Approved by OMB
3060–0678

Date & Time Filed: Nov 18 2005 8:18:51:970PM
File Number: SAT–AMD–20051118–00248

FCC APPLICATION FOR SPACE AND EARTH STATION:MOD OR AMD – MAIN FORM FCC 312 MAIN FORM FOR OFFICIAL USE ONLY	FCC Use Only

APPLICANT INFORMATION
Enter a description of this application to identify it on the main menu:
Amendment to Incorporate an Orbital Debris Mitigation Plan into Modification of 113 W.L. Authorization

1–8. Legal Name of Applicant

Name:	EchoStar Satellite Operating Corporation	**Phone Number:**	303–723–1000
DBA Name:		**Fax Number:**	303–723–1699
Street:	9601 South Meridian Boulevard	**E–Mail:**	
City:	Englewood	**State:**	CO
Country:	USA	**Zipcode:**	80112 –
Attention:	David K Moskowitz		

SAT-AMD-20051118-00248 With attached Conditions
S2636 Grant Date 10/19/2006

See also File Nos.
SAT-MOD-20051007-00198
SAT-AMD-20060724-00081

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see SAT-LOA-20040803-00154

Robert G. Nelson Chief, Satellite Division

EchoStar Satellite Operating Corporation
Attachment - Conditions of Authorization
File Nos. SAT-MOD-20051007-00198, SAT-AMD-20051118-00248,
and SAT-AMD-20060724-00081
Call Sign: S2636

October 19, 2006

EchoStar Satellite Operating Corporation's (EchoStar) applications to modify its authorization to operate a Ka-band satellite, EchoStar-113, at 113° W.L., File No. SAT-MOD-20051007-00198, as amended by SAT-AMD-20051118-00248 and SAT-AMD-20060724-00081 are GRANTED, subject to the terms of its authorization in File No. SAT-LOA-20040803-00154, the technical specifications set forth in its applications, and the conditions set forth below.[1] Accordingly, EchoStar is authorized to operate telemetry, tracking, and command (TT&C) frequencies for its Ka-band satellite at 113° W.L. using 28.352 GHz and 28.598 GHz as the command frequencies, and 18.302 GHz and 18.798 GHz as the telemetry frequencies.

In addition, EchoStar's request for a waiver of section 25.202(g) of the Commission's rules is granted to allow EchoStar to operate TT&C launch and transfer orbit operations in the 13.752 GHz, 13.998 GHz, 11.452 GHz and 11.698 GHz frequency bands.[2] We find EchoStar has demonstrated good cause for a waiver in this instance.[3] First, as EchoStar states, there is no worldwide ground network in the Ka-band frequencies to support TT&C functions during launch and transfer orbit operations, while there is an extensive network of Ku-band frequencies. Further, EchoStar maintains that it will only use small amounts of spectrum for a very limited time during the launch and transfer orbit operations and will coordinate with other authorized users of the bands. EchoStar also states it will operate on a non-harmful interference basis. The International Bureau previously granted a waiver of section 25.202(g) to EchoStar for its Ka-band satellite at 117° W.L. based on similar facts.[4] The International Bureau has also previously granted the use of the 13.75-14.0 GHz frequency band for TT&C, both for launch and transfer orbit operations, and for on-station operations.[5] We anticipate, however, that as more Ka-band satellite systems with TT&C links located within band are authorized, the Ka-band TT&C earth station network will be sufficiently developed and thus there will be no need for operators to request waivers of section 25.202(g) for out-of-band transfer orbit TT&C operations.

1. Pursuant to footnote US337 of the U.S. Table of Allocations, 47 C.F.R. 2.106, any earth station in the United States and its possessions communicating with

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[1] EchoStar Satellite LLC, SAT-LOA-20040803-00154, grant stamped on October 8, 2004 with conditions.

[2] 47 C.F.R. § 25.202(g). Section 25.202(g) requires that TT&C functions for U.S.-licensed satellites be conducted at either or both ends of the allocated bands for the service.

[3] 47 C.F.R. § 1.3.

[4] *See* EchoStar Satellite LLC, Modification of License to Select TT&C Frequencies for its Ka-band Satellite at 117° W.L., *Order and Authorization*, 20 FCC Rcd 4281 (Int'l Bur. 2005).

[5] *See* EchoStar Satellite LLC, Application for Authority to Construct, Launch and Operate a Geostationary Satellite Using the Extended Ku-band Frequencies in the Fixed-Satellite Service at the 109° W.L. Orbital Location, *Order and Authorization,* 20 FCC Rcd 930 (Int'l Bur. 2004); EchoStar Satellite LLC, SAT-MOD-20050930-00195, grant stamped on December 21, 2005 with conditions

EchoStar-113 in the 13.75-14.0 GHz frequency band is required to coordinate with the National Telecommunications and Information Administration's (NTIA) Interdepartment Radio Advisory Committee's (IRAC) Frequency Assignment Subcommittee.[6]

2. Operations of any earth station in the United States and its possessions communicating with EchoStar-113 in the 13.75-14.0 GHz frequency band shall comply with footnotes US356 and US357 of the U.S. Table of Allocations which specify a minimum antenna diameter of 4.5 meters and a minimum equivalent isotropically radiated power (e.i.r.p.).[7] Operations of any earth station located outside the United States and its possessions communicating with EchoStar-113 in the 13.75-14.0 GHz frequency band shall be consistent with footnotes 5.502 and 5.503 to the International Telecommunication Union (ITU) Radio Regulations, which allow minimum antenna diameter as small as 1.2 meters for earth stations of a GSO network.[8]

3. The 11.452 GHz and 11.698 GHz frequency bands in which EchoStar proposes to operate are allocated to terrestrial services and to the fixed-satellite service (FSS) on a co-primary basis.[9] However, under footnote NG104 of section 2.106 and footnote 2 of section 25.202(a)(1) of our rules, FSS operations in these bands are limited to international service in order to limit the number of FSS earth stations with which the terrestrial wireless fixed-service would be required to coordinate.[10] Accordingly, a U.S.-licensed

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[6] Footnote US337 requires that earth stations operating in the 13.75-13.8 GHz band be coordinated through NTIA's IRAC Frequency Assignment Subcommittee to minimize interference to the forward space-to-space link of the National Aeronautics and Space Administration Tracking and Data Relay Satellite System. 47 C.F.R. § 2.106, US337.

[7] These footnotes place certain restrictions on FSS operations in order to protect government operations in the band, including manned space flight. Footnote US356 places a restriction on a minimum antenna size of 4.5 meters for earth stations operating in the 13.75-14.0 GHz band and indicates a minimum e.i.r.p. that should be used. Footnote US357 limits earth station e.i.r.p. spectral density in the 13.77-13.78 GHz band until those geostationary space stations in the space research service for which advance publication information was received by the ITU prior to January 31, 1992 cease to operate in this band. 47 C.F.R. § 2.106, Footnote US357.

[8] Footnote 5.502 to the ITU Radio Regulations establishes minimum antenna diameters for earth stations of geostationary and non-geostationary satellite networks, and places certain restrictions on either the minimum equivalent isotropically radiated power (e.i.r.p.) or the power flux density (p.f.d.) levels produced by earth stations operating in the 13.75-14.0 GHz band. Footnote 5.503 limits FSS earth station e.i.r.p. spectral density in the 13.770-13.780 GHz band for earth stations in the FSS operating with geostationary-orbit space stations, until those geostationary space stations in the space research service for which advance publication information was received by the ITU prior to January 31, 1992 cease to operate in this band.

[9] 47 C.F.R. § 2.106 and 25.202(a)(1). Allocation of a given frequency band to a particular service on a primary basis entitles operators to protection against harmful interference from stations of "secondary" services. Further, secondary services cannot claim protection from harmful interference caused by stations of a primary service. See 47 C.F.R. §§ 2.104(d) and 2.105(c).

[10] 47 C.F.R. § 2.106 footnote NG104 states "[t]he use of the bands 10.7- 11.7 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by the fixed-satellite service in the geostationary-satellite orbit shall be limited to international systems, i.e. other than domestic systems." 47 C.F.R. § 25.202(a)(1) footnote 2

satellite may provide downlink service into the United States and its Possessions in the 10.7 -11.7 GHz frequency band only if the uplink originates outside of the United States and its Possessions. Therefore, if EchoStar wants to use any of these frequencies to provide domestic service, including telemetry and tracking services for a U.S.-licensed satellite, an earth station license application or modification, including a request for waiver of NG104 and footnote 2 of Section 25.202(a)(1), must be filed for the earth station(s) which will access the EchoStar-113 satellite in this band.

4. EchoStar must file a modification to this authorization specifying the precise orbital location for the EchoStar-113 satellite.[11] EchoStar must file this modification within 60 days of this grant.

5. EchoStar has 30 days from the date of this grant to decline the authorization as conditioned. Failure to respond within this period will constitute formal acceptance of the authorization as conditioned.

6. This grant is issued pursuant to 47 C.F.R. § 0.261 of the Commission's rules on delegated authority and is effective upon adoption. Petitions for reconsideration or Applications for Review under the Commission's rules, 47 C.F.R. 1.106 and 1.115, may be filed within 30 days of the date of the public notice indicating this action was taken.

SAT-AMD-20051118-00248
with attached Conditions
See also File Nos.
Call Sign S2636 Grant Date 10/19/2006
SAT-MOD-20051007-00198
(or Other Identifier)
See SAT-LOA- Term Dates
SAT-AMD-20060724-00081
20040803-00154 To
Chief Satellite
Robert G. Nelson Division

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states "[u]se of this band by geostationary satellite orbit satellite systems in the fixed-satellite service is limited to international systems, i.e. other than domestic systems." *See also* Assignment of Orbital Location to Space Stations in the Domestic Fixed Satellite Service and the Application of GE American Communications, Inc., Order and Authorization, 15 FCC Rcd 3385 (Int'l Bur. 1999).

[11] Pursuant to 47 C.F.R. § 25.114(d)(14), EchoStar submitted an application specifying its orbital debris mitigation plans for the 113° W.L. orbital location. In its application, File No. SAT-AMD-20060724-00081, EchoStar states that the in-orbit Satmex-6 satellite operated by Satelites Mexicanos S.A. DE C.V. (Satmex) is the only satellite that will be operated at or close to the EchoStar-113 satellite. EchoStar asserts that it has reached an agreement in principle, with Satmex, that each will operate their respective satellites at an off set from the nominal 113° W.L. orbital location, but failed to specify the offset.

9–16. Name of Contact Representative

Name:	Pantelis Michalopoulos	**Phone Number:**	202–429–6494
Company:	Steptoe & Johnson LLP	**Fax Number:**	202–429–3902
Street:	1330 Connecticut Avenue, NW	**E–Mail:**	pmichalo@steptoe.com
City:	Washington	**State:**	DC
Country:	USA	**Zipcode:**	20036–1795
Attention:		**Relationship:**	Legal Counsel

CLASSIFICATION OF FILING

17. Choose the button next to the classification that applies to this filing for both questions a. and b. Choose only one for 17a and only one for 17b.

- ○ a1. Earth Station
- ◉ a2. Space Station

(N/A) b1. Application for License of New Station
(N/A) b2. Application for Registration of New Domestic Receive–Only Station
- ◉ (N/A) b3. Amendment to a Pending Application
- ○ (N/A) b4. Modification of License or Registration

b5. Assignment of License or Registration
b6. Transfer of Control of License or Registration
- ○ (N/A) b7. Notification of Minor Modification

(N/A) b8. Application for License of New Receive–Only Station Using Non–U.S. Licensed Satellite
(N/A) b9. Letter of Intent to Use Non–U.S. Licensed Satellite to Provide Service in the United States
- ○ (N/A) b10. Other (Please specify)

17c. Is a fee submitted with this application?

○ If Yes, complete and attach FCC Form 159. If No, indicate reason for fee exemption (see 47 C.F.R.Section 1.1114).

○ Governmental Entity ○ Noncommercial educational licensee

◉ Other(please explain): This amendment is made pursuant to the FCC's new orbital debris mitigation rules and does not require a fee per the FCC's Public Notice (DA 05-2698).

17d.

Fee Classification CWY – Space Station Amendment(Geostationary)

18. If this filing is in reference to an existing station, enter:	19. If this filing is an amendment to a pending application enter both fields, if this filing is a modification please enter only the file number:	
(a) Call sign of station: S2636	(a) Date pending application was filed:	(b) File number:
	10/07/2005	SATMOD2005100700198

TYPE OF SERVICE

20. NATURE OF SERVICE: This filing is for an authorization to provide or use the following type(s) of service(s): Select all that apply:

- [x] a. Fixed Satellite
- [ ] b. Mobile Satellite
- [ ] c. Radiodetermination Satellite
- [ ] d. Earth Exploration Satellite
- [x] e. Direct to Home Fixed Satellite
- [ ] f. Digital Audio Radio Service
- [ ] g. Other (please specify)

21. STATUS: Choose the button next to the applicable status. Choose only one.

○ Common Carrier ◉ Non–Common Carrier

22. If earth station applicant, check all that apply.

- [ ] Using U.S. licensed satellites
- [ ] Using Non–U.S. licensed satellites

23. If applicant is providng INTERNATIONAL COMMON CARRIER service, see instructions regarding Sec. 214 filings. Choose one. Are these facilities:

○ Connected to a Public Switched Network ○ Not connected to a Public Switched Network ◉ N/A

24. FREQUENCY BAND(S): Place an 'X' in the box(es) next to all applicable frequency band(s).

- [ ] a. C–Band (4/6 GHz)
- [ ] b. Ku–Band (12/14 GHz)
- [x] c.Other (Please specify upper and lower frequencies in MHz.)

Frequency Lower: 18300 Frequency Upper: 30000 (Please specify additional frequencies in an attachment)

TYPE OF STATION

25. CLASS OF STATION: Choose the button next to the class of station that applies. Choose only one.

- ○ a. Fixed Earth Station
- ○ b. Temporary–Fixed Earth Station
- ○ c. 12/14 GHz VSAT Network
- ○ d. Mobile Earth Station
- ◉ e. Geostationary Space Station
- ○ f. Non–Geostationary Space Station
- ○ g. Other (please specify)

26. TYPE OF EARTH STATION FACILITY:

○ Transmit/Receive ○ Transmit–Only ○ Receive–Only ◉ N/A

"For Space Station applications, select N/A."

PURPOSE OF MODIFICATION

27. The purpose of this proposed modification is to: (Place an 'X' in the box(es) next to all that apply.)

- ☐ a — authorization to add new emission designator and related service
- ☐ b — authorization to change emission designator and related service
- ☐ c — authorization to increase EIRP and EIRP density
- ☐ d — authorization to replace antenna
- ☐ e — authorization to add antenna
- ☐ f — authorization to relocate fixed station
- ☐ g — authorization to change frequency(ies)
- ☐ h — authorization to add frequency
- ☐ i — authorization to add Points of Communication (satellites & countries)
- ☐ j — authorization to change Points of Communication (satellites & countries)
- ☐ k — authorization for facilities for which environmental assessment and radiation hazard reporting is required
- ☐ l — authorization to change orbit location
- ☐ m — authorization to perform fleet management
- ☐ n — authorization to extend milestones
- ☒ o — Other (Please specify)

ENVIRONMENTAL POLICY

28. Would a Commission grant of any proposal in this application or amendment have a significant environmental impact as defined by 47 CFR 1.1307? If YES, submit the statement as required by Sections 1.1308 and 1.1311 of the Commission's rules, 47 C.F.R. 1.1308 and 1.1311, as an exhibit to this application. A Radiation Hazard Study must accompany all applications for new transmitting facilities, major modifications, or major amendments.	○ Yes ◉ No

ALIEN OWNERSHIP Earth station applicants not proposing to provide broadcast, common carrier, aeronautical en route or aeronautical fixed radio station services are not required to respond to Items 30–34.

29. Is the applicant a foreign government or the representative of any foreign government?	○ Yes ◉ No
30. Is the applicant an alien or the representative of an alien?	○ Yes ◉ No ○ N/A
31. Is the applicant a corporation organized under the laws of any foreign government?	○ Yes ◉ No ○ N/A
32. Is the applicant a corporation of which more than one–fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	○ Yes ◉ No ○ N/A

33. Is the applicant a corporation directly or indirectly controlled by any other corporation of which more than one–fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	○ Yes ◉ No ○ N/A
34. If any answer to questions 29, 30, 31, 32 and/or 33 is Yes, attach as an exhibit an identification of the aliens or foreign entities, their nationality, their relationship to the applicant, and the percentage of stock they own or vote.	

BASIC QUALIFICATIONS

35. Does the Applicant request any waivers or exemptions from any of the Commission's Rules? If Yes, attach as an exhibit, copies of the requests for waivers or exceptions with supporting documents.	○ Yes ◉ No
36. Has the applicant or any party to this application or amendment had any FCC station authorization or license revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission? If Yes, attach as an exhibit, an explination of circumstances.	◉ Yes ○ No Question 36

37. Has the applicant, or any party to this application or amendment, or any party directly or indirectly controlling the applicant ever been convicted of a felony by any state or federal court? If Yes, attach as an exhibit, an explination of circumstances.	○ Yes	◉ No
38. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the applicant, guilty of unlawfully monopolizing or attemptiing unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement or any other means or unfair methods of competition?If Yes, attach as an exhibit, an explanation of circumstances	○ Yes	◉ No
39. Is the applicant, or any person directly or indirectly controlling the applicant, currently a party in any pending matter referred to in the preceding two items? If yes, attach as an exhinit, an explanation of the circumstances.	○ Yes	◉ No
40. If the applicant is a corporation and is applying for a space station license, attach as an exhibit the names, address, and citizenship of those stockholders owning a record and/or voting 10 percent or more of the Filer's voting stock and the percentages so held. In the case of fiduciary control, indicate the beneficiary(ies) or class of beneficiaries. Also list the names and addresses of the officers and directors of the Filer.	Q40	

41. By checking Yes, the undersigned certifies, that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes.	◉ Yes ○ No
42a. Does the applicant intend to use a non-U.S. licensed satellite to provide service in the United States? If Yes, answer 42b and attach an exhibit providing the information specified in 47 C.F.R. 25.137, as appropriate. If No, proceed to question 43.	○ Yes ◉ No
42b. What administration has licensed or is in the process of licensing the space station? If no license will be issued, what administration has coordinated or is in the process of coordinating the space station?	

43. Description. (Summarize the nature of the application and the services to be provided). (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.)

EchoStar Satellite Operating Corporation amends its Application for Modification of its 113 W.L. authorization to include an updated orbital debris mitigation plan pursuant to the Commission's Public Notice of October 13, 2005. All other information contained in the Modification remains materially unchanged.

ODM

CERTIFICATION

The Applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application. The applicant certifies that grant of this application would not cause the applicant to be in violation of the spectrum aggregation limit in 47 CFR Part 20. All statements made in exhibits are a material part hereof and are incorporated herein as if set out in full in this application. The undersigned, individually and for the applicant, hereby certifies that all statements made in this application and in all attached exhibits are true, complete and correct to the best of his or her knowledge and belief, and are made in good faith.

44. Applicant is a (an): (Choose the button next to applicable response.)

- ○ Individual
- ○ Unincorporated Association
- ○ Partnership
- ◉ Corporation
- ○ Governmental Entity
- ○ Other (please specify)

45. Name of Person Signing	46. Title of Person Signing
David K. Moskowitz	Executive Vice President and General Counsel

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WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).

FCC NOTICE REQUIRED BY THE PAPERWORK REDUCTION ACT

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THE FOREGOING NOTICE IS REQUIRED BY THE PAPERWORK REDUCTION ACT OF 1995, PUBLIC LAW 104–13, OCTOBER 1, 1995, 44 U.S.C. SECTION 3507.

Orbital Debris Mitigation Plan for the EchoStar Satellite Licensed to be Located at 113° W.L.

EchoStar Satellite Operating Corporation ("EchoStar") has filed a request for modification of its authorization to operate a satellite at 113° W.L. ("EchoStar Satellite").[1] Pursuant to Section 25.114(d)(14) of the Commission's rules,[2] the Commission's Second Report and Order in IB Docket No. 02-54,[3] the Commission's Public Notice published on October 13, 2005, and the e-mail sent to Mr. Pantelis Michalopoulos by Ms. CurTisha Banks of the Commission on November 8, 2005, EchoStar requests that the Commission incorporate this orbital debris mitigation plan into EchoStar's pending modification request.

EchoStar has not yet completed the design for the EchoStar Satellite. EchoStar has a contract in place for the construction of the satellite. Under its license, the design of the satellite is due to be completed by the Critical Design Review ("CDR") milestone of October 8, 2006. Specifically, the Statement of Work associated with the satellite manufacturing contract includes provisions to review orbital debris mitigation as part of preliminary design review ("PDR") and CDR, including a formal Failure Modes and Effects Criticality Analysis ("FMECA"). The information herein, therefore, is based on statements and assurances from the satellite manufacturer.

I. SPACECRAFT HARDWARE DESIGN

EchoStar can confirm that the satellite will not undergo any planned release of debris during its operation. Furthermore, all separation and deployment mechanisms, and any other potential source of debris will be retained by the spacecraft or launch vehicle.

In conjunction with Space Systems/Loral, EchoStar has assessed and limited the probability of the satellite becoming a source of debris by collisions with small debris or meteoroids of less than one centimeter in diameter that could cause loss of control and prevent post-mission disposal. EchoStar has taken steps to limit the effects of such collisions through shielding, the placement of components, and the use of redundant systems.

The EchoStar Satellite will include separate TT&C and propulsion subsystems that are necessary for end-of-life disposal. The spacecraft TT&C system, vital for orbit raising, will be extremely rugged with regard to meteoroids smaller than 1 cm, by virtue of its redundancy, shielding, separation of components and physical characteristics. Omni-directional antennas are mounted on opposite sides of the spacecraft. These antennas, each providing

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[1] EchoStar Satellite Operating Corp., Application for Modification of License to Select TT&C Frequencies for its Ka-band GSO Satellite at 113° W.L., File No. SAT-MOD-20051007-00198 (filed Oct. 7, 2005).

[2] 25 C.F.R. §25.114(d)(14).

[3] *Mitigation of Orbital Debris*, Second Report and Order, 19 FCC Rcd 11567 (2004) ("Second Report and Order").

greater than hemispherical coverage patterns, are extremely rugged and capable of providing adequate coverage even if struck, bent or otherwise damaged by a small or medium sized particle. Either omni-directional antenna, for either command or telemetry, will be sufficient to enable orbit raising. The command receivers and decoders and telemetry encoders and transmitters will be located within a shielded area and will be totally redundant and physically separated. A single rugged thruster and shielded propellant tank provide the energy for orbit raising. Otherwise, there are no single points of failure in the system.

EchoStar will continue to review these aspects of on-orbit operations with the spacecraft manufacturer and will make such adjustments and improvements as appropriate to assure that its spacecraft will not become sources of debris during operations or become derelicts in space due to a collision with a small or large object.

II. MINIMIZING ACCIDENTAL EXPLOSIONS

In conjunction with Space Systems/Loral, EchoStar has assessed and will limit the probability of accidental explosions during and after completion of mission operations. The satellite manufacturer has taken steps to ensure that debris generation will not result from the conversion of energy sources on board the satellite into energy that fragments the satellite. In particular, the satellite manufacturer advises that burst tests are performed on all pressure vessels during qualification testing to demonstrate a margin of safety against burst. Bipropellant mixing is prevented by the use of valves that prevent backwards flow in propellant lines and pressurization lines. Pyrotechnics are nominally used in the mission only as part of the initial deployment process. After orbit raising to the disposal orbit, all unfired pyrotechnics will be fired as part of the final satellite decommission. All batteries and fuel tanks are monitored for pressure and temperature. Excessive battery charging or discharging is limited by a monitoring and control system which will automatically limit the possibility of fragmentation. Corrective action, if not automatically undertaken, will be immediately undertaken by the spacecraft operator to avoid destruction and fragmentation. Thruster temperatures, impulse and thrust duration are carefully monitored, and any thruster may be turned off via redundant valves. Consequently, there is no possibility of explosion during the operating mission. Space Systems/Loral also will conduct an FMECA as part of the design process.

At the end of the satellite's life, all traveling wave tube amplifier ("TWTA"s) will be outgassed, and all residual fuel will be consumed. All fuel latch valves will be placed in an "open" position, and any pressurized system will be vented. Spacecraft battery trickle charge and all automatic battery charging sequences will be disabled.

III. SAFE FLIGHT PROFILES

EchoStar has reviewed the lists of FCC licensed satellite networks, as well as those that are currently under consideration by the FCC. In addition, non-USA networks for which a request for coordination has been submitted to the ITU in the vicinity of 113° W.L., have also been reviewed. For purposes of calculating potential station-keeping volume overlap, U.S. satellites have been assumed to have a maximum east-west excursion of ±0.05° from their nominal location, while non-U.S. satellite networks have been assumed to have a maximum excursion of ±0.1° from their nominal location.

Based on this review, there are two operational satellites within ±0.2° of 113° W.L. These are the GOES 11 satellite operated by the National Oceanic & Atmospheric Administration (NOAA) at 113° W.L. and the Solidaridad 2 satellite operated by SatMex at 113° W.L. Once the launch vehicle manufacturer is selected for the EchoStar Satellite and a launch plan, launch vehicle and launch scenario are developed, EchoStar will engage in physical coordination with NOAA and SatMex, and any satellite operator that has launched a satellite at, or near, 113° W.L. EchoStar also will select one of the established launch agencies with a proven record of safe flight planning, taking care to minimize the possibilities of any collision. The launch contractor will be responsible for collision avoidance maneuvers and launch analysis of in-flight profile planning.

Currently, no launches are expected to inject satellites close to 113° W.L. other than those discussed above. Prior to launch of the EchoStar Satellite, EchoStar will continue to monitor Commission and ITU resources to identify satellites that reasonably can be expected to operate at 113° W.L. +/- 0.2°.

IV. POST-MISSION DISPOSAL

Upon mission completion, EchoStar will maneuver the EchoStar Satellite to a disposal orbit with a minimum perigee of 350 km above the normal GSO operational orbit. This proposed disposal orbit altitude is well above the IADC formula, as required in 47 C.F.R. §25.283 and the Commission's Second Report and Order:[4]

- Solar array area = 60 m^2
- Satellite body area (oriented for max antenna exposure) = 4 m^2
- Ku-band antenna area = 21 m^2
- Total Solar Pressure Area "A" = 85 m^2

- Area-to-mass Ratio ("A/M") = 0.031 m^2/kg
- Solar Pressure Radiation Coefficient (worst case) ("C_R") = 2

Therefore the Minimum Disposal Orbit Perigee Altitude will be equal to

= 36,021 km + 1000 x C_R x A/M
= 36,021 km + 1000 x 2 x 0.031 m^2/kg
= 36,083.2 km
= 297 km above GSO

Approximately 10 kg of propellant will be allocated and reserved for the final orbit raising maneuvers. EchoStar used two methods to calculate this amount. First, it applied the pressure-volume-temperature method, which uses the tank pressure and temperature information to determine remaining propellant. Second, it applied the bookkeeping method, which evaluates the flow rate at average pressure and total thruster on-time of orbital maneuvers to determine the amount of propellant used. EchoStar has assessed fuel gauging uncertainty and has provided an adequate margin of fuel to address such uncertainty.

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[4] Second Report and Order at ¶ 68.