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

In the Matter of Application of	)	File Nos. 183/184/185/186-SAT-P/LA-97;
	)	182-SAT-P/LA-97(64)
Globalstar, L.P.	)	
	)	IBFS Nos. SAT-LOA-19970926-00151/52/53/54
For Authority to Launch and Operate a Mobile-	)	SAT-LOA-19970926-00156;
Satellite Service System in the 2 GHz Band	)	SAT-AMD-20001103-00154

ORDER AND AUTHORIZATION

Adopted: July 17, 2001 **Released:** July 17, 2001

By the Chief, International Bureau and the Acting Chief, Office of Engineering and Technology:

I. INTRODUCTION

1. By this *Order*, we authorize Globalstar, L.P. (Globalstar) to use spectrum in the 2 GHz band to provide Mobile-Satellite Service (MSS) from non-geostationary satellite orbit (NGSO) and geostationary satellite orbit (GSO) satellites.[1] We authorize Globalstar to use the 15.43-15.63 GHz band for NGSO feeder uplinks and the 6700-6800 MHz band for NGSO feeder downlinks.[2] However, we deny Globalstar's request to operate MSS feeder links in the 14.0-14.5 GHz and 11.7-12.2 GHz band from GSO satellites located at 10º East Longitude (E.L.), 100º E.L. and 170º West Longitude (W.L.). In addition, we deny Globalstar's request to operate MSS feeder links in the 14.0-14.5 GHz and 11.7-12.2 GHz bands from a GSO satellite at the 101º W.L. orbit location. We also deny in part and defer in part Globalstar's alternative request to operate MSS feeder links in the 12.75-13.25 GHz band and either the 11.2-11.45 GHz or 10.7-10.95 GHz bands from a GSO satellite at the 101º W.L. orbit location. The authorizations issued in this *Order* represent a significant step in assigning this spectrum for use by MSS providers, and will facilitate implementation of Globalstar's proposed system's technology and service offerings in the marketplace.

[1] The term "2 GHz MSS Band" is used in this *Order* to refer to the 1990-2025 MHz (uplink) and 2165-2200 MHz (downlink) frequencies. These frequencies are allocated to the Mobile-Satellite Service (MSS) in the United States. *See Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service*, ET Docket No. 95-18, First Report and Order and Further Notice of Proposed Rule Making, 12 FCC Rcd 7388 (1997), *aff'd on recon.*, Memorandum Opinion and Order and Third Notice of Proposed Rule Making and Order, 13 FCC Rcd 23949 (1998), *further proceedings*, Second Report And Order and Second Memorandum Opinion and Order, 15 FCC Rcd 12315 (2000) (*2 GHz Allocation & Relocation Proceeding*).

[2] In this *Order*, we refer to the 11.7-12.2 GHz and 14.0-14.5 GHz bands as the "Ku-band."

II. BACKGROUND

2. Globalstar proposes to construct a satellite system, known as GS-2, comprised of both GSO and NGSO satellites, to provide MSS using service links[3] in the 2 GHz band and feeder links[4] in the Ku-band, the Ka-band[5] and/or other bands.[6] Globalstar proposes to use the 1990-2025 MHz and 2165-2200 MHz bands to serve customers in the United States and, where permitted, the 1980-2025 MHz and 2160-2200 MHz bands to serve customers outside the United States.[7] The GS-2's GSO segment includes four satellites spaced across the geostationary satellite orbital arc that rely on inter-satellite service (ISS) links to communicate with each other and with the NGSO satellites below them. Globalstar proposes to position the GS-2's GSO satellites at 10° E.L., 100° E.L., 170° W.L. and 101° W.L. For the GSO component of its system, Globalstar requests 250 megahertz in each direction for feeder link spectrum in the Ku-band.[8] Globalstar also requests access to 100 megahertz of ISS spectrum in either the 59-64 GHz band or, alternatively, the 65-71 GHz band, for communications among the various satellites in its system. Finally, Globalstar proposes to use a combination of access schemes, including code-division multiple access (CDMA), time-division multiple access (TDMA) and frequency-division multiple access (FDMA), for voice and data applications in the system's forward and return links.[9]

3. The proposed configuration of the GS-2's NGSO segment envisions sixty-four NGSO satellites in eight orbital planes inclined at 54 degrees.[10] These NGSO satellites would operate at an altitude of approximately 1420 kilometers with an orbital period of slightly more than 114 minutes. For this NGSO component of its system, Globalstar requests authority to use 200 megahertz for feeder uplinks in the 15.43-15.63 GHz or 19.3-19.7 GHz bands and authority to use 100 megahertz for feeder

[3] "Service links" are the radio links that transmit a user's messages in both directions between a user's earth terminal and the system's satellite(s).

[4] "Feeder links" are the radio links that transmit a user's messages in both directions between the system's satellite(s) and its gateway earth station(s) that connect the MSS network with the public switched telephone network.

[5] In this *Order*, we refer to the 19.3-19.7 GHz and 29.1-29.5 GHz bands as the "Ka-band."

[6] Application of Globalstar, L.P., File Nos. 183/184/185/186-SAT-P/LA-97 and 182-SAT-P/LA-97(64); IBFS File Nos. SAT-LOA-19970926-00151/52/53/54, SAT-LOA-19970926-00156 (September 26, 1997) (Globalstar Application).

[7] Globalstar Application at i, 11, 31. The Members of the International Telecommunication Union (ITU) have divided the world into three Regions. Generally, Region 1 includes Africa, Europe, Northern and Western portions of Asia; Region 2 includes the Americas and Greenland; and Region 3 includes Southern portions of Asia, Australia and the South Pacific. *See* ITU Radio Regulations Article S5, Section I. Under ITU Radio Regulations, the 1980-2010 MHz and 2170-2200 MHz bands are allocated to MSS worldwide. *Id*. Article S5, Section IV. Region 2 allocations, however, vary slightly from those of the other regions. In Region 2, the 1980-1990 MHz band does not become available for MSS until January 1, 2005. *Id*. S5.389A. In addition, the 2010-2025 MHz and the 2160-2170 MHz bands, which the ITU already has identified for MSS use in Canada and the United States, will become available for MSS in the rest of Region 2 on January 1, 2002. *Id*. S5.389C, S5.389D.

[8] The portion of the Ku-band spectrum that Globalstar hopes to use for its GSO feeder links is allocated to the Fixed-Satellite Service (FSS) in the United States; however, the Commission regards feeder-link transmissions as a type of FSS.

[9] Globalstar Application at 6 & Appendix G at G-2 – G-9. Globalstar does not specify how it will segment or combine its proposed TDMA, FDMA and CDMA access schemes.

[10] Globalstar Application at 7-8.

downlinks in the 6700-6875 MHz band.[11] As in its GSO component, Globalstar proposes to use a variety of access schemes for its 2 GHz service links, including CDMA, FDMA and TDMA.[12] Another proposed configuration of the GS-2's NGSO segment would use the same bands and access schemes, but place the newly authorized 2 GHz MSS capacity aboard replacement satellites for a constellation of low-Earth orbit (LEO) satellites that we first authorized in 1995.[13]

4. Globalstar filed its 2 GHz MSS application on September 26, 1997.[14] Various parties filed comments on Globalstar's application and two parties, Boeing and GE Americom, filed petitions to deny or defer Globalstar's application.[15] Among other things, the petitioners objected to Globalstar's financial qualifications, its feeder link frequency selections, its choice of coding techniques and its use of both GSO and NGSO satellites.[16] The Commission subsequently adopted service rules for 2 GHz MSS systems.[17] Globalstar amended its request to address the requirements adopted in the *2 GHz MSS Order*.[18] In its amendment, Globalstar changed its request for an orbit location at 80° W.L. to 101° W.L.,[19] provided more information about its proposed feeder links, amended its request for ISS frequencies, provided the Commission with an orbital debris mitigation statement and requested authority to test its satellites in space before placing the satellites in their authorized orbital planes and orbit locations.[20] In response to a public notice,[21] several parties filed comments on Globalstar's amendment and three parties, GE Americom, Motient Services Inc. (Motient) and PanAmSat Corporation (PanAmSat), filed petitions to deny Globalstar's application.[22] Among other things, the petitioners

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[11] *See* Amendment of Globalstar L.P., File No. SAT-AMD-20001103-00154 (November 3, 2000) (Globalstar Amendment) (requesting uplink spectrum "in Ku- or Ka-band"). After Globalstar filed its initial application, the 1997 World Radiocommunication Conference (WRC-97) refined several NGSO MSS feeder uplink allocations by changing the 15.4-15.7 GHz band allocation to 15.43-15.63 GHz and by changing the 19.3-19.6 GHz band allocation to 19.3-19.7 GHz. *See* Final Acts of the 1997 World Radiocommunication Conference, Geneva (1997). Globalstar recognized that WRC-97 might change the NGSO MSS feeder uplink allocations and indicated its willingness to operate in either of the modified feeder uplink spectrum bands. *See* Globalstar Application at 12 n.9; Globalstar Amendment at 7-8. *Cf.* Globalstar Application at i (requesting uplink spectrum in the prior Ku-band of 15.45-15.65 or in the prior Ka-band allocation of 19.3-19.6 GHz). Therefore, we treat Globalstar's request for spectrum in either the generic "Ku- or Ka-band" as a request for feeder uplink spectrum in the 15.43-15.63 or the 19.3-19.7 GHz bands.

[12] Globalstar Application at 6 & Appendix C at C-1 – C-8. As with the GSO component, Globalstar does not specify how it will segment or combine its proposed TDMA, FDMA and CDMA access schemes.

[13] *See* Globalstar Application at 46-52, referring to *Loral/Qualcomm Partnership, L.P.*, Order and Authorization, 10 FCC Rcd 2333, *erratum*, 10 FCC Rcd 3926 (Int'l Bur. 1995) (*Globalstar Big LEO License*).

[14] Globalstar Application at i.

[15] For a list of pleadings submitted in response to Globalstar's application, *see* Appendix A.

[16] *See, e.g.*, Boeing Petition at 9; GE Americom First Petition at 6-8; PanAmSat Comments at 1-2.

[17] *Establishment of Policies and Service Rules for the Mobile-Satellite Service in the 2 GHz Band*, IB Docket No. 99-81, Report and Order, 15 FCC Rcd 16127 (2000) (*2 GHz MSS Order*).

[18] Globalstar Amendment, footnote 11, *supra*.

[19] *See* Globalstar Amendment at 3.

[20] *See id.* at 4-11.

[21] *See* Public Notice, Report No. SAT-00061 (rel. November 29, 2000) (*2 GHz MSS Amendment PN*).

[22] For a list of parties filing comments or petitions on Globalstar's amended application, *see* Appendix A.

opposed Globalstar's proposal to use Ku-band feeder links at the 101° W.L. orbit location. Globalstar replied to these objections.[23]

III. DISCUSSION

5. Under rules adopted in the Commission's *2 GHz MSS Order*, Globalstar must demonstrate that its system meets certain technical requirements. We address these requirements first. We then turn to Globalstar's request for 2 GHz band service links, Ku-band feeder links and its requests for GSO orbit locations. We also address Globalstar's request for non-common carrier status, Globalstar's implementation milestones, Globalstar's orbital debris mitigation showings and other issues raised concerning Globalstar's proposed service.

A. Threshold Technical Requirements

1. Frequency Agility

6. Under the Commission's service rules and policies, 2 GHz MSS systems must be capable of operating across at least seventy percent of the United States' 2 GHz MSS allocation in the 1990-2025 MHz and 2165-2200 MHz bands.[24] The Commission also requires that 2 GHz MSS systems be capable of operating without fixed frequency translations between the uplink and downlink frequencies.[25] Globalstar's proposed 2 GHz MSS system meets these requirements.[26]

2. Coverage Requirements

7. The *2 GHz MSS Order* concluded that hybrid NGSO/GSO systems, such as Globalstar's system, must meet the same coverage requirements established for other satellite systems.[27] Thus, the NGSO portion of a hybrid system must comply with the NGSO 2 GHz MSS system coverage requirements and the GSO portion must comply with the GSO 2 GHz MSS system coverage requirements.[28]

a. NGSO Coverage Requirements

8. Section 25.143(b)(2) of the Commission's rules requires NGSO 2 GHz MSS systems to be capable of providing continuous coverage throughout all 50 states, Puerto Rico and U.S. Virgin Islands by ensuring that at least one satellite is visible at an elevation angle of at least five degrees within this geographic area at all times.[29] In addition, at locations as far north as 70 degrees North Latitude and as far south as 55 degrees South Latitude, NGSO MSS systems must operate such that at least one

[23] *See generally* Globalstar Second Reply.

[24] *2 GHz MSS Order*, 15 FCC Rcd at 16152 ¶ 52.

[25] *Id.* at ¶ 53.

[26] Globalstar Amendment at 2.

[27] *Id.* at 16154 ¶ 60.

[28] *Id.*

[29] 47 C.F.R. § 25.143(b)(2)(iii).

satellite is visible at an elevation angle of at least five degrees for eighteen hours of every day.[30] The NGSO segment of Globalstar's proposed system meets these requirements.[31]

b. GSO Coverage Requirements

9. Section 25.143(b)(2) of the Commission's rules requires GSO 2 GHz MSS systems to be capable of providing continuous coverage throughout all 50 states, Puerto Rico and U.S. Virgin Islands, if technically feasible.[32] Globalstar's proposal to locate a GSO satellite at 101º W.L. would satisfy this requirement, if granted.[33]

3. Configuration of NGSO Component

10. Globalstar has proposed two alternative configurations for the NGSO component of its 2 GHz MSS system. Under one alternative, Globalstar would consolidate the newly authorized 2 GHz MSS capacity with its constellation of Big LEO satellites that we first authorized in 1995. This would be accomplished by constructing satellites with communications capabilities in both the 2 GHz MSS and Big LEO frequency bands.[34] We are denying this request, because it does not appear capable of effectuation consistent with the requirements of the Commission's rules. Section 25.121 specifies the time frame in which Big LEO licensees may file satellite system replacement applications.[35] In Globalstar's case, its replacement application could be filed no earlier than November 2004.[36] In addition, under milestone requirements, Globalstar must complete construction and launch the first two satellites in the NGSO component of its 2 GHz MSS system no later than January 2005.[37] Even assuming that Globalstar's replacement application could be processed during the less than three month period between mid-November 2004 and January 2005, it would not appear that Globalstar could reasonably meet the July 2003 Critical Design Review milestone for its system, because an authorization critical for implementation of its proposal cannot be requested until almost a year and a half later. Thus, Globalstar's alternative proposal to consolidate 2 GHz MSS and Big LEO communications capabilities on a single satellite would not appear to be capable of effectuation consistent with the milestone requirements for this processing round.

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[30] 47 C.F.R. § 25.143(b)(2)(ii).

[31] Globalstar Amendment at 4-5.

[32] 47 C.F.R. § 25.143(b)(2)(iv).

[33] *See* Section III.C.2., *infra*.

[34] *See* Globalstar Application at 46-52.

[35] *See* 47 C.F.R. § 25.121 (providing that "applications for space station system replacement authorization for non-geostationary orbit satellites shall be filed no earlier than 90 days and no later than 30 days, prior to the end of the seventh year of the existing license term").

[36] *Id. See also* Letter from Charles Windett, Manager, Regulatory Engineering, Globalstar L.P. to Thomas Tycz, Chief, Satellite & Radiocommunication Division, FCC (September 3, 1999) (reporting that implementation of Globalstar's Big LEO system occurred on February 14, 1998); 47 C.F.R. § 25.121(d)(2) (commencing license term upon certification that the initial NGSO space station has been successfully placed into orbit and conforms to its authorization).

[37] *See* Section III.F., *infra*.

B. Service-Link Spectrum

11. The *2 GHz MSS Order* adopted a hybrid band arrangement that divided the 2 GHz MSS uplink (1990-2025 MHz) and downlink (2165-2200 MHz) bands into segments of equal bandwidth based on the number of systems seeking assignments.[38] The Commission determined that providing 3.5 megahertz in each direction for the nine then-pending system proponents would be sufficient to commence operations.[39] The Commission provided that, in the event not all system proponents proceed toward authorization, the remaining system proponents would receive more than 3.5 megahertz of spectrum in each direction upon authorization.[40] In addition, the Commission reserved one additional spectrum segment in each direction for expansion of system(s) by operator(s) meeting certain criteria for service to unserved areas.[41] The following formula expresses the amount of spectrum available for each system in each direction of transmission:

35 megahertz ÷ (Number of System Proponents + One) = Size of Each Spectrum Segment[42]

There are currently eight 2 GHz MSS system proponents participating in this processing round.[43] We will not at this time, however, implement that portion of the Commission's *2 GHz MSS Order* that would give each system proponent access to more than 3.5 megahertz of spectrum in each direction on a primary basis. Subsequent to release of the *2 GHz MSS Order*, the Commission has received new proposals for use of the 2 GHz MSS bands.[44] Delaying the designation of additional spectrum will give the Commission the opportunity to consider these proposals. Therefore, in this *Order*, Globalstar will receive access to a spectrum segment of 3.5 megahertz, in each direction of transmission, on a primary basis, *i.e.*, a "Selected Assignment" for all proposed satellites.[45] Globalstar will choose its Selected Assignment such that the band edge of the assignment is an integer multiple of 3.88 megahertz from the band edge of the 2 GHz MSS band, which will allow the Commission to address the proposals before it.

12. Globalstar must identify the specific frequencies of its Selected Assignment when the first satellite in its system reaches its intended orbit, and notify the Commission in writing of its selection.[46] Consistent with the *2 GHz MSS Order*, Globalstar may also elect to operate outside its Selected

[38] *2 GHz MSS Order*, 15 FCC Rcd at 16138 ¶ 16.

[39] *Id.* at 16139 ¶ 17.

[40] *Id.*

[41] *Id.* at 16146-47 ¶¶ 35-39.

[42] *Id.* at 16138 ¶ 16.

[43] *See 2 GHz MSS Amendment PN*, Report No. SAT-00061.

[44] *See Ex parte* Letter of New ICO Global Communications (Holdings) Ltd., IB Docket No. 99-81 (dated March 8, 2001) (ICO *Ex Parte* Letter); Petition for Rulemaking of the Cellular Telecommunications & Internet Association (filed May 18, 2001) (CTIA Petition).

[45] Systems must be implemented consistent with the plans for incumbent relocation adopted in the *2 GHz Allocation & Relocation Proceeding*, Second Report And Order and Second Memorandum Opinion and Order, 15 FCC Rcd 12315, including the phased plan for relocation in the 1990-2025 MHz band.

[46] *2 GHz MSS Order*, 15 FCC Rcd at 16138 ¶ 16. A satellite's intended orbit is the final orbit it will occupy to provide commercial service. *Id.* n.75.

Assignment on a secondary basis with respect to other 2 GHz MSS operators, subject to certain conditions.[47]

C. Other Requests for Spectrum Assignments

1. NGSO Feeder Links

13. For its NGSO feeder uplinks, Globalstar seeks to use either the 15.43-15.63 GHz band or the 19.3-19.7 GHz band.[48] For its NGSO feeder downlinks, Globalstar proposes to use 100 megahertz of spectrum in the 6700-6875 MHz band. [49] In the United States, the 15.43-15.63 GHz and 6700-6875 MHz bands for which Globalstar seeks authority are not currently allocated for commercial NGSO satellite service and the 6700-6785 MHz band is not allocated in the direction that Globalstar proposes. The International Telecommunication Union (ITU), however, has identified the 15.43-15.63 GHz, 6700-7075 MHz and 5091-5250 MHz bands for feeder link transmissions between earth stations and NGSO MSS satellites.[50] Moreover, the Commission has initiated a rulemaking proposing to amend the domestic Table of Frequency Allocations consistent with the international allocation in the 15.43-15.63 GHz, 6700-7075 MHz and 5091-5250 MHz bands (the "*5, 7, 15 GHz Allocation Rulemaking*").[51] In the interim, we have granted waivers of Section 2.102(a) of the Commission's rules, which prohibits frequency assignments that differ from the Table of Frequency Allocations,[52] to allow NGSO MSS licensees to use portions of these internationally allocated bands for NGSO MSS feeder links.[53]

14. Consistent with these actions, we waive Section 2.102(a) of the Commission's rules to permit the proposed operations, pending completion of the *5, 7, 15 GHz Allocation Rulemaking*.[54] Specifically, we waive Section 2.102(a) to permit Globalstar to operate its feeder uplinks in the 200 megahertz of spectrum in the 15.43-15.63 GHz band, consistent with the international allocation. We also waive Section 2.102(a) to permit Globalstar to operate its feeder downlink transmissions in the

[47] *Id.* at 16139-40 ¶ 19. The 1990-2025 MHz (Earth-to-space) and 2165-2200 MHz (space-to-Earth) bands are immediately adjacent to the 2025-2110 MHz (Earth-to-space, space-to-space) and 2200-2290 MHz (space-to-Earth, space-to-space) bands, respectively, where the Federal Government has extensive satellite network operations. To avoid the possibility of adjacent band interference, this potential interference situation needs to be considered by both non-Government and Government satellite operators when implementing their respective satellite systems near the band edges.

[48] Globalstar Application at 12.

[49] *Id.* at 12 & n.9 (acknowledging that its requests should conform to the allocations made at the then-upcoming World Radiocommunication Conference, WRC-97).

[50] ITU Radio Regulations nn.S5.444A (allocating the 5091-5150 MHz band for assignment to NGSO MSS feeder uplinks until January 1, 2008, subject to coordination), S5.447A (allocating the 5150-5250 MHz band to NGSO MSS feeder uplinks, subject to coordination), S5.458B (allocating the 6700-7075 MHz band to NGSO MSS feeder downlinks, subject to coordination), S5.511A (allocating the 15.43-15.63 GHz band to NGSO MSS feeder uplinks, subject to coordination).

[51] *See Amendment of Parts 2, 25 and 97 of the Commission's Rules with Regard to the Mobile-Satellite Service Above 1 GHz*, ET Docket No. 98-142, Notice of Proposed Rule Making, 13 FCC Rcd 17107 (1998).

[52] 47 C.F.R. § 2.102(a).

[53] *See, e.g., L/Q Licensee, Inc.*, Order and Authorization, 11 FCC Rcd 16410, 16413-14, ¶ 8 (Int'l Bur. 1996).

[54] *See WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969).

6700-6875 MHz band, consistent with the international allocation. Although Globalstar did not specify its preferred operating frequencies within this range, we assign Globalstar specific NGSO MSS feeder downlink frequencies here to avoid any delay in system implementation. Recognizing Globalstar's request to use 100 megahertz of feeder downlink spectrum, we authorize Globalstar to conduct its NGSO MSS feeder downlink operations in the 6700-6800 MHz portion of the band. If Globalstar prefers to operate on a different 100 megahertz within its requested bands, it may file a request for license modification. Finally, having authorized Globalstar's NGSO MSS feeder uplinks in the 15.43-15.63 GHz band, we dismiss Globalstar's alternative request to operate its NGSO MSS feeder uplinks in the 19.3-19.7 GHz band.[55]

15. This authorization of feeder link spectrum is subject to any applicable restrictions or modifications that may be promulgated in the *5, 7, 15 GHz Allocation Rulemaking*. In addition, this authorization should not be construed as a license for Earth-to-space transmission in the 15.43-15.63 GHz band. Such authority must be requested in the context of an earth station application filed pursuant to Section 25.130 of the Commission's rules.[56] As stated in the *2 GHz MSS Order*, Globalstar must coordinate with any other licensees authorized to use the same spectrum for feeder links.[57] Globalstar also must coordinate its proposed NGSO satellite system operations with respect to licensed non-government and authorized Federal Government terrestrial systems, as necessary, in accordance with Section 25.272 of the Commission's rules.[58]

16. The 15.4-15.7 GHz band also is allocated to the aeronautical radionavigation services (ARNS) on a primary basis in the United States and throughout the world.[59] To facilitate sharing of the 15.43-15.63 GHz band between ARNS stations and gateways transmitting to NGSO MSS satellites worldwide, ITU Recommendation ITU-R S.1340 limits ARNS and gateway earth station equivalent isotropically radiated power (e.i.r.p.) and establishes minimum coordination distances between ARNS and gateway stations.[60] We expect Globalstar's operations to comply with the ITU Recommendation ITU-R S.1340 limits. Therefore, prior to authorization of an earth station, Globalstar's feeder link operations in the 15.43-15.63 GHz bands must be coordinated through the Frequency Assignment Subcommittee of the Interdepartment Radio Advisory Committee of the National Telecommunication and Information Administration (NTIA). NTIA also has stated its concern about protecting Government passive service operations in the 6650-6675.2 MHz band from NGSO MSS space station transmissions in

[55] Globalstar's request to operate feeder links in the 19.3-19.7 GHz band was placed on Public Notice on October 15, 1997. *See* Public Notice, Report No. SPB-106, 13 FCC Rcd 8020, 8021 (1997). The Fixed Point-to-Point Communications Section, *et al.*, Lockheed Martin Corporation, and Motorola, Inc. filed comments on Globalstar's request in response to the Public Notice (each filed December 22, 1997). Because we are dismissing Globalstar's request to operate feeder links in the 19.3-19.7 GHz band , we do not address the issues raised in these comments.

[56] 47 C.F.R. § 25.130 (describing filing requirements for transmit earth stations).

[57] *See 2 GHz MSS Order*, 15 FCC Rcd at 16159 ¶ 72 (citing 47 C.F.R. § 25.203(k)).

[58] 47 C.F.R. § 25.272 (defining general intersystem coordination procedures and listing specific requirements for space-station licensees, such as establishing a satellite network control center, filing contact information for key personnel and maintaining a continuously available means of contacting the control center).

[59] *Id*. § 2.106 n.US260.

[60] *See* ITU Recommendation ITU-R S.1340 (addressing sharing between feeder links for the mobile-satellite service and the aeronautical radionavigation service in the Earth-to-space direction in the 15.4-15.7 GHz band).

the 6700-7075 MHz band.[61] As this is an active issue in the *5, 7, 15 GHz Allocation Rulemaking*, Globalstar will be subject to any applicable rules that may be promulgated on this issue. Until such time, we expect the Executive Branch and NGSO MSS entities to work together to address the needs of both services.[62]

2. GSO Feeder Links and Orbit Locations

17. Globalstar seeks authority to position the GS-2's GSO satellites at 10° E.L., 100° E.L., 170° W.L. and 101° W.L.[63] We address Globalstar's request for orbit locations at 10º E.L., 100º E.L. and 170º W.L. first. We then address Globalstar's request for an orbit location at 101º W.L.

18. ***Orbit Locations at 10° E.L., 100° E.L. and 170° W.L.*** Globalstar seeks authority to launch and operate three satellites in the following locations in the geostationary satellite orbital arc: 10º E.L., 100º E.L. and 170º W.L.[64] For these locations, Globalstar seeks authority to use 250 megahertz of spectrum in the 14.0-14.5 GHz band for feeder uplinks and 250 megahertz in the 11.7-12.2 GHz band for feeder downlinks and for telemetry, tracking and command (TT&C).[65]

19. At 10° E.L. and 100° E.L., the proposed feeder uplinks in the 14.0-14.5 GHz band conflict with other previously notified systems that use these frequencies and orbit locations.[66] In the *2 GHz MSS Order*, the Commission noted the "numerous obstacles" to Globalstar's proposal for Ku-band feeder links around the globe and stated that it "expected Globalstar to explain how it intends to coordinate the proposed [GSO MSS] Ku-band operations with existing FSS operations, and the public interest benefit of such an assignment" or have its request denied.[67] In its latest amendment, however, Globalstar fails to explain how it intends to coordinate with other Ku-band users at 10° E.L. and 100° E.L., does not state the public interest benefits of Ku-band operations in these locations and has not

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[61] *See* Letter from Associate Administrator, Office of Spectrum Management, NTIA, to Acting Chief, Office of Engineering and Technology, FCC (May 7, 2001).

[62] *See* 47 C.F.R. § 2.106, footnote S5.458A ("In making assignments in the band 6700-7075 MHz to space stations of the fixed-satellite service, administrations are urged to take all practicable steps to protect spectral line observations of the radio astronomy service in the band 6650-6675.2 MHz from harmful interference from unwanted emissions.").

[63] Globalstar Application at 30; Globalstar Amendment at 3.

[64] Globalstar Application at 30.

[65] Globalstar Amendment at 8-9.

[66] *See* International Telecommunication Union, *Space Network Systems Database*, *available at* www.itu.int/sns/ (last revised November 6, 2000). According to the ITU, a Eutelsat II-F2 satellite operates at 10° E.L. in the 14.0-14.5 GHz band and an Asiasat 2 satellite operates at 100.5° E.L. in the 14.0-14.5 GHz band. If Globalstar were to operate a satellite at either 10º E.L. or 100º E.L. in the 14.0-14.5 GHz band, Globalstar would probably interfere with the existing Eutelsat and Asiasat satellites that operate in the same band.

[67] *2 GHz MSS Order*, 15 FCC Rcd at 16164-65 ¶ 80. In the *2 GHz MSS Order*, the Commission identified a global problem in accessing Ku-band spectrum from any GSO orbit location. For example, the Commission noted that "Globalstar does not indicate how it plans to access its suggested Ku-band orbital *locations*." *Id.* at 16164 (emphasis added). Although Globalstar appears to construe the Commission's request as limited to the particular problems facing Globalstar's abandoned proposal to operate at 80º W.L., *see* Globalstar Amendment at 8, the Commission, in fact, sought additional information on any proposed operations "in the conventional Ku-band FSS frequencies from [Globalstar's] four GSO satellites." *2 GHz MSS Order*, 15 FCC Rcd at 16164-65 ¶ 80.

sought alternative feeder link spectrum.[68] Therefore, we deny Globalstar's request for feeder uplinks in the 14.0-14.5 GHz band for the orbit locations at 10° E.L. and 100° E.L.

20. Similarly at 10° E.L., 100° E.L. and 170° W.L., Globalstar's proposed feeder downlinks in the 11.7-12.2 GHz band are not in accordance with the International Table of Frequency Allocations.[69] To receive feeder link signals from the 10° E.L., 100° E.L. and 170° W.L. orbit locations, Globalstar would need to operate FSS earth stations in ITU Regions 1 or 3 (Europe, Asia or Africa); however, the 11.7-12.2 GHz band is not allocated for FSS in these Regions.[70] Therefore, we deny Globalstar's request for feeder downlinks in the 11.7-12.2 GHz band for the 10° E.L., 100° E.L. and 170° W.L. locations.

21. Lacking any other alternative feeder link spectrum proposal, we deny Globalstar's request for authority to operate feeder links for its proposed GSO MSS satellites at 10° E.L., 100° E.L. and 170° W.L. Should Globalstar wish to continue to pursue a GSO component in its MSS system over Regions 1 and 3, Globalstar remains free to file a modification application that addresses these concerns.

22. ***Orbit Location at 101º W.L.*** Globalstar also seeks authority to use Ku-band feeder links for the 2 GHz GSO MSS satellite it has proposed at 101º W.L.[71] For the 101° W.L. orbit location, Globalstar ideally would like access to 250 megahertz of spectrum in each direction in the "standard Ku-band frequencies." Globalstar's standard Ku-band proposal seeks access to 250 megahertz in the 14.0-14.5 GHz band for feeder uplinks and 250 megahertz in the 11.7-12.2 GHz band for feeder downlinks.[72] As an alternative, Globalstar states that it could accept 250 megahertz of spectrum in each direction in the "extended Ku-band frequencies." Globalstar's extended Ku-band proposal seeks access to 250 megahertz in the 12.75-13.25 GHz band for the feeder uplink and 250 megahertz in the 10.7-10.95 GHz or 11.2-11.45 GHz bands for feeder downlinks.[73] If Globalstar receives authority to operate on extended Ku-band frequencies at 101° W.L., it asks that we waive a footnote in Section 2.106 of the Commission's rules.[74]

23. GE Americom, Motient and PanAmSat request that we deny Globalstar's application for an orbit location at 101º W.L. that would use either standard or extended Ku-band frequencies.[75] GE Americom currently operates the GE-4 satellite on Ku-band frequencies at 101º W.L.[76] GE Americom states that Globalstar's request to position a space station at 101º W.L. "directly conflicts with GE Americom's long-standing authority to operate a Ku-band satellite at that orbital position."[77] According

[68] *See* Globalstar Amendment at 7-10.

[69] *See* 47 C.F.R. § 2.106.

[70] *Id.*

[71] Globalstar Amendment at 3.

[72] *Id*. at 2, 8-9.

[73] Globalstar Reply at 2.

[74] *Id*. at B-1 (citing 47 C.F.R. § 2.106 n.NG104, which provides that "[t]he use of the bands 10.7-11.7 and 12.75-13.25 GHz in the fixed-satellite service is limited to international systems, i.e., other than domestic systems").

[75] Motient Petition at 1; GE Americom Second Petition at 1; PanAmSat Petition at 2.

[76] GE Americom Second Petition at 5.

[77] *Id*. at 1.

to GE Americom, Globalstar has not demonstrated how Globalstar's proposed MSS Ku-band satellite at 101º W.L. could coordinate with GE Americom's FSS Ku-band satellite at 101º W.L.[78]

24. PanAmSat also opposes Globalstar's proposal to use Ku-band feeder links at the 101º W.L. location. PanAmSat operates its Galaxy IV-R FSS satellite at 99º W.L.[79] According to PanAmSat, Globalstar "does not explain why it could not use the non-FSS frequencies specified by other applicants for feeder links" and does not "address how it plans to access Ku-band frequencies" consistent with the Part 25 rules.[80] Citing Globalstar's failure to justify its proposed use of FSS spectrum, its failure to participate in a Ku-band processing round and its failure to coordinate with co-located and adjacent operators, PanAmSat urges us to reject Globalstar's proposed use of Ku-band feeder links at 101º W.L.[81]

25. In its Reply, Globalstar acknowledges that GE Americom holds a superior claim to Ku-band spectrum at 101º W.L. and that PanAmSat has accurately described how permitting Globalstar's proposed standard Ku-band feeder links would create "difficulties" for other space-station operators in this band.[82] Acknowledging the superior rights of other space-station operators, Globalstar contends that it only proposed to use standard Ku-band frequencies at 101° W.L. "at the recommendation of the Commission."[83]

26. As a preliminary matter, Globalstar's claim that it filed for the 101º W.L. orbital slot at the Commission's suggestion is, at best, inaccurate. The Commission does not recommend orbit locations to satellite space-station applicants and did not recommend any particular orbit location to Globalstar in this case. To the extent Globalstar claims to have relied on informal staff advice, we remind Globalstar that persons who rely on informal staff advice do so at their own risk. As a space-station applicant, we remind Globalstar that it must provide complete and accurate information to the Commission about its pending application.[84]

27. On substance, we must deny Globalstar's request to operate on 250 megahertz of spectrum in each direction in the standard Ku-bands of 14.0-14.5 GHz and 11.7-12.2 GHz. Even Globalstar concedes that GE Americom and PanAmSat voice legitimate concerns of interference if Globalstar were to operate at 101° W.L. in the standard Ku-band.[85] In addition, Globalstar has not demonstrated that it could share with the objecting satellite operators. Permitting Globalstar to operate on the same frequencies and to serve the same geographic area would cause harmful interference to other space stations. We will not permit Globalstar to interfere with existing Commission licensees and thus, we deny Globalstar's request to operate on standard Ku-band frequencies at 101° W.L.

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[78] *Id*.

[79] PanAmSat Petition at 4.

[80] *Id*.

[81] *Id*.

[82] Globalstar Reply at 2-3.

[83] *Id*. at 2.

[84] *See* 47 C.F.R. § 1.65.

[85] *See, e.g.*, Globalstar Reply at 3-4 (identifying problems with proposed frequencies at 101° W.L. and noting the applicant's willingness to "pursue . . . alternatives (and/or a different orbital slot)").

28. As for Globalstar's alternative proposal to use extended Ku-band feeder links at the 101º W.L. location, Motient is authorized to operate on similar feeder link bands at the same orbit location.[86] Specifically, Motient's license authorizes it to use the following 200 megahertz of extended Ku-band frequencies at 101º W.L.: 13.0-13.15 GHz and 13.2-13.25 GHz (Earth-to-space) and 10.75-10.95 GHz (space-to-Earth).[87] We deny Globalstar's request to operate on those frequencies that we have authorized Motient to use at 101º W.L.[88]

29. After eliminating the bands previously granted to Motient from Globalstar's feeder-link request, Globalstar might be eligible to receive an authorization to operate in the following bands: 13.15-13.20 GHz and 12.75-13.00 GHz (Earth-to-space) and 10.70-10.75 GHz and 11.20-11.45 GHz (space-to-Earth). Motient, however, filed and subsequently amended an application for a second-generation MSS system that seeks to use virtually the same feeder-link spectrum that Globalstar proposes to use.[89]

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[86] *See* Motient Petition at 2.

[87] *See Amendment of Parts 2, 22 and 25 of the Commission's Rules to Allocate Spectrum for and to Establish Other Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service for the Provision of Various Common Carrier Services*, Memorandum Opinion, Order and Authorization, 4 FCC Rcd 6041, 6048, ¶ 52 (1989); *AMSC Subsidiary Corporation, Applications to Modify Space Station Authorizations in the Mobile Satellite Service*, Memorandum Opinion and Order, 8 FCC Rcd 4040 ¶ 43 (1993).

[88] The following table compares Globalstar's various requests for Ku-band feeder-link spectrum with the existing and proposed Ku-band operations of GE Americom and Motient. Existing operations appear in normal text; proposed operations appear in *italics*:

	GE Americom	Motient	Globalstar
Uplink	*13.75-14.50 GHz*	13.20-13.25 GHz	First Choice: *14.00-14.50 GHz*
		13.00-13.15 GHz	[250 MHz within this band]
		12.75-13.00 GHz	Second Choice: *12.75-13.25 GHz*
		[100 MHz within this band]	[250 MHz within this band]
		[an additional 150 MHz within this band]	
Downlink	11.45-12.20 GHz	10.75-10.95 GHz	First Choice: *11.70-12.20 GHz*
		11.20-11.45 GHz	Second Choice: *10.70-10.95 GHz*
		[100 MHz within this band]	Third Choice: *11.20-11.45 GHz*
		[an additional 150 MHz within this band]	

[89] *See* Motient Petition at 1. In 1998, Motient (formerly AMSC) applied for authority to operate a second-generation MSS system using the same orbit location as its first-generation system and an additional 250 megahertz of spectrum in each direction for feeder links. *See* Motient Petition at 2; *see also* AMSC Subsidiary Corporation, Application, SAT-LOA-19980702-0006 (July 2, 1998) (Motient Second Generation Application). In its original Second Generation MSS Application, Motient sought an additional 100 megahertz in each direction in the following extended Ku-band frequencies: 12.75-13.0 GHz (Earth-to-space) and 11.2-11.45 GHz (space-to-Earth). *See* Motient Second Generation Application at 9. On December 14, 2000, Motient filed an amendment to its pending second-generation MSS application to request an additional 150 megahertz in each direction to use for extended Ku-band feeder links. *See* Motient Services, Inc., Amendment, SAT-AMD-20001214-00171 (December 14, 2000). Although Motient does not propose to operate its second-generation system in the 10.70-10.75 GHz portion of the band or in

Because the pending proposals from Motient and Globalstar may prove mutually exclusive, we defer action on both Motient's and Globalstar's proposal for extended Ku-band feeder-link spectrum until the potential for mutual exclusivity can be resolved.[90] In addition, because Globalstar's request to waive Footnote NG104 of Section 2.106 of our Rules remains contingent on receiving an extended Ku-band assignment at 101° W.L., we also defer Globalstar's waiver request.

30. Resolving mutual exclusivity in the extended Ku-band frequencies is likely to present complex, time-consuming issues. Globalstar's GSO implementation milestones, however, will not be tolled while the potential for mutual exclusivity is resolved. Rather, Globalstar must observe each of the implementation milestones for hybrid GSO-NGSO systems described in this *Order*. As with any space-station licensee, moreover, Globalstar's failure to satisfy an implementation milestone will cause its authorization to become null and void without further action required from the Commission. If Globalstar wishes to pursue alternative orbit locations, alternative feeder-link bands or other changes to the GSO component of its system, Globalstar may do so in a timely filed modification application.

3. Inter-Satellite Service Links

31. Globalstar's application, as amended, requests 100 megahertz of spectrum in the 65-71 GHz band for Inter-Satellite Service (ISS) links.[91] Globalstar states that it will use the ISS links to support communication between satellites within the constellation, which should improve system efficiency and transmission quality. Although non-ISS U.S. Government operations also operate in the 65-71 GHz band, the Commission recently allocated the 65-71 GHz band for non-Government ISS.[92]

32. Globalstar did not specify its preferred operating frequencies within this range; however, we assign Globalstar specific ISS frequencies in this *Order* to avoid unnecessary delay. Consequently, we authorize Globalstar to conduct ISS operations in the 65.0-65.1 GHz band, subject to coordination among the other licensees in the band, and with U.S. Government (non-ISS) operations through NTIA's Interdepartment Radio Advisory Committee's Frequency Assignment Subcommittee. If Globalstar prefers to operate on a different 100 megahertz band within the 65-71 GHz range other than the 65.0-65.1 GHz band that we assign, it may file a request for license modification.

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the 13.15-13.20 GHz portion of the band, these frequency bands do not appear to provide enough frequency spectrum for Globalstar to operate its feeder downlinks and uplinks at 101º W.L.

[90] *See generally Ashbacker Radio Corp. v. FCC*, 326 U.S. 327 (1945) (holding that the Commission may not grant one mutually exclusive application without holding the comparative hearing required by the Communications Act). Motient filed for a portion of the Ku-band feeder-link frequencies prior to Globalstar's initial request for Ku-band feeder-link spectrum. Globalstar filed its initial Ku-band feeder-link application prior to Motient's amended request. For purposes of our *Ashbacker* analysis, these filing dates are not decisive. Both Motient's application, as amended, and Globalstar's application, as amended, are pending requests for frequency spectrum that have the potential to be mutually exclusive.

[91] Globalstar Amendment at 10.

[92] *See Amendment of Part 2 of the Commission's Rules to Allocate Additional Spectrum to the Inter-Satellite, Fixed, and Mobile Services and to Permit Unlicensed Devices to Use Certain Segments in the 50.2-50.4 GHz and 51.4-71.0 GHz Bands*, ET Docket No. 99-261, Report and Order, 15 FCC Rcd 25264, 25282-84 ¶¶ 42-48 (2000).

D. Pre-operational Authority

33. Under Commission rules, the fifteen-year license term for a 2 GHz MSS system begins upon a certification by the system operator that the first satellite in its system has begun operations consistent with the terms and conditions specified in its authorization.[93] The Commission indicated in the *2 GHz MSS Order* that it would "authorize system operators to conduct pre-operational testing in the license grant, to the extent that applicants include such information in their applications."[94] Globalstar requested authority to test its NGSO satellites at lower-than-operational orbits, but did not state the specific orbits it intends to use.[95]

34. Globalstar states that it normally requires sixty days to move a satellite of a multi-spacecraft launch into final orbit.[96] Globalstar states that it will launch its NGSO satellites with other spacecraft and, accordingly, will require approximately sixty days to transition the NGSO satellites to final orbit.[97] During the transition to final orbit, Globalstar seeks authority to conduct limited, intermittent tests of the satellites by transmitting on the systems' assigned service link and feeder link frequencies.[98] According to Globalstar, pre-operational tests provide information necessary to complete the orbit-raising sequence and help assure proper in-orbit performance.[99] Globalstar states that these tests will comply with all power flux-density restrictions for the NGSO satellites.[100] Although Globalstar's plan would appear to be reasonable, we decline to act on its request for pre-operational authority until Globalstar provides more specificity as to the orbits it will use.

E. Regulatory Classification

35. Globalstar requests that the satellite operations being authorized herein not be regulated as a common carrier.[101] Under the Communications Act, Commission Rules, we grant Globalstar's request and treat its space station operations as non-common carrier.[102] We will address the regulatory classification of earth stations operating as part of Globalstar's system in connection with earth station licensing.[103]

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[93] *2 GHz MSS Order*, 15 FCC Rcd at 16175-76 ¶ 103; 47 C.F.R. § 25.121(a) ("Licenses for facilities governed by this part will be issued for a period of 10 years, except that licenses and authorizations in the 2 GHz Mobile-Satellite Service will be issued for a period of 15 years.").

[94] *2 GHz MSS Order*, 15 FCC Rcd at 16176 ¶ 103.

[95] Globalstar Amendment at 10.

[96] *Id.*

[97] *Id.* Globalstar does not specify how long its GSO satellites will require to transition to final orbit. *See id.* at 10-11.

[98] *Id.*

[99] *Id.* at 11.

[100] *Id.*

[101] *Id.* at 54.

[102] 47 U.S.C. §§ 153(44), 332(c)(5); 47 C.F.R. § 20.9(a)(10); *2 GHz MSS Order*, 15 FCC Rcd at 16173 ¶ 95.

[103] We also note that the Commission will address issues concerning protection for aeronautical radionavigation in the 1559-1610 MHz band from the out-of-band emissions of 2 GHz MSS mobile earth terminals (METs) in the

F. Implementation Milestones

36. The *2 GHz MSS Order* adopted milestones for implementation that apply to 2 GHz MSS systems.[104] Consistent with the *2 GHz MSS Order*, therefore, Globalstar must observe the following milestone requirements:

Milestone	Deadline
Enter Non-contingent Satellite Manufacturing Contract for GSO and NGSO Components	12 months after authorization
Complete Critical Design Review (CDR)	24 months after authorization
Begin Physical Construction of All Satellites in NGSO Component	30 months after authorization
Begin Physical Construction of All Satellites in GSO Component	36 months after authorization
Complete Construction and Launch First Two Satellites in NGSO Component	42 months after authorization
Complete Construction of One GSO Satellite in Constellation and Launch It Into Its Assigned Orbit Location	60 months after authorization
Certify Entire System Operational	72 months after authorization

37. Globalstar must describe the status of system construction and operation in its annual reports, and file a certification with the Commission within ten days following each of the milestones specified above.[105]

G. Orbital Debris Mitigation

38. Currently, the FCC addresses issues regarding orbital debris and satellite systems on a case-by-case basis, under the general "public interest, convenience and necessity" standard in the Communications Act.[106] To facilitate our orbital debris analysis, under Section 25.143(b)(1) of our rules, 2 GHz MSS system proponents are required to "describe the design and operational strategies that they will use, if any, to mitigate orbital debris."[107] This rule also requires 2 GHz MSS system proponents to

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pending Global Mobile Personal Communications by Satellite (GMPCS) rulemaking, and the 2 GHz MSS METs will be subject to applicable rules and policies the Commission will adopt in that proceeding. *2 GHz MSS Order*, 15 FCC Rcd at 16196-97 ¶ 163 (citing *Amendment of Parts 2 and 25 to Implement the Global Mobile Personal Communications by Satellite (GMPCS) Memorandum of Understanding and Arrangements*, IB Docket No. 99-67, Notice of Proposed Rule Making, 14 FCC Rcd 5871 (1999)).

[104] *2 GHz MSS Order*, 15 FCC Rcd at 16177-78 ¶ 106.

[105] *See* 47 C.F.R. § 25.143(e)(1) (requiring satellite space-station operators to file annual reports with the Commission every October 15); *Id.* § 25.143(e)(3) (requiring satellite space-station operators to file a certification with the Commission within 10 days of a system implementation milestone).

[106] 47 U.S.C. § 303.

[107] 47 C.F.R. § 25.143(b)(1), as amended by the *2 GHz MSS Order*, 15 FCC Rcd at 16205. The Commission also stated that it intends to commence a rulemaking proceeding proposing to explore orbital debris mitigation issues. *2 GHz MSS Order*, 15 FCC Rcd at 16188 ¶ 138.

"submit a casualty risk assessment if planned post-mission disposal involves atmospheric re-entry of the spacecraft."[108]

39. In adopting this requirement, the Commission indicated that applicants may wish to consult the National Aeronautics & Space Administration (NASA)/Department of Defense (DoD) Guidelines on Debris Mitigation, as well as the ITU Recommendation on disposal of geostationary satellites.[109] The NASA/DoD Guidelines identify four main objectives: 1) controlling debris released during normal operations; 2) minimizing debris generated by accidental explosions; 3) selecting safe flight profiles and operational configurations; and 4) providing for post-mission disposal of space structures.

40. Under the NASA/DoD Guidelines, these objectives are accomplished by a number of means.[110] The first objective – controlling debris released during normal operations – is addressed by minimizing the amount of debris released in a planned manner during normal operations. The second objective – minimizing debris generated by accidental explosions – is addressed by limiting the risk to other space systems from accidental explosions both during mission operations and after completion of mission operations. For mission operations, this is accomplished through analysis of credible failure modes and development of methods to limit the probability they will occur. Post-mission, this is accomplished through depletion of all sources of stored energy on board the spacecraft when they are no longer required for mission operations or post-mission disposal. The third objective – selecting a safe flight profile and operational configuration – is addressed through estimating and limiting the probability of collision with large objects during orbital lifetime, and the probability of disabling collisions with small debris during mission operations.

41. The fourth objective in the NASA/DoD Guidelines – providing for post-mission disposal of space structures – is met by planning for disposal of a spacecraft at the end of mission life to minimize impact on future space operations. This is accomplished through one of two options relevant here. The first option is atmospheric reentry, *i.e.*, leaving the structure in an orbit in which it will remain in orbit for no longer than 25 years after mission completion. Under this option, it is also necessary to address the casualty risk from any portions of the spacecraft that may survive atmospheric reentry. The second option is maneuvering to a storage orbit. There are three suggested storage orbits. The first is between low and middle Earth orbit, *i.e.*, satellite perigee altitude above 2,000 kilometers and apogee altitude below 19,700 kilometers. The second is between middle and geosynchronous Earth orbit, *i.e.*, perigee altitude above 20,700 kilometers and apogee altitude below 35,300 kilometers. The third is above geosynchronous Earth orbit, *i.e.*, perigee altitude above 36,100 kilometers (or approximately 300 kilometers above geosynchronous altitude). In addition to the NASA/DoD guidelines, and as the Commission observed in the *2 GHz MSS Order*,[111] the ITU has developed a recommendation concerning operations in the GSO.[112]

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[108] 47 C.F.R. § 25.143(b)(1), as amended by the *2 GHz MSS Order*, 15 FCC Rcd at 16205.

[109] *See 2 GHz MSS Order*, 15 FCC Rcd at 16118 ¶ 138.

[110] *See The Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band*, IB Docket No. 99-81, 14 FCC Rcd 4843, 4901-03 (1999) (Appendix C).

[111] *2 GHz MSS Order*, 15 FCC Rcd at 16118 ¶ 138.

[112] Recommendation ITU-R S.1003. The recommendation suggests, in pertinent part, that a geostationary satellite at the end of its life should be transferred before complete exhaustion of its propellant, to a "supersynchronous graveyard orbit that does not intersect the GSO," with GSO defined as the mean earth radius of 42,164 kilometers plus or minus 300 kilometers. The recommendation also notes that what constitutes "an effective graveyard orbit"

42. Each of the 2 GHz MSS systems submitted a narrative statement concerning orbital debris mitigation. We note that, to the extent that the statements address debris mitigation issues involving launch vehicle operations, we have neither reviewed nor concluded the plans disclosed are appropriate.[113] We also note that, to the extent debris mitigation plans for MSS systems change, the system proponents should evaluate those changes to determine whether disclosure and/or prior approval is required.[114]

43. In its application amendment, Globalstar addressed orbital debris mitigation issues pertinent to operations, including debris release and accidental explosions.[115] However, Globalstar did not specifically address limiting the probability of collision with large, known objects during satellite orbital lifetime. We expect Globalstar and other 2 GHz MSS systems to develop appropriate operational plans and procedures to minimize the possibility of collision with large, known objects.[116] Globalstar defined an appropriate and specific end-of-mission disposal strategy for its GSO satellites. However, Globalstar was not sufficiently specific regarding a disposal strategy for its NGSO satellites. Therefore, in order to permit assessment of Globalstar's disposal strategy and provide adequate information for potentially effected parties, we require Globalstar to supplement its narrative statement by providing greater specificity regarding its strategy and the range of storage orbit parameters selected for disposal of its NGSO satellites. Globalstar also did not address the depletion of stored energy sources as part of system disposal. We require Globalstar to supplement its narrative statement by stating its intent in this regard. Each of these required supplements to Globalstar's orbital debris narrative statement are to be submitted no later than six months prior to the CDR milestone. We also note that this *Order* does not authorize the relocation of operational satellites to storage orbits at end-of-life. Such authorization will need to be obtained through a request for modification of Globalstar's license.

H. Other Issues

1. Signal Coding Techniques and System Architecture

44. Globalstar states that it intends to use CDMA, TDMA and FDMA technologies in its satellite system.[117] Globalstar also proposes to use both GSO and NGSO satellites in the same satellite system.[118] Several parties criticize these proposals as unworkable and inimical to spectrum sharing.[119] In

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requires further studies. In this regard, we note that orbital perturbations due to solar and lunar gravitation, solar pressure, or other sources, may, over time, result in an inactive satellite's orbit intersecting the GSO, as defined by the ITU recommendation, even if the initial disposal altitude does not intersect the GSO.

[113] The United States licensing authority for commercial launches is the Federal Aviation Administration. *See* 14 C.F.R. § 400 *et seq*.

[114] *See* 47 C.F.R. §§ 1.65, 25.117(a). *See also 2 GHz MSS Order*, 15 FCC Rcd at 16179 ¶ 108 (system modifications requiring prior FCC approval should be identified well in advance of the CDR milestone).

[115] Globalstar Amendment at 6-7.

[116] *See, e.g.*, Amendment to Pending Application of Iridium LLC, SAT-AMD-20001103-00156 (November 3, 2000) at Exhibit 1, p.2.

[117] Globalstar Application at 6.

[118] *Id.* at 1.

[119] *See, e.g.*, Boeing Petition at 10 (requesting additional information on how Globalstar intends to use TDMA, CDMA and FDMA technologies); Constellation Comments at 21 (stating that use of both TDMA and CDMA

its Petition, for example, Boeing asks the Commission to "require Globalstar to explain how it intends to use all three techniques in the same spectrum" and "disclose the amount or percentage of the proposed capacity that it wants to use for each access technique."[120]

45. In our *2 GHz MSS Order*, we adopted a hybrid band arrangement that balanced the needs of operators capable of using overlapping frequencies with those of systems that may not be designed to share co-frequency by providing incentives for shared technology proponents to cooperate during system implementation.[121] While the Commission allowed operators to choose their exclusive Selected Assignments, the Commission elected to permit operators to aggregate their respective spectrum assignments by reaching sharing agreements among them.[122] We believe the *2 GHz MSS Order* provides not only sufficient incentives for the 2 GHz MSS licensees to develop a sharing arrangement among operators using different access technologies, but also sufficient protection in the event complete sharing cannot be accomplished.

2. Additional Showings

46. In their comments, Celsat and ICO note that many of the applicants in the 2 GHz proceeding – including Globalstar – either directly or through what Celsat terms "affiliates," already hold licenses in different bands that permit them to provide MSS.[123] Celsat and ICO ask that we deny MSS incumbents access to new MSS spectrum until new entrants are accommodated.[124] We believe that all of the 2 GHz MSS applicants can be accommodated within the 2 GHz MSS spectrum. Thus, Celsat's request that we grant spectrum to new entrants over incumbents is dismissed as moot.

3. Timing of Licensing

47. AT&T Wireless Services, Inc., Cingular Wireless LLC, Sprint PCS, and Verizon Wireless (Wireless Carriers) in a recent joint letter requested the Commission to defer grant of the pending 2 GHz MSS applications until (1) public comment is sought and received on the implications of New ICO Global Communications (Holdings) Ltd.'s (ICO's) March 8, 2001 *ex parte* letter proposing amendment of the 2 GHz MSS service rules to permit licensees to incorporate an "ancillary terrestrial component" into their 2 GHz MSS networks; and (2) the Commission considers a petition for rule making submitted by the Cellular Telecommunications & Internet Association (CTIA) requesting that the 2 GHz MSS bands be reallocated for other uses, such as terrestrial wireless services.[125] For the reasons

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technologies requires careful analysis by Commission and raising "similar" concerns for Globalstar's proposal to use both GSO and NGSO satellites); ICO Comments at 16 (stating that a "combined GSO and NGSO system would present much more complex interference and coordination problems than a single GSO or NGSO system"); ICO Consolidated Reply at 8 n.26 ("applicants should resolve basic problems of operational design at the application stage").

[120] Boeing Petition at 10.

[121] *2 GHz MSS Order*, 15 FCC Rcd at 16141, ¶ 22.

[122] *Id.*

[123] *See* Celsat Comments at 2 n.1, 3, 7-8.

[124] Celsat Comments at 7 (asserting that incumbent operators should receive no additional spectrum); ICO Comments at 11-12 (raising a similar argument with respect to incumbent Big LEO licensees).

[125] Letter to Michael K. Powell, Chairman, Federal Communications Commission from Douglas Brandon, AT&T Wireless Services, Inc., Brian F. Fontes, Cingular Wireless, LLC, Luisa L. Lancetti, Sprint Corporation, and John T.

set forth in the ICO *Order* issued contemporaneously with this *Order and Authorization*, we deny the Wireless Carriers' request to defer action on the 2 GHz MSS applications.[126]

IV. ORDERING CLAUSES

48. Accordingly, IT IS ORDERED that Application File Nos. 183/184/185/186-SAT-P/LA-97 and 182-SAT-P/LA-97(64); IBFS File Nos. SAT-LOA-19970926-00151/52/53/54, SAT-LOA-19970926-00156 and SAT-AMD-20001103-00154 IS GRANTED, and Globalstar, L.P. IS AUTHORIZED to construct, launch and operate a satellite system comprised of sixty-four non-geostationary-satellite orbit satellites and four geostationary-satellite orbit satellites capable of operating in the 1990-2025/2165-2200 MHz bands in the United States, in accordance with the technical specifications set forth in its application and consistent with our rules unless specifically waived herein, and subject to the following conditions:

a. Globalstar, L.P. must choose a Selected Assignment in the 1990-2025 MHz and 2165-2200 MHz frequency bands upon launch of one satellite into its authorized orbit, and commencement of operations by that satellite;

b. The Selected Assignment shall give Globalstar, L.P. access to 3.5 megahertz in each direction of transmission on a primary basis;

c. The Selected Assignment shall be chosen such that the band edge of the assignment is an integer multiple of 3.88 megahertz from the band edge of the 2 GHz MSS band; and

d. Operations in frequencies in these bands outside the Selected Assignment shall be on a secondary basis with respect to operations of other 2 GHz MSS systems.

49. IT IS FURTHER ORDERED that Globalstar, L.P. IS AUTHORIZED to operate its proposed mobile-satellite system in the 1980-2025 MHz and 2160-2200 MHz frequency bands outside the United States subject to the following conditions:

a. In International Telecommunication Union (ITU) Regions 1 and 3, operations shall be limited to the 1980-2010 MHz and 2170-2200 MHz bands and shall comply with footnote S5.389F of the ITU Radio Regulations;[127]

b. In ITU Region 2, operations shall comply with footnotes S5.389A, S5.389B, S5.389C, S5.389D, S5.389E, and S5.390 of the ITU Radio Regulations;[128] and

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Scott, III, Verizon Wireless, IB Docket No. 99-81 (dated June 13, 2001) (citing the ICO E*x Parte* Letter and CTIA Petition). *Accord Ex parte* Letter of CTIA, IB Docket No. 99-81 (dated July 12, 2001). *But see Ex parte* Letter of Globalstar, L.P., IB Docket No. 99-81 (dated July 2, 2001) (objecting to the Wireless Carriers' request); *Ex parte* Letter of Celsat America, Inc., IB Docket No. 99-81 (dated June 25, 2001) (same).

[126] *See ICO Services Limited, Letter of Intent to Provide Mobile-Satellite Service in the 2 GHz Bands*, Order, DA 01-1635, at ¶¶ 29-31 (Int'l Bur./OET, rel. July 17, 2001).

[127] *See* ITU Radio Regulations n. S5.389F (placing limitations on MSS use of the 1980-2010 MHz and 2170-2200 MHz bands in Algeria, Benin, Cape Verde, Egypt, Mali, Syria and Tunisia).

[128] *See* ITU Radio Regulations nn.S5.389A (allocating the 1980-2010 MHz and 2170-2200 MHz bands to MSS, subject to coordination, effective January 1, 2000, except for the use of the 1980-1990 MHz band in Region 2, which is effective January 1, 2005), S5.389B (placing limitations on MSS use of the 1980-1990 MHz band in Argentina, Brazil, Canada, Chile, Ecuador, the United States, Honduras, Jamaica, Mexico, Peru, Suriname, Trinidad & Tabago,

c. Globalstar, L.P. is obligated to comply with the applicable laws, regulations, rules, and licensing procedures for those countries it proposes to serve.

50. IT IS FURTHER ORDERED that Globalstar, L.P. IS AUTHORIZED to construct, launch and operate a satellite system with a non-geostationary satellite orbit component comprised of sixty-four NGSO satellites capable of operating in the 15.43-15.63 GHz band (Earth-to-space) and the 6700-6800 MHz (space-to-Earth) for feeder link operations, in accordance with the technical specifications set forth in its application and consistent with our rules unless specifically waived herein, and subject to the following conditions:

a. Section 2.102(a) of the Commission's rules, 47 C.F.R. § 2.102(a), IS WAIVED to permit Globalstar, L.P. to operate its feeder uplink transmissions in the 15.43-15.63 GHz band, and its feeder downlink transmissions in the 6700-6800 MHz band, in accordance with the terms of this *Order*, and subject to any applicable rules that may be promulgated in ET Docket No. 98-142, *Amendment of Parts 2, 25 and 97 of the Commission's Rules with Regard to the Mobile-Satellite Service Above 1 GHz*; and

b. Globalstar, L.P. shall coordinate its feeder link operations in the 15.43-15.63 GHz band through the Frequency Assignment Subcommittee of the Interdepartment Radio Advisory Committee of the National Telecommunication and Information Administration.

51. IT IS FURTHER ORDERED that Globalstar, L.P. IS AUTHORIZED to operate its proposed inter-satellite service links in the 65.0-65.1 GHz frequency band and shall coordinate these operations through the Frequency Assignment Subcommittee of the Interdepartment Radio Advisory Committee of the National Telecommunication and Information Administration.

52. IT IS FURTHER ORDERED that Globalstar, L.P.'s request to operate non-geostationary satellite orbit feeder uplinks in the 19.3-19.7 GHz band IS DISMISSED.

53. IT IS FURTHER ORDERED that Globalstar, L.P.'s conditional request for waiver of Section 2.106 Footnote NG104 of the Commission's rules IS DEFERRED.

54. IT IS FURTHER ORDERED that Globalstar, L.P.'s request for authority to configure replacement satellites for its previously authorized constellation of low-Earth orbit (LEO) satellites[129] with 2 GHz Mobile-Satellite Service capacity IS DENIED.

55. IT IS FURTHER ORDERED that Globalstar, L.P.'s request to operate geostationary satellite orbit Mobile-Satellite Service satellites at 10º E.L., 100º E.L. and 170º W.L. that would use 250 megahertz of spectrum in the 14.0-14.5 GHz band (Earth-to-space) and 250 megahertz in the 11.7-12.2 GHz band (space-to-Earth) IS DENIED.

Uruguay and Venezuela), S5.389C (allocating the 2010-2025 MHz and 2160-2170 MHz bands to MSS in Region 2, subject to coordination, effective January 1, 2002), S5.389D (permitting MSS use of the 2010-2025 MHz and 2160-2170 MHz bands in the United States and Canada, effective January 1, 2000), S5.389E (placing limitations on MSS use of the 2010-2025 MHz and 2160-2170 MHz bands in Region 2 with respect to other services' operations in these bands in Regions 1 and 3), S5.390 (placing limitations on MSS use of the 2010-2025 MHz and 2160-2170 MHz bands in Argentina, Brazil, Chile, Columbia, Cuba, Ecuador and Suriname).

[129] *See Globalstar Big LEO License*, *supra* footnote 13.

56. IT IS FURTHER ORDERED that Globalstar, L.P.'s request to operate geostationary satellite orbit Mobile-Satellite Service satellite at 101º W.L. that would use 250 megahertz of spectrum in the 14.0-14.5 GHz band (Earth-to-space) and 250 megahertz in the 11.7-12.2 GHz band (space-to-Earth) IS DENIED.

57. IT IS FURTHER ORDERED that Globalstar, L.P.'s request to operate geostationary satellite orbit Mobile-Satellite Service satellite at 101º W.L. that would use 250 megahertz in the 12.75-13.25 GHz band (Earth-to-space) and 250 megahertz in the 10.7-10.95 GHz or 11.2-11.45 GHz bands (space-to-Earth) IS DENIED IN PART AND DEFERRED IN PART.

58. IT IS FURTHER ORDERED that the Consolidated Petition to Deny, Petition to Defer, and Comments of GE American Communications, Inc. and the Petition to Hold in Abeyance of the Boeing Company ARE DENIED.

59. IT IS FURTHER ORDERED that the Petition to Deny of Motient Services, Inc.; the Second Petition to Deny of GE American Communications, Inc.; and, in relevant part, the Consolidated Petition to Deny of PanAmSat Corporation ARE GRANTED.

60. IT IS FURTHER ORDERED that this authorization shall become NULL and VOID with no further action required on the Commission's part in the event the space station is not constructed, launched and placed into operation in accordance with the technical parameters and terms and conditions of the authorization by the following dates:

Milestone	**Deadline**
Enter Non-contingent Satellite Manufacturing Contract for GSO and NGSO Components	July 17, 2002
Complete Critical Design Review	July 17, 2003
Begin Physical Construction of All Satellites in NGSO Component	January 17, 2004
Begin Physical Construction of All Satellites in GSO Component	July 17, 2004
Complete Construction and Launch First Two Satellites in NGSO Component	January 17, 2005
Complete Construction of One GSO Satellite in Constellation and Launch It Into Its Assigned Orbit Location	July 17, 2006
Certify Entire System Operational	July 17, 2007

61. IT IS FURTHER ORDERED that Globalstar, L.P. will prepare any necessary submissions to the ITU to initiate and complete the advance publication, international coordination, and notification process for the space station(s) authorized by this *Order*, in accordance with the ITU Radio Regulations. No protection from interference caused by radio stations authorized by other Administrations is guaranteed unless coordination procedures are timely completed or, with respect to individual Administrations, by successfully completing coordination agreements. Any radio station authorization for which coordination has not been completed may be the subject of additional terms and conditions as required to effect coordination of the frequency assignments of other Administrations. 47 C.F.R. § 25.111(b).

62. IT IS FURTHER ORDERED that this *Order* is subject to change by summary order of the Commission on 30 days' notice and does not confer any permanent right to use the orbit and spectrum.

63. IT IS FURTHER ORDERED that Globalstar, L.P. may decline this authorization as conditioned within 30 days of the date of the release of this *Order and Authorization*. Failure to respond within that period will constitute formal acceptance of the authorization as conditioned.

64. This *Order and Authorization* is issued pursuant to Sections 0.241 and 0.261 of the Commission's rules on delegations of authority, 47 C.F.R. §§ 0.241, 0.261, and is effective upon release.

FEDERAL COMMUNICATIONS COMMISSION

Donald Abelson
Chief, International Bureau

Bruce A. Franca
Acting Chief, Office of Engineering and Technology

APPENDIX A
LIST OF PLEADINGS ADDRESSING GLOBALSTAR'S APPLICATION AND ASSOCIATED AMENDMENTS

Filed May 4, 1998

Comments of Celsat America, Inc. (Celsat Comments)
Comments of Constellation Communications, Inc. (Constellation Comments)
Consolidated Comments of ICO Services Limited (ICO Comments)
Consolidated Comments and Petition to Deny of Iridium LLC (Iridium Comments)
Comments of Bell Atlantic (Bell Atlantic Comments)
Consolidated Petition to Deny, Petition to Defer, and Comments of GE American Communications, Inc. (GE Americom First Petition)
Comments of PanAmSat Corporation (PanAmSat Comments)
Petition to Hold in Abeyance of the Boeing Company (Boeing Petition)
Comments of the Wireless Cable Association International, Inc. (WCA Comments).

Filed June 3, 1998

Reply to Comments of Globalstar, L.P. (Globalstar Reply)
Consolidated Reply Comments of ICO Services Limited (ICO Reply)

Filed June 18, 1998

Consolidated Reply of the Boeing Company (Boeing Response)
ICO's Consolidated Response to Reply Comments (ICO Response)
Reply of GE American Communications, Inc. (GE Americom Response)
Response of the Wireless Communications Association International, Inc. (WCA Response)

Filed December 14, 2000

Petition to Deny of Motient Services Inc. (Motient Petition)
Petition to Deny of GE American Communications, Inc. (GE Americom Second Petition)
Consolidated Petition to Deny of PanAmSat Corporation (PanAmSat Petition).

Filed January 16, 2001

Reply to Petitions to Deny of Globalstar, L.P. (Globalstar Second Reply)