at least 70 percent of the 2 GHz MSS service link bands in order to address coordination and band arrangement contingencies.[6] By employing this same frequency agility in its feederlink design, Boeing can accommodate an increase in system capacity without making any adjustments in the technical design of its network.

Because Boeing is not proposing herein any changes to the technical design of its satellite, Boeing's request is entirely consistent with the Critical Design Review that Boeing completed for its 2 GHz MSS network on July 17, 2003.[7] Furthermore, Boeing's request for access to additional feeder link spectrum does not conflict with the Commission's recently established policy that licensee making modifications to their spacecraft design should request Commission approval well in advance of CDR, absent

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[6] *See id.*, ¶ 52.

[7] *See Letter from David A. Nall, Counsel to The Boeing Company, to Marlene H. Dortch, Secretary, Federal Communications Commission* (July 24, 2003).

unusual circumstances.[8] Boeing's request for additional feederlink spectrum does not necessitate any changes to its spacecraft design. Therefore, the Commission can accommodate Boeing's request without disrupting the ongoing construction process for Boeing's 2 GHz MSS satellite.[9]

II. INFORMATION REQUIRED BY FCC FORM 312

Question 35 of FCC Form 312 requests a narrative statement regarding any waivers of the Commission's rules that are requested in this application. This information is provided *infra* at Section III, 8.2.

Question 37 of FCC Form 312 requests information regarding Boeing's legal status. The information filed by Boeing with the Commission in its November 3, 2000 application for amendment of its 2 GHz MSS application remains current and valid.

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[8] *See Amendment of the Commission's Space Station Licensing Rules and Policies; Mitigation of Orbital Debris*, First Report and Order and Further Notice of Proposed Rulemaking in IB Docket No. 02-34, and First Report and Order in IB Docket No. 02-54, FCC 03-102, ¶ 191 (May 19, 2003) ("*Space Station License Reform Order*"); *2 GHz MSS Service Rules Order*, ¶ 108.

[9] Although Boeing does not believe that its request for access to additional feederlink spectrum implicates the Commission's policy regarding requests for satellite system modifications contemporaneous with a licensee's CDR milestone, Boeing is requesting in Section 8.2 of this application a waiver of this policy to the extent that it is deemed necessary.

III. INFORMATION REQUIRED BY SECTION 25.114 OF THE COMMISSION'S RULES

25.114(c)(1) Name, Address, and Phone Numbers of Applicant

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25.114(c)(3) Authorization Requested

Boeing requests Commission authority for access to an additional 355 MHz of paired feederlink spectrum in the Planned Ku-band in order to accommodate a significant increase in the capacity of Boeing's 2 GHz MSS network. In support of Boeing's feederlink request, Boeing requests *infra* in Section 8.2 of this application a further waiver of Footnote NG104 of Section 2.106 of the Commission's rules. To the extent

that it is deemed necessary, Boeing also requests a waiver of the Commission's policy requiring satellite system modifications to be filed with the Commission well in advance of a licensee's CDR milestone, absent unusual circumstances.

25.114(c)(4) General Description of Overall System Facilities, Operations and Services

As described in Boeing's July 11, 2003 modification application, Boeing's modified 2 GHz MSS network will offer subscribers assured access to high quality and affordable, next generation mobile wireless services. The system design will provide a flexible, wide area MSS that is fully integrated with and augments terrestrial wireless networks while extending coverage to unserved and underserved areas. The MSS network will provide basic services in the form of packet switched and circuit switched, voice and data services for communication over various networks to include but not necessarily be limited to the MSS network, Public Land Mobile Networks ("PLMNs"), the Internet, and Public Switched Telephone Networks ("PSTN"). Location based services will also be supported. The network will offer services to different mobile earth terminal user types. Integrated chipsets will be incorporated into each terminal type to allow both satellite and terrestrial mobile capabilities.

25.114(c)(5) Spacecraft Communications Subsystem

5.1 Frequency and Polarization Plan

5.1.1 User-to-Satellite and Satellite-to-User Frequency Plan

No change

5.1.2 Gateway-to-Satellite Frequency and Polarization Plan

Boeing's 2 GHz MSS spacecraft is already designed with the capability of operating its feederlinks over a 125 MHz portion, a 250 MHz portion, or a 480 MHz portion of paired spectrum in the Planned Ku-band. This design approach offers flexibility in accommodating future spectrum usage while also ensuring operations that are consistent with Boeing's licensed spectrum authorization. This approach also has the benefit of eliminating the need for further requests for access to feederlink spectrum in order to accommodate secondary 2 GHz MSS service link operations pursuant to spectrum sharing agreements with other 2 GHz MSS licensees.

For the gateway-to-satellite communications link, the scalable feederlink frequency and polarization plans are shown in Figure 1. When operating at full capacity, the forward transponder will be capable of processing three hundred sixty eight 1.25 MHz feederlink segments per polarization.

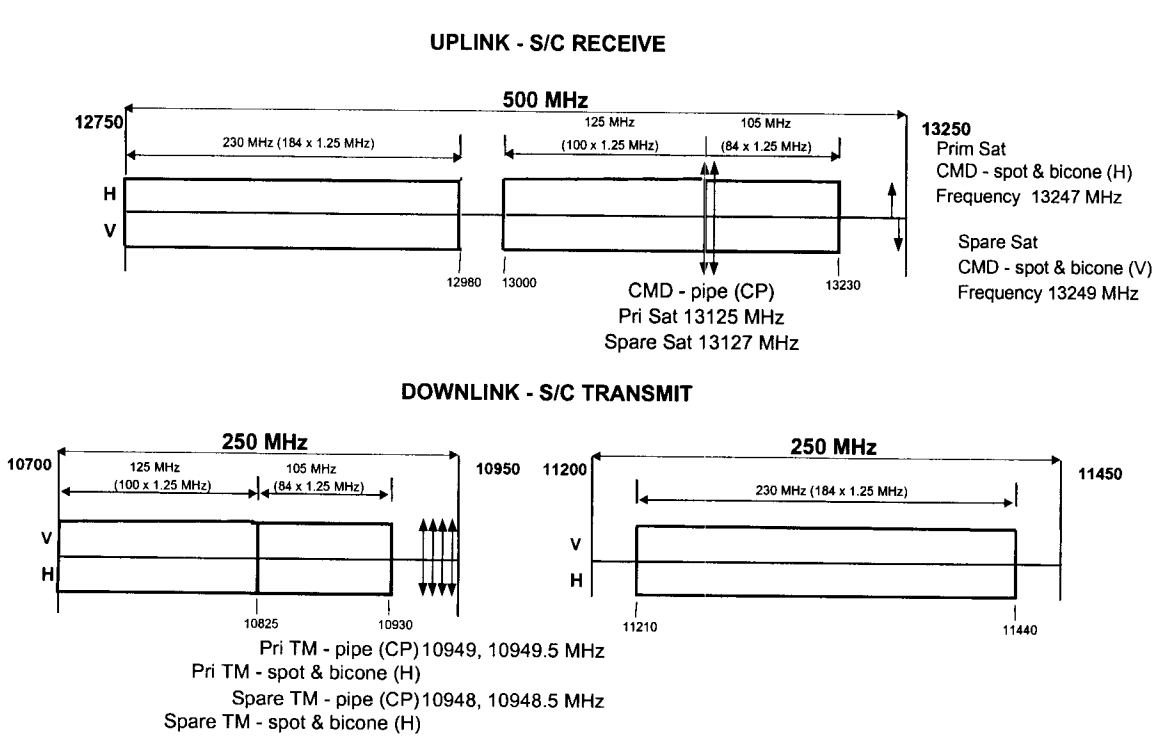

Figure 1 - Feeder Link Frequency Plan

5.1.3 Satellite-to-Gateway Frequency and Polarization Plan

For the satellite-to-gateway communications link, the scalable feederlink frequency and polarization plan is also shown in Figure 3. When operating at full capacity, the return transponder will be capable of processing three hundred sixty eight 1.25 MHz feederlink segments per polarization.

5.2 Emission Designators

No change

5.3 Communications Payload

No change

5.4 Tracking, Telemetry and Command Payload

No change

5.5 Transponder Descriptions

No change

25.114(c)(6) Orbital Locations and MSS Feederlink Frequencies

6.1 Orbital Requirements

No change

6.2 MSS Feederlink Frequencies

Boeing is requesting authority to use up to an additional 355 MHz of paired spectrum in the Planned Ku-band for its feederlinks in order to accommodate a significant increase in the capacity in its 2 GHz MSS network. Specifically, Boeing requests authority to operate its Earth-to-space feederlinks in the 12.75-12.98 GHz and 13.0-13.25 GHz bands and its space-to-Earth feederlinks in the 10.7-10.95 GHz and 11.21-11.44 GHz bands.

In order to protect terrestrial licensees operating in the 12.75-13.25 GHz band, Boeing will coordinate the locations of its feederlink stations with those systems pursuant to Section 25.203(c) of the Commission's rules. Boeing is confident that acceptable locations for its feederlink stations can be identified and successfully coordinated. Boeing will use all interference mitigation techniques available including terrain and manmade shielding to minimize interference to and from terrestrial systems.

To further facilitate coordination in the 12.75-13.25 GHz band, Boeing has also already agreed to comply with a number of siting restrictions for its feederlink facilities that are in addition to the general coordination requirements included in Section 25.203 of the Commission's rules. For example, Boeing has agreed to refrain from using the

13.15-13.2125 GHz band from any site within 50 kilometers of the Nielsen Designated Market Area (DMA) border of a top 100 television market.[10]

Boeing has also agreed to demonstrate when applying for feeder-link earth station licenses that its proposed uplink operations will not interfere with, or require protection from, the operation of any existing fixed service ("FS") station at its current site that is currently authorized to operate in the 18.3-19.3 GHz band in the event that the FS station's assigned frequencies are shifted to the 12.75-13.25 GHz band pursuant to Section 101.85, Section 101.89, Section 101.91, or Section 101.95 of the Commission's rules.[11] Finally, the Commission has stated that it plans to withhold authority for uplink transmissions by Boeing in any portion of the 12.75-13.25 GHz band pending adoption of rules for coordination with BAS and CARS mobile pickup operations.[12]

Boeing intends to provide interference protection to Radio Astronomy operations in the 10.68-10.7 GHz frequency band as specified in footnotes US74 and US211 of the U.S. Table of Frequency Allocations.[13] Boeing will take practicable steps toward meeting Radio Astronomy protection objectives identified in Recommendation ITU-R RA.769-1 "Protection Criteria Used For Radio Astronomical Measurements."

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[10] *See Boeing Modification Order*, ¶ 18 (conditioning Boeing's authorization on this siting restriction agreement).

[11] *See id.* (conditioning Boeing's authorization on this siting restriction agreement).

[12] In adopting this restriction, the Commission acknowledged that, in the event that the rulemaking is not completed before Boeing needs TT&C uplink authority in connection with the launch of its satellite, the Commission would entertain a request for modification of this condition or other appropriate relief. *See id.* ¶ 18 n.40.

[13] *See* 47 C.F.R. § 2.106 (2002).

25.114(c)(7) Predicted Spacecraft Antenna Gain Contours

No change

25.114(c)(8) Service Description, Waiver Request, Link Descriptions and Typical User and Gateway Terminals

8.1 Service Description

No change

8.2 Waiver Request

Boeing is requesting authority in this application to use an additional 355 MHz of paired spectrum in the Planned Ku-band for feederlinks for its 2 GHz MSS network. Footnote NG104 of Section 2.106 of the Commission's rules limits the use of the 10.7-11.7 GHz and 12.75-13.25 GHz bands by FSS networks to international systems. Boeing therefore requests a further waiver of this restriction in order to expand its feederlink operations. To the extent that it is deemed necessary, Boeing is also requesting herein a waiver of the Commission's recently established policy requiring satellite licensees to apply for Commission authority for network modifications well in advance of the licensee's CDR milestone, absent unusual circumstances.

8.2.1 The Standard for Waiver

The Commission has the authority to waive its rules if there is "good cause" to do so.[14] Waiver is appropriate if (1) special circumstances warrant a deviation from the

[14] *See* 47 C.F.R. § 1.3. *See also WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969) ("*WAIT Radio*"); *Northeast Cellular Telephone Co. v. FCC*, 897 F.2d 1166 (D.C. Cir. 1990) ("*Northeast Cellular*").

general rule, and (2) such deviation would better serve the public interest than would strict adherence to the general rule.[15] Circumstances that would justify a waiver include "considerations of hardship, equity, or more effective implementation of overall policy."[16] Generally, the Commission may grant a waiver of its rules in a particular case only if the relief requested would not undermine the policy objective of the rule in question, and would otherwise serve the public interest.[17]

8.2.2 Further Waiver of Footnote NG104

The Commission should grant a further waiver of Footnote NG104 in order to permit Boeing to use additional spectrum in the Planned Ku-band for its feederlinks. Grant of an additional waiver is warranted in part because Boeing's proposed expanded operations will not alter appreciably the coordination environment for terrestrial services operating in the band, now or in the future. As the Commission observed when it granted Boeing an initial waiver of Footnote NG104, Boeing's proposed operation of two feederlink facilities in the United States "should not increase the frequency coordination burden on terrestrial wireless services significantly more than the existing permitted use

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[15] *See Northeast Cellular*, 897 F.2d at 1166. *See also Comsat Corporation, Petition for Partial Relief from the Current Regulatory Treatment of Comsat World Systems' Switched Voice, Private Line, and Video and Audio Services*, Order, 11 FCC Rcd 9622, 9625 (1996); *Petition of General Communications, Inc. for a Partial Waiver of the Bush Earth Station Policy*, Memorandum Opinion and Order, 11 FCC Rcd 2535, 2536 (Int'l Bur. 1996).

[16] *WAIT Radio*, 418 F.2d at 1159.

[17] *See id.* at 1157; Dominion Video Satellite, Inc., *Order and Authorization*, 14 FCC Rcd 8182, 8185 (Int'l Bur., 1999).

of those bands by an international system or by gateway stations for an NGSO FSS system."[18]

The fact that Boeing seeks to use additional spectrum in the band should not alter the Commission's conclusion. As the Commission is aware, international FSS network earth stations are frequently authorized to operate across the entire Planned Ku-band, rather than just a portion of the spectrum. The Commission also authorized gateways for NGSO FSS systems to operate across the entire Planned Ku-band. Therefore, Boeing's proposal to operate its two gateway facilities using most of the band will require no more coordination than already exists for international FSS systems and NGSO FSS gateway facilities.

Furthermore, it is unlikely that a change in the amount of feederlink spectrum used by Boeing would have any *practical* impact on the coordination environment for terrestrial services in the band. Satellite network operators routinely identify physical locations for their earth station facilities that can accommodate future network growth and avoid constructing earth station facilities in locations where coordination can be completed successfully on only a portion of an available spectrum band.

Boeing has always planned to employ this same approach in siting its feederlink facilities. Boeing will identify sites for its two gateways that avoid coordination difficulties both within the bands currently authorized for Boeing's feederlinks and also with respect to all other portions of the Planned Ku-band.

Boeing has also already agreed to comply with a number of siting restrictions for its feederlink facilities that are in addition to the general coordination requirements

[18] *Boeing Modification Order*, ¶ 16.

included in Section 25.203 of the Commission's rules. For example, Boeing has agreed to refrain from using the 13.15-13.2125 GHz band from any site within 50 kilometers of the Nielsen Designated Market Area (DMA) border of a top 100 television market.[19] Even though this restriction applies only to the 13.15-13.2125 GHz band, Boeing intends to observe the siting restriction regardless of the spectrum that it uses for feederlinks in order provide Boeing with flexibility for future growth.

Boeing has also agreed to demonstrate when applying for feederlink earth station licenses that its proposed uplink operations will not interfere with, or require protection from, the operation of any existing FS station at its current site that is currently authorized to operate the 18.3-19.3 GHz band in the event that the FS station's assigned frequencies are shifted to the 12.75-13.25 GHz band pursuant to Section 101.85, Section 101.89, Section 101.91, or Section 101.95 of the Commission's rules.[20] Finally, the Commission has stated that it plans to withhold authority for uplink transmissions by Boeing in any portion of the 12.75-13.25 GHz band pending adoption of rules for coordination with BAS and CARS mobile pickup operations.[21]

Taken together, these restrictions will ensure that Boeing's proposed feederlinks cannot interfere with the growth and development of terrestrial services in the Planned Ku-band. Therefore, an additional waiver of Footnote NG104 is warranted.

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[19] *See id.*, ¶ 18 (conditioning Boeing's authorization on this siting restriction agreement).

[20] *See id.* (conditioning Boeing's authorization on this siting restriction agreement).

[21] In adopting this restriction, the Commission acknowledged that, in the unlikely event that the rulemaking is not completed before Boeing needs TT&C uplink authority in connection with the launch of its satellite, the Commission would entertain a request for modification of this condition or other appropriate relief. *See id.* ¶ 18 n.40.

Waiver of the rule would also promote the Commission's public interest goal of maximizing the number of services that can be provided efficiently to consumers in the same spectrum. As observed in the Commission's Spectrum Policy Task Force Report,

> to ensure that existing services can continue to grow to accommodate marketplace needs, and that new services have a chance to take hold and grow, it is important that the Commission continue to optimize and facilitate access to and use of the radio spectrum.[22]

One of the primary means to facilitate increased spectrum access is to group services that can successfully share spectrum into the same frequency bands.[23] Boeing's proposed feederlink facilities can easily share spectrum with terrestrial services in the Planned Ku-band through the use of siting restrictions and coordination requirements. Recognizing the relative ease of these spectrum sharing conditions, it would be spectrally inefficient to attempt to locate Boeing's MSS feederlinks in dedicated spectrum that is unused by terrestrial services. Instead, the public interest will be best served by granting Boeing a second waiver of Footnote NG104 in order to permit Boeing to use additional spectrum on a shared basis in the Planned Ku-band for its feederlink operations.

8.2.3 Waiver of the Commission's License Modification Policy

The Commission recently established a policy that a satellite licensee seeking to make "modifications to its spacecraft design" should request Commission authority well in advance of its CDR milestone, absent unusual circumstances.[24] In requesting access to

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[22] *Spectrum Policy Task Force Report*, ET Docket No. 02-135, at 15 (Nov. 2002).

[23] *See id.* at 22 (observing that "it may be desirable, where possible, to group technically compatible systems and devices in close spectrum proximity").

[24] *See Space Station License Reform Order,* ¶ 191; *see also 2 GHz MSS Service Rules Order*, ¶ 108.

additional feederlink spectrum, however, Boeing is not proposing any modifications to its spacecraft design in this application. Instead, Boeing's satellite network is already designed with the capability of operating feederlinks and TT&C over a 125 MHz portion, a 250 MHz portion, or a 480 MHz portion of paired spectrum in the Planned Ku-band. Due to the flexible nature of Boeing's spacecraft design, Boeing can accommodate an increase in system capacity without making any adjustments in the technical design of its network. Boeing's request for access to additional feeder link spectrum therefore does not conflict with the Commission's policy regarding system modifications.

In the event that the Commission concludes that Boeing's request for additional feederlink spectrum does implicate the Commission's system modification policy, however, Boeing herein requests a waiver of the policy because of the "unusual circumstances" that exist for Boeing's 2 GHz MSS network. Specifically, the Commission made significant changes to the regulatory environment for Boeing's 2 GHz MSS system – authorizing ATC and increasing Boeing's service link spectrum – more than a year after the Commission granted Boeing its satellite system license and only months before its CDR deadline. Furthermore, Boeing was prepared to request access to additional feederlink spectrum in advance of its CDR milestone as a part of its July 11, 2003 modification application, but was unable to do so because of the Commission's freeze on the filing of space station license modification applications involving additional frequencies.

The Commission's changes in the rules for 2 GHz MSS, combined with its freeze on certain space station modification applications, qualify as unusual circumstances justifying a waiver of the Commission's policy. Furthermore, any refusal to grant a

waiver would constitute a substantial hardship for Boeing. The Commission concluded in its ATC order that MSS licensees can use ATC to expand coverage, improve efficiency and enhance competition in important markets that MSS networks serve, including the maritime, aeronautical, commercial-transportation and public-safety markets.[25]

If Boeing is not permitted to secure access to sufficient feederlink spectrum to provide these additional services to consumers, then Boeing will be left at a clear competitive disadvantage as compared to other MSS networks. Furthermore, the public interest benefits that can be achieved through the provision of ATC would not be made available as a part of Boeing's service, reducing competition and spectrum efficiency, and potentially withholding unnecessarily new communication services from consumers.

In light of the Commission's recent decision to grant MSS licensees with ATC authority, the public interest would best be served by permitting Boeing to incorporate ATC into its network. Boeing's request for additional feederlink spectrum will not result in any delay in the construction and launch of Boeing's satellite. Instead, Boeing has already designed its spacecraft with sufficient flexibility to operate its feederlinks in scalable portions of the Planned Ku-band. Waiver of the Commission's newly established policy is therefore warranted.

8.3 Link Performance

8.3.1 End-to-End Communications Link Performance

No change

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[25] *See Flexibility Order*, ¶ 23.

8.3.2 Feederlink Performance

A link budget analysis for representative end-to-end communications is provided in Appendix A. The attached link budgets are identical to those provided by Boeing in its July 11, 2003 modification application and are provided herein for convenience.

8.4 Typical User Terminals

No change

8.5 Gateway Facilities

No change

25.114(c)(9) Satellite Orbit Characteristics

No change

25.114(c)(10) Power Flux Density Compliance

As indicated in Boeing's July 11, 2003 modification application, the downlink PFD levels for Boeing's Ku-band feederlink spot beams are within the required ITU PFD limits, along with the Commission's limits for operations in the 10.95-11.2 GHz and 11.45-11.7 GHz bands as shown in Table 1 and Table 2 below. Boeing's system will provide identical levels of downlink interference protection to U.S. terrestrial systems operating in these bands.

Table 1 - Feederlink PFD Compliance 10.7 - 11.7 GHz: Southwest Beam

Maximum PFD Limit (dB(W/m^2/4 kHz))	Elevation Angle (degrees)	Slant Range (km)	Maximum Power Flux Density (dB(W/m^2/4 kHz))	Margin (dB)
-150	0	41,680	-189.9	39.9
-150	5	41,128	-189.8	39.8
-140	25	39,072	-174.3	34.3
-140	40	37,719	-161.6	21.6
-140	90	35,787	-188.6	48.6

Table 2 - Feederlink PFD Compliance 10.7 - 11.7 GHz: Mid Atlantic Beam

Maximum PFD Limit (dB(W/m²/4 kHz))	Elevation Angle (degrees)	Slant Range (km)	Maximum Power Flux Density (dB(W/m²/4 kHz))	Margin (dB)
-150	0	41,680	-179.7	29.7
-150	5	41,128	-179.6	29.6
-140	25	39,072	-179.1	39.1
-140	40	37,719	-161.6	21.6
-140	90	35,787	-178.4	38.4

There is no change to the Boeing Ku-band telemetry PFD compliance table provided in its July 17, 2002 modification application.[26]

Boeing intends to provide interference protection to Radio Astronomy operations in the 10.68-10.7 GHz frequency band as specified in footnotes US74 and US211 of the U.S. Table of Frequency Allocations.[27] Boeing will take practicable steps toward meeting Radio Astronomy protection objectives identified in Recommendation ITU-R RA.769-1 "Protection Criteria Used For Radio Astronomical Measurements."

25.114(c)(11) Arrangements for Tracking, Telemetry and Control

No change

25.114(c)(12) Physical Characteristics of Satellite

No change

25.114(c)(13) Financial Qualifications of Applicant

No change

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[26] *See The Boeing Company, Application For Modification of Authority for Use of the 1990-2025/2165-2200 MHz and Associated Frequency Bands for a Mobile-Satellite System*, FCC File No. SAT-MOD-20020726-00113 (July 17, 2002).

[27] *See* 47 C.F.R. § 2.106 (2002).

25.114(c)(14) Non-Common Carrier Status

No change

25.114(c)(15) Schedule and Milestones

No change. Boeing is already complying, and will continue to comply, with the milestone schedule adopted by the Commission for 2 GHz MSS GSO licensees, as required by the Commission in its order modifying Boeing's authorization.[28]

25.114(c)(16) Public Interest Considerations

Boeing is requesting access to additional feederlink spectrum in order to increase significantly the number and density of services that Boeing's network can provide to consumers, including services utilizing ATC technology. Boeing's proposed modifications to its network will increase the cost of constructing and launching Boeing's 2 GHz MSS satellite. Boeing believes that the risks associated with these higher costs are acceptable, however, because of the expanded market segments that can be accommodated.

As the Commission observed in its *Flexibility Order*, the availability of MSS ATC will "allow MSS operators to develop new and innovative service offerings that satellite-only MSS systems cannot offer today."[29] For example, ATC-enabled MSS networks can be used to provide ubiquitous digital telecommunications and broadband services, along with interoperable nationwide public-safety systems.[30] ATC can also be

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[28] *See Boeing Modification Order*, ¶ 28.

[29] *Flexibility Order*, ¶ 23.

[30] *See id.*

used to improve the nation's overall ability to maintain critical telecommunications infrastructure in times of crisis or disaster.[31]

The availability of ATC can also increase the spectral efficiency of MSS networks. As the Commission explained, "MSS ATC has the potential to transmit more information to more individual users within a given amount of spectrum than MSS alone."[32]

Boeing decision to incorporate ATC into its network can bring the public interest benefits of these services to consumers. In order to accommodate ATC, however, Boeing needs access to sufficient feederlink spectrum to utilize fully the expanded capabilities and capacity of Boeing's network. Therefore, grant of Boeing's amended application will serve the public interest.

Boeing's request for access to additional feederlink spectrum will also promote the efficient use of the planned Ku-band. Rather than request access to a dedicated spectrum assignment, Boeing is proposing to operate its feederlinks on a shared basis with existing and future spectrum users in the Planned Ku-band. As noted *supra* in section 8.2.2 of this application, the Commission has a longstanding policy of promoting shared spectrum assignments. Boeing's proposed feederlink facilities can easily share spectrum with terrestrial services in the Planned Ku-band through the use of siting restrictions and coordination requirements. Recognizing the relative ease of these spectrum sharing conditions, it would promote the public interest to permit Boeing to use additional spectrum in the Planned Ku-band for its feederlink and TT&C operations. The

[31] *See id.*, ¶ 29.

[32] *Id.*, ¶ 21.

Commission should therefore grant Boeing's amended application and associated waiver requests.

25.114(c)(17) – 25.114(c)(20

Not applicable

25.114(c)(21) 2 GHz Mobile-Satellite Service Considerations (Section 25.143)

21.1 Legal Qualifications

The information filed by Boeing with the Commission in its November 3, 2000 application for amendment of its 2 GHz MSS application remains current and valid.

21.2 Technical Qualifications

Boeing's technical qualifications are a matter of public record.[33]

21.3 MSS Geographic Coverage Requirements

No change

21.4 Financial Qualifications

No change

21.5 Orbital Debris Mitigation

No change

[33] *See, e.g., Boeing Modification Order*, ¶ 32.

IV. CONCLUSION

With this amendment, Boeing seeks authority to utilize up to an additional 355 MHz of paired spectrum in the Planned Ku-band in order to accommodate a significant increase in the number and density of services that can be provided to consumers using Boeing's 2 GHz MSS network. In light of the significant public interest benefits that will result from Boeing's proposed satellite services, the Commission should grant Boeing's amended application.

Respectfully submitted,

THE BOEING COMPANY

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August 6, 2003

Appendix A. End-to-End Link Budgets[34]

Forward Link Budget			
Radio Interface		RC3	RC3
Standard		cdma2000	cdma2000
Information Type		Voice	Voice
Rate	kbps	4.8	4.8
Mobile Margin	dB	15.0	15.0
System Information			
Satellite Orbit Position	deg W.L.	120	120
Gateway Location		Southwest	Mid Atlantic
(Ku) Uplink Frequency	GHz	13.25	13.25
(S) Downlink Frequency	GHz	2.19	2.19
Speech / Data Rate	kbps	4.8	4.8
Channel Data Rate	kHz	38.4	38.4
Type of modulation	Name	QPSK	QPSK
Equivalent Noise Bandwidth	kHz	9.6	9.6
Chip Rate (CDMA)	Mcps	1.23	1.23
Spread BW (CDMA)	MHz	1.23	1.23
GATEWAY EQUIPMENT PARAMETERS			
Effective U/L (Ku-band) EIRP/Channel per User	dBW	29.38	29.38
UPLINK (Ku) PATH LOSSES			
U/L (Ku) Propagation Losses	dB	-206.28	-206.28
SATELLITE Ku-BAND RECEIVE PARAMETERS			
Ku-Band G/T (EOB)*	dB/K	7.00	7.00
UPLINK (Ku-Band FEEDERLINK) C/N (Thermal)			
Uplink (Ku-band) EIRP	dBw	29.38	29.38
Propagation Losses	dB	-206.28	-206.28
Satellite Receive G/T	dB/°K	7.00	7.00
Boltzman Constant	dBW/K-Hz	-228.60	-228.60
C/No_Up	dB	58.70	58.70
UPLINK (Ku-Band) INTERFERENCE SUMMARY			
C/I (Adjacent Channel)	dB	27.00	27.00
C/I (Inter-Modulation)	dB	20.00	20.00
C/I (Crosspolarization)	dB	26.32	26.32
C/I (Adjacent System Interference)	dB	25.43	25.43
Equilivalent Noise Bandwidth	dBHz	60.90	60.90
C/Io_Up (Total)	dB	78.55	78.55

[34] The link budgets provided herein are identical to the link budgets that Boeing provided in Appendix A of its July 11, 2003 modification application and are reprinted herein for convenience.

Forward Link Budget			
Radio Interface		RC3	RC3
Modulation		cdma2000	cdma2000
Information Type		Voice	Voice
Rate	kbps	4.8	4.8
D/L S-Band EIRP/User	dBW	49.70	49.70
DOWNLINK (S-Band) PATH LOSSES			
D/L (S-Band) Propagation Losses	dB	-191.31	-191.31
USER EQUIPMENT RECEIVER PARAMETERS			
UT Effective G/T	dB/K	-28.00	-28.00
S-BAND DOWNLINK (MOBILE LINK) C/N (Thermal)			
Mobile Margin	dB	15.00	15.00
Downlink (S-Band) EIRP (per User)	dBw	49.70	49.70
Downlink (S-Band) Path Loss	dB	-191.31	-191.31
User Equipment effective G/T	dB/°K	-28.00	-28.00
Boltzman Constant	dBW/K-Hz	-228.60	-228.60
C/No_Down	dB Hz	43.99	43.99
DOWNLINK (S-Band) INTERFERENCE SUMMARY			
C/I (Inter-Modulation)	dB	20.00	20.00
C/I (Co-Channel inter-beam)	dB	4.70	4.70
C/I (Adjacent Channel Interference)	dB	13.00	13.00
Total C/I_Dn	dB	3.99	3.99
Equilivalent Noise Bandwidth	dBHz	60.90	60.90
C/Io_Dn	dB Hz	64.89	64.89
LINK SUMMARY			
Total C/No(Uplink Ku-Band Thermal)	dB Hz	58.70	58.70
Total C/No(Downlink S-Band Thermal)	dB Hz	43.99	43.99
Total C/Io(Uplink Ku-Band Interference)	dB Hz	78.55	78.55
Total C/Io(Downlink S-Band Interference)	dB Hz	64.89	64.89
Total C/(No+Io), for single avg. faded user	dB Hz	43.81	43.81
Received Eb/No (not including degradations)	dB	7.00	7.00
Required Eb/No (10E-3 BER, Voice)	dB	5.00	5.00
Link Margin	dB	2.00	2.00

Return Link Budget			
Radio Interface		RC3	RC3
Modulation		cdma2000	cdma2000
Information Type		Voice	Voice
Rate	kbps	4.8	4.8
Mobile margin (average fade power)	dB	12.5	12.5
System Information			
Satellite Orbit Position	deg W.L.	120	120
Gateway Location		Southwest	Mid Atlantic
Uplink (S-Band) Frequency	GHz	2.01	2.01
Downlink (Ku-Band) Frequency	GHz	11.45	11.45
Speech/Data Rate	kbps	4.8	4.8
Channel Data Rate	kbps	38.4	38.4
Type of modulation	Name	QPSK	QPSK
Equilivalent Noise Bandwidth	kHz	19.2	19.2
Chip Rate (CDMA)	Mcps	1.228	1.228
Spread BW (CDMA)	MHz	1.228	1.228
USER EQUIPMENT PARAMETERS			
UE Effective EIRP	dBW	-6.0	-6.0
UPLINK (S-Band) PATH LOSSES			
U/L Propagation Losses	dB	-190.54	-190.54
SATELLITE RECEIVE PARAMETERS			
Satellite (S-Band) G/T	dB/K	23.0	23.0
UPLINK (S-Band) C/No (Thermal)			
UE Uplink EIRP	dBw	-6.00	-6.00
Mobile Loss (Margin)	dB	-12.5	-12.5
Propagation Losses	dB	-190.5	-190.5
Satellite Receive G/T	dB/°K	23.0	23.0
Boltzman Constant	dBW/K-Hz	-228.6	-228.6
C/No_Up	dB Hz	42.56	42.56
UPLINK (S-Band) INTERFERENCE SUMMARY			
C/I (Adjacent Channel)	dB	-3.0	-3.0
C/I (Co-channel - Inter-beam only)	dB	-12.8	-12.8
C/I (Co-channel - Intra-beam only)	dB	-11.5	-11.5
Equilivalent Noise Bandwidth	dB-Hz	60.97	60.97
C/Io_Up (Total)	dB Hz	45.51	45.51

Return Link Budget			
Radio Interface		RC3	RC3
Modulation		cdma2000	cdma2000
Information Type		Voice	Voice
Rate	kbps	4.8	4.8
SATELLITE TRANSMITTER PARAMETERS			
Ku-Band EIRP/Channel	dBW	10.00	10.00
DOWNLINK (Ku-Band) PATH LOSSES			
D/L (Ku-Band) Path Losses	dB	-212.3	-214.8
GATEWAY EQUIPMENT RECEIVE PARAMETERS			
Gateway Equipment Ku-Band G/T	dB/K	33.8	33.8
DOWNLINK (FEEDER LINK) C/No (Thermal)			
Downlink (Ku-Band) EIRP (per channnel)	dBw	10.0	10.0
Downlink Path Loss	dB	-212.3	-214.8
Gateway Equipment Ku-Band G/T	dB/°K	33.8	33.8
Boltzman Constant	dBW/K-Hz	-228.60	-228.60
C/No_Down	dB Hz	60.11	57.6
DOWNLINK (Ku-Band) INTERFERENCE SUMMARY			
C/I (Co-Channel Interference)	dB	20.00	20.00
C/I (Adjacent Channel Interference)	dB	27.00	27.00
C/I (Cross-polarization Interference)	dB	27.92	27.92
C/I (Noise Interference)	dB	20.00	20.00
C/I (Adjacent System Interference)	dB	22.37	22.37
Equilivalent Noise Bandwidth	dBHz	60.90	60.90
C/Io_Dn	dB Hz	76.21	76.21
LINK SUMMARY			
Total C/No (Uplink S-band Thermal)	dB Hz	42.56	42.56
Total C/No (Downlink Ku-Band Thermal)	dB Hz	60.11	57.61
Total C/Io (Uplink S-Band Interference)	dB Hz	45.51	45.51
Total C/Io (Downlink Ku-band Interference)	dB Hz	76.21	76.21
Total C/(No+Io)	dB Hz	40.73	40.73
Received Eb/No (not including degradations)	dB	3.92	3.92
Required Eb/No	dB	3.90	3.90
Link Margin	dB	0.02	0.02

TT&C Links

No change

Appendix B. Appendix 30B Preliminary Interference Analysis

Boeing herein provides an updated preliminary interference analysis for its GSO satellite at the 120° W.L. orbital position for feederlink spectrum in each transmission direction in the Planned Ku-band (10.7-10.95 GHz, 11.2-11.45 GHz, and 12.75-13.25 GHz). This analysis is identical to the analysis that was provided by Boeing in Appendix B of its July 11, 2003 modification application and is provided herein for convenience. The analysis was performed over the full 500 MHz of the Planned Ku-band to assess feasibility of compatible operation with other Appendix 30B allotments over any portion of the Planned Ku-band.

Using input parameters from Table B.1 for the Boeing spot Ku-band feederlink beams,[35] Boeing performed an MSPACE analysis[36] based on an ITU Appendix 30B Ku-band reference database.[37] With the addition of the Boeing beam, some reference database beams experience minor degradation in carrier-to-interference ratios. Boeing believes satisfactory agreements can be obtained from affected administrations by resolving these minor interference situations with a number of interference mitigation techniques, such as judicious site selection and the use by Boeing of large feederlink antennas.

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[35] The spot beam is defined by one test point at the contour boresite and is displayed in Appendix C

[36] MSPACEg, version 2.11, ITU Radiocommunication Bureau, Sept. 2002.

[37] Appendix 30B Ku-band reference database is [ALOT14AE] made from inpRS31K.txt and inpRS31K.ref with EUTELSAT EXB-80.5W, EXB-83.5E, EXB-86E & EXB-88.5E sub-regional systems recorded in the List "WARC ORB 88 FSS Plan in the 13/10-11 GHz band," Appendix 30B [RS32K], http://www.itu.int/itu-r/space/plans/ap30b/index.html (April 3, 2003).

Table B.1 - Table of Assumed Values for Selected MSPACE Parameters in Appendix 30B FSS Plan Analysis

MSPACE Parameter	Parameter Value(s)
Orbital Longitude (Slot)	-120° (120° W.L.)
Western Service Arc	-122°
Eastern Service Arc	-117°
Western Predetermined Arc (PDA)	-122°
Eastern PDA	-117°
Sat Rx On-Axis Gain	40.1 dBi
Satellite Rx Noise Temp	832K
Sat Ant Pointing Error	0.1°
Sat Ant Rotational Error	1.0°
Sat E/W Stnkeep Error	0.10° (nominal)
Satellite Transmit Beam Boresites	Southwest Beam Mid Atlantic Beam 34.05N, 115.14W 39.06N, 77.56W
Satellite Receive Beam Boresites	Southwest Beam Mid Atlantic Beam 34.07N, 115.04W 39.04N, 77.81W
E/S Antenna Efficiency	65%
E/S Antenna Diameter	11 m
E/S Tx On-Axis Gain	61.7 dBi
E/S Tx Sidelobe Gain	27.0 dBi
E/S Tx Peak Input Pwr to Antenna (aggregate)	15.3 dBW
E/S Tx pwr density	-67.6 dBW/Hz
Uplink Frequency (threshold for high- density carriers)	13.00 GHz
Sat Tx On-Axis Gain	39.4 dBi
E/S Rx Noise Temp	435K
E/S Rx On-Axis Gain	60.2 dBi
E/S Rx Sidelobe Gain	27.0 dBi
Sat Tx Peak Input Pwr	15.6 dBW
Sat Tx pwr density	-66.9 dBW/Hz
Downlink Frequency (threshold for high- density carriers)	10.95 GHz
MSPACE test points (1 per beam)	Southwest Station Mid Atlantic Station 34.06N, 115.09W 39.05N, 77.69W

Appendix C. FeederLink Antenna Contours

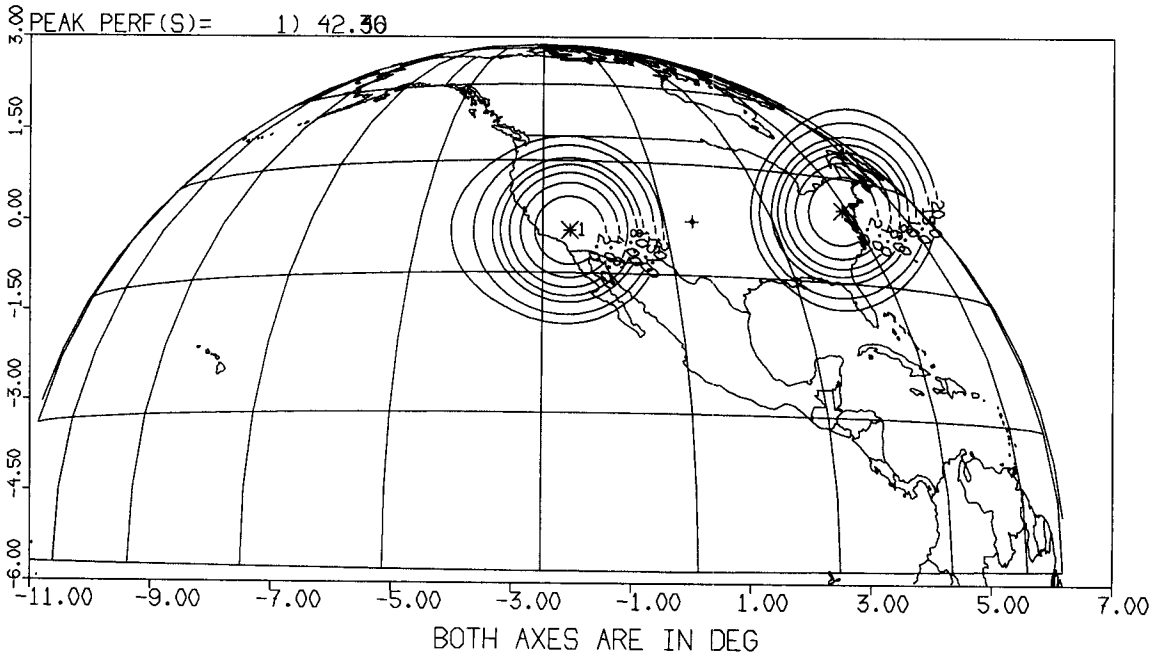


Figure 1 –Ku-band Feederlink Coverage

Appendix D. Appendix 30B Notice

In accordance with Section III of Article 6, Appendix 30B, Boeing herein provides Annex 2 information for its requested use as defined in paragraph 2.6 of Article 2, Appendix 30B. The following information is identical to the information that was provided by Boeing in Appendix D of its July 11, 2003 modification application and is provided herein for convenience.

Presently there is no established format for the Annex 2 information of Appendix 30B. Furthermore, ITU Space Capture software has no provisions to permit the electronic submission of Appendix 30B notices. The format below follows the order of Annex 2B to Appendix 4 of the ITU Radio Regulations, as revised according to Corrigendum 1 to Circular Letter CR/158.[38]

Table D.1 – Appendix 30B Notice Information (Annex 2B to ITU Appendix 4)

Item number	Item Description	Item Value	Comments
A.1	Identity of the satellite network or earth station	--	
A.1.a	Identity of the satellite network	USASATxx	
A.1.d	Country Allotment identification, or, for network not derived from the Allotment Plan, the identity of the satellite network	United States of America USASATxx	
A.1.f	Country symbol of the notifying administration	USA	
A.2.a	Date of bringing the frequency assignment into use	July 2007	

[38] Corrigendum 1 to Circular letter CR/158, "Required Appendix 4 data elements for the submission of information to the Radiocommunication Bureau under Appendices 30, 30A and 30B," ITU Radiocommunication Bureau, March 15, 2002.

A.4	Orbital information	--	
A.4.a.1	Nominal longitude on the geostationary-satellite orbit	120.0° W	
A.4.a.2	Planned longitudinal tolerance Planned inclination excursion	+/- 0.10° +/- 6°	
A.4.a.4	Service arc	122° W – 117° W	
A.5	Coordination: administrations with which coordination has been successfully completed or coordination is sought	None	
A.6	Agreements with other administrations	None	
A.18	Subregional system type, administrations, and allotments	Not applicable	

(FORWARD LINK) (Earth-to-space)

B	Characteristics to be provided for each satellite antenna beam or each earth station antenna	--	
B.1	Designation of satellite antenna beam; include steerable or reconfigurable designation as last character "R"	RG	
B.2	Transmission/reception indicator	R = reception	
B.3	Geostationary space station antenna characteristics	--	
B.3.d	Pointing accuracy of the antenna	0.1°	
B.3.g.1	Maximum co-polar gain (dBi)	40.1	
B.3.g.5	For beams of other than elliptical shape, co-polar gain contours at –2, -4, -6, -10, -20, and 10 dB intervals thereafter down to 0 dBi Beam aimpoint longitude and latitude For steerable beams, the maximum antenna gain and the effective antenna gain contours	Figure 1 115.04° W, 34.07° N 77.81° W, 39.04° N Not applicable	

(FORWARD LINK) (Earth-to-space)

C	Characteristics to be provided for each group of frequency assignments for a satellite antenna beam or an earth station antenna	--	Characteristics of groups of frequency assignments for beam R1.
C.1	Frequency range for each Earth-to-space or space-to-Earth service area	12.75-13.25 GHz	
C.5.a	Receiving system noise temperature (lowest - for a space station this is referred to the output of the receiving space station antenna)	Group 1: 832° K	

C.8	Power characteristics of the transmission	--	
C.8.j	Maximum power density (dBW/Hz) averaged over the necessary bandwidth supplied to the input to the antenna; Frequency below which signals whose peak-to-average ratio is less than 5 dB will be located; Maximum power density (dBW/Hz) averaged over the worst 4 kHz band, supplied to the antenna input.	Group 1: -67.6 Group 1: 13.00 GHz Group 1: -67.6	
C.10	Type and identity of the associated station(s). (This may be another space station, a typical earth station of the network or a specific earth station.)	Typical earth station Identity: TYPICAL-11M	
C.10.c.2	Maximum isotropic gain (dBi)	61.7	
C.10.c.3	Half-power beamwidth (deg)	0.12	
C.10.c.4	Reference radiation pattern	27 – 25LOG(FI)	
C.10.c.5	Lowest total rx system noise temperature, referred to the output of the rx antenna of the earth station under clear-sky conditions, when the associated station is a rx earth station.	Not applicable	This associated earth station is a transmitting earth station for beam R1.

(FORWARD LINK) (Earth-to-space)

C.11.b	Service area identified by a maximum of 20 test points and a service area contour or by a minimum elevation angle for transmitting space stations. Service area identified by a maximum of 20 test points and a service area contour or by a minimum elevation angle for receiving space stations.	Not applicable (34.1, -119.1) (39.1, -77.6); Service area is shown within the –3 dB contours of each beam in Figure 1.	Points given as (°N, °E)
C.12	Minimum required protection ratio, if less than 26 dB	Not applicable	

(RETURN LINK) (space-to-Earth)

B	Characteristics to be provided for each satellite antenna beam or each earth station antenna	--	
B.1	Designation of satellite antenna beam; include steerable or reconfigurable designation as last character "R"	T1	
B.2	Transmission/reception indicator	T = transmission	
B.3	Geostationary space station antenna characteristics	--	
B.3.d	Pointing accuracy of the antenna	0.1°	
B.3.g.1	Maximum co-polar gain (dBi)	39.4 dBi	
B.3.g.5	For beams of other than elliptical shape, co-polar gain contours at –2, -4, -6, -10, -20, and 10 dB intervals thereafter down to 0 dBi Beam aimpoint longitude and latitude For steerable beams, the max antenna gain and the effective antenna gain contours	Figure 1 119.1° W, 34.1° N 77.6° W, 39.1° N Not applicable	Nominal aimpoints; this is a shaped beam.

(RETURN LINK) (space-to-Earth)

C	Characteristics to be provided for each group of frequency assignments for a satellite antenna beam or an earth station antenna	--	Characteristics of groups of frequency assignments for beam T1.
C.1	Frequency range for each Earth-to-space or space-to-Earth service area	10.70-10.95 GHz 11.20-11.45 GHz	
C.5.a	Receiving system noise temperature (lowest - for a space station this is referred to the output of the receiving space station antenna)	Not applicable	Space station transmits in these bands

C.8	Power characteristics of the transmission	--	
C.8.j	Maximum power density (dBW/Hz) averaged over the necessary bandwidth supplied to the input to the antenna; Frequency below which signals whose peak-to-average ratio is less than 5 dB will be located; Maximum power density (dBW/Hz) averaged over the worst 4 kHz band, supplied to the antenna input.	Group 1: -66.9 Group 1: 10.95 GHz Group 1: -66.9	
C.10	Type and identity of the associated station(s). (This may be another space station, a typical earth station of the network or a specific earth station.)	Typical earth station Identity: TYPICAL-11M	
C.10.c.2	Maximum isotropic gain (dBi)	60.2 dBi	
C.10.c.3	Half-power beamwidth (deg)	0.14	
C.10.c.4	Reference radiation pattern	27 – 25LOG(FI)	
C.10.c.5	Lowest total rx system noise temperature, referred to the output of the rx antenna of the earth station under clear-sky conditions, when the associated station is a rx earth station.	Group 1: 435° K	

(RETURN LINK) (space-to-Earth)

C.11.b	Service area identified by a maximum of 20 test points and a service area contour or by a minimum elevation angle for transmitting space stations. Service area identified by a maximum of 20 test points and a service area contour or by a minimum elevation angle for receiving space stations.	(39.05, -119.14) (39.06, -77.56); Service area is shown within the –3 dB contour in Figure 1. Not applicable	Points given as (°N, °E)
C.12	Minimum required protection ratio, if less than 26 dB	Not applicable	

Annex A to Appendix D. Ku-Band Feederlink Coverage

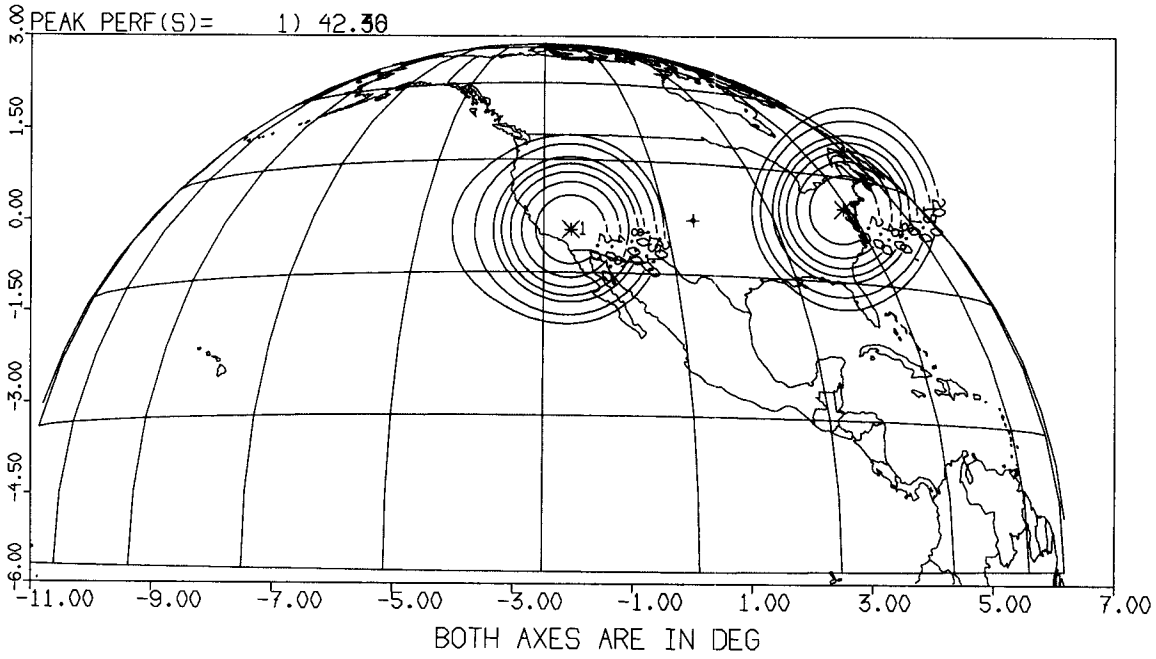
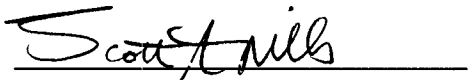


Figure 1 –Ku-Band Feederlink Coverage

CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING ENGINEERING INFORMATION SUBMITTED IN THIS AMENDMENT

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this Amendment, 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 Amendment, and that it is complete and accurate to the best of my knowledge.

By: 

Scott R. Mills
Boeing Satellite Systems
The Boeing Company

July 31, 2003