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

In the Matter of	)	
	)	
Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands;	)	IB Docket No. 01-185
	)	
Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands	)	IB Docket No. 02-364

REPORT AND ORDER
AND NOTICE OF PROPOSED RULEMAKING

Adopted: January 29, 2003 **Released:** February 10, 2003

Comment date **[30 days after Federal Register publication]**
Reply Comment date **[45 days after Federal Register publication]**

By the Commission: Chairman Powell, Commissioners Abernathy and Adelstein issuing separate statements; Commissioner Copps approving in part, dissenting in part and issuing a statement

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I. INTRODUCTION

1. Today we decide to permit flexibility in the delivery of communications by Mobile Satellite Service (MSS) providers that operate in three sets of radio frequency bands: the 2 GHz MSS band,[1] the L-band[2] and the Big LEO bands.[3] Specifically, we permit MSS licensees to integrate ancillary terrestrial components (ATCs) into their MSS networks. Flexibility in this context differs from a so-called "flexible-use" allocation in which licensees can provide any service that appears in the U.S. Table of Allocations for the band either individually or in combination with other allocated services. We decide here to permit MSS operators to seek authority to integrate ATCs into their networks for the purpose of enhancing their ability to offer high-quality, affordable mobile services on land, in the air and over the oceans without using any additional spectrum resources beyond spectrum already allocated and authorized by the Commission for MSS in these bands. We will authorize MSS ATC subject to

[1] The term "2 GHz MSS band" is used in this Order to refer to the 1990-2025 MHz uplink (Earth-to-space transmissions) and 2165-2200 MHz downlink (space-to-Earth transmissions) frequencies, originally allocated to MSS in the United States. *See* U.S. Table of Frequency Allocations, 47 C.F.R. § 2.106 (2002) (providing a precise frequency allocation list and stating various encumbrances on particular sub-bands). A companion item to today's decision alters the 2 GHz MSS band to 2000-2020 MHz for uplink transmissions and 2180-2200 MHz for downlink transmissions. *See Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, ET Docket No.00-258, Third Report and Order, Third Notice of Proposed Rulemaking, and Second Memorandum Opinion and Order, FCC 03-16 (adopted Jan. 30, 2003) (*AWS Third Report and Order*).

[2] The "L-band" is a general designation for frequencies from 1 to 2 GHz. In the United States, the Commission has allocated L-band spectrum for MSS downlinks in the 1525-1544 MHz and 1545-1559 MHz bands and for MSS uplinks in the 1626.5-1645.5 MHz and 1646.5-1660.5 MHz bands. *See* 47 C.F.R. § 2.106.

[3] The term "Big LEO bands" is used in this *Order* to refer to the 1.6/2.4 GHz bands. In general, the Big LEO MSS systems rely on uplinks within the 1610-1626.5 MHz band and downlinks in the 2483.5-2500 MHz band.

conditions that ensure that the added terrestrial component remains ancillary to the principal MSS offering. We do not intend, nor will we permit, the terrestrial component to become a stand-alone service. We believe that permitting MSS ATCs in this manner should: (1) increase the efficiency of spectrum use through MSS network integration and terrestrial reuse and permit better coverage in areas that MSS providers could not otherwise serve; (2) reduce costs, eliminate inefficiencies and enhance operational ability in MSS systems; (3) provide additional communications that may enhance public protection; and (4) strengthen competition in the markets served by MSS.[4]

2. Our decision today balances the traditional goals of effective and efficient use of spectrum with preserving the optimal amount of spectrum for the provision of international satellite services. In this instance, we find that grant of ATC appears to best balance these competing public interest goals. Specifically, based on the record and our detailed technical analyses, we find that granting shared usage of the same MSS frequency band to separate MSS and terrestrial operators would likely compromise the effectiveness of both systems, particularly satellites already operating in the L-band and Big LEO band. In this case, making limited terrestrial authority available to licensed MSS operators in the form of ATC better serves the public interest than the more limited and technically difficult prospect of attempting to share the MSS spectrum, which would pose an unacceptable risk of harmful interference to the existing and planned operations of licensed MSS operators. At bottom, the Commission must choose between two alternatives. We could either prohibit MSS licensees from deploying MSS ATC in order to preserve, on principal, the initial service and operational rules for MSS. Or we could grant additional authority to the MSS incumbents to improve their services and efficient use of spectrum at the cost of giving the incumbents more operational authority than they had originally sought. Forced to choose, we believe granting, rather than withholding, access to spectrum resources represents the better course.

3. Consistent with this Order and the rules we adopt today, 2 GHz MSS, L-band and Big LEO operators may seek authority to integrate ATCs into existing and planned systems. We will authorize MSS licensees to implement ATCs, provided that the MSS licensee: (1) has launched and operates its own satellite facilities; (2) provides substantial satellite service to the public; (3) provides integrated ATC; (4) observes existing satellite geographic coverage requirements; and (5) limits ATC operations only to the authorized satellite footprint.[5] As explained below, observing certain space-segment requirements constitutes the provision of substantial satellite service to the public and should ensure that MSS remains

[4] For an overview of historical and current MSS operations, *see generally, e.g., Establishing Rules and Policies for Use of Spectrum for Mobile Satellite Services in Upper and Lower L-Band,* Report and Order, 17 FCC Rcd 2704, 2708-13, ¶ 11-20 (2002) (discussing technical innovations in MSS, reviewing some of the "strides made in spectrum-efficient MSS technologies" within the L-band and noting that "MSS systems are particularly well suited for providing mobile communication services to areas that are not being adequately served by terrestrial radio facilities").

[5] As we have repeatedly indicated, we intend to authorize ATC *only* as an ancillary service to the provision of the principal service, MSS. We have established a number of gating requirements to ensure that ATC may only operate after the provision of MSS has commenced and during the period in which MSS continues to operate. *See infra* §§ III(C)(2)-(4); *see also infra* App. B. While it is impossible to anticipate or imagine every possible way in which it might be possible to "game" our rules by providing ATC without also simultaneously providing MSS and while we do not expect our licensees to make such attempts, we do not intend to allow such "gaming." For example, even if an MSS licensee were to enter an agreement to lease some or all of the access to its authorized MSS spectrum to a terrestrial licensee, such spectrum could only be used if its usage met the requirements to ensure it remained ancillary to MSS and were used in conjunction with MSS operations, i.e., that it met all of our gating requirements. The purpose of our grant of ATC authority is to provide satellite licensees flexibility in providing satellite services that will benefit consumers, not to allow licensees to profit by selling access to their spectrum for a terrestrial-only service.

first and foremost a satellite service. For planned, licensed MSS systems, licensees may seek ATC authorization prior to launch and operation, but shall not provide ATCs prior to meeting the above criteria, and must have complied with MSS implementation milestones imposed on licensees at the time of seeking authority.

4. To prevent harmful interference and achieve other important public interest goals, we limit ATC deployments to certain "core" spectrum within each MSS licensee's respective spectrum assignments. These core spectrum requirements vary by band due to the unique characteristics of each MSS system's spectrum assignment. In the 2 GHz MSS band, ATC is confined to each MSS operator's "Selected Assignment." In the L-band, ATC is confined to each operator's variable spectrum assignment acquired pursuant to the 1996 Mexico City Memorandum of Understanding and related Operating Agreements (Mexico City MoU). In the Big LEO band, ATC is confined to no more than 5.5 megahertz in each direction of transmission per licensee. We implement this decision through the addition of a footnote to the U.S. Table of Frequency Allocations in section 2.106 of our Rules.[6] We also establish procedures for the authorization of MSS ATC operations consistent with the terms and conditions of this Order.

5. Finally, we initiate a new rulemaking in response to a petition for rulemaking filed by Iridium Satellite LLC (Iridium).[7] In its petition, Iridium requests that we revise our current rules to require MSS systems operating in the 1615.5-1621.35 MHz band to use time division/frequency division multiple access (TDMA/FDMA) technology,[8] rather than code division multiple access (CDMA) technology.[9] In effect, Iridium requests that we make 5.85 megahertz of MSS spectrum currently used by Globalstar L.P. (Globalstar), which uses CDMA technology, available to Iridium, which uses TDMA/FDMA technology. We tentatively conclude that a rebalancing of spectrum in the Big LEO band would serve the public interest and seek comment on the proposal in Iridium's petition and on various alternative uses for the Big LEO spectrum, including whether we should reallocate spectrum for unlicensed services, an additional commercial mobile radio service (CMRS) licensee or other services, or initiate a second processing round by which we could authorize new MSS entry.

II. BACKGROUND

6. We initiated this proceeding to consider the proposals of two MSS operators, ICO Global Communications (Holdings) Ltd. (ICO) and the Mobile Satellite Ventures Subsidiary LLC (MSV), to

[6] 47 C.F.R. § 2.106; *see infra* App. B. This footnote to the allocation table allows MSS licensees to implement MSS ATC pursuant to rules and policies adopted in this Order.

[7] Petition for Rulemaking of Iridium Satellite LLC (filed, July 26, 2002) (Iridium Petition) (included in the record of IB Docket No. 02-364).

[8] TDMA is a transmission technique in which users of the same frequency band are provided alternating time slots for their transmissions in the system, thereby avoiding mutual interference.

[9] CDMA is a transmission technique in which the signal occupies a bandwidth larger than that needed to contain the information being transmitted. The signal is spread over a wide bandwidth, the power is dispersed, and a code is used to send and retrieve the information. The spreading, the variation in the code, and other technical parameters permit a number of users to operate on the same frequency simultaneously without causing mutual harmful interference.

integrate ATCs into their MSS networks using assigned MSS frequencies.[10] ICO is one of five systems currently authorized to provide 2 GHz MSS in the United States.[11] ICO submitted its proposal in *ex parte* filings in Docket No. 99-81,[12] in which we promulgated service rules for operators in the 2 GHz MSS band.[13] MSV is currently licensed to provide MSS in the L-band.[14] MSV submitted its proposal in the

[10] *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Band*, IB Docket No. 01-185, Notice of Proposed Rulemaking, 16 FCC Rcd 15532 (2001) (*Flexibility Notice*). During the course of this proceeding, New ICO Global Communications (Holdings) Ltd. (referred to in the *Flexibility Notice*) merged with ICO Global Ltd. to form ICO Global Communications (Holdings) Ltd. (referred to in this Order as "ICO"). *See* Letter from Cheryl A. Tritt to Magalie Roman Salas, Secretary, Federal Communications Commission, File Nos. SAT-T/C-20000531-00097 and SATAMD-20000612-00107 (December 13, 2001). Also during the course of this proceeding, Motient Services, Inc. (Motient), the U.S.-licensed L-band MSS operator, and TMI Communications and Company, Limited Partnership (TMI), a Canadian-licensed L-band MSS provider, combined their MSS systems into a jointly-owned subsidiary, MSV. *See Motient Services Inc. and TMI Communications and Company, LP/Mobile Satellite Ventures Subsidiary LLC*, Order and Authorization, 16 FCC Rcd 20469 (Int'l Bur. 2001). Due to the substantial commonality of interest among Motient, TMI and MSV, we will refer to the three parties collectively as MSV in this Order unless otherwise indicated.

[11] *See The Boeing Company*, Order and Authorization, 16 FCC Rcd 13691 (Int'l Bur. 2001) (*Boeing 2 GHz MSS License*); *Celsat America, Inc*., Order and Authorization, 16 FCC Rcd 13712 (Int'l Bur. 2001) (*Celsat 2 GHz MSS License*); *Constellation Communications Holdings, Inc.*, Order and Authorization, 16 FCC Rcd 13724 (Int'l Bur./OET 2001) (*Constellation 2 GHz MSS License*), *authorization declared null and void*, *Mobile Communications Holdings, Inc. and ICO Global Communications (Holdings) Limited for Transfer of Control; Constellation Communications Holdings, Inc. and ICO Global Communications (Holdings) Limited for Transfer of Control*, Memorandum Opinion and Order, DA 03-285 (Int'l Bur., rel., Jan. 30, 2003) (*Constellation/MCHI Nullification Order*); *Globalstar, L.P.*, Order and Authorization, 16 FCC Rcd 13739 (Int'l Bur./OET 2001) (*Globalstar 2 GHz MSS License*), *authorization declared null and void*, *Globalstar, L.P., for Modification of License for a Mobile-Satellite Service System in the 2 GHz Band*, Memorandum Opinion and Order, DA No. 03-328 (Int'l Bur., rel., Jan. 30, 2003) (*Globalstar Nullification Order*); *ICO Services Limited*, Order, 16 FCC Rcd 13762 (Int'l Bur./OET 2001) (*ICO 2 GHz MSS Order*); *Iridium LLC*, Order and Authorization, 16 FCC Rcd 13778 (Int'l Bur. 2001) (*Iridium 2 GHz MSS License*); *Mobile Communications Holdings, Inc.*, Order and Authorization, 16 FCC Rcd 13794 (Int'l Bur./OET 2001) (*MCHI 2 GHz MSS License*), *authorization declared null and void, Constellation/MCHI Nullification Order*, DA 03-285; *TMI Communications and Company, Limited Partnership*, Order, 16 FCC Rcd 13808 (Int'l Bur. 2001) (*TMI 2 GHz MSS Order*).

[12] Letter from Lawrence H. Williams and Suzanne Hutchings, ICO Global Communications (Holdings) Ltd., to Chairman Michael K. Powell, Federal Communications Commission, IB Docket No. 99-81 (filed Mar. 8, 2001) (ICO Mar. 8 *Ex Parte* Letter); *see also* Letter from Cheryl A. Tritt, Counsel to ICO Services Limited to Magalie Roman Salas, Secretary, Federal Communications Commission, IB Docket 99-81 (April 20, 2001) (ICO April 20, 2001 *Ex Parte* Letter).

[13] *See 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 Rules Order*).

[14] In 1989, the Commission authorized Motient's predecessor in interest, American Mobile Satellite Corporation, to construct, launch and operate an MSS system in the upper L-band. *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*, GEN Docket No. 88-1234, Memorandum Opinion, Order and Authorization, 4 FCC Rcd 6041 (1989) (*MSV License*), *tentative decision on remand*, 6 FCC Rcd 4900 (1991), *final decision on remand*, 7 FCC Rcd 266 (1992), *aff'd sub nom. Aeronautical Radio, Inc. v. FCC*, 983 F.2d 275 (D.C. Cir. 1993). Beginning in 1999, the Commission granted TMI blanket authority to provide MSS to mobile terminals located in the United States. *See Satcom Systems, Inc./TMI Communications and Company, L.P.*, Order and Authorization, 14 FCC Rcd 20798 (1999), *aff'd sub nom. AMSC Subsidiary Corp. v. FCC*, 216 F.3d 1154 (D.C. Cir. 2000), *modified*, Order and Authorization, 15 FCC Rcd (continued….)

context of an application for authority to launch and operate a next generation L-band satellite system.[15] Other MSS licensees subsequently proposed similar plans.[16]

A. ATC Concept

7. The various proposals for ATC are conceptually different and would rely on different techniques to increase spectrum efficiency by carrying more communications traffic within the same licensed MSS spectrum.

8. MSV, a geostationary MSS operator, would take advantage of the geographic areas that are not served by specific MSS channels because of intra-system interference concerns.[17] These areas are a necessary product of the frequency and geographic intra-system sharing that occurs within their multi-beam satellite systems. By way of background, MSV's next generation system uses satellites that can produce a large number of relatively small "spot-beams" on the surface of the earth. These spot-beams can be small enough to provide satellite coverage to an area on the earth's surface 400 to 500 km across. Figure 1 demonstrates a sample frequency reuse plan for a geostationary MSS system.

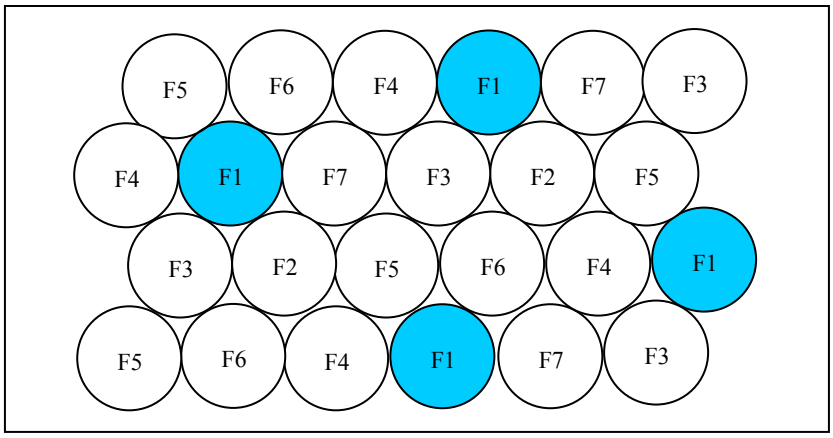
(Continued from previous page)
24467 (Sat. Radiocomm. Div., Int'l Bur. 2000); *see also TMI Communications and Company, L.P.*, Order and Authorization, 15 FCC Rcd 18117 (Sat. Radiocomm. Div., Int'l Bur. 2000).

[15] Application of Motient Services Inc., File Nos. SAT-LOA-19980702-00066, SAT-AMD-20001214-00171 & SAT-AMD-20010302. *See* Public Notice, Report No. SAT-00066 at 2 (rel. Mar. 19, 2001) (*MSV Application*). MSV later indicated that it would seek to use the same ATC network with its current-generation MSS system. *See* Letter from Carson E. Agnew, President and Chief Operating Officer, and Peter D. Karabinis, Chief Technical Officer, Mobile Satellite Ventures, to Marlene H. Dortch, Secretary, Federal Communications Commission, IB Docket 01-185 at 1 (filed, Dec. 16, 2002) (MSV Dec. 16, 2002 *Ex Parte* Letter).

[16] *See, e.g.,* Globalstar Comments at 2-20; Letter from Cheryl A. Tritt, Counsel, ICO Global Communications (Holdings) Ltd. to William F. Canton, Acting Secretary, Federal Communications, IB Docket 01-185 at 6-10 (filed Mar. 8, 2001) (ICO Mar. 8, 2001 *Ex Parte* Letter).

[17] Letter from David S. Konczal, Counsel, Mobile Satellite Ventures Subsidiary, LLC to Marlene Dortch, Secretary, Federal Communications Commission, IB Docket No. 01-185 at 4-6 (filed Jan. 11, 2002) (MSV Jan. 11, 2002 *Ex Parte* Letter).

Figure 1: Example of a Seven-Fold Frequency Reuse Plan

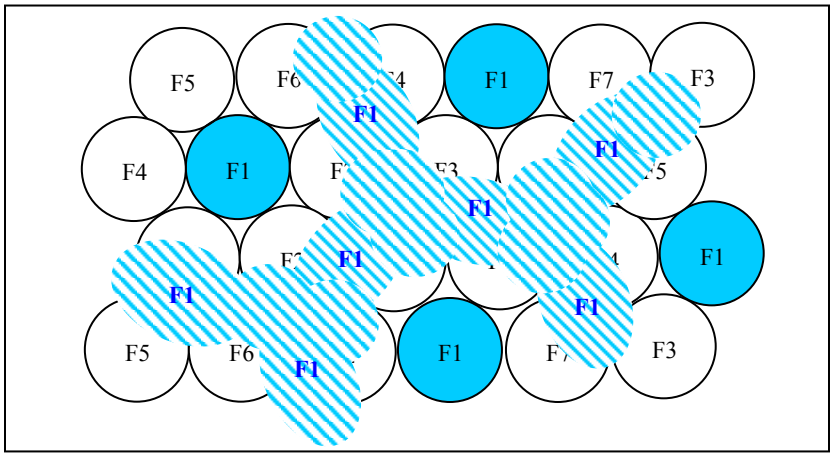


This diagram demonstrates frequency reuse. Here, a spot-beam operating on frequency F1 is surrounded by spot-beams operating on one of six other frequencies (F2 to F7). The distance between spot-beams operating on F1 is sufficient to prevent communications in one F1 beam from causing significant amounts of interference into the closest other spot beam that operates on the same F1 frequency. Because a total of seven frequencies are used in this example, the figure shows a "seven-fold" frequency reuse plan. Frequency reuse plans involving different numbers of frequencies are possible.

9. In the context of MSS, deploying this type of frequency reuse plan leaves areas on the surface of the Earth in which the MSS system is not using a specific MSS frequency, such as frequency F1 as shown in the diagram. The idea behind MSV's ATC is that a terrestrially based communication can occur on frequency F1 in those areas in which the satellite is not using frequency F1 provided that sufficient discrimination exists between the terrestrial transmitters and the MSS satellite beams that use the same frequency. Figure 2 demonstrates a sample frequency reuse plan for a geostationary MSS ATC system.[18]

[18] This sample MSS ATC diagram is based on the proposal of MSV. For additional information on MSV's proposal, *see* MSV Jan. 10, 2002 *Ex Parte* Letter at 18-19.

Figure 2: Example of Possible Additional Frequency Reuse through ATC



After deployment of MSS ATC, a spot-beam operating on frequency F1 is surrounded by spot-beams operating on one of six other frequencies (F2 to F7) and terrestrial cells also operating on F1. The distance between spot-beams operating on F1 and the terrestrial cells, which also operate on F1, is sufficient to prevent harmful interference from occurring in the F1 MSS beams.

10. ATC implementation for the non-geostationary orbit (NGSO) MSS systems, such as that of Globalstar and ICO tend to be more complex both because the NGSO satellites move with respect to the Earth's surface and because multiple MSS satellites may be visible at one time. Like the GSO systems, however, the NGSO use multi-beam antennas and assign selected MSS frequencies to selected satellite antenna coverage beams.

11. Globalstar, for example, would assign separate frequencies to MSS and ATC operations varying the assignments on a timed basis.[19] The ATC services that are planned for urban areas would cause co-frequency MSS services to be unavailable in areas of the United States where the satellite beam coverage included a co-frequency ATC city. These restricted frequency MSS areas would vary as the satellites move in orbit and as the coverage areas change. Globalstar also indicates that by assigning some frequencies to ATC in selected cities while assigning different frequencies to the MSS operations would reduce the loss of MSS coverage area. They also indicate that MSS operators could reserve some spectrum for MSS-only operations.

12. ICO, an NGSO MSS service provider, plans to control the amount of bandwidth assigned to both the MSS system and the ATC based upon traffic load.[20] According to ICO, this concept allows reuse of the MSS spectrum by the ATC in urban areas, while still allowing the satellite to utilize the same spectrum to provide service in rural areas.

13. While MSS ATC systems could operate on unused frequencies within a satellite beam, MSS ATC operators will choose in some cases to operate on some frequencies that are being used within the satellite beam. As a conceptual matter, MSS ATC will generally operate by using certain MSS channels or spectrum on a terrestrial basis over a limited geographic area, such as an urban market. Since the satellite signal generally would be very weak as compared to signals from nearby terrestrial base stations

[19] *See* Globalstar Supplemental Comments at 5.

[20] ICO Mar. 8, 2002 *Ex Parte* Letter, App. B at 2-3.

on the same channel, the channel can be used to provide terrestrial service in place of the satellite service in this geographic area. In areas away from the terrestrial base station (perhaps 20 kilometers or more), the signal from the MSS satellite would be much greater than the signal from the terrestrial transmitter on the same channel, and the user would receive the signal from the MSS satellite. There might be a zone on some channels where neither the terrestrial or satellite signal is able to overcome the interference from the other signal, although satellite signals on other channels still would be available for use.

14. The principal proponents of MSS ATC – MSV, ICO and Globalstar – ask that we permit them to re-use their assigned MSS frequencies to operate terrestrial base stations for the purpose of extending their communications services to urban areas and in buildings where the satellite signal is attenuated. They intend that the terrestrial services offered would be ancillary in nature with MSS remaining their primary service offering.[21] They state that ATC will allow them to more efficiently and dynamically use the spectrum resources assigned to their systems and add that permitting ATC in urban areas will increase their customer base so that they can offer lower-cost services generally.[22] They also contend that a larger customer base will result in economies of scale that will reduce handset manufacturing costs, permitting production of more affordable handsets. They state that if they are permitted to offer ancillary terrestrial services to overcome technical difficulties in penetrating urban areas, they will have a better opportunity for successful development of commercial MSS systems that will serve rural and unserved markets and will be able to use their licensed satellite spectrum more efficiently. In the *Flexibility Notice*, we incorporated by reference both the ICO and MSV proposals.[23]

B. Flexibility Notice

15. In the *Flexibility Notice*, we stated that the potential long-term benefits of MSS merit consideration of approaches to achieve flexibility in the delivery of communications by MSS operators.[24] We asked whether and how we might bring flexibility to MSS spectrum either by: (1) permitting 2 GHz and L-band MSS operators to provide service in areas where the MSS signals are attenuated by integrating terrestrial operations with their networks using assigned MSS frequencies, as has been proposed by two operators, or (2) opening up portions of the 2 GHz and L-bands for any operator to provide a terrestrial service that could either be offered in conjunction with MSS or as an alternative mobile service.[25] In addition, we sought comment on whether we should consider permitting terrestrial operations in the Big LEO bands due to the similarity between these systems and 2 GHz MSS operations.[26]

16. On March 6, 2002, we asked for additional technical discussion concerning a way to implement the alternative proposal discussed in the *Flexibility Notice*, which would open portions of the

[21] *MSV Application at* 6-9; ICO Mar. 8, 2002 *Ex Parte* Letter at 1, 6-10.

[22] *MSV Application at* 12-13; ICO Mar. 8, 2002 *Ex Parte* Letter at 11-13.

[23] *Flexibility Notice*, 16 FCC Rcd at 15534, ¶ 5 & n.7.

[24] *Id.* at 15533, ¶ 2.

[25] *Id.* at 15533, ¶ 3.

[26] *Id.* at 15533, ¶ 4.

MSS bands for any operator to provide a terrestrial service.[27] We sought comment concerning whether, from a purely technical point of view, MSS operations in the 2 GHz MSS, L- and Big LEO bands could be "severed" from terrestrial operations in each band. Specifically, we asked commenters to elaborate on their earlier discussion of whether it would be "technically feasible for one operator to provide terrestrial services and another operator to provide satellite services in the same MSS band."[28]

C. Other Proceedings

17. We note that we do not reach decisions here on issues raised in the *Flexibility Notice* concerning the relocation of incumbents from the 2 GHz MSS bands.[29] Specifically, in the *Flexibility Notice*, we sought comment on the implications of permitting ATCs for existing broadcast auxiliary service (BAS) and fixed service (FS) relocation programs established to implement MSS in the 2 GHz band.[30] We recognize that our decisions here will require us to revisit our existing BAS and FS relocation policies; however, we will consider possible revisions to our current relocation procedures based on the outcome of other proceedings involving our overall spectrum-management plan in the 2 GHz frequencies,[31] and our actions today are not intended to prejudice the outcome of those proceedings.

III. DISCUSSION

18. Below, we consider the MSS ATC proposals and alternative approaches as proposed in the *Flexibility Notice* and in the record, and conclude that permitting ATC in the MSS bands serves the public

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[27] *Commission Staff Invites Technical Comment on the Certain Proposals to Permit Flexibility in the Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, The L-Band, And The 1.6/2.4 GHz Band*, IB Docket No. 01-185, Public Notice, 17 FCC Rcd 4418 (2002) (*Severability Notice*). The responses to the Severability *Notice* shall be referred to as "Supplemental Comments" throughout this Order.

[28] *Severability Notice*, 17 FCC Rcd at 4419.

[29] *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), *further recon. pending* (*2 GHz Allocation and Relocation Proceeding*).

[30] *Flexibility Notice*, 16 FCC Rcd at 15560-62, ¶¶ 72-76. BAS providers maintain that we should suspend and restructure the BAS relocation scheme if we permit introduction of ATCs. *See* Meredith Corporation Reply at 1-4; NAB Reply at 1-10, 16; 2 GHz Broadcast Group at 1-6; SBE Comments at 3-5; SBE Reply at 4, 5. ICO urges us to leave in place relocation policies for FS users. ICO Comments at 51; ICO Reply at 13-15.

[31] *See AWS Third Report and Order,* FCC 03-16 (reallocating up to 30 megahertz of spectrum from the 2 GHz MSS bands for terrestrial services); *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, ET Docket No. 00-258, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, 16 FCC Rcd 16043, 16057-58, ¶¶ 32-34 (2001) (*Advanced Services Further Notice*) (seeking comment on changes that would have to be made in the *2 GHz Allocation and Relocation Proceeding* should the Commission reallocate some portion of the 2 GHz MSS band for other uses, including advanced wireless services); *Improving Public Safety Communications in the 800 MHz Band*, WT Docket No. 02-55, Notice of Proposed Rule Making, 17 FCC Rcd 4873, 4904, ¶ 56 (2002) (*800 MHz Notice*) (seeking comment on relocating BAS and FS incumbents should the Commission use portions of the 2 GHz MSS band as replacement spectrum for displaced 800 MHz licensees, in an overall effort to improve public safety communications).

interest. MSS licensees in each of the three bands at issue in this proceeding are either operating or building satellite systems under authority that the Commission has granted to them. We find that MSS licensees may achieve greater efficiencies in their use of assigned spectrum through MSS ATC and that there would be operational and other benefits that would serve the public interest. We further find that it would be inadvisable or impracticable to adopt other alternatives that would either compromise the operations of MSS licensees or require us to take away the authority that has been granted to MSS licensees. Therefore, we conclude below that the public interest is best served by permitting MSS licensees flexibility to improve MSS by having the option of deploying MSS ATC to improve spectrum efficiency and achieve other public-interest goals, particularly given that our technical analyses demonstrate that we cannot grant to a third party the right to use licensed MSS spectrum for terrestrial use without impacting the rights of the existing satellite licensees. In addition, we discuss the conditions we impose on MSS operators that wish to integrate ATCs into their networks.[32] We then address technical issues related to each band in which we permit ATC. Finally, we consider certain statutory, allocation and licensing issues.

A. MSS ATC Primary Proposal

1. Proposed ATC Use of the Frequency Spectrum

19. Proponents of ATC state that allowing additional MSS flexibility will increase efficiency within spectrum already allocated for MSS, though in some cases they differ on the precise methods by which they would achieve these gains. First, according to these parties, ATC would allow satellite operators to serve new customers that they cannot currently reach.[33] Second, these parties claim ATC would permit satellite operators to divert some communications traffic from the satellite to the terrestrially-based system, which would free existing satellite capacity for other potential users.[34] Third, these parties note ATC would allow an operator to reuse spectrum several more times within relatively small geographic areas than previously possible.[35] Because ATC must operate within bands already allocated to MSS, these parties argue that ATC reuse of the MSS spectrum represents an efficiency gain.[36]

20. Some commenters dispute the anticipated gains in spectrum efficiency that the proponents envision in the MSS bands from ATC.[37] As explained in greater detail below, we do not agree with these

[32] MSS ATC may not commence operation without a grant of authority pursuant to the licensing and service rules we adopt today, which, among other things, require the MSS ATC applicant to demonstrate that it provides substantial satellite service to the public and that it will operate MSS ATC only in the spectrum segments we authorized for ATC operations. *See, e.g., infra* App. B (adopting 47 C.F.R. § 25.143(j), which requires licensing prior to operation).

[33] Constellation Comments at 5, 10; MCHI Comments at 8-11; ICO Comments at 23; MSV Comments at 15-17.

[34] Constellation Comments at 5, 10; MCHI Comments at 8-11.

[35] *See, e.g.*, Loral Comments at 9; Globalstar Bondholders Comments at 27.

[36] Constellation Comments at iii, 5; MCHI Comments at ii, 2, 10-11; ICO Comments at iii, 23-25, 31-36; MSV Comments at i, 16-20; Globalstar Comments at vi, 27-28.

[37] Voicestream Reply at 3 (noting that both the ATC and 'alternate' proposals would "improve spectrum efficiency").

claims.[38] MSS ATC proponents do not seek additional spectrum, but rather greater authority to use spectrum previously licensed for their use in satellite systems in additional ways. As such, the potential efficiency gains of ATC – whether obtained through increased frequency reuse within a satellite beam or through improved MSS reception in urban areas – are real. Indeed, granting MSS operators the ability to provide more and better services to both existing and potentially new subscribers with the same amount of spectrum necessarily improves the efficiency with which they can use the spectrum and, we believe, may ultimately provide a service that is more valuable to consumers. Thus, we find that authorizing ATC will provide MSS operators with the possibility of achieving greater efficiencies within MSS spectrum than possible today by stand-alone MSS space stations or divided control of the MSS space and ground segments.[39]

21. Using frequency-reuse techniques, MSS ATC has the potential to transmit more information to more individual users within a given amount of spectrum than MSS alone. While the exact configuration of each MSS ATC will vary depending on the MSS licensee's system parameters, MSS ATC, in essence, allows licensees the flexibility to achieve greater use of their licensed satellite spectrum than possible under our current MSS service rules. Because terrestrial channels can be re-used many more times over a much smaller area than the satellite use of the same channel, the MSS licensee can achieve higher frequency re-use by deploying MSS ATC than by a satellite-only system. MSS ATC will generally operate by using certain MSS channels or spectrum on a terrestrial basis over a limited geographic area, such as an urban market, that currently may not receive satellite signals due to terrain obstacles or other blockages. In areas away from the terrestrial base station, of course, the signal from the MSS satellite would remain much greater than the signal from the terrestrial transmitter on the same channel, and the user would continue to receive the signal from the MSS satellite. In areas near the terrestrial base station, an MSS ATC subscriber would communicate with the terrestrial base station in a manner that would not interfere with satellite channels that might penetrate the urban terrain.[40] In either case, the MSS licensee would make more efficient use of its licensed satellite spectrum by incorporating greater frequency reuse into its system.

22. Our conclusions about the benefits of permitting MSS the flexibility to provide ATC remain true even if fewer MSS licensees exist in the future than exist today. The question is not whether terrestrial services represent a more efficient use of spectrum than satellite services, but rather whether allowing MSS licensees to improve the efficiency of their licensed systems better serves the public interest than the status quo.[41] We conclude that permitting MSS licensees to enhance spectrum efficiency

[38] *See infra* § III(C) (6). In any case, we also conclude that granting terrestrial rights in MSS spectrum to non-MSS operators is not possible without undermining the authority already granted to MSS licensees. *See infra* § III(B).

[39] For a comparison of ATC versus other delivery methods, *see* § III(B) *infra*.

[40] In theory, there could be a zone on some channels where neither the terrestrial, nor satellite signal is able to overcome the interference from the other signal; however, satellite-coverage rules adopted today require that subscribers must be able to obtain MSS satellite service even in areas near the terrestrial base stations, provided that terrain does not block the satellite signal. Moreover, satellite systems often use different frequencies in different parts of their coverage areas to avoid self-interference. MSS operators have indicated that they will deploy their ATC on frequencies that are not being used by the satellite in that geographic area; thus, no interference zone would occur in these situations.

[41] *Report of Gregory L. Rosston, Ph.D.*, Stanford University, Stanford Institute for Economic Policy Research, Deputy Director, ICO Reply Comments, App. A. at A-3 ("If consumer welfare is enhanced by granting spectrum flexibility, it is irrational to withhold that flexibility solely to prevent an existing licensee from benefiting").

through ATC represents a superior choice to continuing with the regulatory status quo.

2. Operational Benefits

23. The record demonstrates that the integration of an ATC into authorized and existing MSS systems would have several benefits. First, MSS ATC will use more intensive and more efficient frequency reuse techniques to allow MSS licensees to conduct terrestrial mobile operations. By filling gaps in the MSS coverage area and increasing MSS network capacity, MSS ATC should not only permit customers in underserved or unserved terrestrial markets to use ATC-enabled MSS handsets when in urban areas or inside buildings, but also allow MSS operators to develop new and innovative service offerings that satellite-only MSS systems cannot offer today.[42] MSS operators may choose to deploy a variety of new services through ATC-enabled MSS systems, including ubiquitous digital telecommunications and broadband services, interoperable nationwide public-safety systems, and other services that take advantage of the unique coverage and capacity characteristics of ATC-enabled MSS.[43] While the market will ultimately determine the precise mix of new offerings, we expect, at a minimum, that the expanded coverage and improved efficiency resulting from MSS ATC may enhance competition in some of the important niche markets that MSS serves, including the maritime, aeronautical, commercial-transportation and public-safety markets that rely on MSS for service to more remote and underserved locations.[44]

24. Second, for various reasons, improved coverage in urban areas should significantly expand the consumer market that MSS is capable of serving.[45] This larger consumer market would, in turn, allow providers to order larger production volumes, which further reduce the costs of producing phones.[46]

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[42] By "handset," we refer in this Order to all types of communications terminals operated by an individual user and capable of transmitting voice, data, or both. In other words, the terms "phone," "handset" and "terminal" are used interchangeably to refer to end-user devices.

[43] *See, e.g.,* MSV Comments at 9-10; ICO Comments at 21; Globalstar Bondholders Reply at 12.

[44] *See* MSV Comments at 5-11; MSV Reply at 3; Globalstar Comments at 2-4; Globalstar Bondholder Comments at 12-15; ICO Comments at 7; Loral Comments at 3-5.

[45] *See, e.g.,* Globalstar Bondholders Reply at 17 ("ATC authority will allow users to purchase smaller, less expensive phones . . . [and] will expand dramatically the subscriber market and thus will further drive down the price of phones through economies of scale."); ICO Comments at 19-21 ("ATC . . . will solve the market size and product investment problems . . . by making MSS more attractive to 'traditional' MSS market segments, and by creating brand new markets based on seamless service offerings – offerings that simply cannot be provided either by an MSS network that fails to provide reliable service in dense urban areas or by a terrestrial operator that can only offer limited geographic coverage."); MSV Comments at 11-14 ("A market exists for the truly continent-wide service that MSV proposes to offer with its integrated satellite and terrestrial system . . . . The inability of MSS carriers to provide service in urban and indoor environments has prevented MSS providers from developing a critical mass of customers."); Constellation Comments at 8 ("Allowing MSS systems to extend their services into urban areas will have a positive impact on the telecommunications market . . . . [T]he new service capabilities unique to integrated satellite/terrestrial system architecture . . . will allow a more rapid rollout of new advanced or specialized services on a nationwide basis.").

[46] *See, e.g.,* Globalstar Bondholders Reply at 17. Globalstar distinguishes between *dual-mode* MSS ATC handsets and *dual-band* CMRS-MSS handsets. Globalstar claims that dual-mode MSS ATC will be smaller and cheaper than dual-band CMRS-MSS handsets because the dual-mode MSS ATC handsets only need to operate in one frequency band whereas the dual-band CMRS-MSS handsets must operate in two frequency bands. *See id.* ("CMRS-MSS (continued….)

25. Third, an integrated MSS ATC would permit operators to offer all services over a single telephone number.[47] According to Globalstar, consumers who use existing phones that are capable of operating on either terrestrial CMRS or MSS networks requires consumers to use two numbers – one for their MSS mode and a second number for the terrestrial mode.[48] The customer may also receive two separate bills, one from each service provider.[49] An integrated MSS ATC, however, would eliminate the complications and disincentives for customers that dual networks create, which arise from using two different frequency bands and from having two different vendors to achieve integrated, ubiquitous mobile coverage.

26. Fourth, an integrated MSS ATC likely would eliminate operational complications and associated transaction costs MSS operators may incur in separately negotiating terrestrial roaming agreements in limited geographic areas across the footprint of their satellites.[50] While parties opposing ATC assert that MSS providers could enter alternative arrangements with terrestrial service providers,[51] MSS operators contend that such arrangements may be unlikely to occur in practice.[52] Under both the present system and our alternative proposal to permit a third-party operator to conduct terrestrial operations in the licensed MSS bands, an MSS licensee that wishes to offer an integrated satellite and

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phones are larger and more expensive than single-band MSS-ATC phones will be. This is due in large part to the small production runs and redundant circuitry needed for CMRS-MSS phones to receive different terrestrial and satellite frequencies. In contrast, MSS-ATC phones will require only a single circuit and thus will be smaller and less expensive to produce than CMRS-MSS phones. Thus, ATC authority will allow users to purchase smaller, less expensive phones. In addition, ATC authority will expand dramatically the addressable subscriber market and thus further will drive down the price of the phones through economies of scale."). While we recognize that not all MSS providers may decide to include all MSS and ATC functions within a single handset, the option of doing so offers significant potential benefits.

[47] Globalstar Bondholders Reply at 16.

[48] Moreover, if a customer receives a call from a terrestrially based network while using the satellite phone, the phone cannot notify the customer of the incoming call. Globalstar Bondholders Reply at 16 (citing Globalstar Comments at 14; Globalstar Bondholders Comments at 35); Globalstar Bondholders Supplemental Comments at 3. We note that technological and logistical limitations, rather than any express regulatory barrier in our rules, appear to be the principal reasons preventing the use of a single telephone number within a satellite-terrestrial handset.

[49] Globalstar Bondholders Feb. 8, 2002 *Ex Parte* Letter at 6; Globalstar Bondholders Supplemental Comments at 3.

[50] Globalstar Bondholders Supplemental Comments at 3 (identifying difficulties in roaming and joint marketing efforts).

[51] Stratos Comments at 10-11 ("The economies of scale favor using already existing terrestrial service providers and their substantial investment, as opposed to expending new resources to create new terrestrial mobile networks that use MSS spectrum."); Inmarsat Comments at 26 (asserting that MSS providers could enter into contractual agreements with CMRS providers who operate in other bands to "to create a more robust service, and to provide in-building service and coverage of areas where MSS signals may be blocked by buildings or terrain").

[52] Globalstar Comments at 15, 33, 35-36; Globalstar Supplemental Comments at 5 (claiming "there is absolutely no chance that two different operators of two separate mobile systems could successfully" coordinate with multiple terrestrial carriers); Celsat Supplemental Comments at 3 (arguing that it is "highly unrealistic for the Commission to expect MSS and terrestrial competitors can jointly coordinate these complex systems without substantial cost measured in terms of inefficient operations, huge administrative expenses and constant friction."); ICO Comments at 4, 30, 31; ICO Reply at 6; Constellation Comments at 20; Constellation Reply at 5; Constellation Supplemental Comments at 6 (noting that "[c]oordination would not be practical between each MSS licensee and potentially hundreds of different terrestrial licensees.").

terrestrial service at retail to a consumer must negotiate separate terrestrial roaming contracts with terrestrial licensees that would cover various portions of the MSS licensees' footprint.[53] Given the presence of more than one terrestrial competitor in most regions, the MSS operator benefits from operating in as few additional bands as possible.[54] For a roaming agreement to be valuable to an MSS operator, therefore, the MSS licensee would prefer to enter agreements with those terrestrial licensees within, or relatively near, the same set of frequency bands throughout the MSS operators' geographically dispersed service area.[55] An existing MSS operator is concerned that terrestrial licensees in the desired terrestrial roaming band may have an incentive to hold out roaming privileges from the satellite licensee to derive as much value as possible from their rights to the terrestrial spectrum within their licensed geographic area.[56] Existing operators also are concerned that terrestrial and satellite licensees have little incentive to negotiate due to the high transaction costs associated with assuring coverage of such a widely dispersed geographic coverage area, and due to what may be viewed as the limited roaming revenues to be derived from the current MSS customer base.[57]

27. While roaming agreements may or may not be feasible, we are unconvinced that their availability should be a basis for not permitting ATC. Some MSS operators indeed may decide that reliance upon roaming agreements with existing terrestrial providers is preferable to building out their own ancillary terrestrial facilities. Nothing in the action we take today would preclude this option. By granting ATC, however, we give MSS operators another choice. Integrated ATC could permit an MSS operator to achieve network efficiencies by deploying the most efficient architecture for a particular geographic and market environment.[58] As Boeing has observed, moreover, these benefits would not be confined to users of the MSS systems' terrestrial components. Instead, the integrated nature of ATC will "permit MSS subscribers, rural and maritime, to benefit from larger market economies of scale for equipment, service offerings and geographic coverage."[59] These additional capabilities reflect how a grant of terrestrial rights to MSS licensees results in more efficient use of spectrum and benefits not only MSS licensees but also consumers. Urban penetration capability, lower-priced phones, unified numbering, unified billing, and reduced transaction costs could reasonably be expected to result in lower retail prices and greater consumer demand for MSS. In addition, granting MSS licensees the option of deploying ATC has the potential, among other things, to encourage innovation in mobile telecommunications, broadband services and interoperable public-safety systems.

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[53] *See, e.g.*, Globalstar Comments at 15; Constellation Comments at 20; Celsat Supplemental Comments at 3; Constellation Supplemental Comments at 6; ICO Supplemental Comments at 1-2.

[54] The fewer bands an MSS handset is required to use, the less expensive and complex the handset is to produce. *See, e.g.*, Globalstar Comments at 20, 22; MSV Comments at 10, 14-15; Celsat Comments at 5; ICO Comments at 32-36; Constellation Comments at 10, 19, 34-35; Globalstar Bondholders Reply at 16-17, 42; Globalstar Supplemental Comments at 3; MSV Supplemental Comments at 6.

[55] *See, e.g.*, Globalstar Bondholders Reply at 17.

[56] *See, e.g.*, Globalstar Comments at 35; Globalstar Bondholders Reply at 17-18.

[57] *See, e.g.*, Globalstar Comments at 10 n.11, 20; ICO Comments at 22.

[58] ICO Comments at 23; accord *Report of Gregory L. Rosston, Ph.D.*, Stanford University, Stanford Institute for Economic Policy Research, Deputy Director, ICO Reply Comments, App. A. at A-6.

[59] Boeing Reply at 4.

3. Protecting the Public

28. MSS systems have the ability to offer instant global communications for civilians, public-safety organizations, and the military in areas where terrestrial facilities do not exist or do not function.[60] These services also permit law-enforcement, aid agencies and the public to communicate from remote locations on the land, on the sea or in the air through a single telephone number.[61] MSS operators point out the industry's role protecting the public, including the industry's vital role in ensuring reliable communications to protect the welfare of our nation and the lives of its citizens.[62]

29. We believe that ATC-enabled MSS systems may provide additional communications options and, therefore, offer our nation greater protection in times of crisis or disaster than traditional MSS systems alone.[63] By offering ubiquitous coverage with instant, nationwide interoperability, ATC-enhanced MSS may make the public, law enforcement and public-safety organizations easier to reach in the field, regardless of location. Accordingly, MSS ATC may enhance the nation's overall ability to maintain critical telecommunications infrastructure in times of crisis or disaster.[64]

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[60] *See, e.g.,* Globalstar Comments at 6; MSV Comments at 10-11; ICO Comments at iii, 2, 7, 13, 20-21; Stratos Comments at i, 2; Globalstar Bondholders Reply at vii, 5; MSV Supplemental Comments at 2.

[61] The Commission has repeatedly noted the ability of MSS systems to protect public safety. *See, e.g., Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service*, Notice of Proposed Rulemaking, 10 FCC Rcd 3230, ¶ 7 (1995) ("MSS can provide nationwide public safety coverage. . . . [and] MSS could satisfy important requirements that cannot be economically satisfied by other means.'); *Establishing Rules and Policies for the Use of Spectrum for Mobile Satellite Service in the Upper and Lower L-band*, Notice of Proposed Rulemaking, 11 FCC Rcd 11675, 11681 ¶ 12 (1996) ("MSS can . . . meet rural public safety needs and provide emergency communications to any area in times of emergencies and natural disasters."). If a crisis does occur, MSS systems allow military, law-enforcement, aid and relief agencies to overcome incompatibilities in the various units' communications systems. *See* Globalstar Reply at 6.

[62] MSV Comments at 10 ("Motient currently provides service to hundreds of federal, state, and local governmental agencies, including critical public safety organizations like the Federal Emergency Management Agency, U.S. Coast Guard, and local fire and police departments."); MSV Reply at 9-11 (describing the public safety, industrial, and maritime uses of the MSS services that Motient provides using its U.S.-licensed geostationary L-band satellite); Globalstar Reply at 5 ("MSS systems make communications available in emergency situations where terrestrial phone service is not available, either because there is no phone service at the site of the emergency or because the impact of the emergency disrupted existing terrestrial phone service"); ICO Comments at 13-15 (describing the MSS role in providing service in response to the terrorist events of September 11, 2001 as well as in other disasters such as earthquakes, hurricanes, tornadoes, cyclones, floods, forest fires, and refugee migrations) (citations omitted); Globalstar Bondholders at 9-12 (describing the "unparalleled functionality, flexibility, and availability to emergency, law enforcement, and public safety personnel" through Globalstar's MSS services) (citations omitted).

[63] Globalstar Comments at 6 (noting that "[e]mergencies can occur anywhere, inside buildings, on city streets, and in wilderness areas …[and] increasing the usability of MSS phones in more locations through ATC makes MSS a better service for public safety and emergency response organizations."); MSV Comments at 10 (MSS ATC may provide opportunities to establish the type of reliable, ubiquitous, interoperable communications network for which Federal, state and local public-protection organizations have been searching); ICO Comments at iii ("A revitalized MSS industry is virtually the only economically and technically efficient way to bring broadband service to rural Americans, and will arm public safety, military, maritime, and recreational users with primary redundant communications services that are even more essential in today's environment.").

[64] MSS ATC may also alleviate "clogged wireline and terrestrial networks during a man-made or natural disaster." Globalstar Bondholders Comments at 8; *accord* Loral Comments at 2 ("MSS can play a unique and crucial public (continued….)

4. Strengthening Competition

30. MSS operators already possess licenses to use the spectrum allocated for MSS. Our actions today do not grant additional spectrum, but rather grant MSS licensees the ability to modify their licenses to offer a new terrestrial service that is ancillary to MSS.[65] The Commission has granted regulatory flexibility to terrestrial and space-station spectrum licensees after finding that flexibility can promote competition and innovation without consuming additional spectrum resources.[66] The record demonstrates that a similar type of regulatory flexibility is warranted here because it is infeasible as a practical matter for a terrestrial service to share the MSS licensees' spectrum in the same place at the same time without unacceptably risking harmful interference to the existing and planned operations of MSS incumbents and compromising the operations of the MSS licensees.

31. Our decision to grant MSS ATC rests on a sound principle of spectrum management: namely, that the Commission should permit incumbents the option of deploying more efficient, more cost-effective uses of spectrum when granting the additional rights to third parties is impracticable or infeasible. In general, we will grant the rights to incumbents when granting rights to third parties would create an unacceptable risk of harmful interference that impinges on the expectations of Commission licensees. Indeed, as we explain below, authorizing third-party use of the MSS spectrum would impinge on the authority the Commission previously granted the MSS licensees. Significantly, moreover, we do not permit MSS licensees to provide any type of service that the allocation permits, but rather permit the incumbents to deploy MSS ATC subject to several conditions designed in part to ensure the allocation

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safety role by providing a critical alternative for communications when traditional landline and terrestrial wireless systems are not functioning or are overwhelmed."); Globalstar Bondholders Reply at 9-10 n.23 ("the inimitable importance of the MSS industry to homeland security is a sufficient public interest justification to warrant strengthening the MSS industry through a grant of ATC authority.").

[65] *Flexibility Notice*, 16 FCC Rcd at 15533, ¶ 2.

[66] *See Amendment of the Commission's Rules to Permit Flexible Service Offerings in the Commercial Mobile Radio Services*, WT Docket No. 96-6, First Report and Order and Further Notice of Proposed Rule Making, 11 FCC Rcd 8965 (1996) (*CMRS Flexibility Report and Order*) (granting terrestrial CMRS carriers authority to provide fixed services in mobile service bands); *Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions*, MM Docket No. 97-217, Report and Order, 13 FCC Rcd 19112 (1998) (allowing Multipoint Distribution Service (MDS) and Instructional Television Fixed Service (ITFS) licensees to deploy two-way systems), *recon*., 14 FCC Rcd 12764 (1999), *further recon.*, 15 FCC Rcd 14566 (2000); *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, ET Docket No. 00-258, First Report and Order and Memorandum Opinion and Order, 16 FCC Rcd 17222 (2001) (*Advanced Services First Report and Order*) (adding a mobile allocation to the 2500-2690 MHz band); *Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, IB Docket No. 95-91, GEN Docket No. 90-357, Report and Order, Memorandum Opinion and Order, and Further Notice of Proposed Rulemaking, 12 FCC Rcd 5754, 5810-12, ¶¶ 138-142 (1997) (considering whether and how to permit Satellite Digital Audio Radio Service (SDARS) licensees to use in-band, ground-based repeaters to fill gaps in their satellite coverage); *see also XM Radio, Inc.*, Order and Authorization, 16 FCC Rcd 16781 (Int'l Bur. 2001) (granting special temporary authority for SDARS licensee to use terrestrial repeaters); *Sirius Satellite Radio, Inc.*, Order and Authorization, 16 FCC Rcd 16773 (Int'l Bur. 200l) (same).

remains first and foremost a satellite service.[67]

32. While sound spectrum management principles support grant of MSS ATC, granting additional flexibility in the provision of MSS to the public also has the advantage of reinforcing the potential public-interest benefits of MSS itself. For example, the Commission has recognized the potential of MSS to provide ubiquitous service to consumers. ATC will enhance this benefit by making MSS networks more commercially available through truly nationwide coverage.[68] ATC also may create a "self-reinforcing spiral" of increased subscription, reduced handset-production and per-minute prices, and greater cash flow.[69] According to the Globalstar Bondholders, for example, the increased economies of scale that come with providing services to urban customers via ATC will allow MSS operators to serve a broader subscriber base.[70] We find that permitting ATC will allow MSS operators the opportunity to take advantage of a number of network, spectrum and economic efficiencies that may help defray the substantial capital costs required to create and operate a satellite system.[71] These efficiencies could, in turn, reduce the marginal cost of serving subscribers and permit MSS operators to serve more customers.[72] By taking advantage of potential integration of services, MSS operators may also obtain economies of scale: larger customer bases could provide the opportunity to support larger production volumes and, therefore, lower costs for handsets and other equipment.[73] Also, integrating terrestrial services into MSS may reduce the transaction costs of administering separately owned satellite and terrestrial systems.[74]

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[67] Accordingly, the regulatory flexibility to provide ATC in MSS spectrum differs markedly from a "flexible-use" allocation, where a licensee could provide whatever services are allocated for the band without restriction, condition or limitation on the overall mix of service offerings they provide.

[68] ICO Comments at 5-15; MSV Comments at 9-10; Loral Comments at 1-4; Globalstar Bondholders Comments at iv-v, 3-4, 7-22; MCHI Comments at 6-8; MSV Reply at 6.

[69] *See, e.g.*, MSV Reply at 9 ("the viability that accompanies spectrum flexibility is the result of additional revenue and added efficiency from the critical mass of subscribers that are possible with terrestrial operations").

[70] *See* Globalstar Bondholders Comments at v. During the course of this proceeding, the Official Creditors Committee of Globalstar, L.P. (Globalstar Creditors) began to represent the interests of the Unofficial Bonholders Committee of Globalstar, L.P. (Globalstar Bondholders) as well as other Globalstar creditors. *See* Letter from Tom Davidson, Counsel for the Official Creditors Committee of Globalstar, L.P. to Michael K. Powell, Federal Communications Commission, IB Docket No. 01-185, 1 & n.1 (March 22, 2002). Because the Globalstar Creditors and the Globalstar Bondholders share a substantial identity of interest, *id*. (endorsing the positions that the Globalstar Bondholders had taken in this proceeding as of March 22, 2002), we will refer to both entities as the Globalstar Bondholders unless context indicates otherwise.

[71] Of course, the authority to conduct in-band terrestrial operations in licensed satellite spectrum also brings with it new attendant costs, including the potentially considerable expense of constructing terrestrial towers and other, ATC-related infrastructure.

[72] These efficiencies constitute "economies of scope," which are defined as the savings from providing two or more services on an integrated basis compared to the sum of the costs of providing each on a stand-alone basis. *See* Graham Bannock, *et al*, *Penguin Dictionary of Economics* 130 (Penguin Books, 5th ed., 1992).

[73] Globalstar Comments at 16; ICO Comments at 19-20; Constellation Comments at 10; Globalstar Bondholders Reply at 17.

[74] Transaction costs are "those costs other than price which are incurred in trading goods and services. These costs can be substantial, particularly in markets where the good being traded is heterogeneous and complex." David W. (continued….)

33. The opponents of ATC, however, raise several policy objections to granting additional flexibility to MSS licensees. Nearly all of the arguments that flexibility in the provision of MSS will cause anticompetitive harm rest on the assumption that ATC-enabled MSS will prove more profitable than MSS alone.[75] These commenters speculate that MSS licensees offering ATC will focus primarily on terrestrial services and allow their satellite component to degrade.[76] According to AT&T Wireless, terrestrial services would independently produce the vast majority of MSS providers' profits, while the satellite operations would draw little or no revenue and generate most of the system's costs.[77] According to AT&T Wireless, such an imbalance would provide strong economic incentives for MSS providers to supplant MSS with terrestrial service as their primary or even sole service.[78] Indeed, AT&T Wireless expresses skepticism that additional flexibility will work in reviving what are portrayed as struggling MSS providers[79] and adds that, even if ATC succeeds in ensuring the survival of a few MSS providers,[80] ATC would eventually "hasten the demise of MSS itself by reducing or eliminating MSS providers' incentives to provide satellite service through the introduction of the opportunity to move from the difficult MSS market to the far more lucrative terrestrial wireless market."[81] Although most opponents agree that authorizing flexibility will increase the revenues of the MSS licensees by allowing MSS licensees to capture high-revenue, urban users that MSS generally cannot now reach, some commenters remain skeptical that MSS licensees will actually reinvest their new-found revenues in comparatively less profitable MSS space stations.[82]

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Pearce, *MIT Dictionary of Modern Economics* 432 (MIT Press, 4th ed., 1997). In the case of "severed" satellite and terrestrial systems, the costs include contract negotiation and enforcement, possibly with many terrestrial providers, as well as the costs involved in resolving what are likely to be many complex issues about coordination and interference.

[75] *See*, *e.g.*, Stratos at 2-3, 7-9; Iridium Comments at 8; AT&T Wireless Comments at 5-6; Verizon Wireless Reply at 8.

[76] *See, e.g.*, Voicestream Reply at 22 (claiming the availability of satellite services could be eviscerated); Stratos Comments at 2-3, 7-9 (arguing that terrestrial use will overwhelm the MSS bands); Iridium Comments at 4, 8 (it is in ICO's long-term interest to spend a few billion dollars constructing, launching and operating a minimalist MSS constellation in order to gain free access to $30-$40 billion worth of nationwide spectrum).

[77] AT&T Wireless Comments at 5; AT&T Wireless Reply at 5-8.

[78] AT&T Wireless Comments at 5; AT&T Wireless Reply at 5-8.

[79] AT&T Wireless Comments at 2.

[80] *See, e.g.,* AT&T Wireless Comments at 16 (stating that "there is no reason to believe that . . . subsidizing MSS providers . . . would actually sustain MSS operations in the long run."); CTIA Comments at 12 ("it is unlikely that MSS licensees would realize sufficient revenues from providing service in highly competitive urban wireless markets to cross-subsidize service in rural areas" due to the highly competitive market for terrestrial wireless services).

[81] AT&T Wireless Reply at 4; *see also* CTIA Comments at 12 (asserting that authorizing MSS flexibility may "actually harm coverage in rural markets" as MSS operators invest disproportionately in their terrestrial component of their networks).

[82] *See, e.g.*, Voicestream Reply at 13 ("Common sense suggests that MSS licensees would reinvest in the profitable [terrestrial] enterprise to generate yet additional profits," rather than the unprofitable MSS enterprise); Iridium Comments at 2, 8 (asserting that grant of ICO's ATC proposal would result "in the de facto reallocation of [MSS] spectrum for terrestrial use, by ICO and its affiliate Nextel" and that "[a]s a practical matter, the ICO satellite system (continued….)

34. We recognize these parties' economic assumptions, but do not find their arguments to oppose the grant of ATC persuasive. As an initial matter, ATC cannot be provided without continued provision of MSS under the terms specified in this decision and can only be provided in the MSS licensees' authorized frequency bands. If an MSS licensee using ATC were to disregard the rules and conditions adopted in this Order, we would cancel its ATC authorization and, if circumstances warrant, cancel its MSS license as well. We also have the authority to impose monetary forfeitures and other penalties. ATC authority wholly depends on MSS licensees' fulfillment of their construction, launch and operation requirements, and the continuing provision of substantial satellite service to the public.[83] Therefore, an MSS licensee that allowed its MSS offering to degrade could lose its MSS license, the fundamental prerequisite for offering the very type of terrestrial authority that some ATC opponents view as so uniquely profitable.[84]

35. While we are committed to ensuring MSS licensees observe our MSS ATC service rules by using a variety of enforcement mechanisms, up to and including license cancellation, we do not believe that our active intervention to ensure substantial satellite service consistent with the MSS ATC service rules adopted in this Order will prove necessary. As at least one economic expert has stated on the record, "the significant upfront and sunk costs of satellite systems increase the likelihood that the licensees would continue to operate their satellite systems." [85] Unlike marginal costs, sunk costs cannot be avoided by discontinuing or degrading service. In addition, MSS licensees, most of which have limited customer bases and capitalization, would appear unwise to abandon satellite services merely for the opportunity to compete only in the market for terrestrial mobile services where much larger, better financed competitors already engage in "competitive, intense [and] aggressive" price competition.[86] Indeed, the competitive nature of terrestrial CMRS suggests that, even if MSS licensees were under no obligation to maintain their MSS systems, providing ubiquitous MSS would help distinguish their service offerings from larger, more established terrestrial CMRS incumbents. Finally, some commenters claim that, over the longer term, additional investment in satellite infrastructure might not occur because the money spent on construction, launch and operation could be more profitably invested elsewhere.[87] We disagree. Capital will be available for investment in satellite infrastructure regardless of the opportunities

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will be ancillary to the Nextel terrestrial network, regulatory constraints notwithstanding"); Boeing Comments at 7 ("[p]ermitting MSS operators to offer ancillary terrestrial services opens the door to potential abuse . . . . As the terrestrial component grows, an effect could be that the MSS component of the service would provide less and less of the overall system capacity, essentially vacating the spectrum to the terrestrial component."); Cingular/Verizon Joint Comments at 15-16 (asserting that terrestrial wireless service would not be ancillary to MSS).

[83] *See, e.g.*, 47 C.F.R. §§ 25.143(e)(3), 25.161.

[84] *See, e.g.*, Constellation Comments at 29 ("If it is shown that an MSS system has degraded and the operator has made no plans to restore the system to its full coverage capabilities, the Commission can revoke the authorization for ancillary terrestrial operations.").

[85] *See Report of Gregory L. Rosston, Ph.D.*, Stanford University, Stanford Institute for Economic Policy Research, Deputy Director, ICO Reply Comments, App. A. at A-8; Constellation Comments at 29 ("MSS operators have every commercial incentive to maintain high service availability"); Celsat Reply at 11 ("MSS providers will have no economic incentive to convert their 2 GHz MSS systems into terrestrial-only systems.").

[86] *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993,* Seventh Report, FCC 02-179, 17 FCC Rcd 12985, 13012 (2002) (*Seventh CMRS Competition Report*).

[87] *See, e.g.,* CTIA Comments at 12; CTIA Reply at 7; AT&T Wireless Comments at 3, 9-13; AT&T Wireless Reply at 13-17; Cingular/Verizon Comments at 16-23; Cingular/Verizon Reply at 17-22.

available elsewhere as long as that capital can earn the market rate of return.[88] For these reasons, we believe that ATC, instead of acting as a deterrent to satellite investment, will increase the likelihood that MSS operators will provide efficient satellite service to consumers.[89]

36. Despite the views of some commenters, moreover, the projected but unknown relative volume of traffic on one system component or another is not a decisive factor in our analysis of the public interest benefits of MSS ATC. We recognize that, even with a satellite constellation operating at full capacity, terrestrial operations can reuse communications channels more intensively than satellite operations because terrestrial cells can be much smaller than the geographic area covered by satellite spot beams.[90] As a result, even though ATC is restricted to portions of the spectrum that is available to MSS, larger traffic volumes can be supported by MSS combined with ATC than by MSS alone due to higher frequency reuse in the MSS ATC system. If a preponderance of terrestrial traffic were to occur on an integrated MSS ATC system, however, it could simply reflect various factors, such as higher population densities in urban areas or differences between satellite and terrestrial technologies, and the concentration of users need not imply that provision of satellite service is being degraded or diminished.

37. We also disagree with assertions that MSS ATC will allow MSS licensees to competitively harm terrestrial or satellite incumbents.[91] At the outset, the possibility that a Commission action might harm a competitor does not render the action contrary to the public interest. On the contrary, where, as here, the ostensible harm comes from increased competition, the public will benefit by receiving additional competitive choices in the marketplace. Some commenters, however, portray ATC as an anti-competitive subsidy to ailing MSS providers that would distort the market because MSS operators would not be required to acquire terrestrial mobile rights at auction.[92] Some commenters suggest that, as a result, MSS operators would have an unfair or anti-competitive advantage in the provision of satellite or terrestrial services. Other parties appear to argue that ATC-enabled MSS could be used as a financial resource to act anti-competitively with respect to wireless incumbents.[93] At least two ATC proponents,

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[88] In other words, relative rates of return between investments in different types of infrastructure are not directly relevant to our analysis and, in any case, would be highly speculative.

[89] ICO enthusiastically endorses ATC in part to help financially "bolster an important telecommunications service at a critical point in its development." ICO Reply at 5; *see also, e.g.,* Constellation Comments at 3, 7, 9-10 (asserting that, by offering more competitive services in urban areas, MSS operators will improve their finances and increase investor confidence).

[90] These small terrestrial cells in which frequencies are reused are sometimes referred to as pico-cells.

[91] *See, e.g.,* Boeing Comments at 12-13; Boeing Reply at 7-8; Inmarsat Comments at 12-30; Inmarsat Reply at 7-25; Aviation Industries Parties Comments at 5-6, 8-11; AT&T Wireless Comments at 2; AT&T Wireless Reply at 9-11; Iridium Comments at 2.

[92] *See, e.g.,* AT&T Wireless at 4; *see also* Voicestream Reply at 2, 14 (asserting that authorizing ATC without conducting auctions or imposing additional fees would give MSS licensees a competitive advantage that "would distort competition in the mobile telecommunications sector"); P&FF Comments at 13-14 ("Competitors of potential MSS systems are legitimately concerned that a decision to grant permission for ATC systems would allow MSS/ATC providers to compete unfairly for the same customers" because MSS/ATC would not be required to pay for terrestrial rights at auction); *see also* MSTV/NAB Comments at 16 (asserting that it would be "grossly unfair" to authorize ATC when, unlike many terrestrial wireless operators, MSS providers did not purchase spectrum at auction).

[93] *See, e.g.*, Voicestream Reply at 14 ("MSS licensees obviously would have an enormous cost advantage if they could . . . be excused by the Commission from paying any [auction] fees."); P&FF Comments at 14 ("it is at least (continued….)

however, respond that "[t]here will be no subsidy."[94] Motient and TMI, for example, assert that they will create new value by offering a more attractive retail offering: an affordable, nationwide, high-speed communications service with greater reliability, more extensive coverage and more features than is currently available to urban, suburban or rural consumers.[95]

38. The arguments that ATC will be used as an anti-competitive subsidy in the provision of MSS are unconvincing. These concerns appear to be based on the idea that MSS operators would have an unfair competitive advantage over wireless incumbents because the wireless incumbents obtained some of their licenses through auctions whereas the MSS incumbents will have received ATC authority without bidding in an auction. Commenters allege that, if the Commission were not to accept applications for ATC that might produce mutually exclusivity, which might, in turn, result in an auction, the MSS incumbents will have the incentive and ability to distort the competitive market in CMRS. These comments involve two separate arguments: (1) that receiving ATC authority pursuant to this proceeding gives MSS licensees an incentive to set prices below levels that would be established if ATC flexibility were obtained by payment (i.e., in an auction); and (2) that the potential financial benefits of obtaining ATC authority without payment facilitates MSS licenses' ability to engage in predatory pricing against terrestrial wireless incumbents.

39. First, we do not believe that allowing MSS licensees the right to obtain ATC without bidding in an auction creates an incentive to price below competitive levels. As a preliminary matter, terrestrial CMRS and MSS ATC are expected to have different prices, coverage, product acceptance and distribution; therefore, the two services appear, at best, to be imperfect substitutes for one another that would be operating in predominately different market segments. Even if the two services were perfect substitutes, however, permitting greater flexibility in the delivery of MSS services would not confer an unfair advantage on the MSS licensees. While PCS licensees and some cellular licensees obtained licenses through auctions, other cellular licensees did not obtain their licenses through auctions but purchased them in secondary markets, and some cellular licenses were originally obtained through a license lottery or by other means that did not require payment. There is no evidence to show that those who did not purchase licenses in an auction obtained subscribers by charging lower prices than those who obtained their licenses through an auction. According to a Commission study:

> [the] telecommunications experience in the U.S. has . . . been consistent with the theory that historic costs don't alter pricing. For example, within a given market, the prices charged by cellular operators who obtained their licenses via comparative hearings of lotteries are not lower than the prices of those firms that purchased their cellular licenses in the secondary market, or firms that obtained PCS licenses in an auction. Similarly, where a U.S. cellular license has been bought at a significant cost from a party that

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theoretically possible that firms . . .use the MSS/ATC route as a means [for] acquiring the necessary spectrum at greatly reduced cost, thereby placing them at a competitive advantage over CMRS providers").

[94] MSV Reply at 9.

[95] *Id*. Proponents envision different types of new services. For example, ICO envisions new, comprehensive "telematics" services that will provide motorists with location information not only on open roads, but also in parking garages and urban canyons. ICO Comments at 21. Similarly, Constellation asserts that integrated ATC will allow MSS to offer "true nationwide commercial transportation tracking services on a single platform, eliminating the need for commercial vehicles to carry multiple transceivers for multiple networks." Constellation Comments at 8.

> obtained it at no cost, we have not observed any increase in consumer prices.[96]

Based on these considerations, we find that MSS licensees do not have an incentive to forgo recovery of the value of spectrum and price below competitive levels merely because the spectrum was obtained without an auction.[97] Pricing that does not include recovery of the market value of an asset such as spectrum represents a loss (compared to the price that could be sustained in the marketplace) that MSS operators would have to bear regardless of how much, if anything, they spent on acquiring the asset initially.[98] MSS operators would be no more likely to sacrifice any possible commercial advantage generated by ATC than any other commercial advantage that they might possess.[99]

40. Second, we find that, even if the two services were perfect substitutes, the potential financial benefits of obtaining ATC flexibility by grant rather than payment would not facilitate MSS licensees' ability to engage in predatory pricing against wireless incumbents and that MSS operators would face market discipline if they attempted to do so. Predation is a rare phenomenon in the modern U.S. economy, in part because there is a very high risk that such behavior will be unsuccessful.[100] As the Supreme Court explained in *Matsushita Electric Industrial Co. v. Zenith Radio Corp:*

> [T]he success of such [predatory] schemes is inherently uncertain: the short-run loss is definite, but the long-run gain depends on successfully neutralizing the competition. Moreover, it is not enough simply to achieve monopoly power, as monopoly pricing may breed quick entry by new competitors eager to share in excess profits. The success of any predatory scheme depends on maintaining monopoly power for long enough both to

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[96] *See* Evan Kwerel &Walt Strack, *Auctioning Spectrum Rights* 4 (FCC, Feb. 20, 2001), *available at* <http://wireless.fcc.gov/auctions/data/papersAndStudies/aucspec.pdf> (last visited, Dec. 27, 2002).

[97] Indeed, the D.C. Circuit recently characterized arguments that reduced acquisition costs for an asset would lead to anti-competitive practices as "a foolish notion that should not be entertained by anyone who has had even a single undergraduate course in economics." *Fresno Mobile Radio, Inc. v. FCC,* 165 F.3d 965, 969 (D.C. Cir. 1999) (citing Armen A. Alchian & William R. Allen, *Exchange & Production* 222 (3rd ed. 1983) ("[O]nce [an item] is acquired, [its cost is] irrelevant to any future decision."). The D.C. Circuit added that "a moment's reflection would bring one to the realization that the use to which an asset is put is based not upon the historical price paid for it, but upon what it will return to its owner in the future. Would anyone be less interested in earning a return on money he had inherited than on money he had worked for? Of course not!" *Fresno v. FCC,* 165 F.3d at 969.

[98] As an illustration of why MSS operators would set the price of their terrestrial services at an identical level whether they obtain ATC authority by a grant or by payment, suppose that an MSS operator obtains ATC authority by payment. Further suppose that such an MSS operator correctly calculates that he would maximize the profits of his firm by setting a price p for ATC services that undercuts the price charged by terrestrial incumbents by a certain amount. The exact same price p would be profit-maximizing even if the MSS operator obtains ATC authority by grant because the costs of providing ATC service – in particular the value of the additional spectrum resources made available by ATC– are the same under either a payment or grant scenario. Thus, an MSS operator that obtains ATC authority by grant would have no incentive to make price cuts beyond those that would be made by an MSS operator that obtains ATC authority by payment.

[99] For instance, the market value of the spectrum is reflected in the stock price, which is the market value of the firm. To the degree that prices fail to reflect the full value of the spectrum, earnings will decline and so will the market value of the firm.

[100] *See, e.g.*, Ronald L. Koller, *The Myth of Predatory Pricing*, Antitrust Law and Economics Review 3: 105-23, (1971); John E. Kwoka, Jr. *et al.*, ed., *The Antitrust Revolution* 151 (Harper Collins College Publishers, N.Y., 1994).

> recoup the predators' losses and to harvest some additional gain….For this reason, there is consensus among commentators that predatory pricing schemes are rarely tried, and even more rarely successful.[101]

In addition to the high odds against predation actually being successful under any circumstances, we believe that several specific circumstances of the wireless industry make predatory activity on the part of MSS operators highly unlikely. The first circumstance involves the imperfect substitutability between terrestrial services and MSS ATC. Only a limited portion of customers desiring terrestrial service are likely to be interested in supplementary MSS services, which suggests that the two services will not be competing in the same market segment. With different anticipated prices, coverage, product acceptance and distribution, the two services appear to be imperfect substitutes as far as customers are concerned; therefore, predatory pricing, which generally requires extensive and direct competition, would be highly unlikely under these circumstances.

41. The second circumstance involves the fact that MSS operators are not dominant incumbents in the terrestrial wireless marketplace. Alleged predators are almost always dominant incumbents in the market in which predation is alleged because firms in such a position have the greatest incentive and ability to engage in predatory behavior.[102] MSS operators, therefore, do not fit the economic profile of likely predators. As indicated above, MSS ATC is unlikely to compete directly with terrestrial CMRS for the same customer base except for those consumers requiring the enhanced services, and thus is not expected to be dominant in the same market segment. Also, wireless cellular and PCS have already built out systems and provide service to large portions of the U.S. population. An MSS operator with ATC authority would be unlikely to prove able to take large numbers of subscribers away from the wireless operators even at predatory price levels. Also, MSS operators face structural disadvantages that terrestrial wireless operators do not. Due to our requirement that MSS operators provide substantial satellite service as a precondition for providing terrestrial services, any MSS operator choosing to provide terrestrial service must raise hundreds of millions of dollars before providing service to its first terrestrial subscriber.[103] By contrast, terrestrial operators can construct their networks incrementally city-by-city,

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[101] *Matsushita Electric Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 589 (1986) (citing Robert Bork, *The Antitrust Paradox*, 149-155 (1978)). The Commission dismissed similar arguments in *Applications of Voicestream Wireless Corporation, Powertel, Inc, Transferors, and Deutsche Telekom AG, Transferee*, 16 FCC Rcd 9799, 9829, ¶ 89 (2001) (noting that "[i]f the [applicants] were to attempt to engage in predatory pricing, it is highly unlikely that it would be able to maintain such an artificially low price for a sufficiently long period of time to drive competitors out of business."); *see also Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209, 224 (1993) ("Without [recoupment], predatory pricing produces lower aggregate prices in the market, and consumer welfare is enhanced. . . . [U]nsuccessful predation is, in general, a boon to consumers.").

[102] *Kwoka et al., supra*, at 151 (identifying the predator as the dominant firm in each theory of rational predation discussed). For examples of alleged predation by dominant firms, *see, e.g., Standard Oil Co. of New Jersey v. United States*, 221 U.S. 1 (1911); *United States v. Aluminum Co. of Am.,* 148 F.2d 416 (1945); *Am. Tobacco Co. v. United States,* 328 U.S. 781 (1946); *Matsushita Elec. Indus. Corp. v. Zenith Radio Corp.*, 475 U.S. 574 (1986); *United States v. AMR Corp.*, 140 F. Supp. 2d 1141 (2001). For a discussion of an unusual instance in which a non-dominant firm was alleged to engage in predatory behavior, *see Kwoka et al., supra,* at 260; *Brook Group, Ltd. v. Brown & Williamson Tobacco Corp.,* 61 U.S.L.W. 4699 (1993).

[103] Based on industry reports, filings with the Securities and Exchange Commission and agency experience, Commission staff estimates that MSS licensees have spent at least $2.8 to $4.4 billion to construct and launch NGSO MSS systems and at least $1.7 billion to construct and launch a GSO MSS system. *See, e.g., Form 10-K, Globalstar Telecommunications Limited and Globalstar, L.P.,* Dec. 31, 2001, at 32; John M. Bensche, *Revisiting Valuation on the Big LEO Satellite Systems*, Lehman Brothers, 11 (May 29, 1998). Due to inflation, increased (continued….)

with expansion funded, in part, by revenues from existing subscribers.[104] This difference exposes MSS providers to substantial risk that the economy or the mobile satellite communications market could change dramatically between the time an MSS provider forms its business plan and years later when the MSS provider actually commences service.[105]

42. Based on the reasoning above, MSS licensees are highly unlikely to try to use additional flexibility in the provision of MSS to act anti-competitively in the market and are very likely to fail if they tried. Even in the unlikely event that such anti-competitive conduct did occur, it can be resolved through regulatory and judicial remedies. We, therefore, do not find persuasive claims that financial advantages caused by permitting ATC will be used to cut prices below competitive levels.

43. A few commenters argue that granting additional flexibility will, at least in the 2 GHz MSS band, "most likely result in the monopolization of the . . . band and the *de facto* reallocation of that spectrum for terrestrial use by ICO and its affiliate, Nextel Communications."[106] According to these commenters, common ownership in both ICO and Nextel will cause these companies to act in concert and, as a result, exploit competitive advantages that other stand-alone MSS providers cannot match.[107] Some commenters speculate that, as a result of these presumed synergies between Nextel and ICO, investors will not fund new MSS entrants and ICO will "monopolize" perhaps 50 megahertz or more of highly valuable nationwide spectrum for its existing terrestrial network.[108]

44. We do not believe that our primary proposal will specially benefit ICO or Nextel by, for example, providing them unique opportunities that other companies would not also enjoy. ICO and Nextel are separate corporations, neither under the control of the other and each with limited overlapping ownership. Although some investors may own both ICO and Nextel stock, the corporate officers and management have fiduciary responsibilities to their own stockholders, many of whom may not own stock

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capital costs, rising insurance fees and other expenses, future MSS systems are likely to cost as much or more than the incumbent systems did.

[104] Globalstar Comments at v.

[105] The United States' economic downturn and the dramatic growth and extension of terrestrial mobile networks, due in large part to economies of scale, could not have been adequately forecast when the Commission began its Big LEO allocation proceeding nearly a decade ago.

[106] Iridium Comments at 2-3; *accord* Voicestream Reply at 15 ("ICO would have an enormous (and completely artificial) advantage in the new market that the Commission would be establishing (terrestrial-satellite vs. satellite-only)" because "ICO's affiliate, Nextel, already owns and operates a nationwide terrestrial network, and to provide its terrestrial services, . . . ICO/Nextel would only need to add radios (tuned to MSS spectrum) to existing cell sites.").

[107] Iridium Comments at 2 (claiming that "[w]ithout an existing terrestrial infrastructure and customer base (such as is possessed by Nextel) or a business plan targeting a separate market niche (and supported by deep corporate 'pockets'), it is all but inconceivable that funding will be available for new MSS entrants"); *id.* at 3 (claiming that no rational investor "would seek to compete against Nextel's entrenched position in this market.").

[108] *See, e.g.*, Voicestream Reply at 16 ("in authorizing MSS AT[C], the Commission would effectively allow . . . ICO/Nextel to monopolize the satellite market"); Iridium Comments at 2-3.

in both companies.[109] Therefore, ICO and Nextel would be required to independently consider their corporate interests regarding the joint provision of ATC services. Moreover, with respect to the 2 GHz band, whether through our case-by-case review of consolidation transactions or through our ability to open new processing rounds or reallocate spectrum if 2 GHz MSS licensees fail to meet their milestones, we do not intend to allow monopolization of the band. Even if ICO and Nextel currently intended to capitalize on their business strengths and cooperate in offering MSS ATC, nothing would prevent other CMRS and MSS operators from also doing so. For instance, nothing prohibits MSS providers from affiliating with terrestrial providers, through stock ownership, joint ventures, or other means, if a business relationship proves advantageous in the provision of integrated mobile services and as long as such arrangements comply with our rules and policies governing transfers of control.[110] Nor is there any bar on other MSS providers obtaining adequate funding if their business plans appear sound to lenders. Accordingly, we are not persuaded by Voicestream's claim that every MSS licensee except ICO "would be required to build terrestrial networks from scratch."[111] In any case, adopting a generally applicable policy that produces benefits for one class of similarly situated licensees where that is not the intent of the policy is not, without more, improper, arbitrary or otherwise contrary to the law or public interest.

45. Finally, some commenters also challenge the premise that the Commission has allocated the proper amount of spectrum for MSS use.[112] The Commission, however, has allocated MSS spectrum to achieve multiple objectives, including encouraging service to rural areas and enhancing public protection.[113] While, concurrent with adoption of this Order, the Commission has reduced the amount of MSS spectrum through reclaiming the spectrum of MSS providers that do not meet their milestones[114] and

[109] According to ICO, Nextel remains a publicly traded corporation, and any arrangement between ICO and Nextel regarding ATC would require approval by Nextel's independent board members due to overlapping ownership interests among principals of the companies. ICO Reply at 7 n.28.

[110] By analogy, we note that significant cross-ownership has emerged between satellite radio broadcasters and terrestrial audio radio broadcasters. SDARS, which provides radio broadcasts without locally originated programming to consumers via satellite, appears in many respects to compete directly with segments of the terrestrially based broadcast market, and one of the larger shareholders of the SDARS provider XM Radio is Clear Channel Communications Inc., which owns approximately 1,170 terrestrial radio outlets across the country. Brian Steinberg, *XM Satellite Radio's Ads Generate Some Heavy Static*, Wall St. J. (Feb. 1, 2002).

[111] Voicestream Reply at 15. In any case, we note that any entrepreneur seeking to take first advantage of a business opportunity remains subject to considerable risk, no matter how promising the opportunity may appear initially. Success by "first movers" may well pave the way for others to follow – a process that promotes competition and serves the public interest. As an additional safeguard, of course, the Commission's regulatory process, the various agencies responsible for antitrust enforcement and the threat of civil penalties should offer ample protection against what we believe to be the remote and speculative possibility of monopolization.

[112] *See, e.g.*, TDS Comments at 12 ("it would make more sense . . . to . . . reallocate [the MSS spectrum] through auctions" to existing terrestrial wireless carriers); CTIA Comments at 14 ("If anything, there is too much spectrum allocated for MSS today").

[113] *See* discussion *supra* at § IV(A).

[114] The Commission's rules provide for cancellation of a space station license when the licensee fails to meet a milestone. *See* 47 C.F.R. § 25.160. We use a "fairly bright line test" to determine whether an extension is warranted and grant extensions "only when delay in implementation is due to circumstances beyond the control of the licensee." *See, e.g., Amendment of the Commission's Space Station Licensing Rules and Policies*, Notice of Proposed Rulemaking and First Report and Order, 17 FCC Rcd 3847, 3882, ¶ 105 & n.141 (2002) (citations omitted). We recently sought comment on how we might strengthen even these requirements. *Id.* at ¶¶ 104-106.

through reallocating MSS expansion spectrum,[115] a wholesale revision of our spectrum-management priorities is not warranted here. MSS continues to have the potential to provide ubiquitous, high-quality voice and data telecommunications services to the American public.[116] Indeed, the Commission has held that MSS services "will . . . complement wireless service offerings through expanded geographic coverage"[117] and has found that satellites "may offer cost advantages over wireline access in rural and remote areas, where sparsely populated areas cannot provide the economies of scale to justify the deployment costs of wireline networks."[118] The Commission has also found that these advantages may prove particularly relevant to the maritime and aeronautical markets, for which MSS is an important, and sometimes the only, transmission path.[119] In each of these areas, more flexible rules for MSS may serve to enhance the benefits MSS offers to the public by improving the efficiency with which these services are delivered. Of course, nothing in our decision today limits our continuing spectrum-management obligation to ensure that the spectrum is used efficiently and effectively.

B. Alternative Proposals

46. In our *Flexibility Notice*, as an alternative to MSS ATC, we requested comment on the possibility of making some MSS spectrum available for use by any entity to provide terrestrial services, either in conjunction with MSS systems or on their own.[120] In the *Severability Notice*, we sought supplemental comment on whether "it is technically feasible for one operator to provide terrestrial services and another operator to provide satellite services in the same MSS band."[121] Under this approach, portions of the spectrum currently designated for 2 GHz MSS and L-band systems would be made available for use by terrestrial operations, separated from the MSS operations in the bands, and could be assigned by auction. Iridium proposes that we create a secondary terrestrial service (STS)

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[115] *See AWS Third Report and Order,* FCC 03-16, ET Docket No. 00-258 at ¶ 3.

[116] *See 2 GHz MSS Rules Order*, 15 FCC Rcd at 16144-46, ¶¶ 32-34; *Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band*, IB Docket No. 99-81, Notice of Proposed Rulemaking, 14 FCC Rcd 4843, 4846, ¶ 4 (1999) (*2 GHz MSS Rules Notice*); *Amendment of the Commission's Rules to Establish New Personal Communications Services*, Memorandum Opinion and Order, 9 FCC Rcd 4957, 4995-96, ¶¶ 94-97 (1994); *see also, e.g.*, TMI Oct. 7, 2002 *Ex Parte* Letter Attach. 1 at 5 ("The FCC has repeatedly – 1997, 1998, 2000 and 2001 – found that the current spectrum allocation for MSS best serves the public interest") (citations omitted).

[117] *2 GHz MSS Rules Notice*, 14 FCC Rcd at 4843, ¶ 2.

[118] *Extending Wireless Telecommunications Services to Tribal Land*s, Report and Order and Further Notice of Proposed Rule Making, 15 FCC Rcd 11794, 11799, ¶ 13 (2000) (*Tribal Lands Report*).

[119] *Establishing Rules and Policies for the Use of Spectrum for Mobile Satellite Services in the Upper and Lower L-Band*, Report and Order, 17 FCC Rcd 2704, 2708, ¶ 11 (2002)("MSS systems are particularly well suited for providing mobile communication services to areas that are not being adequately served by terrestrial radio facilities"); *Mobile Satellite Services Subsidiary*, Memorandum Opinion and Order, 17 FCC 12894, 12895, ¶ 4 (2002)(noting "the importance of safety-related communications [provided by MSS for] the integrity of maritime safety and distress communications"); *Vistar Data Communications*, Order and Authorization, 17 FCC 12899, 12901, ¶ 8 (2002) (same).

[120] *Flexibility Notice*, 16 FCC Rcd at 15548, ¶ 37.

[121] *Severability Notice*, 17 FCC Rcd at 4419.

allocation across all MSS bands with frequency blocks available to all through competitive bidding.[122]

1. Same-Band, Separate-Operator Sharing

47. Almost all commenters argue that an approach that does not require sharing between non-related parties would better serve the public interest than same-band, separate-operator sharing. While severed operations might theoretically be possible with an extremely limited number of users,[123] MSS ATC proponents maintain that it is not, as a practical matter, advisable for one operator to provide terrestrial services and another operator to provide satellite services in the same MSS band, over the same geographic areas, due to the high likelihood of interference.[124] These parties note that same-band operation by separately owned and operated terrestrial and satellite licensees would likely require network exclusion zones that would restrict traffic over large territories,[125] diminish spectrum efficiency and network capacity for both satellite and terrestrial-based systems,[126] and increase the likelihood of interference to both satellite and terrestrial users.[127] For example, Globalstar argues that the only feasible method to manage MSS ATC interference is to offer terrestrial service in selected locations on selected channels, reusing the channels outside the relatively small boundaries of the terrestrial service area.[128] Globalstar adds that, for operators that use CDMA coding, severing the MSS bands into terrestrial and satellite components would increase the likelihood of interference to a number of important services immediately adjacent to MSS, including radio astronomy, Global Positioning System (GPS), the Global Navigation Satellite System (GLONASS) and Instructional Television Fixed Service (ITFS).[129] Celsat argues that it is unrealistic to expect that MSS and terrestrial competitors can jointly coordinate these complex systems without substantial cost measured in terms of inefficient operations, large administrative expenses and constant friction between the forced joint venturers.[130]

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[122] Iridium Comments at 5-8 & Supplemental Comments at 2-4.

[123] *See infra* § III(D).

[124] *See, e.g.,* ICO Supplemental Comments at 11-19; Globalstar Supplemental Comments at 4-7; MSV Supplemental Comments at 6-9.

[125] *See, e.g.*, Constellation Supplemental Comments at 3.

[126] *See* ICO Supplemental Comments at 11; Celsat Supplemental Comments at 4; Globalstar Supplemental Comments at 6.

[127] For example, Inmarsat, which has claimed that integrated MSS ATC operations would cause unacceptable interference to existing MSS systems, asserts that separately owned and operated satellite and terrestrial operations in the MSS spectrum "would exacerbate an already unacceptable interference threat into the Inmarsat system caused by proposed integrated terrestrial operations." *See* Inmarsat Supplemental Comments at 3.

[128] Globalstar Supplemental Comments at 5. According to Globalstar, terrestrial and satellite services require complex coordination "on the fly" between the satellite and terrestrial modes and, through dynamic frequency assignment, a single operator could offer both satellite and terrestrial services in certain locations while maintaining universal satellite coverage. Furthermore, according to Globalstar, there is no chance that two different operators of two separate mobile systems could successfully accomplish such coordination.

[129] Globalstar March 13, 2002 *Ex Parte* Letter Attach. 1 at 10 (noting that CDMA MSS operators "require all of the licensed spectrum in order to coordinate with these services").

[130] Celsat Supplemental Comments at 3.

48. Other commenters dispute these statements. AT&T Wireless, for example, states that spectrum is currently authorized for co-frequency use by independent, disparate users (including satellite and terrestrial) in a wide variety of contexts, contradicting the MSS operators' contention that the provision of different services by unaffiliated providers would be unworkable.[131] Meanwhile, other commenters, such as Cingular/Sprint, take an equally dim view of same-band sharing regardless of whether a single MSS operator administers spectrum-sharing within a unitary network or whether the MSS licensee coordinates spectrum sharing with one or more separately owned and operated networks. Accordingly, Cingular/Sprint contend that "the central question before the Commission is not the technical feasibility of having a separate ATC operator, but the practical feasibility of doing any spectrum sharing between satellite and terrestrial networks."[132] According to Cingular/Sprint, the sharing of the MSS band between satellite and terrestrial operations, while technically possible, is not practically viable.[133] Based on a technical study performed by Telcordia Technologies (Telcordia Study), Cingular/Sprint conclude that the MSS satellite uplink can tolerate only a small number of active ATC co-channel headsets because of the total EIRP radiated into the sky by the ATC terminals within the MSS beam and argue that "it is technically feasible for separate-operators to share the MSS band in the provision of satellite and terrestrial services, and there would be no loss of spectral efficiency if two different firms as opposed to one firm operated the satellite and terrestrial systems."[134]

49. We conclude that same-band, separate operator sharing is impractical and ill-advised. As a preliminary matter, we find that references to sharing arrangements in other bands, while illustrative that sharing may be possible, particularly where both services operate in limited geographic areas on a fixed basis, do not address how parties to this proceeding can overcome the technical hurdles to workable sharing arrangements between two mobile services. The feasibility of any given satellite-terrestrial sharing arrangement in any given frequency band depends upon inter-related factors including: propagation characteristics of the frequency band, mobility of the communication end points, geographic separation between users, anticipated operating power, protection of adjacent spectrum users from interference, extent of system deployment across territory, and other particulars. Because of these

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[131] *See* Letter from Douglas I. Brandon, Vice President, AT&T Wireless, to William F. Caton, Acting Secretary, Federal Communications Commission at 3 & n.5 (filed April 1, 2002) (AT&T Wireless Apr. 1 2002 *Ex Parte* Letter) (citing *Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, ET Docket No. 98-206, First Report and Order and Further Notice of Proposed Rule Making, 16 FCC Rcd 4096, 4218 ¶ 326 (2000) (citing, *inter alia*, *Amendment to Parts 1, 2, 87 and 101 of the Commission's Rules to License Fixed Services at 24 GHz*, WT Docket No. 99-327, Report and Order, 15 FCC Rcd 16934 (2000); *Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands*, ET Docket No. 95-183, Report and Order and Second Notice Proposed Rule Making, 12 FCC Rcd 18600, 18636 (1997)).

[132] Cingular/Sprint May 13, 2002 *Ex Parte* Letter at 2.

[133] *Id.* at 15. Cingular/Sprint provide a technical study performed by Telcordia Technologies (Telcordia Study) to support their claim that ATC and dynamic frequency assignment would be less spectrum efficient than providing MSS and terrestrial services by separate operators in the same frequency band. The study investigates prospects for sharing spectrum between the MSS and ATC by analyzing the four interference paths between the MSS system and the ATC system: ATC base station to MSS downlink, MSS terminal to ATC base station, MSS satellite to ATC terminal and ATC terminal to MSS uplink. According to Telcordia, interference paths along three of the paths is generally confined to the areas near the ATC base station, and thus is easier to manage. Telcordia concludes that the most difficult sharing situation occurs between ATC handheld transmitters and MSS satellite receivers because the power from the ATC transmitter will reduce the capacity of the MSS systems.

[134] *Id.*, Attach. A at 2.

variables, each proposed satellite-terrestrial band-sharing arrangement is different. Satellite and terrestrial licensees, for example, might prove able to coordinate geographically discrete, fixed, point-to-point operations in the higher frequency bands where rain fade, atmospheric absorption and other factors limit the distance that frequency transmissions can travel.[135] But the same parties might experience great difficulty in coordinating ubiquitous, mobile, multipoint-to-multipoint operations in the lower frequency range such as 1-3 GHz.

50. Accordingly, the various proceedings that AT&T Wireless cites in support of same-band, separate-operator sharing are inapposite to the present case.[136] In the *MVDDS Order*, for example, the Commission concluded, after several years of study, that sharing is possible between geostationary DBS satellites, which provided links to fixed earth stations, and MVDDS systems, which employ highly directional fixed antennas. Yet the mere existence of other sharing arrangements in other bands by other operators with other system geometries, other deployment patterns, other terminal types and other power levels – without more – says nothing about whether and how parties to this proceeding might overcome the particular technical hurdles to workable sharing arrangements applicable to this case. The potential for sharing between stationary services that use highly directional fixed antennas in the bands around 12 GHz has little, if any, relevance to the prospects for sharing among two or more highly sensitive mobile systems that rely on omni-directional antennas in the bands below 3 GHz, which has far more favorable propagation characteristics than the 12 GHz band.

51. AT&T Wireless also cites the *Government Transfer Band Order* as support for the proposition that the Commission has authorized same-band sharing between terrestrial and satellite services.[137] In that decision, however, the Commission actually rejected same-band sharing between terrestrial fixed services and fixed satellite services (FSS) and, after a limited transition period, adopted a permanent freeze on any additional co-primary FSS earth stations in the band.[138] Indeed, many of the

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[135] By way of example, we would generally not expect satellite transmissions from a single, geostationary orbit satellite directly over the United States to a single, fixed earth station in New York generally to interfere with terrestrial transmissions from a fixed location in Virginia to another fixed location in Maryland, particularly in bands in the 40 GHz range.

[136] *See* AT&T Wireless Apr. 1, 2002 *Ex Parte* Letter at 3 & n.5 (citations omitted).

[137] *Id.* at n.5 (citing *Amendment of the Commission's Rules with Regard to the 3650-3700 MHz Gov't Transfer Band*, ET Docket No. 98-237; *The 4.9 GHz Band, Transferred from Federal Gov't Use*, WT Docket No. 00-32, First Report and Order and Second Notice of Proposed Rulemaking, 15 FCC Rcd 20488, 20498, ¶ 20 n.64 (2000) (*3.7/4.9 GHz Government Transfer Band Order*)).

[138] *3.7/4.9 GHz Government Transfer Band Order*, 15 FCC Rcd at 20497-20501, ¶¶ 18-29. In declining to permit same-band, co-primary terrestrial and satellite operations, the Commission held that:

> [I]n this band, allowing FSS on an unrestrained co-primary basis would impede any potential widespread use of the band for terrestrial services. Due to the weak signals that are received in the FSS, coordination with higher-powered terrestrial operations would result in potentially large geographic areas where terrestrial services could not operate to avoid interference to FSS. The size and shape of these "exclusion zones" may be different for each FSS earth station site because factors such as shielding, antenna orientation and terrain elevation will vary from site to site. These coordination requirements and the presence of exclusion zones would significantly increase transaction costs and create a disincentive for deployment of new terrestrial operations. Thus, we find that unrestrained deployment of FSS earth stations could hinder or greatly inhibit the opportunities for terrestrial operations in the band.

(continued….)

same considerations that led the Commission to reject same-band, separate-operator sharing in the *Government Transfer Band Order* – onerous coordination requirements, large and variable exclusion zones, high transaction costs and disincentives for investment – persuade us to decline to adopt the alternative, same-band, separate-operator sharing proposal posed in our *Flexibility Notice.*

52. MSS ATC represents a more efficient alternative than same-band, separate-operator sharing. Even if MSS ATC were not the more efficient alternative in the abstract, we do not make decisions in a vacuum. Ultimately, we must decide whether or not to authorize MSS ATC in light of the license-rights of the MSS incumbents and, in most cases, within the context of already operational MSS services. While we agree with those commenters that suggest it may be theoretically possible for two different firms to own and operate the satellite and terrestrial portions of a single system, we believe that, in reality, no two operators are likely to succeed in organizing themselves to manage the highly complex coordination process required between both the MSS and the terrestrial component at the same time in the same band in the same region. To optimally balance the frequency usage of the terrestrial and satellite portions of the system, the ATC portion must be operated in a manner that controls the ATC terminal-to-MSS uplink interference while still providing ATC service. For NGSO MSS systems, this coordination most likely would need to be accomplished on a dynamic basis to accommodate the motion of the satellite constellation. And, for L-band MSS systems, this coordination must include the ability to permit emergency preemptive, priority message traffic.[139] While it may be an operational challenge for a single operator to assign effectively channels between the satellite and terrestrial operations, multiple operators would find achieving efficiently this type of coordination much more difficult.

53. We disagree with the Cingular/Sprint conclusion that there would not be a loss of spectral efficiency if non-affiliated system operators operated separate MSS and terrestrial systems in the same band. We do agree with Cingular/Sprint that the greater potential for interference exists from the ATC mobile terminals to the MSS receivers. Indeed, we place several technical limitations on ATC systems to avoid ATC interference to MSS systems in the allocation. We also agree that power control must be taken into account when considering the aggregate uplink power of the ATC network.[140] The added power control will reduce the effect of ATC terminals on the MSS satellite receiver and result in minimal MSS capacity loss. We apply certain other limitations on ATC to protect MSS systems from receiving interference (e.g., limitations on the number of base stations permitted to transmit on a given channel in the L-band) and it is questionable whether a limitation on base station deployment, for example to reduce interference to MSS, would provide a gain in spectrum efficiency for a non-affiliated terrestrial network.

54. Our experience in other bands and the technical analysis below supports the MSS ATC

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Id. at 20497, ¶ 18. Furthermore, the Commission limited any mobile operations in the band to base stations, because, unlike mobile terminals, base stations operate from fixed locations that may facilitate sharing in certain circumstances.

[139] *See infra* § III(D)(2)(a)(iv).

[140] Cingular/Sprint, for example, indicate that power control must be taken into account when calculating the interference because "the interference into the MSS uplink is the sum of contributions from multiple ATC terminals." Cingular/Sprint May 13, 2002 *Ex Parte* Letter, Attach. A (Telcordia Study) at 20. The Telcordia Study, however, includes only the 'range compensation' factor that accounts for the difference between the transmit power of a terminal at the cell boundary and the average terminal power within the ATC cell. The ATC terminals near the cell boundary will be commanded, by the power control system, to transmit at a higher power level (because of the greater distance from the terminal to the base station) than the users near the base station itself. The result is that the 'average' ATC terminal will transmit a power somewhat less than it is maximally capable of. In our analysis, we also consider additional margin to compensate for structural attenuation. *See infra* §§ III(D)(1) & III(D)(2).

proponents' technical arguments. Same-band satellite and terrestrial operations have created technical problems in other bands.[141] While these technical problems have not always proved insurmountable, particularly where only stationary deployments are involved,[142] the problems grow more complex where, as here, both the proposed satellite service and the proposed terrestrial service are planned as *mobile* services with widespread deployments.[143] In certain MSS bands at issue in this proceeding, moreover, international agreements[144] and permissive domestic licensing policies[145] make establishing long-term

[141] *See, e.g.*, *Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz,40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations,* Further Notice of Proposed Rulemaking, IB Docket No. 97-95, 16 FCC Rcd 12244 (2001) (V-Band Further Notice) (describing the difficulties of sharing between ubiquitous fixed terrestrial wireless systems and satellite systems, discussing agreements to dedicate separate spectrum to the two services and seeking comment on possible solutions where separation was not possible); *Advanced Services First Report and* Order, 16 FCC Rcd at 17223, ¶ 3 (noting that the possibility of the shared use of the band by MSS is "sharply diminished" by the introduction of terrestrial mobile services in the 2.5 GHz band and rejecting a proposal that would allow MSS to share frequencies in the 2.5 GHz band with terrestrial mobile and fixed services principally because "sharing between terrestrial and satellite systems would present substantial technical challenges").

[142] *Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range,* Memorandum Opinion and Order and Second Report and Order, ET Docket No. 98-206, 17 FCC Rcd 9614 (2002) (*MVDDS Order*) (concluding, after several years of study, that sharing is possible between geostationary DBS satellites and MVDDS systems, which use fixed, highly directional antennas stationary co-frequency terrestrial and satellite operations), *modified by*, Erratum, 17 FCC Rcd 5849 (PSPWD, rel. Aug. 14, 2002); *see also* ICO Supplemental Comments at 13-14 & nn.13-14 (describing MVDDS proceeding).

[143] *See, e.g.*, Globalstar Supplemental Comments at 5 & Attach. 1 at 1-43.

[144] In the L-band, for example, the amount, specific frequencies and geographic location of the spectrum in which the five MSS operators in the region of the United States must operate can vary annually. In 1996, the five MSS operators and their respective administrations agreed to a framework by which they could negotiate future sharing arrangements for L-band spectrum in Region 2. This agreement, the 1996 Mexico City Memorandum of Understanding (Mexico City MoU), provides for annual coordination to divide the spectrum on the basis of, among other things, each satellite system's actual usage and realistic projections of future usage. Although annual meetings were to have taken place under the terms of the Mexico City MoU, these meetings have not occurred since the parties last agreed to a complex spectrum-sharing arrangement in London in 1999; therefore, the parties continue to operate under the 1999 assignments pending further negotiations. The following operators currently share L-band spectrum: MSV (United States); TMI (Canada); Inmarsat (United Kingdom); Solidaridad (Mexico); and Volna-More (Russia). In addition, the Multi-functional Transport Satellite (MTSAT-1R) from Japan is expected to commence L-band MSS operations sometime in 2003. To permit full operations, however, the Japanese system will need to obtain L-band MSS spectrum from the spectrum currently assigned to the five MSS operators that were parties to the 1996 Mexico City MoU. Although the parties to the Mexico City MoU have not yet established a meeting date to negotiate a new operating agreement that accounts for the needs of the new MTSAT system, the Japanese administration is expected to participate in the next available negotiation session under the principles of the Mexico City MoU. *See, e.g.,* MSV Supplement Comments at 8; Inmarsat May 21, 2002 *Ex Parte* Letter, Attach. 1 at 3; Inmarsat Supplemental Comments at 13-14; *see also* National Space Development Agency of Japan, Future Launch Schedule, *available at* <http://www.nasda.go.jp/projects/mission-in-progress_e.html> (last visited Nov. 12, 2002).

[145] Coordination between co-frequency communications systems, for example, requires knowing fairly precise technical information about the configuration and operation of any systems operating in the relevant band. In the 2 GHz MSS band, however, only one of eight MSS licensees currently knows its precise operating frequencies. In the (continued….)

coordination plans extremely difficult and – together with the need to prevent and resolve recurrent concerns about mutual interference – would require the Commission's active and continued oversight over many years and still may not prove successful.[146]

55. Based on the record and our analysis, we find that establishing shared usage between MSS and terrestrial services would likely compromise effectiveness to such a degree that neither service would prove cost-effective, and therefore would probably not be deployed. Therefore, we decline to adopt same-band, separate-operator sharing as an alternative to permitting MSS licensees in each of the three MSS bands at issue in this proceeding the option of adding ATCs in determining how they conduct their MSS operations.

2. Separate-Band, Separate-Operator Sharing

56. In our *Flexibility Notice* and again in our *Severability Public Notice*, we sought comment on whether "it is technically feasible for one operator to provide terrestrial services and another operator to provide satellite services *in the same MSS band*."[147] Though we did not propose a separate-band, separate-operator configuration, several commenters construed the *Flexibility Notice* and the *Severability Public Notice* to propose reallocating spectrum from MSS to terrestrial mobile use. In general, these commenters view the principal MSS ATC proposal as not truly same-band sharing but rather as band segmentation (*i.e.*, separate band, separate operator). For example, Verizon Wireless argues that MSS operations can be "severed" from terrestrial operations by reallocating the terrestrial and satellite spectrum into separate frequency bands.[148] Similarly, AT&T Wireless states that MSS licensees propose to segment the band themselves in the same way that it would be segmented for nonaffiliated providers because ATC and satellite components cannot operate co-frequency in the same cell regardless of whether MSS and terrestrial wireless service are provided by a single or by different providers.[149] According to these commenters, therefore, if "severability" is actually accomplished by segmentation, then there is no reason why the technical requirements for a non-affiliated terrestrial service should be any more complex

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2 GHz MSS Rules Order, the Commission divided the 2 GHz MSS uplink (1990-2025 MHz) and downlink (2165-2200 MHz) bands into distinct segments of equal bandwidth (Selected Assignments) to be based on the number of authorized systems. *See 2 GHz MSS Rules Order*, 15 FCC Rcd at 16138, ¶ 16. An additional segment was reserved for MSS system expansion. *Id.* Under the Selected Assignment approach, each 2 GHz MSS operator must voluntarily identify its selected spectrum after the first satellite in its system reaches its intended orbit. *Id.* On October 15, 2002, ICO notified the Commission that it had selected the first 3.88 MHz segment from the band edge at 1990 MHz (*i.e.*, 1990-1993.88 MHz) and the third 3.88 MHz segment from the downlink band edge at 2165 MHz (*i.e.*, 2172.76-2176.64 MHz). *See* Letter from Cheryl A. Tritt, Counsel to ICO Satellite Services G.P., to Marlene H. Dortch, Secretary, Federal Communications Commission, File No. 188-SAT-LOI-97, IBFS File No. SAT-LOI-19970926-00163 *et al.* (Oct. 15, 2002). Four more 2 GHz MSS licensees must choose their Selected Assignments under our 2 GHz MSS service rules and licensing orders.

[146] *See, e.g.*, Celsat Supplemental Comments at 3 (concluding that the prospect of separately owned and operated MSS and terrestrial mobile operations is "highly unrealistic" because "any Commission program of independent terrestrial operations would force MSS operators to somehow determine the location of all terrestrial users in real time and then to attempt to control millions of terrestrial calls on an on-going, real-time basis *in perpetuity* for their terrestrial competitors") (emphasis in original).

[147] *Severability Notice* at 2.

[148] Verizon Wireless Supplemental Comments at 1.

[149] *See, e.g.*, AT&T Wireless April 1, 2002 *Ex Parte* Letter at 3.

than for a single operator.[150]

57. Most of the MSS licensees addressing this issue disagree at great technical length with the terrestrial operators' statements.[151] The MSS licensees state that they will implement their MSS ATC systems through shifts of frequency that would vary over time.[152] They contend that they do not intend to separate the two types of systems into different channels in the type of permanent way that the terrestrial carriers and their representatives claim that they will.[153]

58. We need not resolve the debate over whether MSS ATC will use a "dynamic" or "static" frequency-assignment mechanism to achieve greater frequency reuse. The Commission has identified MSS as an important component of our overall mix of spectrum allocations. The "separate-band, separate-operator" approach, however, would, in essence, reallocate spectrum from MSS to other uses. We believe that reconsideration of the spectrum-management decision to allocate resources to MSS is unreasonable and unwarranted. Nevertheless, to the extent parties believe that this basic spectrum-management decision should be altered, the Commission has initiated other proceedings to comprehensively address the proper amount of spectrum to allocate to MSS, some of which are resolved today. In this Order, we simply conclude that, within the spectrum currently allocated for MSS, some MSS licensees may find that they can achieve greater spectrum efficiency, greater capacity and more robust service by using MSS in combination with MSS ATC than through MSS alone.

3. Secondary Terrestrial Service

59. In response to the *Flexibility Notice*, Iridium proposed a secondary terrestrial service (STS) in the MSS bands at issue in this proceeding.[154] Under Iridium's STS proposal, the Commission would maintain the primary allocation for MSS in the 2 GHz MSS, L- and Big LEO bands, but establish a new, secondary allocation for terrestrial mobile services. The Commission would not limit eligibility for these new STS licenses to the MSS incumbents and, after opening a filing window, would use competitive bidding to resolve any mutually exclusive applications.[155] Iridium claims that its STS proposal would expand the number of potential parties that might implement terrestrial mobile services in the primary MSS bands beyond the number of MSS systems able to implement ATC under our primary proposal.[156]

60. We believe that Iridium's proposal for a primary MSS allocation and an STS allocation suffers from several problems. Most important, MSS and terrestrial mobile services cannot as a practical matter share the same band unless all of the components that might potentially cause interference,

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[150] *See, e.g.*, *id.* at 8.

[151] *See, e.g.,* ICO Supplemental Comments at 6-19; Globalstar Supplemental Comments at 4-7, Technical Appendix at 1-42; MSV Supplemental Comments at 6-9.

[152] Constellation Supplemental Comments at 3.

[153] *See, e.g.,* ICO Reply at 9-11; Globalstar Reply at 8-10; MSV Reply at 7, 10, 23-24.

[154] Iridium Comments at 5-8; Iridium Supplemental Comments at 2-4.

[155] *See* Iridium Supplemental Comments at 4-6 (explaining various adjustments needed in the 2 GHz MSS service rules to limit uncertainties and other problems necessary to successfully implement a competitive bidding process in the band).

[156] *Id*. at 2.

including the terrestrial base stations, the mobile earth terminals and the MSS satellites, are capable of responding dynamically to interference.[157] As discussed below, the potential for interference between MSS and terrestrial mobile systems is, in fact, so great that we believe only a single type of operator – in this case, the incumbent MSS licensees – would possess both the ability and incentive to coordinate operations in a manner that avoids interference.[158]

61. Iridium also suggests that imposition of secondary status on in-band terrestrial systems would ensure that the satellite systems are adequately protected against harmful interference.[159] Establishing a secondary allocation, however, does not itself adequately protect primary licensees against interference. Iridium recognizes as much when it states that MSS licensees must first achieve a "high degree of comfort" that STS will not interfere with their operations before any new STS licenses could be issued.[160] But it does not identify an interference threshold by which the Commission might measure whether the MSS licensees have achieved comfort.[161] Lacking the necessary technical information in the record, we are concerned how coordination among primary and secondary licensees, alone, could ever result in the operational parameters necessary to make STS workable – the same parameters that Iridium acknowledges would be necessary for STS operations to be successful.[162] Significantly, moreover, primary service users are not required to coordinate with secondary operations.

62. Iridium recognizes that the precise technical parameters of each secondary allocation would be difficult to establish and would vary widely depending on the exact system architectures, operational configurations, coding techniques, power levels and other parameters that each MSS licensee and each in-band secondary terrestrial system chose to use.[163] Complicating matters further, Iridium envisions each

[157] *See* discussion *supra* at Section III(B).

[158] *See* discussion *infra* at Appendix C1-3.

[159] *See, e.g.*, Iridium Supplemental Comments at 6 ("By imposing secondary status on the terrestrial systems, the Commission ensures that the satellite systems are protected.").

[160] Iridium Comments at 6; *see also* Iridium Supplemental Comments at 3 (claiming, twice, that it is "essential" that MSS systems not experience interference from secondary terrestrial operations); Iridium Supplemental Comments at 4 (demanding "*absolute* primary status" for incumbent MSS systems if its STS proposal were to be implemented) (emphasis added); Iridium Comments at 6 (noting that "great care must be exercised in fashioning the technical rules that would govern this new STS").

[161] Iridium Supplemental Comments at 6 (specifics to be worked out in the inter-party coordination process or possibly Commission-established technical parameters); *see also* ICO Supplemental Comments at 14 n.15 (noting that Iridium has "neither provided any specific plan to operate any independent terrestrial system in MSS spectrum nor offered any technical analysis demonstrating the feasibility of such as system") (citation omitted).

[162] *See, e.g.*, ICO Supplemental Comments at 14; Globalstar Comments at 14-15; Globalstar Bondholders Comments at 33-34; Globalstar Bondholders Supplemental Comments at 2; Celsat Comments at 8; Constellation Comments at 16; ICO Reply at 1, 7-8; Celsat Reply at 16-17 n.44; MSV Reply at 13-15; CTIA Reply at 14; Globalstar Reply at 11.

[163] Iridium Supplemental Comments at 5; *see also* Iridium Supplemental Comments at 5 (conceding that STS would involve "potentially complex issues"); Iridium Supplemental Comments at 3 (noting that "[o]bviously . . . [STS] may theoretically complicate . . . coordination").

potential STS licensee as occupying more bandwidth than would be assigned to any one MSS licensee.[164] As a result, each new STS licensee would need to coordinate its proposed secondary operations with at least two primary MSS systems.[165] Because each primary MSS system would use different satellites, different antennas and, in all likelihood, different coding and other operational parameters, each prospective STS licensee would need to design its terrestrial system to meet an insurmountable number of potential interference scenarios.[166] Finally, even if the secondary terrestrial mobile applicant and the primary MSS licensees agreed on co-channel interference limits,[167] the secondary terrestrial mobile applicant would still need to consider the operational parameters of forthcoming next-generation satellite systems and, as with any licensee, protect adjacent channel MSS systems from potential interference.[168] Under these circumstances, a secondary terrestrial mobile system, if ever able to coordinate its operations with the primary MSS licensees, would likely be too constrained in its operations to implement STS.[169]

63. Finally, Iridium appears to believe that permitting all MSS licensees to integrate ATCs into their systems is tantamount to a "policy that, *de facto*, would advance the interests of only one, uniquely situated, MSS system," namely those of ICO in the 2 GHz MSS band.[170] The majority of MSS licensees, however, affirm their ability to improve their spectrum efficiency by integrating a terrestrial component into their licensed MSS systems.[171] Although Iridium itself may not be able to integrate a terrestrial component into its particular MSS system because of its historic choice of system technology,[172] many

[164] *See, e.g.*, Iridium Comments at 6 ("to provide adequate spectrum for STS operations -- including enabling the terrestrial licensee to be able to "work around" a given MSS system -- STS licenses should cover more than the bandwidth of one individual MSS system").

[165] *See also* Constellation Reply at 5 n.15 (asserting that Iridium's proposal to have terrestrial use assignments larger than a single MSS system assignment renders the STS scheme too burdensome to consider as a reasonable alternative). In addition, in the 2 GHz MSS band where MSS licensees have not yet identified their Selected Assignments, Iridium concedes that prospective STS licensees would not even know the licensees with which they would be required to coordinate their operations. *See* Iridium Supplemental Comments at 3-4. To remedy this failing, Iridium urges the Commission to reverse its recently issued *2 GHz MSS Rules Order* in part and immediately assign specific frequencies to the 2 GHz MSS systems. Only by requiring MSS licensees to immediately choose their Selected Assignments could STS applicants know from the outset the identity of the corresponding primary satellite systems with which they would need to coordinate. *See* Iridium Supplemental Comments at 4.

[166] Constellation Reply at 13 (questioning how an STS applicant would ever adapt to both CDMA and TDMA technologies in the Big LEO band).

[167] Iridium Supplemental Comments at 6.

[168] *See, e.g.*, CTIA Supplemental Comments at 8 ("Segmenting and separately authorizing terrestrial service in the MSS bands would not change this basic requirement to protect the operations of licensees in adjacent channels, whether satellite or terrestrial.")

[169] According to MSV, the coordination requirement that Iridium envisions imposing may very well prove so burdensome that MSS spectrum might lay fallow indefinitely. MSV Reply at 14-15.

[170] *See* Iridium Supplemental Comments at 2; Iridium Comments at 3 (claiming that MSS ATC is "an opportunity for ICO and no one else").

[171] *See* Globalstar Sept. 26, 2002 *Ex Parte* Letter, Attach. 1 at 8, 11; TMI Sept. 26, 2002 *Ex Parte* Letter at 7; MSV Aug. 29, 2002 *Ex Parte* Letter at 2.

[172] Iridium is unlikely to prove able to integrate terrestrial operations into its licensed MSS frequencies as a result of its historical choice to deploy time division multiplex analysis (TDMA) coding in its MSS system.

other MSS licensees besides ICO have demonstrated that they can do so. Accordingly, any concern that only one MSS licensee will be able to implement ATC is unfounded. In fact, Iridium appears far less concerned with monopolization of the MSS bands than with advancing its position that, unless the Commission can find a way of allowing *Iridium* to exploit the operational efficiencies, enhancements and other advantages that MSS ATC may offer, the Commission must prevent all other MSS licensees from trying to improve the efficiency of their respective MSS systems through deploying ATC. We, however, refuse to impose the same operational limitations on Commission licensees through regulation that Iridium has imposed on itself through its system design choices.

64. In summary, we conclude that Iridium's STS proposal would involve technical and operational complications, and problems to successfully implement. In light of those problems and notwithstanding the potential that STS may expand the number of parties eligible to implement flexible operations, we conclude that the likely burden on secondary operators, MSS licensees, and the Commission would outweigh the benefits anticipated from the proposal.[173] We, therefore, decline to adopt Iridium's STS proposal.

4. Conclusion

65. The record demonstrates that sharing between MSS and terrestrial mobile services is neither advisable, nor practical. Revocation of the authority of operational MSS systems and those MSS licenses that have met their implementation milestones in good faith is unreasonable and unwarranted. And our detailed technical analyses demonstrate that a third party cannot operate in the licensed MSS spectrum without compromising the operations of existing and future MSS licensees. We, therefore, face a choice between quickly achieving the public-interest benefits of improved spectrum efficiency, reduced costs and increased competition at the price of giving MSS licensees more than they had originally sought, or giving MSS licensees only what they originally received at the price of the public-interest benefits that MSS ATC promises. Under these circumstances, we decide that granting the MSS licensees additional spectrum flexibility represents the better course.

C. MSS ATC Service Rules

66. We adopt service-rule requirements for the provision of MSS ATC that, among other things, effectively condition MSS ATC on the provision of substantial satellite service. As explained below, an MSS licensee that wishes to include ATC must meet certain requirements concerning: (1) geographic coverage; (2) coverage continuity; (3) commercial availability; (4) an integrated offering; and (5) in-band operation.[174] We view full and complete compliance with each of the requirements as essential to the integrity of our "ancillary" licensing regime. Without the integrity afforded by these MSS ATC service-rule requirements, an alternative licensing or distribution mechanism should be used. Thus, failure of an MSS operator to meet any of the ATC service requirements set forth in our Rules and this Order may result in enforcement action, including the imposition of a monetary forfeiture in addition to the loss of

[173] Iridium Supplemental Comments at 8.

[174] As described in detail in section III(G), *infra*, we will require MSS licensees seeking ATC authorization to modify their space-station licenses using FCC Form 312 and provide specific information and certifications describing their ATC operations as meeting these requirements. As is Commission practice for any application to modify a space-station license, these applications will be available for review in the licensee's public file. Any applications meeting these requirements will be treated as minor modifications. As with any minor modification, if upon Commission review the Commission deems it in the public interest to seek comment on an MSS ATC application, the Commission at its discretion may provide public notice and opportunity for comment.

ATC and MSS operating authority. We remind licensees that, under section 503(b) of the Communications Act and the Commission's rules, the Commission may assess a monetary forfeiture against common carriers in amounts up to $120,000 for a single violation or per day of a continuing violation with a maximum forfeiture amount of $1,200,000 and against non-common carriers in amounts up to $11,000 for a single violation or per day of a continuing violation with a maximum forfeiture amount of $87,500.[175] We have no reason to believe that licensees will not comply in good faith with the service rules we adopt today; however, we will not hesitate to use our statutory enforcement authority against those licensees that do not.

1. "Ancillary" Service

67. Our decision to permit MSS ATC is based upon the premise that ATC remains "ancillary" to a fully operational space-based MSS system. We find that an ATC system is "ancillary" when an MSS operator meets all of our requirements for the provision of ATC.

68. In the *Flexibility Notice*, we stated that we intended the term "ancillary" to refer to those terrestrial services that MSS operators provide that: (1) "are integrated with the satellite network"; (2) "use assigned MSS frequencies"; and (3) "are provided for the purpose of augmenting signals in areas where the principal service signal, the satellite signal, is attenuated."[176] We added that, by using the term "ancillary," we intended to exclude "services that differ materially in nature or character from the principal services offered by MSS providers."[177] Our intention in defining the term "ancillary" in the *Flexibility Notice* was to distinguish our use of "ancillary" in the context of the *Flexibility Notice* from other instances in which the Commission has employed the term, not to suggest any additional requirements. In other words, we intended the term ancillary to refer to a proposed set of conditions under which an MSS licensee might offer integrated mobile services in the bands allocated for the MSS licensee's use, consistent with its existing MSS authorization.[178]

69. Some commenters dispute our definition of "ancillary" in the *Flexibility Notice*.[179] For example, in the *Flexibility Notice*, we said that we did not intend ATC services to differ materially "in nature or character" from MSS services. By this language, we sought to illustrate our expectation that MSS and MSS ATC *services* should remain similar in material respects; in other words, we envisioned both MSS and MSS ATC as generally offering the same types of applications to the end user. While our intent in defining the term ancillary was to clarify, we believe that our definition in the *Flexibility* Notice may, in fact, have led to confusion of our use of the term "ancillary" in this context. CTIA, for example,

[175] 47 U.S.C. § 503(b); 47 C.F.R. § 1.80.

[176] *Flexibility Notice*, 16 FCC Rcd at 15546-47, ¶ 30.

[177] *Id.* at 15546-47, ¶ 30.

[178] *Id.* at 15546, ¶ 30; *see also* discussion *supra* n.5.

[179] *See, e.g.*, Cingular/Verizon Comments at 15 & n.47. Cingular and Verizon, for example, cite Webster's Dictionary for the proposition that "ancillary service is by definition subordinate or auxiliary to the primary service." *Id. Cf., e.g.*, Globalstar Bondholders Supplemental Comments at 2 ("[b]y definition, terrestrial authority cannot be 'ancillary' to MSS licenses unless terrestrial authority is available exclusively to existing MSS licensees"); MSV Comments at 23 (asserting that "no matter how much traffic is originated or terminated over the terrestrial base stations, the vast majority of the United States land mass will be served by the satellite and service in rural and remote areas will not be degraded" and therefore any in-band terrestrial use will remain "ancillary" to the satellite emissions).

states that MSS and MSS ATC must, by necessity, differ in "nature and character" due to their different physical configurations.[180] Moreover, we recognize that our use of the term "ancillary" in the *Flexibility Notice* departs from dictionary definitions of the term.[181] To avoid confusion, therefore, we decline to adopt in our rules a definition of the term "ancillary," and instead clarify that the term "ancillary," with respect to MSS ATC, is defined as terrestrially-based, in-band MSS operations meeting the technical and policy requirements set forth in this Order.

70. Concerning the merits of requiring ancillary operation, commenters generally agree that, if ATC is permitted, MSS operators should: (1) integrate ATC offerings with the principal MSS offering, (2) use the same frequencies for ATC and the principal MSS operations, and (3) use ATC simply to augment signals, consistent with MSS operations, rather than create a materially different service.[182] Both commenters that support and those that oppose ATC caution against allowing a terrestrial component designed to augment MSS to become a freestanding terrestrial mobile service in spectrum allocated domestically and internationally for MSS use.[183] To the extent ATC is authorized, commenters generally support adopting the limiting principles on ATC operation.[184]

71. While commenters generally agree on the need to ensure that MSS terrestrial operations remain "ancillary," commenters disagree over precisely which operational requirements will best allow us to exercise effective oversight of MSS operations. In the *Flexibility Notice,* we sought comment on whether to ensure ancillary operation by requiring MSS licensees to observe five requirements concerning: (1) geographic coverage; (2) coverage continuity; (3) commercial availability; (4) in-band operation; and (5) central data switching.[185] Commenters also proposed that we adopt (6) mandatory bundling requirements for MSS ATC service offerings. We address each of these proposals and other proposed limitations on MSS ATC below.

2. Substantial Satellite Service

72. We require MSS licensees that seek authority to offer ATC service to provide substantial satellite service to the public. As described below, substantial satellite service requires certain band- and network-specific demonstrations concerning the MSS space-segment's geographic coverage area, coverage continuity and commercial availability. Applicants for MSS ATC authority must demonstrate

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[180] CTIA Comments at 3.

[181] 1 *The New Shorter Oxford English Dictionary* 75 (1993) (defining ancillary as "subservient, subordinate, auxiliary, providing support; now esp. providing essential support or services to a central function or industry, especially to hospital or medical staff"); *Merriam-Webster's Collegiate Dictionary* (2002) (defining ancillary as "subordinate, subsidiary" or "auxiliary, supplementary"), *available at* <http://www.m-w.com/cgi-bin/dictionary?ancillary> (last visited, Dec. 30, 2002).

[182] *See, e.g.*, API Comments at 5 (stating that "to the extent that MSS providers are permitted to offer terrestrial services in the 2.1 GHz band, such services should be authorized only on an ancillary basis.").

[183] *See* Boeing Comments at 6; Celsat Reply at 9 ("Celsat fully endorses the Commission's carefully drawn definition of ancillary because it ensures that terrestrial operations remain truly ancillary to the satellite service.").

[184] *See, e.g.,* Boeing Comments at 5-8; ICO Comments at 43-51; MSV Comments at 27-28; CTIA Comments at 3-5; Voicestream Reply at 20-24; Constellation Reply at 9-16; TRW Reply at 4-6; Boeing Reply at 5-10; MSV Reply at 25-27; Globalstar Reply at 8-9.

[185] *See Flexibility Notice*, 16 FCC Rcd at 15551-52, ¶¶ 42-46.

compliance with these requirements and, of course, will remain responsible for the continuing accuracy and completeness of any information furnished in pending applications.[186] Upon licensing, failure of an MSS ATC licensee to meet any of these requirements will result in enforcement action with penalties up to and including loss of ATC and MSS operating authority as well as the imposition of a monetary forfeiture.

a. Geographic Coverage

73. We find that for an MSS licensee to secure and to maintain authority to implement ATC, it must provide space-segment service across the entire geographic area stipulated in our rules and policies for that operator's particular space-station system geometry and frequency band as proposed in the *Flexibility Notice*. In the *Flexibility Notice*, we sought comment on whether to authorize MSS ATC only after the MSS operator demonstrates that it can provide space segment service covering all 50 states, Puerto Rico, and the U.S. Virgin Islands one-hundred percent of the time, consistent with the coverage requirements for 2 GHz MSS GSO operators.[187] For the L-band, we proposed an analogous restriction. We sought comment on adopting the same requirement for L-band operators "except that if a GSO MSS operator in the L-band can demonstrate that 100 percent coverage is not possible from the orbit location of the satellite" we proposed to "permit commercial operation of terrestrial facilities so long as the MSS service is continually available in all geographic areas the satellite is capable of covering."[188] We also sought comment on minimum coverage requirements for Big LEO operators prior to their being permitted to provide ATCs.[189]

74. Parties that support authorizing ATC support adopting geographic coverage requirements similar to the ones we proposed.[190] According to these parties, geographic coverage requirements will help ensure that MSS providers use ATC only where space-station signals are attenuated and will not migrate their service toward terrestrial-only operation at some point in the future.[191] MSS operators are unlikely to spend resources on ATC facilities in areas where space-station signals already reach because deployments in those areas would only duplicate existing infrastructure investment. Geographic coverage requirements, therefore, can help ensure that ATC remains an integrated operation that augments rather than replaces satellite-based MSS services.[192] Indeed, by imposing geographic coverage requirements we

[186] *See infra* App. B; 47 C.F.R. § 1.65.

[187] *See Flexibility Notice*, 16 FCC Rcd at 15547, ¶ 32; *id.* at 15551, ¶ 42.

[188] *See id.* at 15551, ¶ 43.

[189] *See id.* at 15564, ¶ 80.

[190] *See, e.g.*, Celsat Reply at 10 (addressing the coverage requirements for 2 GHz MSS band licensees and stating that "Celsat supports this coverage requirement because it effectively ensures that ancillary terrestrial use will always be part and parcel of a fully functioning satellite system."); Boeing Comments at 8; API Comments at 5 ("API agrees with the Commission's proposal that a certain level of MSS coverage be established before MSS licensees are authorized to provide terrestrial service."); MSV Comments at 23 (supporting Commission's proposals to ensure MSS licensees comply with satellite implementation and service requirements).

[191] *See, e.g.*, Celsat Reply at 11.

[192] *See, e.g.,* MSV Comments at 23; ICO Comments at 23-24; Globalstar Bondholders Reply at 21; Letter from Laurence H. Williams, ICO Global Communications Ltd., to Marlene H. Dortch, Secretary, Federal Communications Commission, IB Docket No. 01-185, at 1-2 (filed, Dec. 16, 2002) (ICO Dec. 16, 2002 *Ex Parte* Letter).

intend to prohibit an MSS licensee from deploying an ATC base station that uses all of the MSS system's available frequencies to the exclusion of the satellite signals. If an MSS licensee were to deploy a base station that uses all available satellite channels, we are concerned that a user at some distance from the terrestrial base station may not receive a signal from either the terrestrial component, or the satellite system because the base station signal would be too weak and the satellite signal would be experiencing too much interference from the base station to close a link to the end user.[193] We believe that an MSS licensee would not intentionally create "dead zones" for its customers, especially since the primary selling point of MSS ATC service would be ubiquitous coverage to end users.[194] Nevertheless, imposing geographic coverage requirements on MSS ATC operators will not permit these types of "dead zones" because an MSS licensee that left no satellite channels available for customer use would necessarily violate the band-specific requirements for ubiquitous or nearly ubiquitous geographic coverage.[195] For these reasons, an MSS licensee that wishes to provide ATC must ensure that it remains capable of providing the necessary throughput to maintain space-segment service across the entire geographic area stipulated in our rules and policies for that operator's particular space-station system geometry and frequency band. We intend to deny any initial or modification applications for MSS ATC systems that propose space-segment throughput that would be insufficient to meet the applicable geographic-coverage requirement.

75. In implementing geographic coverage requirements, we take into account the variable system configurations and band segments of the MSS systems at issue in this proceeding. For example, Globalstar Bondholders notes that our current geographic coverage requirements for space-stations differ depending on whether the system is GSO or NGSO and depending on the frequency band in which the satellite operates.[196] Under our satellite service rules, for example, Big LEO and 2 GHz MSS NGSO licensees must be capable of providing service: "(i) to all locations as far north as 70º North latitude and as far south as 55º South latitude for at least 75% of every 24-hour period, *i.e.*, that at least one satellite will be visible above the horizon at an elevation angle of at least 5º for at least 18 hours each day, and (ii) on a continuous basis throughout the fifty states, Puerto Rico and the U.S. Virgin Islands, i.e., that at least one satellite will be visible above the horizon at an elevation angle of at least 5º at all times." [197] Similarly, L-band MSS licensees must be capable of providing service to "all of the U.S. domestic market, including all fifty states, Puerto Rico, the Virgin Islands and U.S. coastal areas up to 200 miles."[198] According to the Globalstar Bondholders, therefore, the Commission should "use existing coverage requirements as an ATC authority threshold to prevent MSS providers from neglecting required coverage outside of the 50 states, Puerto Rico, and the U.S. Virgin Islands."[199] We agree with Globalstar Bondholders that we should hold MSS space-station licensees that implement ATC to a standard no less

[193] *See infra* App. C.

[194] *See* Globalstar Bondholders Comments at 2; Globalstar Bondholders Reply at 3; Celsat Comments at 17 n.42; MCHI Comments at 5-8; Celsat Reply at 11; MSV Comments at 23; MSV Reply at 11; ICO Comments at 2; ICO Reply, App. at A-6.

[195] New rule section 25.147(a)(6), moreover, expressly prohibits ATC base stations from using all available MSS frequencies. *See infra* App. B (adopting new rule 47 C.F.R. § 25.147(a)(6)).

[196] Globalstar Bondholders Reply at 21-22 n.50.

[197] *See* 47 C.F.R. § 25.143(b)(2).

[198] *MSV License*, 4 FCC Rcd at 6055, ¶ 97.

[199] Globalstar Bondholders Reply at 21-22 n.50.

rigorous than that required for MSS operations generally. Thus, an eligible MSS licensee that wishes to implement ATC must provide space-segment service across the entire geographic area stipulated in our rules and policies for that operator's particular space-station system geometry and frequency band. We incorporate into Part 25 of our rules the specific geographic coverage requirements applicable to each type MSS system under consideration in this Order as a prerequisite for the provision of ATC.[200]

76. We do not find persuasive the various concerns of parties opposed to geographic coverage requirements. These parties describe the geographic coverage requirements as "cumbersome" and "difficult to enforce."[201] These parties speculate that partial or temporary lapses in geographic coverage may create unanticipated complexities for enforcement.[202] We have, however, administered geographic coverage requirements on space station systems for many years.[203] These requirements are verifiable and represent an unusually straightforward standard for such a technically complex service.[204] As ICO observes, moreover, we apply similar types of coverage requirements for terrestrial wireless services.[205] We have, in practice, found geographic coverage requirements neither cumbersome, nor difficult to enforce, and we find that the addition of an ATC will not materially complicate our administration of these longstanding requirements.

77. We also find it unlikely that geographic coverage requirements would encourage the demise of MSS space station operations. Assertions to the contrary appear to rest on speculation that geographic coverage requirements do nothing to diminish the presumed financial incentives for an MSS ATC operator to reduce its capacity for satellite services to maximize the capacity of its available spectrum for terrestrial services, which would constrain other satellite operations in the band.[206] We have rejected this

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[200] *See infra* App. B.

[201] Stratos Reply at 14; *see also, e.g.*, Aviation Industry Parties Comments at 11 ("Even with these coverage requirements, the temptation will be great for the MSS operator to abandon or minimize its efforts to provide MSS and to concentrate on cellular service. At the end of the day, the hundreds of millions of dollars invested by aviation in the development of this service and the equipage of its aircraft would be for naught.").

[202] AT&T Wireless Comments at 6 ("Even if the Commission could rationally determine the appropriate level of MSS coverage that should be required prior to the commencement of terrestrial service, it is not clear what consequences should attach to partial or permanent lapses in satellite coverage caused by technical failure or obsolescence of a satellite (or any other reason).").

[203] *See, e.g.,* 47 C.F.R. § 25.143(b)(2)(iii).

[204] *See 2 GHz Order*, 15 FCC Rcd at 16153-54, ¶59.

[205] *See* ICO Reply at 10 n.41 (*citing* 47 C.F.R. § 24.103; *id*. § 24.203). Section 24.103(a) of our rules, for example, requires nationwide narrowband PCS licensees to "construct base stations that provide coverage to a composite area of 750,000 square kilometers or serve 37.5 percent of the U.S. population within five years of initial license grant date; and, shall construct base stations that provide coverage to a composite area of 1,500,000 square kilometers or serve 75 percent of the U.S. population within ten years of initial license grant date." 47 C.F.R. § 24.103(a). Alternatively, a narrowband nationwide PCS licensee may "provide substantial service to the licensed area." 47 C.F.R. § 24.103(a). Our rules define "substantial service" as "service that is sound, favorable, and substantially above a level of mediocre service that would barely warrant renewal." 47 C.F.R. § 24.103(d).

[206] Stratos Reply at 17.

same type of argument in considering grants of flexibility for other Commission licensees,[207] and have considered and rejected these arguments as applied to MSS ATC elsewhere in this Order.[208]

b. Coverage Continuity

78. We further adopt a requirement that MSS operators maintain space station coverage over the relevant geographic area to maintain authority to provide ATC. We also adopt standards for reasonable replacement of satellites in the event coverage should degrade as a result of satellite failure tailored to the particular configuration of a given MSS satellite system. For operational NGSO MSS ATC systems, we require the licensee to maintain an in-orbit spare. For operational GSO MSS ATC systems, we require the licensee to maintain a spare satellite on the ground within one year of commencing operations and launch it into orbit during the next commercially reasonable launch window following a satellite failure. We require licensees to report any outages that meet this standard within ten days of their occurrence.

79. In the *Flexibility Notice*, we also sought comment on whether and how to require the MSS operator to maintain space-station signal coverage if, for example, a satellite fails.[209] As discussed above, MSS licensees have strong economic and legal incentives to recoup the investment costs of their MSS systems by continuing to offer satellite-based services.[210] For global MSS operators, revenues from satellite service offerings to customers in the United States represent only a portion of the total revenue from the global satellite-services market. Under these circumstances, an MSS operator would have an economic incentive to replace the failed satellite.

80. Commenters that support ATC also tend to support requiring MSS licensees to maintain continuous coverage of the geographic region relevant for that particular licensee as a condition for ATC authority.[211] According to the Globalstar Bondholders, for example, "[e]nforcing MSS coverage requirements can ensure the provision of 'ancillary' service by preventing the operation of an ATC platform from degrading in any way the satellite service received by MSS subscribers that are not served by the ATC platform."[212] Several ATC proponents add that, if a licensee's failure to replace a satellite causes the MSS portion of the system to degrade, the Commission should revoke ATC authority.[213]

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[207] *See, e.g.*, *CMRS Flexibility Order,* 11 FCC Rcd at 8975, ¶ 22 ("[N]othing in the record suggests that giving licensees who provide CMRS services the flexibility to offer fixed service would make them less responsive to market demand for mobile service. In fact, the record indicates that most carriers intend to offer consumers integrated packages and combinations of mobile and fixed services.").

[208] *See supra* § III(A)(4) (discussing competition and MSS ATC).

[209] *See Flexibility Notice*, 16 FCC Rcd at 15551, ¶ 44.

[210] *See supra* § III(A)(4) (addressing enhanced competition).

[211] *See, e.g.*, Celsat Comments at 14 ("full-time coverage of the service area is the best way to ensure that terrestrial reuse of the 2 GHz MSS band is truly ancillary to the satellite service."); Boeing Comments at 8-9 ("Boeing, therefore, would support the revocation of an MSS operator's terrestrial authorization if the operator does not, for example, replace a sufficient number of failed satellites within a reasonable time period to maintain the Commission's coverage requirements.").

[212] Globalstar Bondholders Reply at viii.

[213] *See* Constellation Comments at 27; *see also, e.g.,* MSV Comments at 23-25; MSV Reply at 23-27. MSV supports a requirement that MSS licensees maintain their satellite service in order to provide terrestrial service, but (continued….)

81. Notwithstanding the preexisting economic and legal incentives that an MSS licensee may have to return the MSS space component to full operation as quickly as possible in the event of a satellite failure, we find that imposing a continuous coverage requirement would address concerns raised by certain commenters that MSS operators might not exercise sufficient diligence in returning an MSS system to full operation if the operator can continue to generate operating revenues from its ancillary terrestrial system.[214] AT&T Wireless, for example, claims that an infusion of new investment capital to ATC-enabled MSS systems "would make compliance with any satellite coverage thresholds adopted by the Commission virtually impossible because no new investment dollars would be devoted to launching and maintaining capital-intensive satellite systems."[215] We question whether an MSS operator would direct investment to ATC at the expense of the MSS system on which the authority to operate ATC depends. Although we view investment in ATC at the expense of MSS coverage requirements as unlikely, expressly conditioning ATC authority on maintenance of the MSS licensee's satellite-coverage obligation may provide some benefit in helping to ensure continued investment and innovation in an MSS licensee's space-station assets, because it would require the MSS operator to act as if the space-segment assets were still the company's sole source of income.[216] Given widespread support for a continuous coverage requirement,[217] the lack of any significant cost to MSS licensees and the possibility of some long-term benefit to the public, we adopt our proposal to require MSS licensees to maintain continuous coverage of the geographic region that we require them to serve.

82. As a part of our proposal to require continuous coverage, we sought comment on the circumstances under which we should revoke an MSS operator's ATC authority if coverage were interrupted. Although most commenters support a reasonable time for replacement of failed or disabled satellites, commenters propose widely variant time periods in which to replace failed MSS space stations.[218] MSV, for example, proposes that the Commission allow an operator two years to replace a failed satellite.[219] ICO proposes a three-month replacement period.[220] Meanwhile, Boeing proposes that the Commission establish specific milestones for satellite replacements, which, if not met, would require the MSS licensee to forfeit ATC authority; Boeing does not specify a time period in which replacement

(Continued from previous page)
asserts that an MSS operator whose satellite has failed should receive "a reasonable period of time," which MSV asserts is two years, to launch a replacement satellite. MSV Comments at 24-25.

[214] *See, e.g.,* AT&T Wireless Comments at 2-3; AT&T Wireless Reply at 2, 5-7; Boeing Comments at 7; CTIA Comments at 5-9.

[215] AT&T Wireless Reply at 11. Similarly, Boeing notes that, without some type of coverage requirement in place, over time "there is a strong possibility that the 2 GHz spectrum could eventually 'default' to terrestrial use without any satellite component." Boeing Comments at 8.

[216] *See, e.g.*, Boeing Comments at 9 ("[o]nce ATS is initiated, MSS operators that employ ATS should also maintain, on an ongoing basis, sufficient satellite coverage and service availability of their MSS services.").

[217] *See, e.g., id.* at 8; MSV Comments at 24-25; ICO Comments at 44-46; Constellation Reply at 9; Boeing Reply at 5-6; MSV Reply at 25; Globalstar Reply at 8.

[218] Celsat Reply at 10-11 & n.26.

[219] *See* MSV Comments at 24-25 (suggesting a maximum two-year limit during which the MSS operators should be permitted to operate terrestrial facilities without satellite coverage, taking into consideration the time to procure "long-lead" parts to assemble a spare satellite).

[220] ICO Comments at 44 (suggesting three months as a reasonable replacement deadline for "all but the most unexpected outages")

should occur, but suggests that the milestones should be shorter than those required for the construction and operation of initial MSS satellites.[221]

83. The construction, launch and operation of space stations are subject to launch failures, satellite malfunctions and other unique hazards. We agree that MSS licensees should repair or replace space stations within a reasonable time frame. For 2 GHz MSS systems, for example, we required licensees to meet a series of implementation milestones designed to ensure the construction, launch and operation of systems within three-and-a-half years of grant of the NGSO MSS licensees and within five years of the GSO MSS license grant.[222] Repairing or even replacing a malfunctioning satellite, for all its complexity, requires less time than designing and constructing a new system. Even in the worst case where a satellite is destroyed, a licensee can ordinarily replace a lost satellite with a ground spare at the next available launch window, or procure a technically identical satellite in an expedient manner since it would have already completed the complex design process. As suggested by Boeing's comments, however, different types of failures on different types of systems require different periods of time to correct.[223] To recognize these differences, we adopt a standard for reasonable replacement tailored to the particular configuration of a given MSS satellite system and the relative cost of NGSO and GSO space stations. For operational NGSO MSS ATC systems, we will require the licensee to maintain at least one in-orbit spare. For operational GSO MSS ATC systems, we will require the licensee to maintain a ground spare within one year of commencing operations and launch the ground spare into orbit during the next commercially reasonable launch window following a satellite failure. We require licensees to report any outages that meet this standard within ten days of their occurrence.[224]

84. While no replacement standard can anticipate every potential failure with precision, adopting standards tailored specifically for NGSO and GSO MSS configurations strikes an appropriate balance between reinforcing the licensee's commercial and legal incentives to provide continuous service and allowing sufficient time for the licensee to repair or replace satellites that have failed. In addition, we note that nothing in this Order constrains our authority to impose forfeitures on licensees that fail to meet their obligations as MSS licensees in addition to any other remedies available under our rules. We adopt these requirements as a condition of authorizing ATC and incorporate them into Part 25 of our rules.

c. Commercial Availability

85. In the *MSS Flexibility Notice*, the Commission asked whether an "MSS operator could initiate operation of terrestrial services as soon as its operational satellites cover 100 percent of the United States

[221] *See* Boeing Comments at 9.

[222] *2 GHz MSS Rules Order*, 15 FCC Rcd at 16177-78, ¶ 106. Specifically, for 2 GHz MSS NGSO system licensees must enter into a non-contingent satellite manufacturing contract for the system within one year of authorization, complete critical design review within two years of authorization, begin physical construction of all satellites in the system within two and a half years of authorization, and complete construction and launch of the first two satellites within three and a half years of grant. *See id.* For 2 GHz MSS GSO systems, licensees must enter into a non-contingent satellite manufacturing contract within one year, complete critical design review within two years, begin physical construction of all satellites in the system within three years, and complete construction of, and launch, one satellite of its constellation into its assigned orbital location within five years of authorization. *Id.*

[223] *See, e.g.,* Boeing Comments at 9.

[224] *See infra* App. B.

100 percent of the time, even if the operator has not yet launched its entire constellation of satellites."[225] We require MSS to be commercially available in accordance with the coverage requirements that pertain to each band as a perquisite to an MSS licensee's offering ATC service.[226]

86. Whether an operator can commence ATC operations prior to making its satellite system commercially available to the public represents an extension of the arguments for and against the geographic or continuous coverage requirements discussed above. Several commenters note, and we agree, that the financial incentives to operate an MSS system are neither as strong, nor as pressing, if an MSS licensee can operate the terrestrial component of its system prior to constructing, launching and operating MSS space stations and offering commercial MSS services.[227] According to these commenters, an MSS operator that can operate the terrestrial component of its system prior to operating the satellite portion may choose not to launch space stations, or may delay implementation through petitions for waiver of the implementation milestones.[228] We remain committed to the vigorous enforcement of our satellite implementation milestones. If the Commission were to permit full-scale commercial operation of MSS ATC prior to the commercial availability of service from the MSS space stations, however, the denial of a milestone extension request and the accompanying revocation of the applicant's MSS license would adversely affect not only the MSS licensee, but also the MSS licensee's terrestrial customers. Unlike satellite space station failures, in which the licensee may have one year or more to repair or replace the satellite prior to loss of ATC authority, a licensee's failure to meet an implementation milestone, such as a licensee's failure to enter a binding contract for the construction of the satellites, could occur without any advance notice to the public or the Commission. As a result, the Commission would be forced to choose between maintaining the integrity of its satellite licensing process, or requiring the operator to immediately cease service to customers with little advance notice. Given the potential for disruption either to an MSS licensee's customers or to the integrity of the Commission's licensing processes that might occur, we find that permitting commercial operation of ATC prior to commencement of MSS operations would disserve the public interest. Therefore, authorizations to provide MSS ATC shall be conditioned upon the commercial availability of MSS in accordance with the requirements of this Order prior to or at the same time ATC operations are initiated.

3. Integrated Service Offering

87. To remain consistent with our allocation and service rules, we believe that MSS licensees should offer an integrated service. MSS licensees must make an affirmative showing to the Commission that demonstrates that their ATC service offering is truly integrated with their MSS offering. We recognize that it is important for industry to have a clear understanding of what would meet this showing. Accordingly, the Commission is creating a minimum showing that would constitute a safe harbor for MSS ATC applicants to demonstrate that they are providing an offering that is integrated with their MSS

[225] *See Flexibility Notice,* 16 FCC Rcd at 15551, ¶ 44.

[226] *See* App. B.

[227] *See, e.g.*, Boeing Comments at 8 ("[a] prior condition for offering ATS should be full compliance with" existing satellite implementation milestones).

[228] *See, e.g., id.* at 8-9; AT&T Wireless Comments at 2-3; *see also* Globalstar Reply at 25 ("Allowing MSS providers to offer commercial ATC services prior to compliance with applicable satellite coverage requirements could undermine the ancillary nature of ATC.").

offering.[229] The safe harbor is that MSS licensees that wish to provide ATC services could demonstrate that they use a dual-mode handset to provide the proposed ATC service.

88. MSS licensees that choose not to rely on this safe harbor will have to submit for Commission review evidence demonstrating that the service they propose to offer will be integrated. This can be accomplished through technical, economic or any other substantive showing that the primary purpose of the MSS licensee's system remains the provision of MSS.[230] We encourage MSS operators to submit integrated service showings as early as possible to allow full evaluation without compromising the timing of ATC deployment. This integrated service requirement and the other rules adopted today will help ensure that MSS remains first and foremost a satellite service and that the terrestrial component remains ancillary to the primary purpose of the MSS system. In this manner, the public will be able to obtain the many benefits associated with the deployment of MSS systems.

4. In-Band Operation

89. In the *Flexibility Notice*, we sought comment on which MSS frequencies we should permit MSS licensees to operate MSS ATC.[231] The Commission generally allocates spectrum on either a primary basis or a secondary basis.[232] Within the 2 GHz MSS band, however, MSS licensees may operate outside of the specific MSS sub-band that they have selected on a secondary basis to other MSS licensees, subject to certain conditions.[233] Within the Big LEO band, operators are authorized to use different amounts of spectrum within the band, depending on the type of frequency coding they have chosen to deploy.[234] And within the L-band, MSS operators' specific frequency assignments in the region of North America are assigned by international agreement and consensus, and operations outside of these assigned frequencies is generally not permitted.[235] In our *Flexibility Notice,* we asked whether and under what conditions we should authorize MSS ATC inside of the MSS allocations, but outside of the narrow "Selected Assignment" that any given MSS operator has elected to use.[236] Commenters also addressed whether granting ATC authority in less than all of an operator's licensed MSS frequencies in the Big LEO

[229] We do not believe that this same requirement should be imposed on Personal Data Assistants (PDAs), laptops, or other computers.

[230] An economic showing could include, for example, information on the pricing structure of an integrated service offering.

[231] *See Flexibility Notice*, 16 FCC Rcd at 15552, ¶ 46-47.

[232] A spectrum allocation permits the use of radio frequency spectrum for one or more of the various defined radio services listed in section 2.1 of the Commission's rules. 47 C.F.R. § 2.105(b) & n.7.

[233] *See Flexibility Notice*, 16 FCC Rcd at 15552, ¶ 46-47; *see also Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands*, Report and Order, 9 FCC Rcd 5936, 5956, 5958 ¶¶ 48, 52 (1994) (*Big LEO Service Rules Order*) (granting all CDMA Big LEO licensees the right to operate across the entire 2483.5-2500 MHz band and the 1610-1621.35 MHz band).

[234] *Big LEO Service Rules Order*, 9 FCC Rcd 5954-63, ¶¶ 43-63.

[235] *See Comsat Corporation d/b/a Comsat Mobile Communications*, Memorandum Opinion, Order and Authorization, 16 FCC Rcd 21661, 21696-99, ¶¶ 65-72 (2001) (*Comsat Authorization*).

[236] *See Flexibility Notice*, 16 FCC Rcd at 15552, ¶¶ 46-47.

bands was appropriate.

90. In the 2 GHz MSS band, several ATC proponents support authorizing ATC across the entire MSS band, subject to the same or similar requirements as the principal MSS operations.[237] These commenters support granting ATC authority that is entirely coterminous with MSS authority in the eligible MSS bands.[238] Other commenters, however, urge us to adopt spectrum-usage restrictions on MSS ATC. CTIA, for example, urges the Commission to limit 2 GHz MSS ATC only to the licensee's Selected Assignment. According to CTIA, authorizing greater flexibility in MSS spectrum uses will impair the Commission's ability to reallocate spectrum "[b]ecause terrestrial systems would have to be physically retuned if their frequency bands were changed" due to missed implementation milestones or Commission action.[239] Voicestream similarly proposes a 7 megahertz spectrum cap on MSS ATC operation in the 2 GHz MSS band to prevent an MSS licensee from aggregating too much MSS spectrum for MSS ATC.[240]

91. In the Big LEO band, the Commission has divided the band between CDMA compatible systems and TDMA compatible systems. As explained in the Notice of Proposed Rulemaking initiated below,[241] the Commission in 1994 found that up to four CDMA Big LEO MSS systems could share 11.35 megahertz of service uplink spectrum in the 1610-1621.35 MHz band and 16.5 megahertz of service downlink spectrum in the 2483.5-2500 MHz band. The Commission then found that one TDMA system could operate satellite uplinks and downlinks in single 5.15 megahertz block of spectrum in the 1621.35-1626.5 MHz band. At present, two Big LEO systems – Iridium and Globalstar – are currently operational. As a CDMA system, Globalstar is authorized to operate uplinks in 11.35 megahertz of spectrum and downlinks in 16.5 megahertz of spectrum. As a TDMA system, Iridium operates bi-directionally in 5.15 megahertz of spectrum. After the close of the comment cycle in this rulemaking, however, Iridium petitioned the Commission to re-designate portions Big LEO band downlink spectrum from CDMA systems (Globalstar) to TDMA systems (Iridium) and implement other changes in the Big LEO band plan.

92. In the L-band, specific MSS frequencies are agreed upon through the Mexico City MoU,

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[237] *See, e.g.*, TMI Comments at 2 ("operation outside a 'selected assignment' or 'selected segment' should be both feasible and desirable due to the enhanced spectral efficiency"); Constellation Comments at 33 ("Constellation believes that the Commission should allow terrestrial use of any portion of the MSS operator's "selected assignment.").

[238] For example, TMI suggests that, as with satellite-based MSS operations, the Commission should limit MSS ATC operations that involve more than one Selected Assignment to situations in which MSS operators have devised a sharing scheme for the operation of terrestrial and satellite facilities. TMI Comments at 2-3. Similarly, just as MSS licensees must coordinate any satellite-based MSS operations outside of their Selected Assignment with other MSS licensees, Globalstar states that the Commission should require "some degree of coordination" among MSS licensees for any MSS ATC operations outside of the operator's Selected Assignment. Globalstar Reply at 7. Boeing, however, proposes to bar MSS operators from offering MSS in its Selected Assignment if the MSS operator provides ATC "in a 2 GHz MSS sub-band outside its selected assignment, or vice versa." Boeing Comments at 7.

[239] CTIA Comments at 14. CTIA also claims that limiting MSS ATC to an operator's Selected Assignment would limit interference to other services, such as GPS. *Id.* For our analysis of possible interference concerns, *see* discussion *infra* at § III(D).

[240] Voicestream Reply at 24.

[241] *See infra* § IV.

which is an agreement between the five MSS satellite operators and their respective national administrations that provide service in the L-band in the North American coverage area regarding spectrum assignments between the operators. The operators signed a one-year agreement, which was originally was to be revisited annually, that provided each system with an amount of spectrum based on its current and projected near-term traffic requirements.[242] The precise frequency assignments for these operators within the L-band MSS spectrum are subject to confidentiality provisions under the Mexico City MoU. The parties to the MoU last revised spectrum assignments in 1999 and, pending further negotiations, continue to operate under those assignments today.

93. To ensure maximum gains in spectrum efficiency, minimal potential for interference and limited regulatory intrusion, we believe a licensee's authority to operate MSS ATC should remain linked to its MSS authority, and limited to the precise frequency assignment authorized for MSS. Therefore, we limit each MSS licensee to its "core" MSS spectrum in each of the three bands at issue in this proceeding:

- In the 2 GHz band, an MSS operator may seek authority to provide ATC only in its Selected Assignment, which, under the *2 GHz MSS Rules Order* is comprised of 3.5 megahertz in each direction for a total of 7 megahertz for each MSS licensee.[243] Because coordination among the MSS licensees to conduct MSS ATC outside of the MSS licensee's Selected Assignment is likely to prove difficult, time-consuming and unlikely to produce an acceptable interference environment, operations beyond the MSS licensee's Selected Assignment are not permitted.

- In the Big LEO band, both of the two MSS operators in band – Iridium and Globalstar – may seek authority to provide ATC in no more than 5.5 megahertz of spectrum in each direction consistent with the MSS ATC service rules.[244] Accordingly, systems that operate uplinks and downlinks in separate bands, such as Globalstar, could deploy MSS ATC in a total of up to 11 megahertz of spectrum while systems that operate uplinks and downlinks in the same band, such as Iridium, could deploy MSS ATC in a total of up to 5.5 megahertz. To avoid any possible prejudice to the outcome of allocation and assignment decisions under consideration in the Notice of Proposed Rulemaking adopted below, we adopt an upper limit of 5.5 MHz in each direction for possible MSS ATC operations. Furthermore, to avoid harmful interference, Big LEO MSS licensees will be permitted to implement ATC only on those channels that MSS is authorized, consistent with the Big LEO band-sharing arrangement set forth in this Order.[245]

- In the L-band, an MSS operator may seek authority to provide ATC only in those frequency assignments that are available to that MSS operator for MSS use in accordance with the

[242] *See International Action: FCC Hails Historic Agreement on International Satellite Coordination*, "News Release," Report No. IN 96-16 (June 25, 1996); *see also Flexibility Notice*, 16 FCC Rcd at 15539-40, ¶ 13.

[243] The seven megahertz spectrum assignment originally granted to each 2 GHz MSS licensee is subject to increase, pending resolution of the 2 GHz MSS milestone implementation review process.

[244] We do not intend to prohibit Iridium from using technically innovative techniques to deploy in-band terrestrial operations in its MSS frequencies, provided Iridium can meet the technical and service rules established in this Order.

[245] *See infra* § III(D)(3) (discussing where Iridium and Globalstar can operate ATCs); *see also infra* Section IV (Notice of Proposed Rulemaking, seeking comment on proposals for reassigning or reallocating a portion of spectrum in the Big LEO MSS frequency bands).

Mexico City MoU.[246] If future agreements reached pursuant to the Mexico City MoU were to alter precise frequency assignments of MSS ATC providers in the United States, the MSS ATC provider would be required to operate on its assigned MSS frequencies.

Generally speaking, therefore, MSS licensees may generally seek authorization for MSS ATC only in the bands in which they are authorized to operate an MSS system, subject to the same regulatory status and restrictions, if any, that the MSS licensee would have to observe in that MSS assignment.

5. Central Data Switching

94. In the *Flexibility Notice*, we sought comment on whether requiring that MSS operators integrate the terrestrial and satellite operations of their network through one central data switch would ensure that the terrestrial component is ancillary to the satellite component.[247] We asked commenters to address the types of functions that a central data switch performs and to discuss whether and how requiring a central data switch might encourage the integration of terrestrial component into the MSS network.[248] We also sought comment on how we might monitor compliance with a central data switch requirement.[249]

95. The comments indicate a certain amount of confusion over what we meant by proposing a "central data switch." Only three commenters addressed the issue at any length. MSV, which construed the "central data switch" as central monitoring and control point, supported this requirement.[250] ICO and Constellation, which construed a "central data switch" to mean routing all traffic over a single switch, opposed the proposal as failing to promote the integration of ATC into MSS and as creating a significantly more vulnerable, more expensive and more inefficient MSS system.[251] By proposing a central data switch, we did not intend that MSS operators would need to route their communications through a single mechanical or optical device that opens or closes circuits in the MSS licensee's systems.

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[246] *See infra* § III(D)(2).

[247] *Flexibility Notice*, 16 FCC Rcd at 15551-52, ¶ 45.

[248] *Id.*

[249] *Id.*

[250] MSV Comments at 25.

[251] ICO Comments at 25 n.41 (claiming that the central data switch requirement "would make urban MSS traffic more vulnerable to outage (because it would create a single point of failure) and more expensive (because it would prevent network operators from using least-cost routing)."); *accord id.* at 45-46 (claiming no need exists for a central data switch requirement since it would not limit use of ATC, would not integrate ATC and MSS, would not ensure the terrestrial component remains ancillary to an MSS network, would make the service "more vulnerable to outage by creating a single point of failure for all traffic in the network" and would contravene the Commission's general policy of operational and service flexibility"); Constellation Comments at 31 n.65 ("Requiring a "central data switch" is inefficient and may undercut the ability to establish a robust, distributed network and entail intrusive Commission involvement in network design and operation. The situation becomes complicated since integrated networks are likely to have different paths for signaling and traffic, and for voice and packet-switched data."). In its reply comments, MSV indicated its opposition to a central switch requirement as envisioned by Constellation and ICO. *See* MSV Reply at 25-26 (asserting that if the Commission sought to require central routing as Constellation and ICO assert, then "MSV shares ICO's concern that such a requirement will not allow for least cost routing and will result in a 'single point of failure.'").

We agree with the commenters that adopting such a requirement would impose costs far in excess of any possible benefit in integrating ATC-enable MSS systems. We expressly decline to adopt a single-switch requirement for MSS ATC systems.

96. MSV's vision of our "central data switch" requirement comes closest to what we actually intended. We sought comment on the need for centralized control necessary to achieve dynamic frequency management of both MSS and ATC operations, and, in fact, the proponents of MSS ATC view centralized control as crucial to successful implementation of MSS ATC.[252] Constellation, for example, states that central control of both satellite and earth-station components of MSS permits the operator "to manage the assignment of powers and frequencies for satellite and terrestrial links within a satellite beam coverage area to maximize the total amount of service offered to subscribers …."[253] ICO adds that it has developed and installed a single, integrated Satellite Resource Management System (SRMS) that will "produce frequency allocation plans that vary minute-by-minute, tracking [the system's] satellite movements through their six-hour orbits."[254] Although the MSS ATC proponents propose various methods of coordinating intra-system satellite and terrestrial operations, each method of achieving greater frequency reuse through MSS ATC requires the operator's "full knowledge of all satellite and terrestrial activity on its network in order to make real-time adjustments to accommodate continuously changing operating conditions."[255]

97. While we find that the ability to dynamically control the basic components of an integrated MSS ATC system is necessary for MSS ATC to achieve the maximum frequency reuse possible through the combination of satellite and terrestrial infrastructure, we agree with those commenters that note that requiring system management through a single central point of presence may have undesirable consequences. We also find the record does not demonstrate any significant benefit to such a requirement. Accordingly, we decline to adopt our proposal that MSS ATC operators control their respective MSS ATC operations through a central data switch.

6. Other Proposed Requirements

98. While certain technical standards are necessary to protect the public and to establish a baseline for commercial negotiation, we must resist the temptation to proscribe detailed, uniform technical specifications for Commission licensees absent legitimate public interest justifications for doing so.[256] Some commenters claim that ATC will quickly escape the basic limiting principles we seek to maintain unless we impose specific regulatory measures on MSS ATC operations beyond those we

[252] MSV Comments at 25-26; ICO Supplemental Comments at 6-7.

[253] Constellation Supplemental Comments at 4.

[254] ICO Supplemental Comments at 8.

[255] *Id.* at 11.

[256] Globalstar Reply at 15 ("A grant of ATC authority should not require MSS providers to integrate ATC and MSS platforms in any one particular manner. Commission dictated integration is not flexibility at all. Rather, ATC authority is intended to provide MSS providers with the operational flexibility to individually develop, guided by efficiency enhancing market forces and public interest needs, innovative solutions to the coordination challenges raised by ATC-MSS integration.").

proposed in the *Flexibility Notice*.[257] Although commenters opposed to ATC ask us to consider adopting any number of additional regulatory restrictions on MSS ATC, the principal limitations they propose would require MSS operators: (1) to offer satellite service as the predominant use in any given geographic area;[258] (2) to use dual-mode handsets or to route terrestrial calls through the MSS satellite network to ensure MSS ATC system integration; [259] (3) to demonstrate a technical inability to serve proposed ATC locations with MSS satellites as a condition to site-by-site ATC authorization;[260] (4) to pay annual fees to the Commission in exchange for MSS ATC rights;[261] and (5) to regulate the carriage,[262] pricing,[263] or terms and conditions[264] of an operator's MSS ATC offering. These proposed conditions, with slight variations from commenter to commenter, represent the most fully developed conditions that appear in the record.[265] In general, we find that the complexity, cost and inefficiency of these proposed conditions would outweigh any limited utility that they might have.

99. First, requiring MSS licensees to ensure that satellite services constitute the "predominant" or "primary" use of their systems – whether measured in minutes of use or by number of customers – would limit spectrum efficiency. As we have found, to achieve the spectrum efficiency gains, ATC relies on flexible switching between the terrestrial and satellite components: the operator can dynamically allocate spectrum to either satellite use or terrestrial use. The proposal to require "predominant" satellite use would limit the MSS provider's flexibility and its concomitant spectrum efficiencies, e.g., by requiring predominant satellite coverage in geographic areas that can be more efficiently served by ATC, such as large cities. Also, establishing precisely how much of a limitation on MSS operators such a requirement would entail determining how to measure the "predominance" of satellite services between highly flexible, dynamically coordinated spectrum uses – whether by minutes of use, number of channels

[257] *See, e.g.*, Comtech Mobile Comments at 5 ("simply defining the term 'ancillary' may be insufficient to ensure that satellite service remains the primary use of the spectrum").

[258] Voicestream Reply at 22 (proposing that the Commission adopt a rule barring an MSS operator from acquiring more terrestrial customers than satellite customers); Comtech Mobile Comments at 2-5 (recommending a limit on the proportion of a system's customers that use the terrestrial network rather than the satellite network as their primary source of service (*i.e.*, more than 50% of the customer's monthly minutes are over the terrestrial path rather than the satellite path)).

[259] Voicestream Comments at 20-24. CTIA suggests that the Commission only permit MSS providers to provide ATC services using dual-band handsets that automatically select a satellite transmission path if it is available. CTIA Comments at 6.

[260] API Comments at 5 (proposing a requirement that MSS licensees provide technical evidence that they are unable to serve via satellite each location that they intend to serve via ATC).

[261] *See* P&FF Comments at 2, 13-15.

[262] Stratos Comments at 16-20.

[263] Voicestream Reply at 22.

[264] Stratos Comments at 16-20.

[265] While other regulatory initiatives have been suggested, these other proposals duplicate existing regulations or lack sufficient record evidence for us to adopt. API, for example, proposes that MSS licensees "periodically" report their geographic coverage. API Comments at 5. Section 25.143 of our rules, however, already imposes such a reporting requirement on MSS licensees. *See, e.g.*, 47 C.F.R. § 25.143(e) (requiring Big LEO and 2 GHz MSS licensees to report the operational status of their satellite constellations on October 15 of each year).

occupied, number of consumers served, revenue from calls, or coverage area of each component. In short, even if we had not found that imposing a predominant use requirement for MSS ATC would limit spectrum efficiency, we currently lack sufficient record evidence to determine any basis by which to select one measure of "predominant use" over another.

100. Second, requiring satellite-routing would defeat most of the benefits of authorizing ATC in the first instance. The disadvantages would increase markedly if we were to further restrict MSS operators to offering only dual-mode phones that defaulted to the satellite transmission path. Requiring MSS licensees to route all traffic through the MSS satellite system would greatly limit the spectrum efficiency gains that will occur under ATC. Under the satellite-routing proposal, an MSS operator would be required to route communications from ATC base stations to MSS earth stations to the MSS satellite and back again, *even if more efficient system transmissions paths existed*. An MSS ATC user, for example, might place a call to another MSS ATC user within the broadcast radius of the same ATC base station. Instead of permitting the licensee to use the least-cost routing method through the ATC base station, a satellite-routing requirement would force the licensee to send the signal from the ATC base station to an MSS earth station, which would send the signal to the MSS space-station, which would retransmit the signal back to the MSS earth station, which would return the signal to the ATC base station from which it originated.[266] This circuitous, unnecessary transmission path would materially increase the cost and complexity of ATC and greatly limit the spectrum efficiencies possible under the dynamic spectrum-sharing model of an MSS ATC. We are not persuaded that the public interest considerations ostensibly served by requiring satellite-routing justify the significant costs of limiting consumer choice, stifling innovation, and requiring additional operational expenses and inefficiencies.

101. Third, requiring MSS licensees to demonstrate a technical inability to serve proposed ATC locations with MSS satellites as a condition of every ATC base station authorization would create spectrum and administrative inefficiencies. Achieving optimal spectrum usage may require an MSS operator to use ATC even though a particular call might be served via satellite. Moreover, requiring an MSS licensee to demonstrate a technical inability to serve the area surrounding the ATC base station would require the Commission to adopt a site-by-site licensing process to scrutinize the technical merits of every proposed ATC base station location. The MSS licensee would need to update its engineering analysis for each proposed ATC base station location whenever buildings are built, modified, or razed in or near the proposed ATC base station location. Tower locations are scarce in any urban environment. Subjecting MSS licensees to the additional technical constraint of guaranteeing that no satellite signal could penetrate the proposed tower location, particularly given the steady variation of our nation's urban landscape due to development and demolition, has the potential to preclude the selection and construction of any MSS ATC base stations. We find that the expensive, time-consuming testing and monitoring of every proposed base station locations would prevent the rapid deployment and development of MSS ATC without any corresponding public benefit or regulatory rationale.

102. Fourth, we reject a proposal to impose additional fees on MSS licensees that implement ATC to supplement their MSS network. In the case of MSS ATC, several commenters observe[267] and

[266] *See, e.g.*, Globalstar Reply at 26 ("Artificially limiting terrestrial spectrum reuse as proposed by these commenters would increase the amount of traffic required to be carried by an MSS provider's satellite system. Some of this traffic could be more efficiently and economically carried via an ATC platform. By requiring this traffic nevertheless to be carried via satellite, the Commission effectively would reduce the amount of spectrum bandwidth available to rural subscribers that only can be economically served by satellites.").

[267] *See* MSV Comments at 31-32 (asserting that no rational basis exists by which to determine the magnitude of any such fees).

even the principal proponent of an MSS ATC fee acknowledges, that insufficient economic data exists on which we could develop a rational user-fee regime.[268] Even if we were to conclude that a user fee on MSS ATC were warranted and could be rationally geared to the prospects of the MSS ATC segment, the Communications Act of 1934, as amended, does not clearly authorize us to impose such fees on MSS licensees that implement ATC. When Congress allowed flexible use of the broadcast spectrum and permitted licensees to offer ancillary or supplemental services, for example, Congress granted the Commission express authority to require the licensee to pay fees designed to avoid unjust enrichment and to recover for the public an amount that, to the extent feasible, equals the amount that would have been recovered had the service been licensed pursuant to the provisions of section 309(j).[269] Outside of the broadcast spectrum, however, no similar grant of authority directs us to impose fees on other flexible uses that we permit. As we observed in our *Flexibility Notice*, "absent legislation, we likely do not have the authority to assess . . . fees" on MSS ATC.[270] No commenter disputes this observation. At this time, therefore, we do not find that imposing additional fees on MSS licensees that implement ATC would serve the public interest.

D. Technical Requirements and Rules for Terrestrial Operations

103. In the *Flexibility Notice*, we proposed to adopt flexible technical requirements and service rules that would encourage ATC development in the most rapid, economically efficient and diverse manner.[271] We proposed to apply a minimum set of technical standards to avoid harmful interference to other users of the spectrum and sought comment on whether our specific proposals were necessary and sufficient.[272] After reviewing the record evidence, including comments from the National Telecommunications and Information Administration (NTIA), we address these issues in this section. First, we individually evaluate the 2 GHz MSS band, L-band, and Big LEO bands. Though the concepts and proposals for ATC operations are similar among the MSS systems, each frequency band has its distinct inter-service and intra-service sharing scenarios. In each of the bands, we address the intra-service sharing scenarios (i.e., MSS systems sharing the same MSS allocation with ATC operations) and then we evaluate the inter-service sharing possibilities (i.e., when the MSS ATC operations are in a frequency band that is adjacent to another service allocation). For the intra-service analyses, we evaluate the amount of interference that would be caused to another operator's system that is sharing the same MSS allocation. This interference could be an increase in the noise received by the space station receivers of the other MSS system or it could be interference caused to the mobile earth terminals (METs)

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[268] *See* P&FF Comments at 13 n.49, 14-15.

[269] *See* 47 U.S.C. § 336; *see also Fees for Ancillary or Supplementary Use of Digital Television Spectrum Pursuant to Section 336(e)(1) of the Telecommunications Act of 1996*, MM Docket No. 97-247, Memorandum, Opinion and Order, 14 FCC Rcd 19931, 19939, ¶ 20 (1999) (construing section 336 of the Communications Act to provide that "only *ancillary or supplementary* services are subject to fees under the Act") (emphasis in original).

[270] *Flexibility Notice*, 16 FCC Rcd at 15549-50, ¶ 40.

[271] *Id*. at 15555, ¶ 54.

[272] We sought comment on what limits should be placed on the terrestrial facilities' out-of-band emissions into adjacent bands, whether it is necessary to impose intersystem limits, or instead allow applicants to coordinate among themselves, whether there are alternative approaches that would provide ample protection while better furthering our goals of encouraging rapid, efficient deployment of integrated MSS terrestrial services, and whether there are differences between the 2 GHz MSS and L-bands that would require an alternative approach for operations in one or the other band. *Id.*

operating with the other MSS system. For the inter-service case, we evaluate the impact of out-of-band emissions from ATC operations on adjacent band systems.

104. We adopt technical parameters for ATC operations in each of the bands at issue designed to protect adjacent and in-band operations from interference from ATC.[273] We fully expect that these operational parameters will be sufficient. Nevertheless, in the unlikely event that an adjacent MSS or other operator does receive harmful interference from ATC operations, either from ATC base stations or mobile terminals, the ATC operator must resolve such interference. If the MSS ATC operator claims to have resolved the interference and other operators claim that interference has not been resolved, then the parties to the dispute may petition the Commission for a resolution of their claims.[274]

1. 2 GHz MSS Band

105. On August 25, 2000, the Commission released the *2 GHz MSS Rules Order* setting forth licensing and service rules for pending applicants to provide MSS in the 1990-2025 MHz and 2165-2200 MHz bands.[275] In the *2 GHz MSS Rules Order*, the Commission adopted a band arrangement that can accommodate initially the multiple and technically-diverse systems that have requested authorization. Each authorized system received an equal share of the available frequencies. Because there is not sufficient spectrum to award to each applicant the full amount of spectrum that it has indicated its proposed system requires, the Commission stated in the *2 GHz MSS Rules Order* that operational systems could aggregate spectrum assignments "by reaching agreement for sharing of those assignments among themselves."[276] Not all proposed systems can share the same spectrum due to the modulation schemes proposed. A licensee will select the specific frequencies in which its primary service operations will take place at the time it has launched one satellite into its intended orbit.[277] In addition, because there are a number of incumbent terrestrial services, such as Broadcast Auxiliary Services, in the 2 GHz MSS band, each authorized system will have flexibility to operate MSS at other frequencies in the band.[278]

106. The July 17, 2001 Orders authorizing Boeing, Celsat, Constellation, Globalstar, ICO, Iridium, MCHI, and TMI to provide 2 GHz MSS in the United States requires the satisfaction of certain implementation milestones.[279] Our milestone rules are intended to ensure the speedy delivery of service

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[273] Many of the rules adopted today impose operating limits to protect against harmful interference based on current technology, current coding methods or current network configurations. *See infra* App. B (adopting new rules 47 C.F.R. §§ 25.147, 25.252, 25.253, 25.254). Although our rules are designed with today's systems in mind, we do not intend to limit the ability of existing or future licensees to deploy new, different or innovative technologies, provided that the applicant can demonstrate that the new system configuration produces no greater interference than permitted under our existing rules. We adopt notes to this effect in each of our band-specific MSS ATC rules. *See infra* App. B (47 C.F.R. §§ 25.252, 25.253, 25.254).

[274] *See, e.g.*, 47 C.F.R. §§ 25.272, 25.274.

[275] *2 GHz MSS Rules Order*, 15 FCC Rcd 16127.

[276] *Id*. at 16140-41, ¶ 22.

[277] *Id.* at 16138, ¶ 16.

[278] *Id.* at 16139-40, ¶¶ 19-21. Operations at frequencies outside of an MSS operator's selected frequency assignment cannot cause harmful interference to other assigned satellite networks or incumbent terrestrial services.

[279] *See supra* n.10. As foreign applicants seeking authorizations for their foreign licensed systems, ICO and TMI were authorized as non-U.S. licensed satellite systems for which the Commission reserved spectrum to serve the (continued….)

to the public and to prevent warehousing of spectrum.[280] To date, all licensees have certified that they have met their first construction milestone of July 17, 2002 to enter into a non-contingent satellite manufacturing contract. Boeing plans to use its 2 GHz MSS license specifically to provide aeronautical services.[281] Boeing has filed an application to modify its 2 GHz MSS authorization to substitute a geostationary orbit satellite network for the non-geostationary orbit MSS network in its license.[282] Celsat plans to implement a geostationary satellite orbit MSS system while Iridium plans to implement a non-geostationary satellite orbit MSS system.[283] Globalstar has filed an application to modify its 2 GHz MSS authorization to reduce the number of operational non-geostationary orbit satellites in its network, with proposed technical modifications.[284] TMI operates a geostationary orbit satellite system licensed in Canada and, through a subsidiary, holds a letter of intent authorization from the Commission.[285] ICO operates an NGSO satellite network and is authorized under the laws of the United Kingdom and, through a subsidiary, holds a letter of intent authorization from the Commission which requires that a second satellite be launched prior to January 2005.[286] On July 18, 2002, ICO, Constellation, and MCHI filed

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United States. Pursuant to the *2 GHz MSS Rules Order*, these authorizations provided each system access to "Selected Assignments" of 3.5 megahertz of spectrum in each of the 1990-2025 MHz and 2165-2200 MHz bands and the transceivers must be capable of tuning across at least 70% of the MSS allocation. The International Bureau delayed full implementation of the *2 GHz MSS Rules Order* with regard to an incremental 0.38 megahertz of spectrum per licensee in each band, pending Commission consideration of various pending proposals related to the 2 GHz frequencies.

[280] These milestone deadlines began to run on the authorization date, July 17, 2001. Specifically, non-geostationary satellite orbit (NGSO) MSS operators must enter into a non-contingent satellite manufacturing contract within one year of authorization, complete critical design review (CDR) within two years of authorization, begin physical construction of all satellites in the system within two-and-a-half years of authorization, and complete construction and launch of the first two satellites within three-and-a-half years of authorization. *See 2 GHz MSS Rules Order*, 15 FCC Rcd at 16177, ¶ 106. The entire system must be launched and operational within six years of authorization. *Id.* at 16178, ¶ 106. Geostationary satellite orbit (GSO) operators must enter a non-contingent satellite manufacturing contract within one year, complete CDR within two years, begin physical construction of all the GSO satellites in the system within three years, and complete construction of one satellite in the constellation and launch it into its assigned orbital location within five years of authorization. *Id.* at 16177, ¶ 106. Hybrid GSO-NGSO satellite systems must follow GSO milestones for the GSO portion of their systems as well as NGSO milestones for the NGSO portion of their systems. *Id.*

[281] *Boeing 2 GHz MSS License*, 16 FCC Rcd at 13704, ¶ 36.

[282] *See Application of The Boeing Company to Modify its Satellite Authorization*, SAT-MOD-20020726-00133, Public Notice Report No. SAT-0115 (rel. Aug. 1, 2002).

[283] *Celsat 2 GHz MSS License*, 16 FCC Rcd at 13712, ¶ 2; *Iridium 2 GHz MSS License*, 16 FCC Rcd at 13778, ¶ 2.

[284] *See Applications of Globalstar L.P. to Modify its Satellite Authorization*, SAT-MOD-20020722-00107, SAT-MOD-20020722-00108, SAT-MOD-20020722-00109, SAT-MOD- 20020722-00110, SAT-MOD- 20020722-00112, Public Notice Report No. SAT-0115 (rel. Aug. 1, 2002).

[285] *See TMI 2 GHz MSS Order*, 16 FCC Rcd 13808. MSV, one of the original applicants in this proceeding, is a joint venture between TMI and Motient Corporation. *See supra* n.13 and accompanying text**.**

[286] *See ICO 2 GHz MSS Order*, 16 FCC Rcd at 13775 ¶ 34. ICO has informed the Commission that it has completed construction of additional satellites. *See, e.g.*, Letter of Cheryl A. Tritt, Counsel to ICO Services Limited to Magalie Roman Salas, Secretary, Federal Communication Commission, File Nos. 188-SAT-LOI-97; SAT-LOI-19970926-00163; SAT-AMD-20000612-00107; SAT-AMD-20001103-00155 (filed Oct. 15, 2001) (responding to its obligations under section 25.143(e) Annual Report and Certification of Construction Milestones).

applications with the Commission proposing to: (1) transfer control of Constellation's and MCHI's MSS licenses to ICO; and (2) modify the technical specifications of Constellation's and MCHI's 2 GHz MSS systems to conform with the technical specifications of ICO's 2 GHz MSS system.[287] The proposed modifications include a request for Constellation and MCHI to implement their 2 GHz MSS systems by sharing satellite infrastructure with ICO pursuant to a Spectrum Sharing Agreement, pending approval of the transfer of control applications.[288] On January 29, 2003, the International Bureau declared Constellation's, Globalstar's and MCHI's 2 GHz MSS licenses null and void, after finding that these entities failed to satisfy their first 2 GHz MSS implementation milestone.[289]

107. In its application, ICO proposed four different frequency plans and architectures to integrate ATC into its MSS system.[290] Briefly, the four architectures are: (1) Forward Band Mode, (2) Reverse Band Mode, (3) Downlink Duplex Mode, and (4) Uplink Duplex Mode. In the Forward Band Mode, ATC Mobile Terminals (MTs) would transmit in the MSS uplink frequency band and Base Stations (BSs) would transmit in the downlink band; in the Reverse Band Mode, the MTs would transmit in the MSS downlink frequency band and the BSs would transmit in the uplink band; in the Uplink Duplex Mode, the MTs and BSs would transmit in the uplink MSS frequency band; and in the Downlink Duplex Mode, the MTs and BSs would transmit in the downlink MSS frequency band. We evaluate in Appendix C1 all four Modes of ATC operation in greater detail to determine the potential for each Mode to cause interference to other in-band 2 GHz MSS systems and to systems operating in adjacent frequency allocations. ICO was the only 2 GHz MSS band licensee to submit a proposal for ATC.[291] Other than Boeing, which was the only 2 GHz MSS band licensee to express concern about ATC operations potentially interfering with its MSS system, the 2 GHz MSS band licensees either generally supported the concept of ATC or explicitly indicated that ATC could be implemented without causing interference to MSS systems.[292]

108. We conclude that the Forward Band Mode of operation for ATC is the least interfering to in-band MSS systems and systems operating in adjacent frequency bands. Moreover, since the Forward Band Mode would require the fewest technical and operating constraints, overall it would have the greatest amount of technical flexibility for implementation and it appears to be the more desirable Mode

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[287] *Application of Constellation Communications Holdings Inc. to Modify its Satellite Authorization*, SAT-MOD-20020719-0103, Public Notice Report No. SAT-0116 (rel. Aug. 5, 2002); *Application of Constellation Communications Holdings Inc. to Transfer Control of Satellite Authorizations to ICO Global Communications Holdings*, SAT-T/C-20020718-00114, Public Notice Report No. SAT-0116, (rel. Aug. 5, 2002); *Application of Mobile Communications Holdings Inc. to Modify its Satellite Authorization*, SAT-MOD-20020719-0105, Public Notice Report No. SAT-0116, (rel. Aug. 5, 2002); *Application of Mobile Communications Holdings Inc. to Transfer Control of Satellite Authorizations to ICO Global Communications Holdings*, SAT-T/C-20020719-00104, Public Notice Report No. SAT-0116, (rel. Aug. 5, 2002) (collectively *ICO/MCHI/Constellation Applications Notice*).

[288] *See ICO/MCHI/Constellation Applications Notice,* at 1-3.

[289] *See supra* n.11.

[290] *See* ICO Mar. 8, 2001 *Ex Parte* Letter at 8-10 & App. B.

[291] Globalstar, however, provided substantial technical information on how it would integrate a forward band mode ATC network in its 2 GHz MSS system. *See* Globalstar Supplemental Comments, Technical Comments at 15-18.

[292] *See, e.g.,* ICO Comments at 15-30; Constellation Comments at 22-38; TMI Comments at 2-4; MCHI Comments at 11; Globalstar Bondholders Comments at 31; *see also, e.g.,* Boeing Comments at 12-13; Boeing Reply at 7-8, 23. Boeing's specific concerns are addressed below.

to implement ATC.[293] As described in detail in Appendix C1, our analyses indicate that the Reverse Band Mode, and both Duplex Modes of operation for ATC, have significantly greater potential to interfere with other systems than the Forward Band Mode. Specifically, an ATC MT operating in Reverse Band Mode or the Downlink Duplex Mode, has the potential to interfere with other MSS MET receivers when the terminals are within approximately 300 feet of each other.[294] Additionally, ATC BSs operating in Reverse Band Mode and in the Uplink Duplex Mode have the potential to interfere with Broadcast Auxiliary Service (BAS) equipment in the allocation above 2025 MHz when, for example, ATC BSs and Electronic News Gathering (ENG) receivers are within 2.6 km of each other.[295] The technical and operational constraints that would have to be placed on these Modes of ATC operation to protect in-band and adjacent allocation systems (e.g., coordination prior to operation, more stringent EIRP or out-of-band emission levels) would lessen the technical flexibility to effectively deploy ATC. We decline to authorize these Modes of operation for ATC and we adopt technical rules to implement the Forward Band Mode.

109. To implement the decision in this Order, we adopt rules permitting ATC in the Selected Assignments of the 2 GHz MSS band licensees.[296] The ATC technical rules shall apply to all 2 GHz MSS licensees choosing to implement ATC in their selected MSS frequency assignments.[297] The technical rules for ATC, discussed below, provide for operation of ATC in the 2 GHz MSS allocations, protect currently licensed in-band MSS systems from interference, and protect systems operating in adjacent service allocations from interference. In brief, to protect other in-band MSS systems and systems operating in adjacent frequency bands, ATC operators will be required to meet specific MT out-of-band emission limits based upon our analyses that include reserving a minimum amount of link margin for power control in their ATC networks to accommodate for structural attenuation.[298] ATC operators will also be required to meet specific BS out-of-band emission limits, meet an EIRP limit toward the horizon and maintain a separation distance from airports. We discuss each of the rules below.

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[293] ICO, for example, indicates that "the Forward Band Mode is the most straightforward" and it seems to place more emphasis on this Mode of operation. *See* ICO Mar. 8, 2001 *Ex Parte* Letter at 8. Globalstar and MSV also support the Forward Band Mode approach for ATC operations in the Big LEO and L-band, respectively. *See* Globalstar Comments at 1a & n.28; Motient/TMI Assignment and Modification Application, File No. ISP PDR-20010302-00007 at 8-9 (filed, Mar. 1, 2001).

[294] *See infra* App. C1 § 2.2.4.1.

[295] *See infra* App. C1 § 3.1. Added constraints would be required on the Base Stations (e.g. site-by-site coordination of the base stations prior to operation) to ensure protection of ENG operations in the adjacent frequency allocation.

[296] ICO has informed the Commission of its Selected Assignment within the 2 GHz MSS Band. *See* Letter of Cheryl A. Tritt, Counsel to ICO Satellite Services G.P. to Marlene H. Dortch, Secretary, Federal Communications Commission, File No. 188-SAT-LOI-97; IBFS Nos. SAT-LOI-19970926-00163; SAT-AMD-20000612-00107; SAT-AMD-20001103-00155 (October 15, 2002) (2 GHz MSS Selected Assignment Notification, Annual Section 25.143(e) Report, and Section 25.121(d)(2) Certification).

[297] *See supra* § III(C); *see also infra* App. B.

[298] We use the term "structural attenuation" to mean the signal attenuation caused by transmitting to and from mobile terminals that are located in buildings or other man-made structures that limit the transmission of radiofrequency radiation.

a. Intra-Service Sharing

110. ICO's ATC proposal suggests that ATC could be provided on a licensee's selected MSS assignment and, on a secondary basis, on other MSS licensees' selected frequency assignments in the MSS allocation.[299] Since we are limiting 2 GHz licensees ATC operations to the licensee's selected assignments,[300] we only address the interference potential of ATC operations in one licensee's selected frequencies to the MSS operations in another licensee's selected frequency assignments (i.e., we address the interference potential from an adjacent channel perspective). Boeing has conducted substantial technical studies on adjacent channel interference in response to ICO's proposed integrated ATC network.[301] Boeing is concerned about the potential for interference that ICO's ATC operations could cause to Boeing's licensed MSS satellite network. We address Boeing's analysis, which is based upon its original proposal for a non-geostationary satellite network, in Appendix C1.

111. Boeing submitted initial comments indicating that, based upon a number of assumptions, it is concerned about possible interference from the ATC BSs to its satellite uplink receivers.[302] Since we are only authorizing the Forward Band Mode of ATC operation, BSs will not be transmitting in the satellite uplink band and this potential for interference no longer exists. Additionally, Boeing indicated that, based on ICO's proposal, it did not expect interference to occur to its satellite uplink receivers from ATC MTs.[303] However, ICO modified its proposal to include more liberal ATC MT out-of-band emission levels[304] and we evaluate the Boeing link analysis in Appendix C1 using the modified assumptions provided by ICO. The results of our analysis concur with Boeing's initial results that ATC MTs operating in Forward Band Mode will not interfere with Boeing MSS receivers in the uplink. Specifically, taking into account the -67 dBW/4kHz out-of-channel emission level we adopt and the mitigating effects of ATC network power control which is standard engineering practice to include in terrestrial mobile networks,[305] the Boeing satellite receiver noise would be increased by less than 1%.[306] This increase in satellite receiver noise temperature would not cause unacceptable interference to Boeing's satellite operations or other MSS systems operating in adjacent channels in the MSS

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[299] This proposal is consistent with the MSS service rules relating to MSS frequency assignments. *See 2 GHz MSS Rules Order* 15 FCC Rcd at 16172-89, ¶¶ 92-140.

[300] *See supra* § III(C)(3).

[301] *See* Boeing Comments App. A at 1-7.

[302] Boeing Comments at 12.

[303] *Id.*, App. A, Table 4.

[304] ICO modified its MET out-of-channel emission level of -93.5 dBW/4kHz to -67 dBW/4kHz. *See* ICO Apr. 11, 2002 *Ex Parte* Letter at 2.

[305] *See* MSV Reply, Technical Annex at 7; *see also* Jean-Paul M.G. Linnartz, ed., *Wireless Communication: The Interactive Multimedia CD-ROM, Link Budget*, *available at* <http://150.250.105.16/~krchnave/spring2002/wireless/Kluwer_CD/chaptr04/outage/linkbudg.htm> (last visited, Jan. 9, 2003).

[306] *See infra* App. C1. The analysis contained in Section 2.1.3. does not include the use of power control and therefore the results are conservative. A typical value to use for power control in cellular and PCS systems is 18 dB. Incorporating power control in the ATC network would add at least 10 dB to Boeing's link margin to protect it from receiving interference from ATC MT transmissions.

allocation.[307] To protect in-band MSS systems from interference, we adopt section 25.252(c)(2) to require that 2 GHz ATC MTs meet an out-of-channel emission level of -67 dBW/4kHz with the expectation that a MSS licensee will reserve a minimum of 10 dB in its link budget for power control within its ATC network, as is within the 10-20 dB range of standard engineering practice, to overcome the effects of structural attenuation. MSS licensees may not extend the coverage area of any ATC cell beyond the point where an ATC MT could operate at the edge of coverage of the ATC cell with a maximum EIRP of -10 dBW.

112. Boeing also submitted substantial technical analyses on the potential for interference that ATC operations could have on its downlink operations. Specifically, Boeing addressed the impact it would expect ATC BS and MT operations to have on its aircraft earth station receivers.[308] Since we are only authorizing the Forward Band Mode of ATC operation, MTs will not be transmitting in the satellite downlink band and this potential for interference no longer exists. However, the potential for the BSs to interfere with MSS MET receivers still exits in the Forward Band Mode and we analyze the impact on Boeing's MT receivers in Appendix C1.[309] The Boeing analysis assumed an out-of-channel[310] emission level of -56 dBW/4kHz.[311] However, ICO modified this level to -100.6 dBW/4kHz to be more restrictive than originally proposed.[312] Using the more restrictive out-of-channel level, brings the separation distance between the ATC BSs and the Boeing aircraft earth stations down from almost 22 km to 190 meters (630 feet) to avoid interference to the aircraft earth stations on or near the ground.[313] An airport is a controlled area, and maintaining a separation distance between a BS and a runway or tarmac of approximately 190 meters should be achievable. Though the separation distance is relatively small, it may be possible for in-flight earth stations to be located within 190 meters from an ATC BS (one that separated from an airport by more than 190 meters) when the aircraft is taking off or landing. To mitigate the potential interference caused to aircraft receivers either in-flight or on the ground, we first adopt section 25.252(b)(1) to limit 2 GHz BS out-of-channel emissions to -100.6 dBw/4kHz and also section 25.252(b)(4) to require MSS licensees to locate all BSs more than 190 meters from the runways and aircraft stand areas of any airport and at least 190 meters away from airport landing and take-off flight paths to mitigate potential out-of-band interference.[314]

113. There also exists the potential for the BSs to saturate or overload aircraft receivers while

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[307] The 1% increase in satellite receiver noise temperature is compared to the 6% delta T/T used to denote an unacceptable level of interference and trigger coordination among satellite systems prior to operation of a new satellite network.

[308] Boeing Comments at 10.

[309] *See infra* App. C1 § 2.2.2.

[310] By "out out-of-channel," we mean at the edge of the 2 GHz MSS licensee's Selected Assignment.

[311] Boeing Comments, App. A, Table 1.

[312] *See* ICO April 11, 2002 *Ex Parte* Letter at 2.

[313] *See infra* App. C1 § 2.2.2. The Forward Band Mode ATC BSs would produce an increase in the satellite earth station receiver noise by 6% or less.

[314] *See infra* App. B (adopting new rules 47 C.F.R. §§ 25.252(b)(1), (b)(4)).

they are on or near the ground.[315] Boeing provides an analysis in its comments that suggests that its receivers will be overloaded by ATC transmissions when its receivers are within approximately 2 km of a BS.[316] Our analysis confirmed Boeing's calculations that, in areas where free-space propagation is the dominant mode of propagation, the ATC BSs may saturate a Boeing MET that is located within approximately 2 km of an ATC BS.[317] We analyzed this situation further, however, to take into account the effects of propagation in an urban environment (where BSs will be located) and while the aircraft receiver is on or near the ground. In urban areas where free-space propagation will not be the dominant mode of propagation, higher attenuation of the BS signals will result in less interfering power being received by a MSS MET.[318] Using the BS in-band EIRP of 27 dBW, and taking into account the down-tilt of the antenna of 2.5 degrees, a maximum EIRP of 25.5 dBW (27 dBW – antenna gain G with downtilt = 2.5 degrees) will result toward the horizon. Limiting the ATC BS to 25.5 dBW toward the horizon, and taking into account the effects of signal attenuation in an urban setting, we conclude that Boeing's MSS receivers, and the receivers of other MSS systems in the 2 GHz band that may be less robust to overload interference, will not undergo saturation from BSs located in urban areas when the METs are also located in the urban area. We therefore adopt this EIRP limit in our rules.[319] To take into account Boeing's concern of overload interference to MSS METs located outside of urban areas, we require that 2 GHz ATC BS be limited to an aggregate power level of -51.8 dBW/m^2 (in addition to the 190 meters restriction to protect MSS METs from out-of-band interference) at the runways and aircraft stand areas of any airport and airport landing and take-off flight paths to avoid the possibility of overload interference to an aircraft MSS receiver.[320]

114. We also address the potential situation where BS transmissions could overload an MSS earth station on board an aircraft that is airborne. Boeing assumes, among other things, that mainbeam coupling of the BS antenna and the airborne MSS MET exists. We developed a mathematical model to simulate the interference scenario posed by Boeing where the total interfering power from 1000 randomly distributed BSs visible to an aircraft at various altitudes is calculated at the input of an airborne MSS earth station receiver.[321] Our analyses further assumes that each randomly distributed BS has an EIRP of 27

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[315] Receiver overload, or saturation, occurs when sufficient interference power is present at the receiver to cause it to act in a non-linear manner. This potential for interference is increased by the requirement that MSS earth stations are capable of tuning across 70% of the MSS allocation. *See 2 GHz MSS Rules Order,* 15 FCC Rcd at 16152, ¶ 52.

[316] *See* Boeing Additional Technical Analysis, April 5, 2002, Table 7.

[317] *See infra* App. C1 § 2.2.4.2. We note that if the antenna is tilted toward the ground at a 5 degree angle vs. a 2.5 degree angle (used by Boeing) the separation distance reduces to less than 1 km in a free-space propagation environment.

[318] *See infra* App. C1 § 2.2.4.2. Specifically, we use a program developed by the National Institute of Standards and Technology that compares the results of several propagation models and the results show that significantly higher attenuation than free space loss should be expected in an urban setting. We note, too, that the additional attenuation in the urban environment would also be sufficient to protect MSS receivers that are less robust to overload interference (i.e., -60 dBm).

[319] *See infra* App. B (adopting new rule § 25.252(a)(3), which requires MSS ATC licensees to limit BS EIRP toward the horizon to 25.5 dBW).

[320] *See supra* App. C1 § 2.2.4.2.

[321] *See infra* App. C1 § 2.2.4.3 (describing the assumptions used to simulate the interference scenario) & Attach. 1 (MathCad Model).

dBW, that the antenna follows the ITU-R model contained in Recommendation ITU-R M.1336,[322] and the antenna height is at 30m and tilted toward the ground by 2.5 degrees. Based on the results of our analysis, a relatively large deployment of ATC BSs would not cause Boeing's airborne MSS receivers to saturate while airborne and the potential for interference is low if the BS maximum EIRP toward the horizon is limited to 25.5 dBW (27 dBW – antenna gain G with downtilt = 2.5 degrees). We adopt section 25.252(a)(3) to limit BS EIRP toward the physical horizon to 25.5 dBW and an over-head gain suppression greater than 25 dB outside of the main lobe of the antenna to ensure protection of airborne MSS terminals.[323]

b. Inter-Service Sharing

115. We have also evaluated the potential interference that may be caused to systems operating in adjacent frequency allocations to the 2 GHz MSS band. Our findings are described in detail in Appendix C1, Section 3. We summarize our findings, below and conclude that ATC operations in the 2 GHz MSS allocations will not cause unacceptable interference to systems operating in adjacent frequency allocations.

116. Broadcast Auxiliary (BAS) and Electronic News Gathering (ENG) equipment operate above the 1990-2025 MHz MSS uplink allocation. The Society of Broadcast Engineers (SBE) is concerned about the potential for interference that ATC operations could cause to ENG and BAS operations in the adjacent allocation.[324] SBE is particularly concerned about the interference that could be caused if proposed BS operations are permitted in the uplink MSS allocation.[325] According to SBE, placing high-powered BSs in spectrum immediately adjacent to spectrum used for BAS receivers will require a separation distance of 2.6 km between a BS and BAS receiver. We indicated earlier that maintaining this type of separation distance is one example of a technical and operational constraint that would limit the implementation of ATC networks. Because we are adopting rules to implement Forward Band Mode ATC operations, however, the potential for BS interference to ENG and BAS equipment no longer exists. SBE indicates in its same comments that low power mobile telephone use of the MSS allocation will pose little or no risk of interfering with BAS receivers.[326] The rules we adopt in section 25.252 to protect in-band MSS systems from out-of-channel interference will also protect ENG and BAS equipment operating in frequency bands above the MSS uplink allocation.[327]

117. In the *Flexibility Notice*, we proposed adopting out-of-band emissions limitations for ATC operations consistent with our current rules for PCS.[328] CTIA, and certain incumbent PCS licensees

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[322] *See* ITU-R Recommendation F.1336-1, *Reference Radiation Patterns of Omnidirectional, Sectoral and Other Antennas in Point-to-Multipoint Systems for Use in Sharing Studies in the Frequency Range From 1 to About 70 GHz*, *available at* <http://www.itu.int/rec/recommendation.asp?type=items&lang=e&parent=R-REC-F.1336-1-200005-I> (last visited, Jan. 8, 2003).

[323] *See infra* App. B (adopting new rules 47 C.F.R. §§ 25.252(a)(3), (a)(5)).

[324] SBE Comments at 6-11; SBE Reply Comments at 1.

[325] SBE Comments at 8. We address SBE's additional comments on ICO's proposed duplex operations and use of a single antenna for ATC and MSS operations in Appendix C1, Section 3.1.

[326] SBE Comments at 8.

[327] *See infra* App. B (adopting new rule 47 C.F.R. § 25.252).

[328] *Flexibility Notice*, 16 FCC Rcd at 15547, 15555-56, ¶¶ 34, 55.

and PCS equipment manufactures, however, have raised the issue of possible out-of-band emissions interference from 2 GHz ATC METs transmitting in the 1990 to 2025 MHz band to PCS mobile receivers operating in the 1930-1990 MHz band, which they claim would not be adequately protected by our current attenuation requirement of 43 + 10 log P dB for PCS mobile transmitters.[329] CTIA also has indicated that PCS mobile handsets would not be able to adequately filter out transmissions from nearby MSS ATC handsets; which could result in either a desensitization or overload of PCS receivers. Verizon has also expressed its concern on this same point.[330] CTIA suggests that this potential for interference could be mitigated by providing 15-20 MHz of frequency separation between the PCS bands and ATC operations and by imposing much tighter out-of-band emissions limits on ATC equipment.

118. We agree with the commenting parties that under certain circumstances, there is a potential for interference from MSS ATC handsets to existing PCS handsets. However, we believe that the amount of frequency separation and the extremely stringent out-of-band emissions limits requested by CTIA and Verizon to address this form of interference are unnecessarily restrictive. The 1980-2010 MHz band has been allocated for MSS use since the 1992 World Administrative Radio Conference. Since at least 1994, we have been aware of the potential for some level of interference between MSS and PCS systems.[331] PCS carriers similarly were aware of potential interference from MSS systems in adjacent spectrum, and could have taken this into account in the design of their equipment. But the likelihood of potential interference from future MSS operations was generally considered minimal due to the fact that MSS systems were expected to operate primarily in rural and/or remote environments, and in such areas the probability of an MSS handset operating close enough to a PCS handset to cause interference was low. However, ATC may pose a greater interference problem for adjacent PCS operations because of the likelihood that ATC handsets will operate in the identical environments in which PCS handset operate (e.g., in urban areas, indoors, etc.), and that in such environments ATC handsets could be close enough to PCS handsets to cause interference. We therefore find that some additional requirements on ATC handsets are necessary and appropriate.

119. *Out-of-Band Interference*. To address out-of-band emission interference, we shall require that MSS ATC handsets comply with a more stringent out-of-band emissions limitation than we originally proposed in the *Flexibility Notice*. Specifically, we will require that any ATC mobile terminal meet the following out of band requirements: emissions below the frequency 1995 MHz and above the frequency 2025 MHz shall be attenuated by at least 70 + 10 log P dB, measured in a one megahertz or greater bandwidth; emissions in the band 1995-2000 MHz and 2020-2025 MHz shall be attenuated by at least a value as determined by linear interpolation from 70 + 10 log P dB to 43 + 10 log P dB at the nearest MSS band edge at 2000 MHz or 2020 MHz, respectively; and, all other emissions shall be

[329] *See, e.g.,* Letter from Diane Cornell, Counsel, Cellular Telecommunications and Internet Association to Marlene H. Dortch, Secretary, Federal Communications Commission, IB Docket No. 01-185 at 4-10 (filed, Jan. 14, 2003) (CTIA Jan. 14, 2003 *Ex Parte* Letter).

[330] Letter from Donald C. Brittingham, Director, Wireless Spectrum Policy, Verizon Corp. to Marlene H. Dortch, Secretary, Federal Communications Commission, IB Docket No. 01-185 at 1-6 (filed, Jan. 6, 2003). Nextel, however, disagrees with CTIA and Verizon's view, contending that while ATC could theoretically cause interference to PCS operations in limited circumstances, the probability of such interference actually occurring is low. *See* Letter from Regina M. Keeney, Counsel, Nextel Communications Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission, IB Docket No. 01-185 at 3-7 (filed Jan. 22, 2003).

[331] *See Amendment of the Commission's Rules to Establish New Personal Communications Services*, Third Memorandum Opinion and Order, 9 FCC Rcd 6908, 6922-23, ¶¶ 83-87 (1994).

attenuated by at least 43 + 10 log P dB.[332] In addition, in the event that a PCS operator receives harmful interference from ancillary ATC base stations or mobile terminals, we will also require that the ATC operator must resolve any such interference. If the MSS ATC operator claims to have resolved the interference and other operators claim that interference has not been resolved, then the parties to the dispute may petition the Commission for a resolution of their claims. We find that compliance with these requirements will adequately protect incumbent PCS operations in the 1930 to 1990 MHz band from interference from MSS ATC and still maintain the usefulness of spectrum in the 2000-2020 MHz band for ATC operations.[333] We also find that compliance with more stringent out-of-band limitations will further the public interest in helping the Commission to establish more effective and efficient spectrum management.[334]

120. *PCS Receiver Desensitization or Overload*. Certain incumbent wireless carriers assert that there exists the potential for ATC mobile terminals to cause desensitization or receiver overload to PCS mobile receivers operating below 1990 MHz.[335] We do not believe that the problem of desensitization and overload is as severe as these parties contend. First, we believe that the parties may have assumed that the only interference rejection capability of an existing PCS mobile receiver is from the front-end band pass filter of the receiver. This does not take into account other factors such as additional filtering from the intermediate frequency (IF) circuitry. Additionally, the parties' assertions that receiver desensitization or overload interference will occur appear to be based on what would be considered worst-case circumstances (e.g., that ATC and PCS handsets are operating in close proximity under line-of-sight conditions, that ATC handsets are operating at full power, and that the antennas of the handsets are aligned for perfect coupling). The probability of these various circumstances occurring simultaneously is relatively small. We thus believe that, while the potential for PCS receiver desensitization or overload from ATC operations exists, it is less than suggested by the commenting parties. We also believe that interference problems that may develop over time as ATC is deployed can be mitigated by future PCS handset design modifications and through a cooperative effort by PCS and MSS ATC licensees to resolve these issues.[336]

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[332] In addition to adopting this -70 dBW/MHz emission to protect PCS receivers, the Commission's decision to reallocate the 1990-2000 MHz band to services other than MSS will result in a 10 MHz separation between ATC and current PCS operations. *See AWS Report and Order*, FCC 03-16.

[333] In setting out requirements for attenuating out-of-band emissions by 43 + 10 log P dB at 2000 MHz and at 70 + 10 log P dB at 1995 MHz, we would expect that the actual out-of-band emissions in the PCS band at 1930-1990 MHz would be attenuated even more.

[334] As noted in a recent staff report by the Spectrum Policy Task Force, the staff recommended that the Commission consider tightening out-of-band emission limits over time so that disparate uses of the spectrum can have less interference impact on each other. *See* Federal Communications Commission, Spectrum Policy Task Force Report, ET Docket No. 02-135, 22 (Nov. 2002), *available at* <http://www.fcc.gov/Daily_Releases/Daily_Business/2002/db1115/DOC-228542A1.doc> (last visited, Jan. 29, 2003). Furthermore, as suggested in the Spectrum Policy Task Force report, we will review these out-of-band limits in about five years to determine whether they are adequate or necessary. *See id.* at 32.

[335] *See* CTIA Jan.14, 2003 *Ex Parte* Letter at 5-6.

[336] We note that, as a practical matter, there will be some period of time before ATC is deployed and a longer period before it has the potential to reach market penetration levels that could materially affect the likelihood of interference. We also note that the Spectrum Policy Task Force report encourages the use of voluntary receiver performance requirements to address these types of problems. *See* Spectrum Policy Task Force Report at 31.

121. We also analyzed the impact of ATC operations on the Space Operations Service allocation above the 1990-2025 MHz MSS uplink allocation. Again, since we are adopting rules to implement the Forward Band Mode of ATC operation, the MET transmissions are the only potentially interfering element of ATC with respect to Space Operations systems in this frequency range. Our analysis indicates that, using conservative assumptions developed by the ITU-R,[337] ATC MET out-of-band emissions above 2025 MHz will be significantly below the interference criteria established for the Space Operations Service.[338] Space Operations Service (and Space Research Service) systems operate above the 2165-2200 MSS downlink frequency allocation as well. In the Forward Band Mode of ATC operation, BSs would transmit in the 2165-2200 MHz MSS downlink frequency allocation. Of the two services, the Space Operations Service has the more stringent interference criteria. This is used in our evaluation of the interference potential from ATC to these adjacent band systems.

122. Our analysis concludes that Space Operations and Space Research systems receiving on the ground in the 2200-2290 MHz band would be protected from ATC out-of-band emissions.[339] A separation distance of 0.82 kilometers is required to protect a space operations downlink facility from the out-of-band emissions of an ATC base station. These receive facilities are typically located on government facilities where BSs would not be co-located and interference to space operations receivers would be in a controlled environment. The interference margin for space research receivers, by our calculations, is actually more than 5 dB and interference from BSs to space research receivers is not expected. Space research antennas generally are large antennas that track the space research satellites and they, too, are typically located on government facilities where BSs operations would be in a controlled environment. For space research receivers that are used by universities and private companies, and are located in urban areas, there are operational characteristics (i.e., the elevation angle from the earth station to the satellite would be greater than 0 degrees) that have not been taken into account in our analysis that would increase the interference margin. Given these factors, in addition to the extra attenuation that BS signals would experience in an urban setting, the interference margin for these types of space research receivers would increase, making the sharing situation more compatible.

123. We then evaluated the potential interference from BS out-of-band emission levels caused to terrestrial fixed and mobile systems operating below the 2165-2200 MHz MSS downlink allocation. ATC BSs will operate in the Forward Band Mode under far more constrained out-of-band emission levels than those required of PCS base stations licensed to operate below 2165 MHz.[340] Interference from BSs to mobile systems operating in the adjacent frequency allocations therefore is not an issue. Analog and digital terrestrial fixed service systems continue to operate in and below the MSS allocation,[341] however,

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[337] *See* Recommendation ITU-R SA.1154, *Provisions to Protect the Space Research (SR), Space Operations (SO) and Earth-Exploration Satellite Service (EES) and to Facilitate Sharing with the Mobile Service in the 2025-2110 MHz and 2200-2290 MHz Bands*, *available at* <http://www.itu.int/rec/recommendation.asp?type=items&lang=e&parent=R-REC-SA.1154-0-199510-I> (last visited, Jan. 10, 2003).

[338] *See infra* App. C1 § 3.1.

[339] *See infra* App. C1 § 3.2.

[340] For reference, the BS out-of-band emission level of -100.6 dBW/4kHz we adopt here compares favorably to the – 75 dBW/MHz for a PCS base station operating at maximum power and with a 43+10 log P out-of-band requirement.

[341] We note that because MSS licensees are required to relocate terrestrial licensees in the event that an incumbent terrestrial facility causes interference to the MSS earth station receivers within the MSS band, we address the potential for out-of-band interference to terrestrial facilities, not the potential for in-band interference. *See 2 GHZ* (continued….)

and we analyze the impact of ATC operations on these adjacent band systems. Our analysis indicates that the proposed ICO BSs would meet the long-term and short-term interference criteria to protect analog terrestrial fixed systems in the adjacent frequency band.[342] It further indicates that because the interference margins calculated for analog systems are so large, more robust digital terrestrial fixed systems will not experience interference from out-of-band ATC base-station emissions.[343]

124. Last, we address the potential interference to the Global Positioning System (GPS) from ATC BSs and MTs operating in the 2 GHz band. GPS operates in a portion of the 1559-1610 MHz Radionavigation Satellite Service (RNSS) allocation. In the *Flexibility Notice*, the Commission recognized that the unwanted emissions from terrestrial stations in the MSS will have to be carefully controlled in order to avoid interfering with GPS receivers.[344] The Commission specifically requested comment on whether limits for base stations similar to those specified in section 25.213(b) for mobile earth terminals (METs) are adequate to protect GPS receivers.[345] NTIA responded to our request for comment along with several other parties.[346] NTIA asserts that there are two issues that must be considered in the request for comment on the protection of GPS: (i) the frequency range(s) over which the emission level would be applicable; and (ii) whether the emission level established for a mobile earth station in an MSS system should be applied to ATC BSs and MTs.[347] Other parties support the application of the GMPCS limits to ATC BSs and MTs.[348]

125. Since the release of the *Flexibility Notice*, the Commission has adopted the *GMPCS Order* that requires MSS METs transmitting on frequencies between 1990 MHz and 2025 MHz conform to two restrictions: a wideband limit of -70 dBW/MHz, averaged over 20 milliseconds, on the EIRP density of the out-of-band emissions in the 1559-1610 MHz frequency range and a narrowband limit of -80 dBW/700 Hz, also averaged over 20 milliseconds, on emissions in the 1559-1610 MHz frequency range.[349] On NTIA's first point, then, the *GMPCS Order* expanded the frequency range from that

(Continued from previous page)
Rules Order, 15 FCC Rcd at 16132, ¶ 78. Our analysis presumes that ATC BSs are used only to provide service in areas where direct MSS signal reception otherwise would be available absent attenuation or blockage from natural or man-made structures in that area and that any relocation of incumbent terrestrial facilities necessary to protect direct MSS reception has been completed prior to ATC operations.

[342] *See infra* App. C1 § 3.2.

[343] *See infra* App. C1 § 3.2.

[344] *Flexibility Notice*, 16 FCC Rcd at 15559 & 15565, ¶¶ 68 & 83.

[345] *Id.*

[346] *See, e.g.,* Letter from Fredrick R. Wentland, Acting Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration to Donald Abelson, Chief, International Bureau, Federal Communications Commission, IB Docket No. 01-185 at 1 (Nov. 12, 2002) (NTIA Nov. 12, 2002 *Ex Parte* Letter).

[347] *Id.* at 2. NTIA also urges the Commission to adopt out-of-band emission levels for the newly allocated L2 (1215-1240 MHz) and L5 (1164-1188 MHz) frequency bands for future GPS operations. *Id.*

[348] *See* Globalstar July 1, 2002 *Ex Parte* Letter at 24.

[349] *Amendment of Parts 2 and 25 to Implement the Global Mobile Personal Communications by Satellite (GMPCS) Memorandum of Understanding and Arrangements*, Report and Order and Further Notice of Proposed Rulemaking, 17 FCC Rcd 8903, 8936, ¶ 88 (2002) (*GMPCS Order*). Additionally, in a separate rulemaking proceeding for (continued….)

required of section 25.213(b) to protect GPS from MSS MET out-of-band emissions. On NTIA's second point about whether the emission levels established for a mobile earth station in an MSS system should be applied to ATC BSs and MTs, NTIA indicates that the GMPCS emission limits in the 1559-1610 MHz band for METs operating in the 1990-2025 MHz frequency range are based on protection of GPS receivers used on aircraft in a precision approach landing operational scenario and not to protect terrestrial (e.g., land-based) operational scenarios.[350] NTIA is correct that the GMPCS rules that apply to MSS equipment are based on aircraft usage of the GPS system. We recognize that NTIA believes that these rules do not provide adequate protection to terrestrial usage. [351] NTIA also expressed its concern and reluctance to limit the protection of GPS based on the aviation scenario only and believes strongly that protection of terrestrial uses of GPS such as E911-assisted GPS should be addressed.[352]

126. The record before us does not support the adoption out-of-band emission levels more stringent than those required of GMPCS equipment. Nor does it support expanding the limits to frequency allocations other than the 1559-1610 MHz band.[353] We require that 2 GHz ATC base stations and mobile terminals meet the already established GMPCS wideband and narrowband out-of-band emission levels to protect GPS operations in the 1559-1610 MHz band. Indeed, ICO provided ATC base station and mobile terminal equipment specifications that demonstrate that it is capable of meeting the GMPCS out-of-band emission attenuation requirements.[354] In light of NTIA's concerns, however, we plan to continue to assess the appropriate interference protection levels for GPS. Moreover, the Office of Engineering and Technology (OET) will issue a public notice shortly soliciting comment to assist in the examination of what changes in the level of protection for GPS, if any, should be established in the future. The public notice will address the out-of-band emission limits that are necessary to protect the three GPS civil signals for various operational scenarios (e.g., terrestrial, aviation, maritime).

c. Conclusion

127. We adopt certain technical and operational rules to provide for 2 GHz MSS ATC MT and BS operations in the Forward Band Mode of operation to protect in-band, adjacent channel systems within the MSS allocation and systems operating in adjacent frequency allocations. ATC MTs are required to meet an out-of-band attenuation level of 43 + 10 log P dB at the 2 GHz MSS band edge and increasing to 70 + 10 log P at 1995 MHz and 2025 MHz, respectively. ATC BS are required by our rules to meet an out-of-assigned-band emission limit of -100.6 dBW/4kHz and are limited to producing an

(Continued from previous page)
establishing rules for MSS in the 2 GHz bands, NTIA filed comments supporting the -70 dBW/MHz and -80 dBW emission limits in the 1559-1610 MHz band for MES operating in the 1990-2025 MHz band. *See* Comments of the National Telecommunications and Information Administration, IB Docket No. 99-81, at 9 (filed, June 24, 1999), *available at* <http://svartifoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6007946277> (last visited, Dec. 30, 2002).

[350] *See* NTIA Nov. 12, 2002 *Ex Parte* Letter, Encl. 2 at 5.

[351] *GMPCS Order,* 17 FCC Rcd at 8923-25, ¶¶ 49-52. The limits adopted in the *GMPCS Order* are based on an assumed separation distance of approximately 100 feet between an airborne GPS receiver and a single terrestrial transmitter.

[352] NTIA Jan. 24, 2003 *Ex Parte* Letter at 2-3.

[353] *See, e.g.,* NTIA Nov. 12, 2002 *Ex Parte* Letter, Encl. 1 at 1 & Encl. 2 at 2 (discussing expanded frequency bands for GPS).

[354] *See* ICO Apr. 11, 2002 *Ex Parte* Letter at 2 (discussing out-of-band emissions in 2 GHz MSS downlink band).

EIRP of no more than 25.5 dBW toward the horizon with an overhead gain-suppression requirement. ATC operators must locate their BSs at least 190 meters from any airport runway or aircraft stand area, including take-off and landing flight paths; a power flux of -51.8 dBW/m^2 must be maintained at the same airport areas. ATC BSs and MTs must also meet the out-of-band emission levels required of GMPCS equipment to protect GPS operations in the 1559-1610 MHz RNSS allocation. These rules are sufficient to protect other systems operating in or near the 2 GHz MSS allocations, while providing 2 GHz MSS licensees the operational and technical flexibility, should they choose to implement ATC as part of their MSS networks.

2. L-Band

128. In 1989, the Commission licensed AMSC, now MSV, to construct, launch, and operate a three-satellite GSO MSS system in the upper portion of the L-band.[355] Recently, the Commission modified MSV's license to operate in the Lower L-Band as well.[356] MSV is authorized, consistent with international coordination arrangements, to operate on spectrum throughout the entire L-band not to exceed a total of 20 MHz of spectrum.[357] MSV currently operates one satellite, which was launched in 1995 and is coordinated with the four other non-U.S.-licensed L-band satellite operators in the North America coverage area. Today, MSV offers land, maritime, and aeronautical MSS, including voice and data, to the United States and its coastal areas.

129. MSV seeks authority to operate an ATC as part of its current and next-generation mobile satellite systems in both the upper and lower L-bands.[358] Generally, MSV proposes ATC operations that are integrated with its satellite network. This would, according to MSV, enable co-channel reuse of the satellite service link frequencies in adjacent satellite antenna beams to provide coverage to areas where the satellite signal is attenuated by foliage or terrain and to provide in-building coverage.[359] Customers using lightweight, handheld mobile terminals could communicate through both the satellite and the ATC base stations. The satellite path would be the preferred communications link, but if the user's satellite path is blocked, the communications link would be sustained via the fill-in base stations. When a user travels between the two coverage areas or between base stations, the network control facility would hand off the user among facilities as required to sustain a continuous communications link. For the public interest reasons set forth above, we establish here the technical service rules for L-band ATC operations. MSV and other L-Band operators authorized to provide services in the U.S. may now seek to modify their authorizations, consistent with the technical rules adopted here, to operate ATC in conjunction with their space station networks on the frequency assignments authorized and coordinated for MSS.

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[355] *See MSV License* 4 FCC Rcd at 6048-49, ¶¶ 53-59. The term "upper L-Band" denotes the 1545-1559 MHz and 1646.5-1660.5 MHz bands.

[356] *See L Band MSS Rules Order,* 17 FCC Rcd at 2704, ¶ 1. The term "lower L-Band" denotes the 1525-1530 MHz, 1530-1544 MHz and 1626.5-1645.5 MHz frequency bands.

[357] The Administrations that are parties to the North American MOU include the United States, Canada, Mexico, Russia and the United Kingdom. Unlike most international coordination agreements that create permanent assignments of specific spectrum, the operators' assignments change from year to year based on their marketplace needs. Each of the five operators received less spectrum than it had requested for its system, and in some cases, less spectrum than it had been authorized to use by its respective administration.

[358] *See, e.g.,* MSV Dec. 16, 2002 *Ex Parte* Letter at 1.

[359] MSV Mar. 1, 2001 *Ex Parte* Letter at ii.

a. Intra-Service Sharing – Protection of Adjacent Channel and Adjacent Beam MSS Operations

130. Inmarsat has conducted substantial technical studies in response to MSV's ATC proposed use in the L-band. Inmarsat, in the first instance, is concerned about the potential interference MSV ATC operations could cause to its currently operating, Inmarsat-3 satellite network. Inmarsat is also concerned about the potential impact on its future generation network, Inmarsat-4.

131. Inmarsat argues that the Commission should not allow terrestrial use of the L-band because terrestrial uses would create unacceptable interference to Inmarsat's network and the services it provides, including vital safety services provided in the L-band.[360] Inmarsat claims that the terrestrial services proposed at L-band would create five main interference problems:[361]

(1) The in-band signals of MSV's ATC mobile terminals (MTs) will cause unacceptable interference to the signals being received by the Inmarsat satellites;[362]
(2) The out-of-band emissions from MSV's ATC MTs will cause unacceptable interference to the signals being received by the Inmarsat satellites;[363]
(3) ATC base station (BS) in-band signals will create unacceptable interference into the receivers of nearby Inmarsat mobile earth terminals;[364]
(4) ATC base station out-of-band emissions would create unacceptable interference into the receivers of nearby Inmarsat mobile earth terminals;[365] and
(5) MSV's ATC operations will degrade the performance of its own space-based services and reduce the traffic-carrying capacity of the MSV space segment, thereby increasing MSV's need for additional L-band spectrum.[366]

We evaluate below MSV's reply[367] to each of Inmarsat's points and conclude that MSV's use of ATC consistent with the operational restrictions adopted herein will be capable of protecting the current and future generation Inmarsat satellite networks from unacceptable interference.

(i) Effect of ATC Operations on Inmarsat Satellites

132. Inmarsat and MSV currently share the L-band spectrum with three other GSO MSS systems in North America. The United Kingdom is the licensing administration for the Inmarsat space segment. The Commission has licensed fixed earth stations (the Land Earth Station or Gateway) and

[360] Inmarsat Comments at 2.

[361] *Id.* at 12-17.

[362] *Id.*, Technical Annex § 3.1.

[363] *Id.*, Technical Annex § 3.2.

[364] *Id.*, Technical Annex § 3.3.

[365] *Id.*, Technical Annex § 3.4.

[366] *Id.*, Technical Annex § 3.5.

[367] *See* MSV Reply, Technical App. at 1-26.

authorized METs in the United States to access the Inmarsat system.[368] Canada is the licensing administration for the TMI space stations. The Commission has also authorized MSS mobile earth terminals (METs) in the United States to access the Canadian space stations.[369] We do not wish to create a situation where either of these systems would be incapable of serving the United States in accordance with their authorizations. We evaluate the potential for interference that MSV's ATC base stations and MTs would have on the Inmarsat system, in particular. TMI supports the ATC network as proposed by MSV.[370] NTIA analyzed the potential for interference to an Inmarsat satellite receiver based upon its use to support the Global Maritime Distress and Safety System (GMDSS) and the Aeronautical Mobile Satellite En-Route Service (AMS(R)S).[371]

133. MSV, TMI and Inmarsat are able to serve METs in the United States through the use of geographic and frequency separation. In the geographic regions served by both Inmarsat and MSV, for example, the satellites use different frequencies (i.e., frequency separation). Where the two systems serve different geographic areas of the United States, each of the systems may use the same frequencies (i.e., through geographic separation). In either scenario, the Earth station transmissions of each of the systems are received by the other's space station receiver. The more stations transmitting simultaneously on the Earth (or the greater the power level from a given station or group of stations), the greater the potential for interference to the other's space-station receiver. A space network receives interference from the other system in the form of "noise."[372] The analyses conducted by MSV and Inmarsat evaluate the amount of "noise" that the other system will receive from MSV's use of ATC. Inmarsat and NTIA are concerned that the MSV ATC system may cause interference to its MSS system. Based upon the analyses below and supplemented by the L-Band Technical Appendix (Appendix C2) we conclude that the interference potential is not significant and that ATC operations will not preclude Inmarsat from continuing to serve end users in the United States now or in the future. To this end we adopt several technical limitations on L-Band ATC, also discussed more thoroughly, below.

134. The parties to this proceeding have disagreed over the correct value to use for certain of the parameters required to analyze the potential interference from the proposed MSV ATC system to the Inmarsat satellites. By making the assumption that a number of these parameters take on the same value for both systems and analyzing the difference in effect of ATC interference between the two systems, it is possible to qualitatively determine which system will receive the greatest amount of interference. MSV proposes to operate its ATC system in a way that limits interference to its own satellite and we have developed an analysis to determine the magnitude of the corresponding interference that would be received by the Inmarsat satellites.

135. As noted above, both the Inmarsat and MSV systems share the spectrum through either frequency separation (when they operate in the same geographic regions) or through geographic

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[368] *See Comsat Authorization*, 16 FCC Rcd at 21702-07, ¶¶ 82-93.

[369] *See Application of SatCom Systems Inc. and TMI Communications and Company, LP,* Order and Authorization, 14 FCC Rcd 20798, 20826-28, ¶¶63-75 (1999).

[370] MSV Comments at i.

[371] *See* NTIA Nov. 12, 2002 *Ex Parte* Letter, Encl. 4.

[372] By "noise," we refer to any type of interference that destroys the integrity of signals on a line. *See* Webopedia, Noise, *available at* <http://www.webopedia.com/TERM/n/noise.html> (last visited, Jan. 8, 2003). Radio waves, electrical wires, lightning and other frequency emitters can create noise. *Id.*

separation (when they operate co-frequency). When the MSV and Inmarsat-4 satellites operate on a co-frequency basis, the Inmarsat-4 satellite receives interference power from all of the areas on the ground in which MSV is operating both MSS and ATC on a co-frequency basis. We first identify the most sensitive potential interference situation. Our worst case analysis examines the difference in the ATC MT interference power received by both the MSV satellite and the Inmarsat-4 satellite while assuming that several of the disputed technical parameters are the same for both the MSV and Inmarsat system.[373] The methodology of our analysis is described below.

136. Both the MSV and Inmarsat satellites will have a large number of antenna beams and each beam will be assigned to provide coverage to a specific area on the ground. Both satellites can serve the same geographic area by having the overlapping beams operate on separate frequencies. More than one beam from each satellite can operate on the same frequency, as long as there is sufficient geographic separation (antenna beam discrimination) between co-frequency beams. To assess the interference to an Inmarsat beam operating on frequency F1 from all of the MSV beams operating on the same frequency, F1, we begin with the interference power that MSV's satellite is able to accept as self interference from its own ATC operations. This self interference is quantified as the power level that causes an increase in MSV's satellite receiver noise of 0.25 dB. We note this level of interference power as $P_{0.25}$. MSV has indicated that it will implement its ATC system so that it will have an average of 10 dB (i.e., a factor of 10) antenna discrimination between the MSV satellite receiver and the ATC transmitters operating on the ground near the F1 beam coverage area. The 10 dB power differential means that the actual interference power generated by ATC transmitters near the land area served by the F1 beams can actually be 10 times higher than the power that would increase the MSV receiver noise by 0.25 dB (i.e., $P_{0.25}$). The maximum interference power generated near the ground area served by the F1 beam is then proportional to $P_{0.25}$*10. This value ($P_{0.25}$*10) represents the interference power generated near MSV's beams operating on the same frequency as the relevant Inmarsat receiver.

137. We then determine how many F1 beams the MSV network will have. MSV states that its next generation satellite will have about 200 beams and will use a 7 fold frequency reuse plan. Therefore one can assume that, MSV will operate (200/7 = 28.6) 29 beams[374] each producing $P_{0.25}$*10 interference power and a total interference power on the ground proportional to $P_{0.25}$*10*29. This value is equal to 290 times $P_{0.25}$ or $P_{0.25}$*290. Because Inmarsat and MSV are sharing on a co-frequency, geographic-separation basis, this interference power is generated on the ground in areas not directly covered by the Inmarsat antenna beam in question. The power that enters the Inmarsat F1 beam depends upon the antenna discrimination between the Inmarsat antenna beam and the land areas in which the ATC interference power is generated. Calculations, in Appendix C2, Section 1.11, show that Inmarsat has at least 25 dB (a factor of 1/300) discrimination towards the land areas in which the interference from ATC is generated. So, the interference power potentially received by the Inmarsat F1 beam is capped at $P_{0.25}$*290/300 = $P_{0.25}$*0.96, or slightly less than the interference power received by MSV's satellite beams.

138. This qualitative analysis assumes two things: (1) MSV's noise power will increase no more than 0.25 dB and (2) certain system parameters will be the same for both the MSV and Inmarsat systems. Both assumptions are reasonable. First with respect to 0.25 dB noise-power cap, Inmarsat correctly notes that it is very difficult to accurately and repeatedly measure the noise increase in a satellite receiver of 0.25 dB. These types of measurements, however, are not required. As discussed in detail

[373] In a separate calculation, we do take into account the different values for the parameters associated for the different satellites.

[374] This parameter is discussed in more detail in App. C2, Section 1.13. The value used here is a worst case value.

below, limiting the total number of base stations operating on a specific frequency effectively limits the potential interference noise at the MSV satellite to 0.25 dB. Second, with respect to the similarity in system parameters, both the MSV and Inmarsat systems will, in fact, respond similarly in similar situations or Inmarsat would gain benefit with respect to MSV on the following:

- ***Average Power Reduction*** – any reduction in average transmit power of the ATC transmitters whether in power control, vocoder factor and voice activation factor would affect the interference power received at both satellites equally.

- ***Outdoor Blockage*** – we agree with Inmarsat that outdoor blockage will reduce the interference power towards the Inmarsat satellite by about 3 dB, or 50%; however, because the MSV satellite will be, on the average, seen at a higher elevation angle than the Inmarsat satellites, we conclude that outdoor blockage will reduce the interference power more towards the Inmarsat satellites when compared with the interference received at the MSV satellite.[375]

- ***Polarization Isolation*** – both MSV and Inmarsat satellite receivers use the same type of polarization, so any reduction in average transmit power of the ATC transmitters caused by this affect would reduce the interference power received at both satellites equally.

- ***Free Space Loss*** – the average distance between CONUS and the MSV satellites will be slightly less than the average distance between CONUS and the operational Inmarsat satellites, so the propagation loss from the ATC transmitters to the MSV satellite will be slightly less than the propagation loss from the ATC transmitters to the Inmarsat-4 satellite. This differential means that the interference at the MSV satellite would be slightly greater than at the Inmarsat-4 satellite due to this parameter.

- ***Satellite Mainbeam Gain*** – both Inmarsat-4 and the next generation MSV satellite will have the same main beam gain of 41 dBi.

- ***Satellite Receiver Noise Temperature*** – the Inmarsat satellite receiver noise temperature of 600K[376] is higher than that of the MSV satellite receiver of 450K.[377] Therefore, the effect of a given low-level of interference power will be somewhat less noticeable to the Inmarsat-4 receiver than it would be to the MSV receiver.

In summary, this qualitative evaluation of potential interference from MSV's ATC MT's to the Inmarsat-4 satellite, assuming that the parameter values listed above would be equal for both the MSV and Inmarsat satellites, removes the areas of dispute over the parameter values estimating the worst case potential interference situation. The results show that one should expect the interference power received by an Inmarsat-4 beam operating co-frequency with MSV's ATC network to be about the same, or less

[375] We use the term "outdoor blockage" to describe the radiofrequency attenuation that occurs when an obstacle interrupts the link-of-sight path between a transmitter and a satellite receiver. "Outdoor blockage" is distinct from "structural attenuation." We use the term "structural attenuation" to mean the signal attenuation caused by transmitting to and from mobile terminals that are located in buildings or other man-made structures that limit the transmission of radiofrequency radiation. *See supra* n.229. We use the two terms to distinguish between these two concepts and to avoid the confusion that might result from using the various terms that commenters employ.

[376] Inmarsat Comments, Technical Annex at Table 3.1-1.

[377] MSV Reply, Technical App. at 4.

than, the interference power received by MSV.

139. We now conduct a quantitative assessment of the potential for interference between the two systems. This analysis determines the potential for interference to Inmarsat by evaluating the ratio of noise that would be produced by MSV's MSS operations (if fully loaded) to noise that would be produced by MSV's future MSS and ATC operations.[378] Our calculations first assume that MSV and Inmarsat provide service to the same geographic region but in different sub-frequency bands of the L-Band (i.e., they are sharing the L-band using frequency separation)[379] and, second, that MSV and Inmarsat use the same frequency assignments where their satellite footprints do not overlap (i.e., they are sharing through geographic separation).[380] The results of our analysis show that the impact of future MSV operations, both ATC and MSS, on current and future Inmarsat satellites will be significantly less than the current sharing situation in the L-band, assuming a fully loaded current system.[381]

140. Our evaluation of potential interference to Inmarsat's networks is based on MSV's comparison of the percentage of increased noise that the Inmarsat networks (current and future) would experience from the currently operating MSV MSS system to the future generation MSV system incorporating ATC operations.[382] Our analysis assumes that the ATC system is implemented as a TDMA GSM system. It also assumes that ATC MTs are limited to an out-of-band emission level of -67 dBw/4kHz, that the link budget for ATC reserves a minimum of 18 dB for structural attenuation and that the vocoder is used to reduce potential interference.[383]

141. We conclude, based on the results of our analyses in Appendix C2, that the MSV satellite system will produce significantly less interference to other L-Band satellites than MSV's current MSS system. Furthermore, MSV's proposed ATC system will produce only a small portion of the increased noise that the MSV satellite will cause to other systems in the L-band. Specifically, for the adjacent band case (frequency separation), MSV's use of ATC would contribute to the Inmarsat-4 network (the worst case) less than one quarter of one percent of the noise that MSV's currently licensed MSS system would produce without ATC.[384] The noise received by Inmarsat-4 from MSV's future MSS and ATC operations, combined, would still produce less than one quarter of one percent of the noise that MSV's currently operating system would produce, assuming 90,000 simultaneously operating ATC METs in the future MSV system.[385] For the adjacent beam case (geographic separation), MSV's use of ATC would

[378] *See* App. C2, Evaluation of L-Band ATC Proposals, Tables 2.1.1.A – 2.1.1.D.

[379] *See infra* App. C2 at Table 2.1.1.A.

[380] *See infra* App. C2 at Table 2.1.1.C. Sharing through geographic separation does not necessarily imply "true" adjacent sharing. The "adjacent beam" with which ATC sharing is feasible must have sufficient beam isolation for sharing with MSV's MSS operation to occur.

[381] *See* App. C2 at Tables 2.1.1.B and 2.1.1.D (summarizing the results of our calculations).

[382] *See* MSV Jan. 11, 2002 *Ex Parte* Letter at 22.

[383] *See infra* App. C2 § 1.3.5.

[384] *See infra* App. C2 at Table 2.1.1.B. It is emphasized that the percentages of increased noise do not take into account MSV's proposed use of variable rate vocoders. For the assumptions used in our analyses, *see infra* App. C2 § 1.

[385] *See infra* App. C2 at Table 2.1.1.B.

contribute to the Inmarsat-4 network (the worst case) about one tenth of one percent of the noise that MSV's currently licensed MSS system would produce without ATC.[386] The noise received by Inmarsat-4 from MSV's future MSS and ATC operations, combined, would produce only a little more than three percent of the noise that MSV's currently operating system would produce.[387]

142. In sum, both of our analyses for ATC operations over MSV's next generation satellite network include the effects of out-of-band and adjacent-beam sharing. In general, the Inmarsat satellites appear to have more discrimination to ATC MT operations, either via antenna beam discrimination or out-of-band roll-off,[388] than the MSV satellite. As a result, the noise-floor of Inmarsat's satellite receivers would be significantly less affected by MSV's MTs than MSV's own next-generation satellite receivers. To protect co-frequency and adjacent frequency MSS operations in the L-band from ATC operations, we adopt several rules that are based on the ATC system operating as a TDMA GSM system. Under these rules, the ATC handsets must use a 1 watt peak EIRP and must implement both a power control of 30 dB in 2 dB steps and a vocoder algorithm that is capable of reducing the time averaged power by 7.4 dB. Specific out-of-band emissions are adopted for the MTs. In addition, the number of base stations permitted to operate on a 200 kHz channel is limited to no more than 1725. An MSS licensee shall also reserve a minimum of 10 dB in its link budget for power control within its ATC network, as is within the range of standard engineering practice to overcome the effects of structural attenuation. In addition, MSS licensees shall not extend the coverage area of any ATC cell beyond the point where an ATC MT could operate at the edge of coverage of the ATC cell with a maximum EIRP of -10 dBW.

143. We believe we have accurately analyzed the potential for interference from MSV ATC transmitters to Inmarsat; however, we recognize that both Inmarsat and MSV reach somewhat different conclusions on the circumstances under which interference would occur. Recognizing the importance of providing adequate interference protection to Inmarsat, and in particular the safety-related services it provides to ships and aircraft, we will permit MSV to operate only 50% of its permitted base stations per channel (*viz.*, 50% of 1725, or 863 stations) during an initial 18-month, phase-in period.[389] This restriction will be equivalent to imposing an additional 3 dB of protection for Inmarsat during initial deployment. The 18-month phase in period will permit Inmarsat and MSV to study whether any interference has resulted, giving enough time to observe any seasonal variations and to analyze the results of the study. After the 18 month period, MSV may operate all 1725 base stations per channel. While we adopt rules to prevent harmful interference, we do not intend to prohibit L-band MSS operators from agreeing to less restrictive limitations on MSS ATC. We support and encourage private negotiations among interested parties in the band and will consider waiver requests of these rules based on negotiated agreements.

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[386] *See infra* App. C2 at Table 2.1.1.D. It is again emphasized that the percentages of increased noise do not take into account MSV's proposed use of variable rate vocoders.

[387] *See infra* App. C2 at Table 2.1.1.D.

[388] We note that Inmarsat-4 will have approximately 25 dB of antenna discrimination towards the ATC transmitters compared with MSV's planned 10 dB average discrimination in the adjacent beam situation. In the adjacent band situation, the ATC transmitter will have at least 50 dB out-of-band roll-off to the Inmarsat satellite while the MSV system receives the transmissions in-band.

[389] We intend the initial 18-month, phase-in period to occur only once. For example, if the phase-in period were met during the life of MSV's current-generation satellite system, the deployment MSV's next-generation satellite system would not restart a new phase-in period.

144. MSV also requests the ability to provide ATC operations in conjunction with its currently operating first-generation MSS network.[390] According to the system characteristics for the first-generation MSV system[391] and the currently operating Inmarsat network,[392] the next-generation satellites will be about 12 dB more sensitive to interference than the current satellite systems. Since the first generation satellites are *less* susceptible to interference from ATC operations as proposed than the second-generation satellite systems are, the limitation on the number of ATC base stations (1725) combined with the limitation on the number of ATC base stations (863) during the one-time, 18-month, phase-in period is more than sufficient to protect the current generation satellites that are in operation. Therefore, we will permit ATC operation in conjunction with first-generation satellites so long as the rules in place to protect next-generation satellite systems are met.

145. Furthermore, MSV urges the Commission to minimize the restrictions on its planned ATC network deployment to the extent possible where its operations are not co-channel with another MSS system's operations. They argue that such situations require no restrictions and that if the amount of isolation between the co-channel operations with other MSS satellites is greater than that used to develop any restrictions, then those restrictions on co-channel operations should be relaxed accordingly.[393] Above, we discuss one such restriction. By limiting the number of base stations carriers permitted to operate on a 200 kHz channel, the noise increase to the MSV satellite is limited to 0.25 dB. We find this restriction is necessary because we are not convinced, based on the record, that MSV can accurately and repeatedly measure this low level of interference at their satellite and we believe that this limitation on MSV's satellite noise increase will provide for MSS ancillary terrestrial service and limit the potential for interference to other co-frequency MSS operators.

146. In addition, MSS operations in the L-band are to be conducted according to the frequency arrangement arrived at under the 1996 Mexico City MOU. The MOU is a confidential frequency sharing arrangement that was intended to be revisited annually by the operators until the long-term requirements of all parties are satisfied and a final agreement among the Administrations is reached. At this time, it is unclear which channels will be occupied by which MSS operator in the future because the MOU frequency arrangement is not static. Even in a static environment, parties do not always agree on the precise types of operations that constitute co-channel interference. In a dynamic environment, such as L-band MSS, we are concerned that determining the co-channel interference that arises from fluctuating and geographically discrete operations might require our continued oversight over many years with no foreseeable end.

147. For these reasons, we decline to adopt rules that would relax interference protections to other MSS licensees based on MSV's assumption that the number of co- and adjacent-channel operations in the L-band is limited. To this end, we limit MSV to 1725 base stations carriers on any given 200 kHz channel. We will, however, entertain case-by-case requests by MSV to deploy more base stations than permitted by this rule upon a showing that there would be no increase in co-channel or adjacent channel interference to other MSS providers and that the MSS licensee's satellite service would not be affected

[390] MSV Dec. 16, 2002 *Ex Parte* Letter at 1.

[391] MSV Reply, Technical App. at 4.

[392] Inmarsat Comments, Technical Annex at Table 3.1-1.

[393] *See, e.g.,* Letter from Lon Levin, Vice President, Mobile Satellite Ventures, to Marlene H. Dortch, Secretary, Federal Communications Commission (Jan. 16, 2003) (MSV Jan. 16, 2003 *Ex Parte* Letter).

beyond that permitted in the rules.[394] Any request should also indicate whether or not all affected parties to the 1996 Mexico City MOU agree to the proposed additional terrestrial operations.

(ii) Effect of ATC Base Stations on Inmarsat MES

148. Inmarsat raised concerns about the potential for interference that MSV's ATC base stations could cause to its MET receivers.[395] This potential for interference may exist in four ways: (1) overload[396] of the Inmarsat land-based MET receiver when it is near an ATC base station; (2) out-of-band interference to the Inmarsat land-based MET receiver from ATC base stations; (3) aggregate interference to an airborne Inmarsat MET receiver from a large number of MSV base stations visible from an aircraft; and (4) overload of an airborne Inmarsat MET receiver from an ATC base station. We evaluate each of these potential interference situations. Our evaluation assumes that the ATC base stations must operate with no more than 19.1 dBW per carrier and no more than 3 carriers per cell. The base station must use a left-hand-circular-polarization (LHCP) antenna with 16 dB of peak gain and an overhead gain suppression of 40 dB outside of the main lobe of the antenna. The EIRP towards the horizon must be limited to 14.1 dBW per carrier and the base station will implement a power control algorithm of 30 dB in 2 dB steps. We examine the potential for interference from MSV's base stations in these four cases and determine it to be minimal.

149. *Inmarsat MET Receiver Overload*. Inmarsat claims that if an MSV base station is operating within 100 meters of one of its METs, the MET will receive a signal that is significantly above that which would saturate or overload its MET receiver. Inmarsat assumes in its analysis that MSV will have 25 carriers per ATC cell, that its MET will overload or saturate when exposed to –120 dBW of interfering power (or –90 dBm), that the MSV base station antenna discrimination would be 0 dBi when the MSS terminal is 100 meters from a base-station antenna (i.e., there would be no antenna discrimination), and that the signal attenuation from the base station to the MET would be free-space loss (*i.e.*, no blockage from buildings or other sources is taken into account).[397]

150. In contrast, MSV states that the maximum number of carriers per ATC cell in its design is only 3, that it has tested a representative ensemble of satellite terminals to determine actual, as-built desensitization/overload thresholds that demonstrates the saturation level to be –45 dBm, that, in practice, its base station antennas will typically be on a tower or building and the angle from the base-station antenna main-beam to the MET receiver would lead to a discrimination value of –12.5 dB, and MSV uses the Walfisch-Ikegami (WI) propagation model which predicts 94 dB of loss versus the 76 dB of free space loss assumed by Inmarsat.[398]

151. In our analysis of ATC base stations overloading Inmarsat MET stations, we use three carriers per cell in accordance with MSV ATC design parameters. We also assume a receiver saturation

[394] *See generally* App. B (adopting 47 C.F.R. § 25.253).

[395] Inmarsat Dec. 6, 2001 *Ex Parte* Letter at 7.

[396] Receiver "overload" or "saturation" occurs when the input total power is sufficient to drive the receiver from its normal, operational linear state, into a non-linear state. The resulting non-linear state results in the distortion of the desired input signals and, for severe overload, the inability of the receiver to operate.

[397] Inmarsat Comments, Technical Annex at Section 3.3.1.

[398] MSV Reply, Technical App. at § III.

value of –60 dBm.[399] The –60 dBm value is considerably more conservative (by 15 dB) than the threshold value of –45 dBm measured by MSV for an Inmarsat mini-M terminal.[400] Assuming a –60 dBm threshold value for receiver overload should be sufficient to take account of Inmarsat's MET receiver susceptibility to overload interference principally because a -50 dBm value is the standard for airborne terminals.[401] Furthermore, we use a value of –12.5 dB as the amount of antenna discrimination between the base station antenna and Inmarsat's MET at 100 meters. Recommendation ITU-R F.1336 indicates that it is possible to have as much as 24 dB of antenna discrimination between an ATC base station antenna and a MET located 100 meters from the base station.[402] We therefore believe that the 12.5 dB value proposed by MSV in its analysis is reasonable to use in ours. Last, we assume a value of 86 dB of attenuation due to path loss in our analysis of overload interference. The 76 dB value proposed by Inmarsat is close to the calculated free-space-loss if the antenna is located on a 50-meter tower 100 meters from the MET. We base our use of 86 dB on a program formulated by the National Institute of Standards and Technology, which compares various propagation models and produces a range of expected loss from 80 to 94 dB due to path loss for this situation.[403]

152. Taking the above factors into account, our analysis indicates that any signal loss between an MSV ATC base station and the Inmarsat MET greater than approximately 86 dB should be sufficient to protect an Inmarsat MET from overload interference in an urban environment.[404] Indeed, all of the propagation models, except free-space, predict an urban environment loss greater than 86 dB at virtually all locations, even most of those within 100 meters of the MSV base station. The actual loss is a strong function of the surrounding environment and the propagation model used. It is possible that in limited situations, particularly in urban settings, the free-space loss between an Inmarsat terminal and a base station may be less than 86 dB. Nevertheless, all of the urban and city propagation models used predict a loss significantly higher than the free-space model and we do not expect overload interference from ATC base stations to Inmarsat METs in an urban environment to be problematic. We do not anticipate that many ATC base stations will be deployed outside of urban areas and the probability of unacceptable interference to METs outside of urban areas will be low. Although there may be a few instances where an Inmarsat MET receiver will be overloaded by a nearby ATC base station, we provide further protection by adopting section 25.253(c)(2), which limits ATC base stations to a maximum EIRP level of 14.1 dBW toward the horizon to protect other MSS system METs from overload interference.[405]

153. Though in these cases, occasional, limited periods of saturation of Inmarsat's terminals operating in these areas could occur, we expect this to occur rarely. This possibility must be considered in light of the already limited usage of L-Band terminals in urban settings due to line-of-sight interruption between the Inmarsat terminals and the satellite due to buildings, trees and other obstructions. As discussed above in this Order, we believe that the use of an ATC system in addition to a MSS system is a

[399] *See infra* App. C1 § 1.2.4.

[400] *See* MSV Reply, Technical App. at 14.

[401] *See* Boeing April 8, 2002 *Ex Parte* Letter, Technical Analysis at 10.

[402] *See infra* App. C2 at Figure 1.8.A.

[403] *See infra* App. C2 § 1.6.

[404] *See infra* App. C2 § 2.2.1.A.

[405] *See infra* App. B (adopting new rule 47 C.F.R. § 25.253(e)(2)).

more efficient use of the spectrum than the use of MSS systems alone.

154. Certain open areas such as airports and harbors, even within an urban environment, offer large building-free areas where signal propagation from a base station is best characterized as free-space propagation. We have analyzed these areas and we adopt limits to protect airborne and maritime Inmarsat terminals in these locations. [406] Maritime Inmarsat terminals, such as the Inmarsat-B terminal, utilize larger antennas than the typical airborne Inmarsat terminal. The use of different antennas means the protection criteria for airports will differ from the protection criteria for harbors. Based upon calculations contained in Table 2.2.1.3.A of the L-Band Technical Appendix C2, the MSV base station should be placed 470 meters from a runway or aircraft stand area. This assumes that two base stations are visible to the aircraft. Additionally, the ATC base station shall produce a power flux density at the edge of the airport of no more than -73.0 dBW/m^2 per 200 kHz. We adopt section 25.253(c)(3) to codify these limits on ATC base station emissions near airports to protect aircraft earth stations. In the case of Inmarsat terminals operating on boats and ships, we find that a separation distance of 1.5 km (0.9 miles) is required for the protection of the Inmarsat-B terminal from an ATC base station if there is a clear view of the water from the base station. We adopt this separation distance in our Rules. Additionally, a pfd of -64.6 dBW/m^2 per 200 kHz shall be maintained at the waters edge of any navigable waterway. We, therefore, adopt section 25.253(c)(5) to codify these limits on ATC base station emissions near harbors and navigable waterways to protect maritime Inmarsat terminals [407]

155. *Out-of-Band Interference to Inmarsat METs*. Inmarsat also expressed concern about the possibility of out-of-band interference from MSV's ATC base stations to its MET receivers.[408] In MSV's analysis, it assumes an out-of-band suppression level of -57.9 dBW/MHz (-118 dBW/Hz) for its base stations based on Ericsson's commitment to designing MSV's equipment to meet that value.[409] MSV assumes, as in the overload case, that there will be 12.5 dB of antenna discrimination between the ATC base station and the Inmarsat MET. It also assumes 8 dB of polarization isolation between the base station antennas and the MET antennas used by Inmarsat.[410] Alternatively, Inmarsat assumes an out-of-band emission value of –27 dBW/200 kHz (-80 dBW/Hz), no antenna gain discrimination from the ATC base station to the Inmarsat terminal, and 3 dB of polarization isolation.[411]

156. The details of both MSV's and Inmarsat's analyses are compared in Appendix C2, Table 2.2.1.2.A. The table also contains the assumptions we used in analyzing the impact of out-of-band interference. We use the out-of-band emission attenuation value that MSV proposed and which its equipment manufacturer is committed to meeting. For the reasons discussed in the receiver overload section, above, we use a –12.5 dB value for antenna discrimination between the ATC base station and the Inmarsat MET and assume a propagation loss between the transmitter and receiver in an urban environment of 86 dB of attenuation. Since the two systems will use orthogonal circular polarized antennas, and both antennas are viewed outside of their main beams, we do not assume a large value of

[406] *See infra* App. C2 § 2.2.1.B.

[407] *See infra* App. B (adopting new rule 47 C.F.R. § 25.253(e)(5)).

[408] Inmarsat Comments, Technical Annex, § 3.4.

[409] *See* MSV Jan. 11, 2002 *Ex Parte* Letter at 26; MSV Comments at Ex. E.

[410] *See* MSV Jan. 11, 2002 *Ex Parte* Letter at 26.

[411] Inmarsat Comments, Technical Annex, Table 3.4-1.

polarization discrimination.

157. Based on our analysis of out-of-band interference from ATC base stations to Inmarsat MET receivers, and taking all of the above factors into account, we conclude that an Inmarsat MET could experience a noise increase of approximately 3%. This is in contrast to 600,000% calculated by Inmarsat in its analysis.[412] The Noise to Interference ratio (N/I) that corresponds to 3% is 15 dB (i.e., the noise produced by the ATC base station in the Inmarsat MET will be 15 dB below the noise floor of the receiver) and the Inmarsat MET receiver performance should not be adversely affected by the MSV base station. This situation should not be problematic. As discussed above in this Order, we believe that a more efficient use is made of the spectrum by having both ATC and MSS operations in the urban environment rather then the MSS operations alone. We adopt an ATC Base Station out-of-band emission limit of -57.9 dBW/MHz in section 25.253(b) to protect other MSS system METs from ATC out-of-band interference.[413]

(iii) Effect of ATC on Airborne Inmarsat Terminals

158. *Out-of-Band Interference to Airborne Inmarsat METs*. Inmarsat performed an analysis to assess the possibility of an airborne Inmarsat terminal receiving interference from a large number of MSV ATC base stations at various elevation angles while the aircraft is flying at a worst-case altitude of 302 meters (1000 feet).[414] From an altitude of 302 m, a circular area approximately 164 kilometers (100 miles) from edge-to-edge[415] is visible from the aircraft. Inmarsat's analysis conservatively assumes that there would be 1000 ATC base stations in this visible area and Inmarsat refers to ITU-R Recommendation F.1336[416] as evidence that, at best, an antenna isolation of only approximately 10 dB is available from any one of the ATC base station antennas within that visible area.[417] We compare Inmarsat's analysis with MSV's assessment of the potential for interference to Inmarsat airborne receivers.[418]

159. One important factor in analyzing the potential for interference, however, is the amount of isolation expected to occur between the aircraft terminal and the ATC base stations in the area visible to the aircraft. We developed such a model to determine the amount of isolation that should be expected based on Inmarsat's parameters. Specifically, our model randomly distributes 1000 potentially interfering ATC base station transmitters across the area visible to the aircraft flying at an altitude of 302 meters. It

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412 *Id.*

413 *See infra* App. B (adopting new rule 47 C.F.R. § 25.253(c)).

414 Inmarsat Comments, Technical Annex, § 3.3.2.

415 An MSV Base station antenna with a height of 30 meters is visible from an aircraft at an altitude of 302 meters at a distance of 81.9 kilometers.

416 ITU-R Recommendation F.1336, *Reference Radiation Patterns of Omnidirectional, Sectoral and Other Antennas in Point-To-Multipoint Systems for Use in Sharing Studies In The Frequency Range from 1 GHz to about 70 GHz*, *available at* <http://www.itu.int/itudoc/itu-r/archives/rsg/1998-00/rwp9d/43844.html> (last visited, Jan. 10, 2003).

417 Inmarsat Comments, Technical Annex, § 3.3.2. Inmarsat compares its assumption that MSV's ATC base station antennas will have only 10 dB of overhead antenna discrimination to the aircraft versus MSV's assumption that a maximum isolation of 40 dB is achievable.

418 MSV Jan. 11, 2002 *Ex Parte* Letter at 22-25; MSV Reply, Technical App. at 22.

then calculates the line-of-sight distance from each visible base station to the aircraft, sums the propagation loss between each base station and the aircraft antenna, yielding the aggregate ATC base station signal attenuation level (i.e., isolation factor). Our model calculates an expected isolation of 105.1 dB between an airborne Inmarsat MET and the population of ATC base stations visible to the aircraft.[419] Our interference analysis also uses MSV's out-of-band suppression value of 68 dB in the part of the frequency band used by Inmarsat and it assumes that an average gain of 0 dB from the Inmarsat antenna will be available because the antenna will be mounted on the upper surface of the aircraft.

160. Our results show that there is a potential increase in the Inmarsat receiver noise floor of approximately sixteen percent[420] as opposed to MSV's calculated value of five percent.[421] However, a better criterion to use is the interference-to-noise ratio (I/N) at the receiver. According to our calculations, the worst case I/N is approximately -8 dB, whereas MSV's I/N works out to be -13 dB. In other words, the interference is 8 dB less (or reduced by a factor of 9) than the self-inherent noise of the Inmarsat airborne receiver. This level of added noise would not hinder the operation of the airborne receiver. Moreover, the situation improves dramatically as the aircraft altitude is increased. For example, raising the altitude to 5000 ft increases the I/N ratio to approximately -17 dB. At this point the interference is negligible. To ensure the protection of airborne METs of other MSS systems, we adopt section 25.253(e), which requires a maximum overhead gain suppression of 40dB.

161. *Inmarsat Airborne Receiver Overload.* Inmarsat also contends that there exists the possibility of an airborne Inmarsat terminal being overloaded by ATC base stations.[422] Our analysis of potential saturation of airborne Inmarsat terminals again uses Inmarsat's parameters of 1000 base stations visible to a low-flying aircraft at 302 meters (1000 feet) and that the same isolation factor of 105.1 dB would result. We use the –50 dBm receiver overload threshold for the airborne terminals.[423] Based on these input parameters, we conclude that there exists 10 dB of margin against receiver overload from ATC base stations. As indicated for the out-of-band case, however, as the altitude of the aircraft is increased the margin against saturation increases significantly. Given the conservative nature of our model (e.g., antenna gain patterns, 1000 base stations in the visible area,[424] the lowest acceptable aircraft altitude, and no account of terrain shielding), overload from ATC base stations is not expected to be an issue for airborne Inmarsat terminals.

(iv) Other Inmarsat Arguments

162. *Constraint of Future Development of MSS.* Inmarsat claims that adopting ATC limits designed to protect only today's spacecraft would preclude more advanced spacecraft from operating.[425]

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[419] In comparison, MSV calculates an isolation factor of 101.6 dB. *See* MSV Reply, Technical App. at 24.

[420] *See infra* App. C2 § 2.2.3.

[421] MSV Reply, Technical App. at 23.

[422] Inmarsat Comments, Technical Annex § 3.3.2.

[423] *See infra* App. C2 at Table 2.2.3.2.A.

[424] In developing this computer model, we assumed maximum of 1000 base stations was assumed. While we realize that the area visible to an aircraft increases with altitude, we kept constant the number of base stations at 1000. This number of base stations was felt to be conservative.

[425] Inmarsat Nov. 6, 2002 *Ex Parte* Letter, Attach. 1 at 14-15.

By more advanced spacecraft, Inmarsat is specifically referring to those having higher antenna gains and higher gain-to-receiver noise temperatures (G/T) ratios. We disagree. The advance in spacecraft technology to which Inmarsat is referring is due to advances in technology that generate high-gain, multiple-beam antenna patterns. There are two situations to consider: (1) in-beam/out-of-band and (2) out-of-beam/in-band (or co-frequency). In the first situation, isolation between the two systems is provided by the transmitter out-of-band specifications. If two different MSS systems cover the same geographic area with two different generation satellites, the newer generation system with the higher gain antenna will not necessarily suffer a larger degradation in receiver noise floor. Table 2.1.1.A of Section 2.1 of Appendix C2 analyzes this co-beam, adjacent channel case and shows that the MSS terminals of the fully loaded current-generation MSV system will cause a 3.5% increase in noise temperature of each beam of the current generation Inmarsat MSS system that has four beams covering the United States. For the next-generation system with 100 beams covering the United States, the increase in receiver noise is 3.8% or approximately the same. In this case, the next-generation system has a larger number of smaller antenna beams (100 vs. 4) each with appreciably higher gain (41 dBi vs. 27 dBi). While the next generation system has higher gain, which makes each individual MSV MSS terminal result in a higher increase in interference, the area covered by each beam is smaller. Because the beam is smaller, it encompasses fewer MSS terminals and the two effects balance resulting in the approximately same total noise for the current and next generation systems.

163. Table 2.1.1.C of Appendix C2 addresses the second case where the intersystem isolation is created by the spacecraft antenna. The Table indicates that the interference level does, in fact, go up as the antenna gain increases. Two of the current MSV MSS terminals in the side-lobes of the Inmarsat 3 satellite antenna will increase the Inmarsat receiver noise level by 58.6%. Because of the higher satellite antenna gain on the Inmarsat 4 satellite, the same MSS terminals in the side lobes of the Inmarsat 4 satellite, antenna increase the receiver noise by 794%. However, using the next generation MSV MSS terminals, the increase in the receiver noise levels is reduced to 1.8% and 23.9% respectively for Inmarsat-3 and Inmarsat-4. This indicates that, considering only the MSS operations, there will be a limit to the differences in technology between the systems that can share on a co-frequency basis. If one system implements a very sensitive satellite system ahead of another MSS system the new system may be at a disadvantage. With respect to the ATC, we note that in the case of both Inmarsat-3 and Inmarsat-4, the calculated noise floor increase from ATC operations is significantly less than from the MSV MSS operations. The issue, therefore, is not that ATC could constrain the future development of the MSS, but that the imbalance between current and future MSS systems that are operating on a co-frequency basis could end up constraining antennas used on the most advanced MSS system.

164. *Appropriate Technical Factors for Calculating ATC Limits in the Uplink Band*. Inmarsat states that the ATC should be limited so that the increase in the Inmarsat receiver noise floor is no more than 1%, and a 20 dB margin 'to allow future spacecraft technology development' should be used in calculating this 1%.[426] We are not aware any national or international requirement to limit the interference to or from any system to an increase in system noise of 1%. Historically, a 6% increase in a system's noise temperature has been used as a coordination trigger for space systems. That is, if the interference power from one space system causes a noise temperature increase of less than 6% in another space system then coordination is not required. However, as Inmarsat has shown the typical increase in noise level of the Inmarsat 3 satellite, resulting from the L-Band MSS coordination process, is on the order of 29%, which is much higher[427] than the typical coordination trigger of 6%.[428] Inmarsat also

[426] *Id.* at 17.

[427] In a coordination process system operators are not bound by any particular inter-system interference limit.

contends that, without prejudicing the L-Band MSS coordination process, the same increase in Inmarsat 4 system's noise temperature can be expected from MSV's next generation MSS operations.[429] We conclude that as long as the increase in receiver noise from the ATC is significantly less than the increase in noise resulting from the MSS operations, that sharing is feasible, and we disagree with Inmarsat's suggested 1% limit. Inmarsat also suggests that a 20 dB margin be used in determining the increase in noise to an MSS satellite receiver from ATC to allow for future spacecraft technology development. As discussed above, we conclude that the MSS operations are the limiting factor in co-frequency sharing between MSS systems and not the ATC operations. Therefore, no specific margin is required.

165. MSV argues that it is possible to use a specific technique for measuring the ATC emissions being received at its spacecraft.[430] MSV asserts that it can use its satellites to monitor the level of aggregate interference caused by its terrestrial communications services to its satellite system. To be assured that its own network will inter-operate with maximum efficiency, MSV indicates that its system will be deployed with built-in monitoring capabilities to assess on a real-time basis the terrestrial signal that is generated by MSV's terrestrial operations.[431] Based on inputs from monitoring, closed loop feedback control will be imposed on the terrestrial network such that the aggregate terrestrial signal being measured by MSV's satellites does not approach potentially harmful limits. Moreover, MSV indicates that it is prepared to monitor and report the aggregate signal power being received at its satellites from its mobile terminals operating in the terrestrial mode, and limit those operations accordingly to the extent necessary to protect its own satellite operations and those of Inmarsat.[432] This technique would permit measurement of the aggregate terrestrial uplink power at the MSV satellite. MSV states that the techniques that it can use are proprietary because of possible patentable ideas. But a total increase in noise power at the satellite receiver of 0.25 dB, MSV states, can be measured.

166. Inmarsat opposes the use of "aggregate uplink PFD limits" as a way of constraining L-band emissions.[433] It contends that it would be difficult to apportion the PFD among various countries in view of the MSS satellites and among the various systems operating in this band would, for a number of reasons, be difficult to measure. [434] Inmarsat maintains that because MSV's MSS satellite operates at a different orbital location than the Inmarsat spacecraft, the level of terrestrial interference that each spacecraft actually receives from MSV's terrestrial terminals will vary.[435] Inmarsat also indicated that it would be difficult to monitor and control L-Band terrestrial emissions via aggregate emission limits.

167. We agree with Inmarsat that it would be difficult to monitor and control L-Band emissions on an aggregate basis. We are not convinced that it is possible to accurately and repeatedly

(Continued from previous page)

[428] Inmarsat May 10, 2002 *Ex Parte* Letter at 3.

[429] This is also close to the increase in Inmarsat 4 noise temperature, resulting form MSV's MSS operations that we calculated in Table 2.1.1.C (33.5% versus 29%)

[430] MSV Reply, Technical App. at 10-11.

[431] *Id.* at 10.

[432] *Id.* at 11.

[433] Inmarsat Nov. 6, 2002 *Ex Parte* Letter at 18.

[434] *Id.* at 12.

[435] Inmarsat Reply at 17.

measure such a small increase in the noise floor of a satellite receiver due solely to ATC transmissions. Factors such as equipment inaccuracies, changes in downlink atmospheric losses, the difficulty of separating the ATC emissions from multiple L-Band sources within the MSV system and the effect of having multiple L-Band MSS systems contribute to the impracticality of this technique. It is possible, however, to limit the maximum number of ATC transmitters that can operate at one time from the United States territory and we take this approach. We adopt a limit of 1725 Base Stations that can be deployed to operate on any 200 KHz channel in section 25.253(c) to achieve the same effect.

168. Inmarsat maintains that all co-frequency transmitters within the affected side lobes of its MSS satellites' uplink beams must be constrained, and that this includes any ATC transmitters in the US, Canada, Mexico and Central and South America.[436] ATC transmitters greater than approximately 3 or 3½ satellite beam-width, away from an Inmarsat beam will be decoupled from the beam in question by at least 30 dB and will not contribute substantially to co-channel interference in that beam.[437] Additionally, as shown by Inmarsat, beams within approximately 2 to 2 ½ beam-widths of the coastline of the United States, Canada, Mexico, Central America and the Northern part of South America are constrained from Inmarsat co-channel operations because of the MSS operations of other L-Band MSS systems.[438] This potentially leaves a small set of Inmarsat beams that could potentially be affected by ATC co-frequency operations. However, as we have stated, if the interference power generated by the ATC is significantly less than that generated by the co-frequency MSS operations then there should not be an interference issue.

169. *Appropriate Technical Factors for Calculating ATC Limits in the Downlink Band*. Inmarsat enumerates a number of technical factors it believes should be taken into account in calculating limits for any ATC operation for protection of an Inmarsat receiver from saturation in the downlink band.[439] This subject is treated in detail in the Technical Appendix C2.[440] Inmarsat also addressed what it calls "appropriate"[441] technical factors to protect an Inmarsat MET from unwanted emissions. Again this subject is treated in the Technical Appendix C2. As discussed in detail in the Appendix C2, Section 1, we have considered Inmarsat's assumptions, as well as MSV's and we can not agree with all of Inmarsat's proposed technical factors.

b. Inter-service Sharing – Protection of Adjacent Service Systems

170. Several services are allocated spectrum that is between and adjacent to the 1525-1559 MHz and 1626.5-1660.5 MHz L-band MSS spectrum. Between the frequency bands, the AMS(R)S and aeronautical terrestrial services are allocated spectrum in the upper L-band, and the GMDSS and Search and Rescue Satellite (SARSAT) downlinks operate in portions of the lower L-band. At the top edge of the uplink MSS band, above 1660 MHz, the Radio Astronomy Service is allocated spectrum within and adjacent to the L-Band spectrum. Below the 1626.5 MHz MSS band edge, Big LEO MSS systems

[436] Inmarsat Nov. 6, 2002 *Ex Parte* Letter at 11.

[437] *Id.* at 7.

[438] *See* Inmarsat Sept. 12, 2002 *Ex Parte* Letter at 10.

[439] Inmarsat Nov. 6, 2002 *Ex Parte* Letter at 19.

[440] *See infra* App. C2 § 2.2.1.A.

[441] Inmarsat Nov. 6, 2002 *Ex Parte* Letter at 20.

operate in the MSS allocation from 1610-1626.5 MHz. Several services are allocated spectrum adjacent to the 1525-1559 MHz band as well. Below the 1525 MHz band edge, Mobile Aeronautical Telemetry systems operate in the 1435-1525 MHz allocation. Above the 1559 MHz band edge, the Global Positioning System operates in the 1559-1610 MHz Radionavigation Satellite Service (RNSS) allocation. We assess the potential for L-Band ATC operations to interfere with these services.

(i) Systems Operating Within the 1525-1559 MHz and 1626.5-1660.5 MHz Bands of the L-Band Spectrum

171. Footnote US308 to the U.S. Table of Allocations provides priority to AMS(R)S systems in the upper L-band.[442] In 1993, NTIA and the Federal Aviation Administration (FAA) proposed a minimum set of capabilities to ensure that METs operating in the band 1545-1559 MHz and 1646.5-1660.5 MHz comply with Footnote US308 and ITU Radio Regulation S5.357A.[443] MSS METs that are authorized to provide MSS in the upper L-band are subject to meeting these conditions. MSV's ATC operations (MT and base stations) must meet the same conditions to protect AMS(R)S to comply with footnote US308. Indeed, MSV demonstrates in its comments that its ATC system will possess inherent features for handling priority communications to comply with the same priority and preemption requirements that its MSS system must comply with according to US308.[444] Specifically, MSV's ATC system will be capable of prohibiting entire populations of mobile terminals from accessing its system to provide spectrum for AMS(R)S.[445] In addition to its priority capabilities, the MSV system will also be capable of preempting active channels automatically and immediately (i.e., in less than one second, the MSV gateway would be able to allocate the preempted resource(s) to the AMS(R)S).[446] Terminals would be preempted from providing MSS and ATC through MSV's ability to simultaneously preempt corresponding satellite and terrestrial resources by the use of a centralized and common control facility for space and ground assets.[447] Based on MSV's representations, we conclude that its ATC system will meet the priority and preemption requirements that it is obligated to meet to comply with Footnote US308. We adopt section 25.253(a)(5) to require that, at time of license application, ATC operators demonstrate how they will comply with the requirements of US308.

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[442] 47 C.F.R. § 2.106, n.US308. Footnote US308 to the U.S. Table of Frequency Allocations provides as follows: "In the frequency bands 1549.5-1558.5 MHz and 1651-1660 MHz, the Aeronautical-Mobile Satellite [R] requirements that cannot be accommodated in the 1545-1549.5 MHz, 1558-1559 MHz, 1646.5-1651 MHz and 1660-1660.5 MHz bands shall have priority access with real-time capability for communications in the mobile satellite service. Systems not interoperable with the services shall operate on a secondary basis." The ITU Radio Regulation contains a similar priority-and-preemptive-access requirement. *See* ITU Radio Regulations, S5.357A, *available at* <http://people.itu.int/~meens/Pt2/RR/s5note2.htm> (last visited, Dec. 24, 2002). In addition, we note that in the 1545-1549.5 MHz, 1558-1559 MHz, 1646.5-1651 MHz and 1660-1660.5 MHz bands, MSS is secondary to AMS(R)S and the 1660-1660.5 MHz band is reserved for AMS(R)S with the further condition that mobile earth stations operating in these bands shall not cause harmful interference to stations in the Radio Astronomy Service.

[443] *See* Letter to Cheryl Tritt, Chief, Common Carrier Bureau, Federal Communications Commission, from Richard D. Parlow, Associate Administrator, Office of Spectrum Management, NTIA, and Gerald Markey, Manager, Spectrum Engineering Division, FAA (Jan. 14, 1993).

[444] *See, e.g.,* MSV Comments, Technical App., Section V.

[445] MSV Comments, Technical App. at 8-9.

[446] *Id.*, Technical App. at 10.

[447] *Id.*, Technical App. at 11.

172. On a related matter, the Aviation Industry Parties jointly oppose the FCC's ATC proposal insofar as it would permit licensing terrestrial base stations to provide land mobile service in the upper L-band MSS/AMS(R)S allocation.[448] Current aviation requirements and new initiatives, the Parties assert, depend upon continued access to interference-free use of the upper L-band MSS allocation with real-time priority and preemptive access to the entire spectrum in the allocation when the need arises. According to the Parties, the proposal by MSV to add a terrestrial land mobile service to the L-band MSS allocation would increase the risk of interference to critical safety communications with aircraft in flight and diminish the unique spectrum available for aviation systems.[449] NTIA analyzes potential interference to the Inmarsat-4 satellite based upon its usage in the AMS(R)S and GMDSS services.[450] NTIA asserts that, based upon MSV's analysis, interference to Inmarsat-4 satellite receivers could be possible.[451] NTIA also expresses concern over possible interference from ATC BSs to Inmarsat METs operating as AMS(R)S receivers.[452] We address the potential for MSV's ATC system to interfere with the Inmarsat system, specifically, and conclude that it is possible to provide ATC in the L-Band without causing unacceptable interference to Inmarsat's current and planned satellite networks. Also, we require MSV's ATC system operators, as mentioned above, to demonstrate how the ATC system is capable of complying with the AMS(R)S priority and preemption requirements that it is obligated to meet under Footnote US308 and under the ITU Radio Regulations.

173. In the *Flexibility Notice*, we noted that, according to Footnote US309, terrestrial stations are permitted to operate in the frequencies allocated to the AMS(R)S.[453] The Aviation Industry Parties and MSV do not take issue with US309 with respect to potential interference that could be caused to stations operating under the footnote allocation. Rather, ICO and MSV contend that the existence of the footnote for aeronautical terrestrial stations in the AMS(R)S supports their claim that it is possible to have a footnote allocation for ATC operations.[454] The incorporation of ATC into the U.S. Table of Allocations

[448] Aviation Industry Comments at 6-10.

[449] The Aviation Parties add that their industry will be making increased demands on the Inmarsat system and the upper L-band spectrum for safety communications, that MSV's system is not interoperable with the AMS(R)S system described in the Standards and Recommended Practices (SARPS) of the International Civil Aviation Organization (ICAO), and that MSV's system does not provide any significant coverage on over-ocean routes and in remote areas of the world where ground infrastructure is inadequate. *See* Aviation Industry Comments at 6-10; Boeing Reply at 8.

[450] *See* NTIA Nov. 12, 2002 *Ex Parte* Letter at Encl. 4.

[451] Specifically, NTIA calculates that interference would occur if more than 661 MTs transmitted simultaneously on the same frequency as an Inmarsat-4 beam. *See* NTIA Nov. 12, 2002 *Ex Parte* Letter, Encl. 4 at 6. MSV has asserted that 2000 MTs operating on the same basis would not cause harmful interference. *See* MSV Jan. 11, 2002 *Ex Parte* Letter at 25.

[452] *See* NTIA Nov. 12, 2002 *Ex Parte* Letter at Encl. 3.

[453] *Flexibility Notice,* 16 FCC Rcd at 7, ¶ 12 n.27. We note that footnote US309 expressly provides that "[t]ransmissions in the bands 1545.5-1559 MHz from terrestrial aeronautical stations directly to aircraft stations, or between aircraft stations . . . are also authorized when such transmissions are used to extend or supplement the satellite to aircraft links. Transmissions in the band 1646.5-1660.5 MHz from aircraft stations . . . directly to terrestrial aeronautical stations, or between aircraft stations, are also authorized when such transmissions are used to extend or supplement the aircraft-to-satellite links." *See* 47 C.F.R. § 2.106 n.US309.

[454] *See* ICO Comments at 48; MSV Comments at 32. Indeed, there are no terrestrial stations operating in conjunction with AMS(R)S systems currently in operation that could receive interference. *See* AIP Comments at 7.

is addressed in Section III.F of this Order.[455]

174. Similar to the priority granted to AMS(R)S in the upper L-Band, footnote US315 to the U.S. Table of Allocations provides priority to the GMDSS in the lower L-band spectrum.[456] Recently, the Commission established rules listing the minimum set of capabilities to ensure that METs operating in the bands 1530-1544 MHz and 1626.5-1645.5 MHz frequency bands comply with Footnote US315 and ITU Radio Regulation S5.353A.[457] MSS METs that are authorized to provide service in the lower L-Band are subject to meeting these conditions.[458] ATC operations (MT and base stations) must meet the same conditions to protect GMDSS to comply with footnote US315. MSV demonstrates in its comments that its ATC system will be capable of prohibiting entire populations of mobile terminals from accessing its system thereby providing priority to GMDSS automatically and immediately (i.e., in less than one second, the MSV gateway would be able to allocate the preempted resource(s) to the GMDSS).[459] Terminals would be preempted from providing MSS and ATC through MSV's ability to simultaneously preempt corresponding satellite and terrestrial resources by the use of a centralized and common control facility for space and ground assets.[460] NTIA expressed concern that ATC operations could cause interference to GMDSS receivers.[461] Based on MSV's representations, we conclude that its ATC system will meet the priority and preemption requirements that it is obligated to meet to comply with Footnote US315. We adopt section 25.253(a)(5) to require at time of license application, ATC system operators to demonstrate how they will comply with the requirements of US315.[462]

(ii) Systems Operating Within the 1626.5-1660.5 MHz Portion of the L-Band Spectrum

175. A portion of the Radioastronomy Service (RAS) allocation in the L-band overlaps with the L-Band MSS allocations from 1660-1660.5 MHz. The ITU has conducted studies and developed a

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[455] *See infra* § III.F.

[456] 47 C.F.R. § 2.106, n.US315. Footnote US315 to the U.S. Table of Frequency Allocations provides as follows: "In the frequency bands 1530-1544 MHz and 1626.5-1645.5 MHz, maritime mobile-satellite distress and safety communications, *e.g.*, GMDSS, shall have priority access with real-time capability in the mobile-satellite service. Communications of mobile-satellite system stations not participating in the GMDSS shall operate on a secondary basis to distress and safety communications of stations operating in the GMDSS. Account shall be taken of the priority of safety-related communications in the mobile-satellite service." Similar language is contained in the ITU's Radio Regulation 5.353A.

[457] *See L-Band MSS Rules Order,* 17 FCC Rcd 2720-2722, ¶¶37-40.

[458] *See* 47 C.F.R. § 25.136(d).

[459] MSV Comments, Technical App. at 10.

[460] *Id.*, Technical App. § V.

[461] *See* NTIA Nov. 12, 2002 *Ex Parte* Letter, Encl. 3 (addressing potential interference to both AMS(R)S and GMDSS receivers from MSV BS). For our analysis of this sharing situation, *see infra* App. C2 § 2.2.2.

[462] *See infra* App. B (adopting new rule 47 C.F.R. § 25.253(a)(5)).

Recommendation on protection requirements for Radioastronomy stations.[463] The RAS sites in the United States are identified in section 25.213(a)(1)(i) and (ii) of the Commission's Rules.[464] ATC operators should take all practicable steps to avoid causing interference to U.S. RAS observations in the 1660-1660.5 MHz band, consistent with Recommendation ITU-R RA.769-1 of the International Radio Regulations. Since RAS observatories in the U.S. are located in remote areas specifically to avoid receiving interference from radio frequency transmitters operating in and near the RAS spectrum, we anticipate that the potential for ATC METs to interfere with Radioastronomy observations in the 1660-1660.5 MHz band is significantly mitigated.

(iii) Systems Operating Within the 1525-1559 MHz Band Portion of the L-Band Spectrum

176. Search and Rescue Satellite (SARSAT) downlink operations are conducted in the 1544-1545 MHz band in accordance with Footnote S5.356 of the International Radio Regulations.[465] SARSAT uplink transmissions are located around 406 MHz from Emergency Position Indicator Radio Beacon (EPIRB) transmitters, which are downlinked in the 1544-1545 MHz band to various earth station receivers in located in the United States. The locations of these Earth stations are listed in the Appendix C2, Table 3.3.A. MSV is not authorized to provide MSS service in the 1544-1545 MHz band so the potential for interference is strictly an out-of-band case.[466] We note, however, that some of the SARSAT earth stations listed in Table 3.3.A. are located in or near urban areas where ATC base stations would be located.[467] In its filing, NTIA calculated the minimum coordination distance between a SARSAT station an ATC BS.[468] Our calculation, although based upon a different type of analysis, substantially agree with the analysis performed by NTIA.[469]

177. In Section 3.3 of Appendix C2, we analyze the potential for interference between transmitting ATC base stations operating in bands adjacent to the receiving SARSAT earth stations. We base our analysis on the MSV ATC base stations being capable of meeting an out-of-band emission level of -57.9 dBW/MHz as in our other interference analyses. We calculate that if an ATC base station is located more than 86 km from the SARSAT receivers, under free-space loss conditions, interference to the SARSAT earth station will not occur.[470] However, by using a rough terrain model, the distance is

[463] *See* ITU-R Recommendation, ITU-R RA.769-1, *Protection Criteria Used for Radioastronomical Measurements*, available at <http://www.itu.int/rec/recommendation.asp?type=items&lang=e&parent=R-REC-RA.769-1-199510-I> (last visited, Jan. 10, 2003).

[464] *See* 47 C.F.R. §25.213(a)(1)(i)-(ii).

[465] *See* ITU-R, Radio Regulations, n.S5.356, *available at* <http://people.itu.int/~meens/Pt2/RR/s5note2.htm#S5.356> (last visited Dec. 24, 2002); 47 C.F.R. § 2.106 n.S5.356 (incorporating international rule into domestic table of allocations). S5.356 states that the use of the band 1544-1545 MHz by the mobile-satellite service (space-to-Earth) is limited to distress and safety communications.

[466] *See L-Band MSS Rules Order*, 17 FCC Rcd at 2712, ¶ 19.

[467] *See* NTIA Nov. 12, 2002 *Ex Parte* Letter at Encl. 5.

[468] *See* NTIA Nov. 12, 2002 *Ex Parte* Letter at Encl. 5.

[469] *See infra* App. C2 § 3.3.

[470] *See infra* App. C2 at Table 3.3.B. This result is based on the worst case scenario of the main-beam coupling between the SARSAT receive antenna and the ATC base station transmitting antenna using free-space loss.

reduced to less than 27 km. As shown in Appendix C2, in many areas around the SARSAT stations, the radio horizon is less them 27 km. Therefore, path profiling (i.e., selecting locations for ATC base stations where main-beam coupling would be less likely to occur) would further reduce this distance. MSV shall take all steps to avoid causing interference to the SARSAT earth station located at the sites listed in Table 3.3.A of Appendix C2. We adopt section 25.253(f)(1) to require the ATC base station licensee to provide the Commission with sufficient information to complete coordination of any ATC base station placed within 27 km from one of the locations listed in Table 3.3.A and within the radio horizon of the SARSAT earth station prior to operation.

(iv) Systems Operating Adjacent to the 1626.5-1660.5 MHz Portion of the L-Band

178. MSV's ATC MTs will transmit to ATC base station receivers in the 1626.5-1660.5 MHz frequency band. Below the 1626.5 MHz band, Big LEO systems operate in the 1610-1626.5 MHz MSS allocation. Big LEO MSS MET emissions are limited in EIRP density by national and international regulations.[471] Additionally, Big LEO MSS METs are subject to the out-of-band emission mask contained in section 25.202(f) of the Commission's rules. Given these parameters, Big LEO systems must be capable of tolerating MET emissions in the 1610-1626.5 MHz band that range from -47 dBW/4KHz to –58 dBW/4kHz. The peak EIRP of MSV's ATC MTs is 0.0 dBW with a bandwidth of 200 kHz. Using the same section 25.202(f) out-of-band emission mask that applies to Big LEO terminals yields a maximum ATC MET emission level of –60 dBW/4kHz that could be present in the Big LEO frequency band. Since this value is lower than the more restrictive emission levels that Big LEO METs are permitted to emit in the Big LEO band, out-of-band emissions from MSV's ATC METs will not interfere with Big LEO systems operating in the adjacent spectrum.

(v) Systems Operating Adjacent to the 1525-1559 MHz Band

179. Mobile Aeronautical Telemetry (MAT) systems operate below 1525 MHz in the 1435-1525 MHz allocation in the United States and its possessions. MSV analyzed the interference situation and asserts that, under the worst-case scenario, there would be no interference to an MAT receiver if it is located at least 0.9 km from an MSV ATC base station.[472] However, we believe that radio line of sight would be the appropriate trigger for coordination between ATC base stations in the L-band and MAT stations operating in the adjacent spectrum because this trigger was used previously to coordinate Satellite Digital Audio Radio Service (SDARS) terrestrial repeaters operating near the 2360-2390 MHz MAT allocation.[473] We adopt section 25.253(f)(2) to require L-band ATC operators to take all practicable steps to avoid locating ATC base stations within radio line of sight of MAT receive sites in order to protect U.S MAT systems consistent with ITU-R Recommendation ITU-R M.1459. MSS ATC base stations located within radio line of sight of a MAT receiver must be coordinated with the Aerospace and Flight Test

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[471] See ITU Radio Regulations, Article 5, Table of Frequency Allocations, S5.364, *available at* <http://people.itu.int/~meens/Pt2/RR/s5note2.htm> (last visited, Dec. 24, 2002); 47 C.F.R. § 2.106 (incorporating S5.364 into the domestic table of allocations). Specifically, Big LEO METs are limited to an EIRP density of –15 dBW/4kHz in parts of the band where airborne electronic aids to air navigation are being developed, and –3 dBW/4kHz elsewhere in the band.

[472] A smaller distance of 0.1 km would be the result if there is no direct line of sight between the ATC base station and the MAT receiver. *See* MSV Jan. 11, 2002 *Ex Parte* Letter at 29.

[473] *See* Letter from William K. Keane, Counsel, Aerospace and Flight Test Radio Coordinating Council, to Magalie Roman Salas, Secretary, Federal Communications Commission, IB Docket No. 95-91 (filed Sept. 19, 2000) (submitting an agreement between AFTRCC and XM to use a line of sight trigger).

Radio Coordinating Council (AFTRCC) for non-Government MAT receivers.[474] For government MAT systems, the licensees must supply the Commission with sufficient information to coordinate with the Inter-department Radio Advisory Committee (IRAC) on a case-by-case basis prior to operation.[475] A listing of current and planned MAT receiver sites can be obtained from the AFTRCC for non-Government sites and through the IRAC Liaison for Government MAT receiver sites.

180. We also evaluated the potential interference to the Global Positioning System (GPS) from ATC BSs and MTs operating in the L-band. GPS operates in a portion of the 1559-1610 MHz Radionavigation Satellite Service (RNSS) allocation. In the *Flexibility Notice*, the Commission recognized that the unwanted emissions from terrestrial stations in the MSS will have to be carefully controlled in order to avoid interfering with GPS receivers.[476] The Commission specifically requested comment on whether limits for base stations similar to those specified in section 25.213(b) for mobile earth terminals (METs) are adequate to protect GPS receivers.[477] NTIA responded to our request for comment along with several other parties.[478] NTIA asserts that there are two issues that must be considered in the request for comment on the protection of GPS: (i) the frequency range(s) over which the emission level would be applicable; and (ii) whether the emission level established for a mobile earth station in an MSS system should be applied to ATC BSs and MTs.[479]

181. Since the release of the *Flexibility Notice*, the Commission has adopted the *GMPCS Order* that requires MSS METs transmitting on frequencies between 1610 MHz and 1660.5 MHz conform to two restrictions: a wideband limit of -70 dBW/MHz, averaged over 20 milliseconds, on the EIRP density of the out-of-band emissions in the 1559-1605 MHz frequency range and a narrowband limit of -80 dBW/700 Hz, also averaged over 20 milliseconds, on emissions in the 1559-1605 MHz frequency range.[480] The wideband emission level in the 1605-1610 MHz is determined by linear

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[474] AFTRCC is a professional organization of Radio Frequency Management Representatives from major aerospace manufacturing companies. *See* Aerospace and Flight Test Radio Coordinating Council Organization, *available at* <http://www.aftrcc.org/afintro.htm> (last visited, Dec. 30, 2002).

[475] IRAC is a government forum designed to assist the Assistant Secretary of the Department of Commerce in assigning frequencies to U.S. Government radio stations and in developing and executing policies, programs, procedures, and technical criteria pertaining to the allocation, management, and use of the spectrum. *See* IRAC Functions and Responsibilities, *available at* <http://www.ntia.doc.gov/osmhome/iracdefn.html> (last visited, Dec. 30, 2002).

[476] *Flexibility Notice,* 16 FCC Rcd at 15559 & 15565, ¶¶ 68 & 83.

[477] *Id*.

[478] *See, e.g.,* NTIA Nov. 12, 2002 *Ex Parte* Letter at 1-4; Globalstar July 1, 2002 *Ex Parte* Letter at 24; Letter from Bruce D. Jacobs, Counsel, Mobile Satellite Ventures L.P. and Raul R. Rodriguez, Counsel U.S. GPS Industry Council to Marlene H. Dortch, Secretary, Federal Communications Commission, IB Docket No. 01-185 at 1-2 (filed July 17, 2002) (*MSV/USGPSIC Agreement*).

[479] *See* NTIA Nov. 12, 2002 *Ex Parte* Letter at 2. NTIA also urges the Commission to adopt out-of-band emission levels for the newly allocated L2 (1215-1240 MHz) and L5 (1164-1188 MHz) frequency bands for future GPS operations.

[480] *GMPCS Order*, 17 FCC Rcd at 8936, ¶ 88. Additionally, separate licensing Orders for MSS METs in the L-band, NTIA filed comments urging the International Bureau to require METs to meet the -70 dBW/MHz and -80 dBW emission limits in the 1559-1610 MHz band. *See* Comments of the National Telecommunications and Information Administration, IB Docket No. 99-81, at 9 (filed, June 24, 1999), *available at*
(continued….)

interpolation from –70 dBW/MHz at 1605 MHz to –10 dBW/MHz at 1610 MHz. On NTIA's first point, then, the *GMPCS Order* expanded the frequency range from that required of section 25.213(b) to protect GPS from MSS MET out-of-band emissions. On NTIA's second point about whether the emission levels established for a mobile earth station in an MSS system should be applied to ATC BSs and MTs, NTIA indicates that the GMPCS emission limits in the 1559-1610 MHz band for METs operating in the 1610-1660.5 MHz frequency range are based on protection of a GPS receivers used on aircraft in a precision approach landing operational scenario and not to protect terrestrial operational scenarios.[481] NTIA is correct that the GMPCS rules, and the rules that we adopt here, that apply to MSS equipment are based on aircraft usage of the GPS system. [482] NTIA also expressed its concern and reluctance to limit the protection of GPS based on the aviation scenario only and believes strongly that protection of terrestrial uses of GPS such as E911-assisted GPS should be addressed.[483] We are extending this standard to apply to terrestrial based GPS subject to further consideration through a public notice that will be issued by OET.

182. The record before us does not support the adoption out-of-band emission levels more stringent than those required of GMPCS equipment. Nor does it support expanding the limits to frequency allocations other than the 1559-1610 MHz RNSS band. It would not be appropriate to apply more stringent out-of-band emission levels unilaterally to ATC equipment any more than it would be appropriate to apply more stringent out-of-band emission levels to terrestrial mobile systems such as PCS. Furthermore, we disagree with certain of the assumptions made by NTIA in its analysis to support its position that the out of band levels for L-Band ATC base stations and mobile terminals should be made more stringent than for GMPCS and terrestrial mobile equipment. For example, we do not agree that a 3 dB allowance for BS interference allotment included in the NTIA analysis for terrestrial GPS receivers or the 6 dB allowance for BS interference allotment included in the NTIA analysis for aviation GPS receivers are necessary.[484] We also are unpersuaded at this juncture by NTIA's assertion that it is appropriate to establish interference standards based on a 2 meter separation distance given that the probability of a L-band ATC MT transmitter located within 2 meters of a GPS receiver[485] is relatively small.[486] We recognize that NTIA disagrees with this assessment, which further warrants consideration of

(Continued from previous page)
<http://svartifoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6007946277> (last visited, Dec. 30, 2002).

[481] *See, e.g.,* NTIA Nov. 12, 2002 *Ex Parte* Letter at 1-4.

[482] *GMPCS Order,* 17 FCC Rcd at 8923-25, ¶¶ 49-52. The limits adopted in the *GMPCS Order* are based on an assumed separation distance of approximately 100 feet between an airborne GPS receiver and a single terrestrial transmitter.

[483] NTIA Jan. 24, 2003 *Ex Parte* Letter at 2-3.

[484] *See* NTIA Nov. 12, 2002 *Ex Parte* Letter, Encl. 1 at 7.

[485] *Id.*, Encl. 2 at 8.

[486] We estimate that the probability of an L-band ATC MT being located within two meters of a GPS receiver is on the order of 0.024%, assuming a cell size of 1 kilometer radius that is served by three sector antennas and 21 randomly distributed terminals within the cell. *See supra* § III(D)(1)(b). NTIA, however, states that the –70 dBW/MHz EIRP limit for ATC MTs results in a required distance separation of 107.8 meters between the GPS receiver and the ATC MT. For the same cell size (1 km radius) and the same number of MTs, NTIA states that the probability increases to 73%. We will seek comment on what constitutes appropriate protection for GPS operations through a public notice.

this issue through the OET public notice.

183. To protect GPS operations, therefore, we require L-band ATC BSs and MTs to meet the already established GMPCS wideband and narrowband out-of-band emission levels. MSV provides ATC base station equipment specifications that MSV claims demonstrates that its equipment manufacturer, Ericsson, is committed to meeting specific out-of-band emission attenuation requirements.[487] Furthermore, in order to demonstrate that its base stations will be capable of meeting the -70 dBW/MHz and –80 dBW for discrete spurious emissions measured in a 700 Hz bandwidth to protect GPS, MSV will operate its ATC base stations with a maximum transmit power of 23.9 dBW EIRP, per sector, and it will incorporate a 1.2 MHz guard band between the ATC base station transmission and the band edge of the RNSS allocation and the band edge of MSV's assignment.[488] Based on this information, MSV's base stations should be capable of meeting the -70 dBW/MHz (and –80 dBW for discrete spurious emissions) out-of-band emission levels in the RNSS allocation as required by other transmitters currently operating in frequency bands adjacent to GPS operations and interference to GPS aviation uses, as envisioned in the context of the GMPCS proceeding, is not expected.

184. On July 17, 2002, an agreement was submitted to the FCC jointly by the GPS Industry Council and MSV. This agreement specifies that the MSV ATC base stations will "[u]se filtering to achieve -100 dBW/MHz, or lower" emissions in the 1559-1605 MHz frequency band. Also, the ex parte filing states that the ATC Terminals will "[u]se filtering to achieve -90 dBW/MHz, or lower, in [the] short-term" and will "migrate to -95 dBW/MHz, or lower, for new terminals in 5 years (from the date MSV service is operational)" for emissions in the [1559-1605 MHz] band. The limits spelled out in this agreement are well below the GPS protection limits contained in the *GMPCS Order* and contained in the Commission Rules. We recognize the importance of the GPS system to commercial, government and consumer users. We fully support and encourage negotiations among parties whose operations may affect GPS. In certain instances, concerns have been expressed, including by Federal agencies, regarding protection of GPS operations. Though we are adopting the existing limit of -70 dBW/MHz for ATC operations, we plan to continue to assess the appropriate interference protection levels for GPS. As discussed above, OET will issue a public notice shortly soliciting comments from all stakeholders to assist in the examination of what changes in the level of protection for GPS, if any, should be established in the future.

c. Technical and Operational Provisions for L-Band ATC

185. *Additional Spectrum to Support ATC*. Inmarsat contends that MSV's ATC operations will degrade the performance of its own space-based services, reduce the traffic-carrying capacity of the MSV space segment, and thereby increase MSV's need for additional L-band spectrum.[489] Alternatively, Inmarsat argues that if MSV does not need the spectrum that it has currently coordinated for its satellite system's use, then under the MOU coordination process, the excess spectrum should be made available to another MSS provider that needs it.[490] MSV asserts that by carefully increasing its intra-system noise level (i.e., self-interference) and limiting it to 0.25 dB due to ATC operations, it can use its coordinated

[487] MSV Comments, Ex. E.

[488] MSV uses a base station EIRP of 19.1 dBW/200 kHz per carrier and 3 carriers per sector or a total of 23.9 dBW per sector. *See* MSV Comments, Technical App., Ex. E.

[489] Inmarsat Comments, Technical Annex § 3.5.

[490] Inmarsat Reply at 26.

and licensed MSS frequency assignments for ATC operations. MSV has based its interference analyses on this objective. Using this and other conservative assumptions, MSV claims, it can operate its proposed terrestrial facilities, including thousands of ATC terminals operating simultaneously on each of MSV's carrier frequencies, without risk of causing harmful interference to its own satellite operations or to any of the co-channel, adjacent channel, or adjacent band operations of Inmarsat.[491]

186. The analyses we discussed earlier show that if MSV limits its system noise to an increase of 0.25 dB due to ATC, the impact on Inmarsat's current and planned satellite networks is not significant. Furthermore, our analyses confirm that MSV will be able to provide for thousands of simultaneous nationwide ATC users and MSS users by using ATC assignments in geographic areas where MSS is not capable of being delivered directly by satellite that would otherwise go unused. Indeed, MSV will still need to coordinate spectrum with other L-band operators to support its MSS requirements and its ATC operations must adhere to the same frequency assignments that support its MSS requirements. Therefore, use of the spectrum that is coordinated for MSS to support MSV's ATC operations would not be at the expense of other L-Band MSS operations or MSV's own MSS operations. In this regard, MSV will only be permitted in MSS coordination negotiations to base its spectrum requirements on MSS operations without ATC.[492]

187. *Recordkeeping Requirements for ATC Operations*. We determined earlier that if MSV limits the number of co-frequency, 200 kHz bandwidth, base station carriers to less than 1725, the aggregate effect of ATC on Inmarsat's current and future satellite networks will not be significant. This same number of simultaneously transmitting ATC METs (1725) will increase MSV's satellite receiver noise level by 0.25 dB and, therefore, this same number of simultaneously transmitting, co-frequency METs was used to evaluate the co-frequency interference effects on other MSS systems. Since MSV's proposed TDMA- GSM ATC system can, at most, serve a single MET transmitting per base station carrier, by limiting the number base station carriers to 1725 on any single frequency, we limit the maximum increase in MSV's satellite receiver noise level to 0.25 dB and, correspondingly, limit the co-frequency interference to other MSS systems. This 1725 limit is not a limit on the total number of base stations or a limit on the simultaneously number of transmitting METs. This is a limit on the number of base stations operating on any one frequency. To ensure that MSV's ATC operations will not cause unacceptable interference to other MSS systems, we adopt section 25.253(c) to limit the number of co-frequency base stations to 1725 which is less that the 2000 proposed by MSV.

188. To enforce the limit we place on ATC base stations in section 25.253(e)**,** we also require L-band ATC operators to maintain a record of the total number of base stations throughout the U.S. operating on any given 200 kHz of spectrum. ATC operators must provide this information to the Commission, upon request, to resolve any interference complaint it receives from any L-band MSS operator that ATC operations are causing co-channel interference to its MSS network. Additionally, we will condition ATC authorizations such that the licensee must monitor and report, on an annual basis, the number of co-frequency base station carriers implemented. Since, MSV may only implement an ATC system in sub-bands obtained through the L-Band MOU coordination process, based upon its MSS needs, the total number of base stations is determined by the total coordinated MSS bandwidth. During future coordination, the L-Band spectrum identified for the various MSS operators may be aggregated. Furthermore, since the adjacent channel interference to other MSS systems was based upon a total

[491] MSV Reply at 13.

[492] MSV states that is committed to continuing to limit its coordination efforts to gaining access to spectrum for its satellite operations. *See* MSV Reply at 17.

number of 90,000 simultaneously transmitting MTs, we require that ATC operators report to the Commission, on an annual basis, the peak traffic on the ATC system and to limit this peak traffic to no more than 90,000 ATC MTs. These reporting requirements are in addition to any other reporting requirements and licensing conditions ultimately applied to an ATC authorization.

3. Big LEO Systems

189. In 1992, the World Administrative Radio Conference (WARC-92) allocated the 1610-1626.5 MHz band on a co-primary basis to the Mobile Satellite Service (MSS) in the Earth-to-space direction, and the 1613.8-1626.5 MHz band in the space-to-Earth direction on a secondary basis. WARC-92 also allocated the 2483.5-2500 MHz band on a co-primary basis to MSS operations in the space-to-Earth direction.[493] In 1994, the Commission domestically allocated the 1610–1626.5/2483.5-2500 MHz bands to the MSS in the U.S.[494] In that same year, the Commission released the service rules for MSS systems in these frequency bands which, among other things, established licensing procedures for time division multiple access/frequency division multiple access (TDMA/FDMA) operations in the 1621.35-1626.5 MHz portion of the allocation and code division multiple access (CDMA) operations the 1610-1621.35 MHz and 2483.5-2500 MHz bands.[495]

190. Currently, Globalstar and Iridium are licensed and operational in the Big LEO Bands. Both systems are required to protect Radio Astronomy Service (RAS) observations that take place in the 1610.6-1613.8 MHz portion of the band by limiting MET emissions and (in Iridium's case) satellite out-of-band emissions in the RAS band and avoiding simultaneous operations during RAS observations within several coordination areas throughout the U.S.[496] Big LEO licensees are also required to protect systems operating in the frequency bands immediately adjacent to the MSS allocation. Specifically, Big LEO MSS MET out-of-band emission levels must be significantly attenuated to protect systems operating in the Radio Navigation Satellite Service (RNSS) allocation such as the U.S. Global Positioning System (GPS) and the Russian Global Navigation Satellite System (GLONASS).[497] Globalstar is the only Big LEO system authorized to operate in the 2483.5-2500 MHz band in the downlink direction. Globalstar's system is required to share the downlink spectrum with industrial scientific and medical (ISM) equipment; Broadcast Auxiliary Service (BAS) electronic news gathering (ENG) equipment; private land mobile operations; fixed microwave services both in the 2483.5-2500 MHz band and in the band below 2483.5 MHz; and the multi-point distribution service/instructional television fixed service (MMDS/ITFS) systems operating above 2500 MHz.

191. Globalstar proposes to deploy ATC in a Forward Band Mode of operation in conjunction

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[493] *See* ITU Radio Regulations Article 5.

[494] *See Amendment of Section 2.106 of the Commission Rules to Allocate the 1610-1625 MHz and the 2483.5-2500 MHz Bands for Use by the Mobile-Satellite Service, Including Non-Geostationary Satellites*, Report and Order, 9 FCC Rcd 536, 536, ¶ 1 (1994) (*Big LEO Order*).

[495] *See Big Leo Service Rules Order*, 9 FCC Rcd at 5954-5965, ¶¶43-63. Hereafter we refer to these frequency bands as the "Big LEO" bands. Globalstar is licensed to operate its MSS system in the 1610-1621.35/1483.5-2500 MHz bands and Iridium is licensed to operate its MSS system in the 1621.35-1626.5 MHz band.

[496] *See* 47 C.F.R § 25.213.

[497] *See GMPCS Order*, 17 FCC Rcd at 8928, ¶64 (2002) (establishing specific out-of-band emission levels that Big LEO MSS METs must meet according to a specified time schedule).

with its Big LEO system,[498] and it proposes to operate its ATC base stations in the MSS downlink band using either cdma-2000 or IS-95 system characteristics.[499] Therefore, Globalstar's ATC mobile terminals will transmit in the same uplink band as the MSS mobile earth terminals and the ATC base stations will transmit in the same downlink band where its MSS satellites transmit.[500] Under the Globalstar ATC proposal, ATC would temporarily receive its own block of spectrum in regions around ATC base stations and the MSS service would not use the same frequency channels that are assigned to the ATC service in the regions near ATC base stations on a dynamic basis. The frequency assignments would be changeable and managed according to total demand, peaking periods, geographic distribution of terminals, fixed versus mobile usage, etc.[501] Though Iridium does not object to the technical feasibility of ATC, (indeed Iridium indicates that it is technically possible for Iridium to incorporate an ATC network into its currently authorized Big LEO system), Iridium does question whether ATC would be a commercially viable option for its currently licensed TDMA/FDMA Big LEO network.[502] In place of providing technical information on how ATC could be incorporated into its currently licensed TDMA/FDMA Big LEO system, Iridium provided general information on its alternative to ATC: a Secondary Terrestrial Service (STS). Moreover, Iridium has filed a petition with the Commission requesting additional spectrum for its Big LEO system in the 1.6 GHz band.[503] For reasons indicated elsewhere in this Order, we decline to adopt Iridium's STS proposal[504] and we address Iridium's petition for additional spectrum in a Notice of Proposed Rulemaking.[505]

192. To implement the decision in this Order, we adopt rules for ATC used in conjunction with Big LEO MSS systems. Big LEO CDMA licensees will be permitted to deploy ATC systems using either cdma-2000 or IS-95 system characteristics.[506] The rules we adopt today do not bar Iridium from

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[498] *See* Globalstar Bondholders Mar. 13, 2002 *Ex Parte* Letter at 13.

[499] *See* Letter from William D. Wallace, Counsel to Globalstar, L.P. to Marlene Dortch, Secretary, Federal Communications Commission, IB Docket No. 01-185 (filed May 29, 2002). Globalstar incorporates by reference the cdma2000 system characteristics contained in the "Final Report-Spectrum Study of the 2500-2690 MHz band" (March 30, 2001), Tables 1 and 2 of App. 2.1, and to the Recommended Minimum Performance Standards for Base Stations supporting Dual Mode Wideband Spread Spectrum Cellular Mobile Stations (IS-97A) and Recommended Minimum Performance Standards for Mode Wideband Spread Spectrum Cellular Mobile Stations IS-97.

[500] Globalstar Bondholders Mar. 13, 2002 *Ex Parte* Letter at 13-15.

[501] Globalstar Supplemental Comments at 25.

[502] The currently licensed Iridium system is required to operate both its uplink and downlink transmissions in the 5.15 megahertz of spectrum from 1621.35-1626.5 MHz. "New Iridium has no doubt that, as a purely technical matter, it can operate a terrestrial signal within the existing TDMA allocation without causing interference to its satellite signal. The larger question is whether this can be accomplished in a commercially viable manner." *See* Iridium Comments at 4.

[503] *See Amendment of Parts 2.106, 25.143 and 25.202 of the Commissions Rules to Require Operation of LEO MSS Systems Using TDMA/FDMA Techniques in the 1615.5-1626.5 MHz Frequency Bands,* Petition for Rulemaking, at 4-7 (filed July 26, 2002) (proposing a new band arrangement for Big LEO CDMA and TDMA/FDMA systems. Iridium makes no request for additional spectrum in the 2483.5-2500 MHz band).

[504] *See* discussion *supra* at § III(B)(3).

[505] *See* discussion *infra* at § IV(B).

[506] Globalstar provided sufficient technical information for us to consider in developing our rules for ATC systems used in conjunction with CDMA MSS systems.

applying for ATC authorization in its licensed MSS spectrum from 1621.35-1626.5 MHz, though the record lacks sufficient information to demonstrate how an ATC network could operate in conjunction with a TDMA/FDMA MSS system. Also, given Iridium's petition for additional Big LEO MSS spectrum, it would be premature to adopt rules to implement ATC in those portions of the Big LEO bands implicated by the Notice of Proposed Rulemaking. To prevent the actions we take today from prejudicing the outcome of our Notice of Proposed Rulemaking, however, we will permit CDMA licensees to deploy ATC in the 1610-1615.5 MHz portion of the 1.6 GHz band and the 2492.5-2498 MHz portion of the 2.4 GHz band.[507] The disposition of the spectrum from 1615.5-1621.35 MHz will be determined by the Commission's ruling on the Notice of Proposed Rulemaking. Here, we address the potential interference concerns raised by in-band MSS, and adjacent band system licensees below. We conclude, generally, that Big LEO ATC can operate in the designated CDMA portions of the Big LEO bands using either cdma-2000 or IS-95 system characteristics without causing interference to other in-band MSS systems and systems operating in adjacent allocations to the MSS spectrum.

193. With regard to permitting ATC base stations to operate in the 2492.5-2498.0 MHz portion of the 2483.5-2500 MHz MSS band, because the use of the remainder of the band will not be decided by this Order and in order not to prejudice possible future action by the Commission, it is necessary that any ATC base stations installed in the 2492.5-2498.0 MHz band be tunable across the entire 2483.5-2500 MHz MSS allocation. To this end, we adopt section 25.254(a)(4) which requires that the applicant demonstrate that the base stations are, in fact, tunable across the entire 2483.5-2500 MHz MSS allocation.

a. Protection of In-band Systems in the 1610-1626.5 MHz Band

194. Globalstar demonstrates that at least two CDMA systems operating in the1.6/2.4 GHz bands would be able to coordinate use of the assigned frequencies so that both could provide ATC and MSS without causing harmful interference to the other. ATC operations in the uplink band would be made possible by placing limitations on ATC mobile terminal aggregate EIRP levels in one portion of the band while the already established aggregate EIRP level for MSS mobile earth terminals would continue to apply in another portion of the uplink band.[508] MSS operations would continue to share the whole downlink band through application of satellite power flux density limits and limiting ATC base station operations to certain portions of the downlink band in a given geographical area.[509] Moreover, Globalstar maintains that the Radioastronomy Service (RAS) which operates in the MSS uplink band would be protected from ATC interference in accordance with the existing coordination agreement which uses exclusion zones and power limits to protect RAS observations from MSS mobile earth terminal operations.[510]

195. First we address the possibility of multiple CDMA system access to the Big LEO frequency bands. The Commission concluded that the Big LEO band arrangement would accommodate four CDMA systems and one TDMA/FDMA system.[511] Based on Recommendation ITU-R M.1186

[507] *See* discussion *infra* at § IV(B).

[508] Globalstar Supplemental Comments at 35.

[509] Globalstar Bondholders Mar. 13, 2002 *Ex Parte* Letter at 33.

[510] *Id.* at 25.

[511] *See Big LEO Service Rules Order*, 9 FCC Rcd at 5954-5965, ¶¶ 43-63.

which establishes the parameters that CDMA MSS system operators use to coordinate their operations in a manner that enables them to reuse the same spectrum,[512] Globalstar asserts that at least two CDMA MSS systems can deploy an ATC network in the Big LEO bands without causing mutually unacceptable interference. Constellation agrees with Globalstar that ATC operations can be effectively coordinated among CDMA licensees using channel assignments.[513] We agree with Globalstar and Constellation that at least two CDMA MSS systems would be able to operate in the Big LEO bands if the systems implement ATC operations. Indeed, Recommendation ITU-R M.1186 has been used successfully by CDMA MSS operators to coordinate the operations of their systems and its framework will facilitate the coordination ATC used in conjunction with the CDMA MSS systems to avoid causing mutually unacceptable interference. Since Globalstar is currently the only CDMA licensee in the Big LEO bands, interference from Globalstar's ATC system to another CDMA system is not an issue. However, the amount of Big LEO spectrum designated for CDMA operations is subject to the outcome of our *Notice of Proposed Rulemaking* and there exists the possibility that a second, future, CDMA MSS system could enter the Big LEO bands.[514] We would require a second CDMA MSS system to coordinate its network (including ATC if it is part of the MSS network) using the Recommendation ITU-R M.1186 parameters. To this end, we provide a way for Globalstar to readily implement ATC, we leave open the possibility for multiple CDMA MSS entry, and do not preclude the possibility that Iridium could be granted access to additional Big LEO spectrum for its TDMA/FDMA system.

196. We also evaluated the potential interference that ATC systems could cause to the Radio Astronomy Service (RAS) which operates in the 1610.6-1613.8 MHz band at various locations in the U.S. As we indicated earlier, Big LEO MSS mobile earth terminals are required to protect the RAS from out-of-band emissions interference. Big LEO MSS ATC operators must: (1) ensure the Big LEO network is capable of determining the position of its mobile earth terminals; and (2) take specific measures to prevent interference to RAS observations in the event any of the licensee's mobile earth terminals enter any of the pre-established coordination zones around the U.S. RAS sites.[515] Globalstar proposes that the same limitations be placed on Big LEO ATC systems and there were no objections to this approach. We see no reason why the same procedures that apply to protect RAS observations in the 1610.6-1613.8 MHz band from MSS MET operations could not also apply to ATC mobile terminals. We therefore apply our rules that currently apply only to Big LEO MSS METs to include MSS terminals with ATC capability. Specifically, we adopt section 25.254(d) to provide interference protection to RAS observations in the

[512] *See* ITU, Recommendation ITU-R M.1186, *Technical Considerations for the Coordination Between Mobile Satellite service (MSS) Networks Utilizing Code Division Multiple Access (CDMA) and Other Spread Spectrum Techniques in the 1-3 GHz Band, available at* <http://www.itu.int/rec/recommendation.asp?type=items&lang=e&parent=R-REC-M.1186-0-199510-I> (last visited, Feb. 3, 2003). We do note, however, that the assertions made by Globalstar were presumably based on the use of 11.35 MHz and 16.5 MHz of spectrum in the uplink and downlink bands, respectively. Additional information is needed in the context of the *Notice of Proposed Rulemaking* to determine how many CDMA MSS systems could operate ATC in the band sharing arrangement ultimately adopted by the Commission. *See infra* § IV(B).

[513] *See* Constellation Comments at 16.

[514] *See* discussion, *infra* § IV(B) (seeking comment on whether a second processing round should be established for additional MSS licenses).

[515] *See* 47 C.F.R. § 25.213 of the Commission's rules. All 1.6/2.4 GHz Mobile Satellite Service systems shall be capable of determining the position of the user transceivers accessing the space segment through either internal radiodetermination calculations or external sources such as LORAN–C or the Global Positioning System. During periods of radio astronomy observations, land mobile earth stations shall not operate when located within geographic protection zones defined in 47 C.F.R. § 25.213 (a)(1)(i)-(iv).

U.S. from ATC mobile terminals.

b. Protection of Systems Operating in Bands Adjacent to 1610-1626.5 MHz

197. We address the potential interference to the Global Positioning System (GPS) from ATC BSs and MTs operating in the Big LEO-bands. GPS operates in a portion of the 1559-1610 MHz Radionavigation Satellite Service (RNSS) allocation. In the *Flexibility Notice*, the Commission recognized that the unwanted emissions from terrestrial stations in the MSS will have to be carefully controlled in order to avoid interfering with GPS receivers.[516] The Commission specifically requested comment on whether limits for base stations similar to those specified in section 25.213(b) for mobile earth terminals (METs) are adequate to protect GPS receivers.[517] NTIA responded to our request for comment along with several other parties.[518] NTIA asserts that there are two issues that must be considered in the request for comment on the protection of GPS: (i) the frequency range(s) over which the emission level would be applicable; and (ii) whether the emission level established for a mobile earth station in an MSS system should be applied to ATC BSs and MTs.[519] Globalstar supports the application of the GMPCS limits to ATC BSs and MTs.[520]

198. Since the release of the *Flexibility Notice*, the Commission has adopted the *GMPCS Order* that requires MSS METs transmitting on frequencies between 1610 MHz and 1660.5 MHz conform to two restrictions: a wideband limit of -70 dBW/MHz, averaged over 20 milliseconds, on the EIRP density of the out-of-band emissions in the 1559-1605 MHz frequency range and a narrowband limit of -80 dBW/700 Hz, also averaged over 20 milliseconds, on emissions in the 1559-1605 MHz frequency range.[521] The wideband emission level in the 1605-1610 MHz is determined by linear interpolation from –70 dBW/MHz at 1605 MHz to –10 dBW/MHz at 1610 MHz. On NTIA's first point, then, the *GMPCS Order* expanded the frequency range from that required of section 25.213(b) to protect GPS from MSS MET out-of-band emissions. On NTIA's second point about whether the emission levels established for a mobile earth station in an MSS system should be applied to ATC BSs and MTs, NTIA indicates that the GMPCS emission limits in the 1559-1610 MHz band for METs operating in the 1610-1660.5 MHz frequency range are based on protection of a GPS receivers used on aircraft in a precision

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[516] *Flexibility Notice,* 16 FCC Rcd at 15559 & 15565, ¶¶ 68 & 83.

[517] *Id*.

[518] *See generally* NTIA Nov. 12, 2002 *Ex Parte* Letter; Globalstar July 1, 2002 *Ex Parte* Letter at 24; *MSV/USGPSIC Agreement* at 1-2

[519] NTIA Nov. 12, 2002 *Ex Parte* Letter at 2. NTIA also urges the Commission to adopt out-of-band emission levels for the newly allocated L2 (1215-1240 MHz) and L5 (1164-1188 MHz) frequency bands for future GPS operations. *Id.*

[520] *See* Globalstar July 1, 2002 *Ex Parte* Letter at 24.

[521] *GMPCS Order,* 17 FCC Rcd at 8936, ¶ 88. Additionally, separate licensing Orders for MSS METs in the L-band, NTIA filed comments urging the International Bureau to require METs to meet the -70 dBW/MHz and -80 dBW emission limits in the 1559-1610 MHz band. *See* Comments of the National Telecommunications and Information Administration, IB Docket No. 99-81, at 9 (filed, June 24, 1999), *available at* <http://svartifoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6007946277> (last visited, Dec. 30, 2002).

approach landing operational scenario and not to protect terrestrial operational scenarios.[522] NTIA is correct that the GMPCS rules, and the rules that we adopt here, apply to aircraft usage of the GPS system. We recognize that NTIA believes that these rules do not provide adequate protection to terrestrial terminals.[523]

199. The record before us does not support the adoption of out-of-band emission levels more stringent than those required of GMPCS equipment. Nor does it support expanding the limits to frequency allocations other than the 1559-1610 MHz RNSS band. It would not be appropriate to apply more stringent out-of-band emission levels unilaterally to ATC equipment any more than it would be appropriate to apply more stringent out-of-band emission levels to terrestrial mobile systems such as PCS.[524] As indicated above, concerns have been expressed, including by Federal agencies, regarding protection of GPS operations. NTIA also expressed their concern and reluctance to limit the protection of GPS based on the aviation scenario only and believes strongly that protection of terrestrial uses of GPS such as E911 assisted GPS should be addressed.[525] Though we are adopting the existing limit of -70 dBW/MHz (wideband emissions) and –80 dBW (narrowband emissions) for ATC operations; however, we plan to continue to assess the appropriate interference protection levels for GPS. As discussed above OET will issue a public notice shortly soliciting comment from all stakeholders to assist in the examination of what changes in the level of protection for GPS, if any, should be established in the future.

200. To protect GPS operations, Globalstar proposes that interference to GPS and GLONASS in the adjacent frequency band be limited by applying the same out-of-band emission specifications that are required of Globalstar's MSS mobile earth terminals to ATC mobile terminals.[526] We agree with Globalstar's approach. The recent adoption of our GMPCS rules is the culmination of several years' work to strike a balance between the MSS system operations in the Big LEO bands (among others) and the protection requirements of RNSS systems such as GPS operating in the frequency band immediately adjacent to the MSS allocation.[527] We apply the same out-of-band emission levels to ATC base stations and mobile terminals' protection of adjacent systems in the RNSS allocations as those adopted in the GMPCS proceeding. We adopt section 25.254(b)(4) to apply the GMPCS out-of-band emission levels to Big LEO ATC mobile terminals.

c. Protection of Systems Operating in and Near the 2483.5-2500 MHz Band

201. The Society of the Broadcast Engineers (SBE) contends that TV BAS equipment operating below 2483.5 MHz and MMDS/ITFS equipment operating above 2500 MHz will experience

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[522] *See* NTIA Nov. 12, 2002 *Ex Parte* Letter at 5.

[523] *GMPCS Order,* 17 FCC Rcd at 8923-25, ¶¶ 49-52. The limits adopted in the *GMPCS Order* are based on an assumed separation distance of about 100 feet between an airborne GPS receiver and a single terrestrial transmitter.

[524] For a discussion of the basis for our assumptions about cell size, the number of randomly distributed terminals and other factors that lead us to different conclusions about the requisite level of protection for GPS than NTIA reached, *see, e.g., supra* § III(D)(1)(b).

[525] NTIA Jan. 24, 2003 *Ex Parte* Letter at 2-3.

[526] *See* Globalstar Bondholders Mar. 13, 2002 *Ex Parte* Letter at 26.

[527] *See GMPCS Order,* 17 FCC Rcd at 8928, ¶ 64.

interference from Big LEO ATC base stations.[528] SBE specifically commented that MSS ATC base stations in the 2483.5-2500 MHz band will cause out-of-band interference in TV BAS ENG Channels A8 and A9.[529] SBE also claims that ENG channel A10 (2483-2500 MHz) is operating at the same frequency as the Big LEO space-to-earth (downlink) component and that brute force overload of ENG receivers would occur.[530] We also note that fixed and mobile services are permitted to operate in these frequency bands. Specifically, Private Land Mobile Services and Fixed Microwave Services that include video transmissions operate in this same frequency range.[531]

202. The IS-95 system characteristics that Globalstar proposes as a candidate for its ATC operations allow for higher EIRP levels for base stations than for cdma-2000 base stations.[532] We evaluate the affects of the potentially more interfering ATC network using IS-95 system characteristics. As explained in greater detail in Appendix C3, Section 4.2, the amount of interference caused to BAS equipment is a function of how close (geographically) the ATC base station is located to the BAS receivers of these systems. By selecting certain operating frequencies for the ATC base stations and the BAS assignments, one can simultaneously operate the equipment without causing mutually unacceptable interference at shorter distances. We evaluated the separation distance as a function of frequency assignment and conclude that ATC base station operations (using either cdma-2000 or IS-95 characteristics) can be conducted so as not to cause adjacent band interference to BAS systems operating below 2483.5 MHz given the band-sharing arrangement we adopt for ATC operations in the band and the availability of information on the BAS.[533] The fixed and mobile operations in the adjacent 2450-2483.5 MHz band include many video links that are generally similar to, but of a lower power than, those of BAS. By analogy to the analysis in the appendix for BAS, we would expect that ATC base stations could be operated on selected frequencies so that interference to these fixed and mobile stations could be avoided. Insofar as fixed and mobile operations in this frequency range are similar to the BAS characteristics, we conclude that adjacent band interference to these systems will also be avoided through coordination.[534] ATC operators will be required to protect all existing licensees in the adjacent bands.

203. Additionally, there are several hundred BAS, fixed and mobile facilities licensed on a grandfathered basis throughout the U.S. where the receivers could potentially receive brute force overload interference from ATC base stations operating in the 2483.5-2500 MHz band. To avoid causing brute force overload interference to BAS, fixed and mobile equipment, ATC operators, prior to construction and operation of ATC base stations, must consult local coordination committees for information on the frequencies used and the geographic locations of these systems that may receive brute force overload

[528] *See* SBE Comments at 10.

[529] *Id*.

[530] *Id*.

[531] *See, e.g.,* 47 C.F.R. §§ 90.20, 90.35, 90.103 & 101.147. There are nearly 500 active licenses under Parts 90 and 101 in the band 2450-2483.5 MHz, including critical public safety functions.

[532] CDMA-2000 base stations operate at 10W of power with a 17dBi antenna while IS-95 base stations operate at 20W of power with a 19dBi antenna. See Globalstar May 29, 2002 *Ex Parte* Letter, Technical Statement Attach. at 2 (including the system characteristics for cdma-2000 and IS-95 systems).

[533] *See* discussion *infra* at ¶ 191 & App. C3 § 4.2.

[534] Globalstar has indicated that it is willing to coordinate with existing fixed service installations. *See* Globalstar March 13, 2002 *Ex Parte* Letter at 25.

interference. ATC operators shall take such steps necessary to avoid causing brute force overload interference to previously licensed facilities. If a mutual agreement to this effect cannot be reached, the Commission must be notified and it will take such action as may be necessary to ensure that a mutually acceptable arrangement is arrived at.[535] In any event, ATC operators will be required to protect against adjacent-channel and brute-force overload interference to previously licensed users. Coordination among the shared services within the 2450-2483.5 megahertz band varies from service to service. Part 90 licensees are not required to coordinate their operations within the band. Part 74 licensees coordinate among other BAS licensees. And Part 101 licensees are required to coordinate according to section 101.103(d). In the past, the Commission has encouraged participation in situations where it has not expressly required coordination in this band or established procedures for inter-service coordination. ATC operators will be required to take measures to protect against all types of interference to existing licensed services in this band.

204. Globalstar contends that ATC base stations operating below 2498.0 MHz will not interfere with MMDS/ITFS.[536] We evaluated in Appendix C3, Section 4.2, the worst case potential for ATC base stations to interfere with currently deployed MMDS/ITFS operations above 2500 MHz under various situations and we agree with Globalstar that ATC base station operators (using either cdma-2000 or IS-95 characteristics) would protect existing MMDS/ITFS equipment, provided that ATC base station operations are below 2498.0 MHz. ATC base stations using either cdma-2000 or IS-95 characteristics can be located within a meter of MMDS/ITFS equipment without causing unacceptable interference.[537] We also note that the Commission has before it a petition to refarm the band above 2500 MHz to provide for cellular-like services and the use of the band is subject to change.[538] Therefore, we will permit ATC base stations using cdma-2000 or IS-95 characteristics in the portion of the downlink band from 2492.5-2498.0 MHz.

205. Although unlicensed ISM equipment is not subject to any protection from current MSS downlink operations, our research indicates that most unlicensed ISM equipment manufacturers build out-of-band signal rejection features into their hardware.[539] As indicated above, in order for Big LEO ATC base stations to protect licensed adjacent band receivers, the operating frequency is an important factor in reducing interference while keeping the geographic separation distance between the equipment to a minimum. For other reasons, we are limiting ATC base station operations to assignments above 2492.5 MHz which places the frequency band edge of the ATC base stations greater than 25 MHz from the users

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[535] *See, e.g.*, 47 C.F.R. § 74.604.

[536] Globalstar Bondholders March 13, 2002 *Ex Parte* Letter at 26.

[537] *See* discussion *infra* at App. C3 § 4.2.3 (comparing geographic separation distances as a function of frequency separation).

[538] *See Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems,* First Report and Order and Memorandum Opinion and Order, 16 FCC Rcd 17222, 17240-42, ¶ 33-36 (*ITFS/MMDS Order*); *Wireless Telecommunications Bureau Seeks Comment on Proposal to Revise Multichannel Multipoint Distribution Service and the Instructional Television Fixed Service Rules*, Public Notice, RM-10586, 17 FCC Rcd 20526 (rel. Oct. 17, 2002), *available at* <http://svartifoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6513307317> (last visited, Dec. 24, 2002).

[539] *See* WaveLAN Technical Bulletin 003/A, Lucent Technologies, *available at* <http://www.novocmp.de/prod/wirl/WLAN/bilder/Download/Tb-003.pdf> (last visited, Dec. 12, 2002).

of lower 2.4 GHz ISM band making interference to ISM devices a non-issue.

206. In summary, we adopt a band arrangement for Big LEO ATC operations based on the technical information provided by the Big LEO licensees and users of the adjacent frequency allocations. We apply the same out-of-band emission limits to ATC capable terminals and base stations that apply to MSS mobile earth terminals to protect RNSS systems operating below 1610 MHz. Additionally, we apply the same operational rules to ATC terminals that currently apply to Big LEO MSS mobile earth terminals to protect RAS observations within the Big LEO uplink band. Furthermore, by requiring ATC base stations to operate at EIRP and out–of-channel emission levels consistent with cdma-2000 or IS-95 architectures, the band arrangement we adopt today for Big LEO ATC base stations will not cause adjacent band interference to BAS and MMDS/ITFS users of the allocations adjacent to the Big LEO downlink band. We also adopt coordination provisions for ATC base stations that cause brute force overload to BAS and other licensed services in the 2.4 GHz band.

E. Statutory Considerations

1. Section 303(y)

207. In the *Flexibility Notice*, we sought comment on whether permitting ATC in the MSS spectrum would be consistent with section 303(y) of the Act.[540] Section 303(y) of the Act[541] gives the Commission additional authority to allocate spectrum to provide flexibility of use, provided that the use is consistent with international agreements to which the United States is a party; and, if after notice and comment, the Commission finds that such an allocation would be in the public interest; would not deter investment in communications services and systems, or technology development; and would not result in harmful interference among users.[542]

208. As a preliminary matter, we find that our decision to permit qualifying MSS licensees to incorporate ATC does not require that we make a finding under section 303(y). The Commission has previously found that the section 303(y) review requirement applies only to flexible use determinations by the Commission that would enable the sharing of specific spectrum bands by services treated as distinct by the international and domestic allocations process, and not as a precondition to adoption of flexible intra-service regulations.[543] Our decision today grants limited flexibility by permitting the reuse of already licensed spectrum. We do not adopt new allocations in the 2 GHz, L- and the Big LEO MSS bands, but rather indicate that ATC is permissible by footnote in the domestic table of allocations; therefore, we find that we are not required to make any findings under section 303(y) of the

[540] *Flexibility Notice*, 16 FCC Rcd at 15544, ¶ 25.

[541] 47 U.S.C. § 303(y).

[542] The Commission also has general authority to allocate spectrum for flexible use and has previously noted that nothing in the language or legislative history of section 303 of the Communications Act, 47 U.S.C. § 303, suggests any limitation on the Commission's discretion to prescribe the nature or number of the service or services to be rendered over radio frequencies. *See Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use*, 1998 WL 812430, Memorandum Opinion and Order, ET Docket 94-32, ¶ 15 (rel., Nov. 25, 1998); *see also In the matter of Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use,* Second Report and Order, 11 FCC Rcd 624 at 633-4, ¶¶ 20-21 (noting that Commission precedent supports the permissibility of allocating spectrum in a manner that allows for its use by a broadly defined service).

[543] *Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules*, 15 FCC Rcd 476, 486, ¶ 22 (2000).

Communications Act. We note, however, that parties have raised important issues in response to our questions in the *Flexibility Notice* concerning 303(y) that merit discussion here. We have previously considered the criteria contained in section 303(y) under our broader public interest mandates in the statute, when making decisions that may affect the broader allocation through service rules, and we believe it is in the public interest to do so in this proceeding in light of the issues raised in the record.[544] Accordingly, while the flexibility to provide ATC that we grant today is subject to limiting conditions, we nevertheless find that permitting qualifying MSS licensees the flexibility to incorporate ATC, which will permit them to improve service to certain geographic areas by improving signal quality through the use of terrestrial facilities in the 2 GHz, L-band, and the Big LEO MSS bands, is consistent with the criteria in section 303(y) of the Act and with the Commission's long standing policy of granting spectrum users additional flexibility to implement new services.[545] We have already determined elsewhere in this Order that providing flexibility for MSS licensees to incorporate ATC serves the public interest[546] and would not result in harmful interference.[547] We address below the remaining elements raised by commenters.

a. Investment Incentives

209. Some commenters state that granting MSS licensees the flexibility to incorporate ATC service will attract investment to the band in question.[548] Other commenters argue that there is insufficient evidence on the record on the issue of capital investment and whether it would be spurred or deterred by granting ATC.[549] Others claim that granting ATC in certain bands, such as the upper L-band, would deter investment in new technologies employing these frequencies.[550]

210. We disagree with commenters claiming that there is not enough evidence of potential

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[544] *Id.*

[545] *See, e.g., Common Carrier Point-to-Point Microwave Radio Service,* First Report and Order, 29 F.C.C. 2d 870 (1971); *Amendment of Parts 2 & 22 of the Commission's Rules to Permit Liberalization of Technology & Auxiliary Service Offerings in the Domestic Public Cellular Radio Telecommunications Service*, Report and Order, 3 FCC Rcd 7033, 7037, ¶¶ 24-30 (1988); *Amendment of Parts 2 & 22 of the Commission's Rules to Permit Liberalization of Technology & Auxiliary Service Offerings in the Domestic Public Cellular Radio Telecommunications Service*, Memorandum Opinion and Order, 5 FCC Rcd 1138, 1139, ¶ 10 (1990); 47 C.F.R. § 22.901 (cellular services); 47 C.F.R. Parts 24 and 27 (broadband PCS and Wireless Communications Services rules); *PCS Second Report and Order,* 8 FCC Rcd 7700, 7710-13, ¶¶ 19-24 (1993); *Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use*, Second Report and Order, 11 FCC Rcd 624, 627-38, ¶¶ 6-28 (1995); *Amendment of the Commission's Rules to Permit Flexible Service Offerings in the Commercial Mobile Radio Services,* First Report and Order and Notice of Further Proposed Rulemaking, 11 FCC Rcd 8965, 8967, ¶ 3 (1996) (CMRS); *Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, 12 FCC Rcd 5754, 5787-816, ¶¶ 81-153 (1997)(DARS); *IFTS/MMDS Order,* 16 FCC Rcd at 17235-38, ¶¶ 22-30 (ITFS and MMDS).

[546] *See supra* § III(A).

[547] *See supra* § III(D) and Apps. C1-C3.

[548] *See, e.g.*, ICO Comments at 29; Celsat Comments at 12-13; Globalstar Comments at 8; MSV Comments at 21; Loral Comments at 9; Globalstar Bondholder Comments at 24 n.38.

[549] *See, e.g.*, Cingular/Sprint July 31, 2002 *Ex Parte* Letter at A-11; AT&T Wireless Comments at 11-13; Telephone and Data Systems Reply at 8.

[550] *See* Aviation Industry Parties Comments at 9-10.

investment to move forward with ATC. We find that grant of flexibility to incorporate ATC makes previously unusable spectrum, and spectrum of limited use in particular locations, available for more innovative services, thereby promoting investment and the development of mobile satellite technology. For example, without ATC, in some cases, MSS operators are unable to provide service in urban areas reliably, because of a variety of factors discussed above. ATC will enable MSS providers to reuse their licensed spectrum to improve signal reliability. As a result, MSS operators will be in a better position to offer improved, more commercially valuable mobile satellite services. MSS operators may be able to offer nationwide mobile satellite services with a ubiquitous signal at more affordable prices. Without ATC, unused or underutilized licensed MSS spectrum would be used less efficiently or used less intensively.

211. The Commission has long recognized that increased flexibility in spectrum usage promotes technological development, innovation, investment, economic growth, and consumer choice. For example, our CMRS policies have emphasized flexible use of spectrum resources, and this broad flexibility has been the basis of a series of regulatory actions extending over many years by which the Commission has encouraged investment and innovation in wireless telecommunications technologies.[551] While we recognize that the flexibility to implement ATC that we adopt for MSS operators today is limited, we nevertheless find that it is likely to increase competition in mobile satellite services, which will result in improved MSS services and increased investment and enhanced technology development in the MSS industry. [552] We also find that our technical rules, which are designed among other things, to protect adjacent users and services from harmful interference from ATC operations are sufficient to mitigate any concerns expressed in the record about financial disincentives in adjacent services.

b. Consistency with International Agreements

(i) L-Band

212. Inmarsat claims that granting ancillary terrestrial operations to MSS operators is inconsistent with various international agreements to which the United States is a party, including the International Telecommunications Union (ITU) Radio Regulations and the Mexico City Memorandum of Understanding. We disagree with Inmarsat's analysis and find that granting the flexibility to implement ATC in the L-band, subject to conditions necessary to protect other users of the band, is consistent with all relevant international agreements to which the United States is a party.

(a) ITU Radio Regulations

213. Inmarsat argues that granting the proposed flexibility is inconsistent with the ITU Radio Regulations, the product of an international treaty to which the United States is a party.[553] Inmarsat argues that the proposed terrestrial allocation is inconsistent with the Radio Regulations because there is no primary allocation for terrestrial services in the United States in the L-band and, therefore, such use would be a non-conforming use.[554] As a non-conforming use, Inmarsat argues the proposed terrestrial

[551] *See supra* § III (A)(4).

[552] *See Seventh CMRS Competition Report*, 17 FCC Rcd at 13017-18.

[553] Inmarsat Sept. 12, 2002 *Ex Parte* Letter at 4.

[554] *Id*.

services must not, under applicable Radio Regulations,[555] cause harmful interference outside of the United States.[556] According to Inmarsat, the proposed terrestrial operations will cause harmful interference to the operations of the Inmarsat, Russian, Japanese[557] and Mexican L-band satellite systems.[558] Furthermore, Inmarsat argues that IMT-2000 studies,[559] contained in ITU Recommendations, confirm the need for separate bands for the satellite and terrestrial components of mobile communications systems in order to avoid harmful interference.[560] MSV acknowledges that, under applicable ITU Radio Regulations, its ATC operations will be required to operate on a non-harmful interference basis to all other services and systems, and argues that it will not cause harmful interference to the operations of the Inmarsat, Russian, Japanese and Mexican L-band systems.[561]

214. As we have discussed above, we find that with appropriate technical limitations terrestrial service can be provided in the L-band without causing harmful interference to other L-Band users, including mobile aeronautical telemetry and radio astronomy operations.[562] ITU Radio Regulations provide for the operation of communications systems that do not conform to the service allocation, provided that the services are on a non-harmful interference basis.[563] Accordingly, we conclude that our approach to permitting ATC in the L-band is consistent with applicable ITU regulations.

(b) Mexico City MOU

215. We believe that our decision to remove domestic barriers to improve the delivery of MSS signals in particular areas in the United States is consistent with our commitments under the Mexico City MoU. Under the MoU, parties agreed to attempt to avoid harmful interference and to use spectrum assignments in the most efficient manner practicable. [564] As described in detail above and in the

[555] ITU, Radio Regulations, Art. 4 §§ 4.4, 8.5.

[556] Inmarsat Sept. 12, 2002 *Ex Parte* Letter at 4.

[557] It should be noted that Japan is not currently a party to the MOU in North America. Mexico and Russia have provided no objections to ATC in this proceeding. Moreover, TMI (the fifth party to the MOU and a Canadian licensee) is on the record supporting ATC.

[558] Inmarsat Comments at 18.

[559] ITU-R M.1036 Annex 1.

[560] Inmarsat Sept. 12, 2002 *Ex Parte* Letter at 4.

[561] MSV Reply at 15.

[562] *See supra* § III(D)(2).

[563] ITU RR No 4.4 requires that "Administrations of the Member States shall not assign to a station any frequency in derogation of either the Table of Frequency Allocations in this Chapter or the other provisions of these Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations." *See* ITU, Radio Regulations § 4.4.

[564] *See also, e.g., SatCom Systems, Inc.*, Order and Authorization, FCC No. 99-344, 14 FCC Rcd 20798, 20813, ¶ 32 (1999) (noting that "the Commission must condition all licenses on the outcome of the international coordination process" and that "the U.S. Administration will continue to advocate the coordination of additional spectrum for the [MSV] system in the coordination process").

Technical Appendix, we believe that granting MSS licensees greater latitude in choosing their precise system architecture will not cause harmful interference to systems of other parties of the MoU and should improve spectrum efficiency.[565] While we recognize that Inmarsat, which is also a party to the Mexico City MoU, may disagree with our interference and spectrum-efficiency conclusions,[566] we have evaluated its claims, and we have addressed its concerns by placing constraints on MSV's ATC operations designed to overcome the potential for interference that Inmarsat has identified. Moreover, nothing in this Order is intended to adjust the spectrum assignment to which signatories are entitled under the Mexico City MoU. The only "purpose" of the Mexico City MoU is to establish a process to develop operating agreements for the operation of geostationary mobile satellite service networks in the L-band in the region around North America. Because the MoU adjusts the parties' L-band spectrum assignments, based on present and future *satellite* spectrum usage, we agree with MSV's assertion that parties could not legitimately identify terrestrial ATC usage to justify a larger MSS satellite spectrum assignment.[567] We therefore conclude that permitting the integration of terrestrial infrastructure into licensed MSS systems remains fully consistent with the terms of the Mexico City MoU, to which the Commission is party.

(ii) Other Bands

216. With respect to the other bands at issue in this proceeding, namely the 2 GHz MSS and Big Leo bands, our analytical framework is similar. Our action today must be consistent with international agreements regarding spectrum, of which the principal governing law is the ITU Radio Regulations, the product of an international treaty to which the United States is a party.[568] In ITU Region 2, the 2 GHz MSS band is allocated for terrestrial mobile and fixed services, and mobile satellite services on a co-primary basis.[569] Consequently, our action today, permitting ATC in the 2 GHz MSS band, is consistent with the relevant international agreements to which the United States is a party without requiring ATC to operate on a non-interference basis .

217. In the Big LEO band, there is an allocation for terrestrial mobile and fixed services in the 2.4 GHz service downlink band, but no allocation in the 1.6 GHz uplink band.[570] Therefore, in the uplink band ATC will be a non-conforming use.[571] As a non-conforming use, ATC must not, under applicable

[565] *See* discussion *infra* at III.D.

[566] *See, e.g.,* Inmarsat Sept. 12, 2002 *Ex Parte* Letter, Attach. 1 at 4.

[567] *See* MSV Reply at 17 ("MSV is committed to continuing to limit its coordination efforts to gaining access to spectrum for its satellite operations."); *see also, e.g.*, MSV Reply at 15 ("Authorizing terrestrial operations in the L-band is consistent with the ITU Radio Regulations as well as the Mexico City Memorandum of Understanding (MoU), because such operations will be on [a] non-interference basis to other systems, [and] will not be a factor in L-band coordination negotiations . . . "); MSV Jan. 10, 2002 *Ex Parte* Letter at 4 ("ATC operations will not require MSV to coordinate access to more spectrum").

[568] *See* International Telecommunication Convention, Oct. 2, 1947, 63 Stat. 1399, T.I.A.S. No. 1901, 30 U.N.T.S. 316. This international treaty is the basic instrument that created and vested certain rights with the ITU. Signatory countries to the treaty retain any rights not explicitly granted to the ITU.

[569] *See* 47 C.F.R. § 2.106 (Table of Frequency Allocations).

[570] *See id*.

[571] ITU, Radio Regulations § 4.4.

Radio Regulations,[572] cause harmful interference to systems of other services operating outside of the United States – and we have concluded that it will not. Therefore, we conclude that permitting ATC in the Big LEO band is consistent with the relevant international agreement to which the United States is a party.

218. We further note that the 2 GHz, Big LEO and L-band MSS bands are each included in the ITU allocations for IMT-2000.[573] We agree with the commenters that argue that IMT-2000 contemplates a separate satellite component;[574] however, permitting ATC in the United States will not hinder further implementation of the terrestrial IMT-2000 deployment in the United States and abroad.[575] Therefore, ATC use of each of the satellite allocations proposed is consistent with the international obligations of the United States under the Radio Regulations. Finally, we have independently reviewed the complete record in this proceeding and conclude that granting such flexibility is consistent with international agreements to which the United States is a party.

2. Section 309(j)

219. We find that our decision to permit MSS operators to acquire ATC authority does not establish the requisite conditions for assigning terrestrial licenses in the MSS bands through competitive bidding, pursuant to section 309(j) of the Communications Act.

a. Section 309(j)(1)

220. In the *Flexibility Notice*, we observed that limiting terrestrial service rights in the MSS bands to MSS operators providing terrestrial service on an ancillary basis did not appear to implicate our obligation to use competitive bidding under section 309(j). We reasoned that, because terrestrial rights would be linked to pre-existing MSS authorizations and operations, there would be no mutually exclusive applications triggering the competitive bidding provisions of section 309(j).[576] In support of this position, a number of commenters argue that the Commission issued MSS system licenses in a manner that avoids the "mutual exclusivity trigger" of section 309(j), and no new mutual exclusivity will be created by authorizing only MSS licensees "to operate ancillary facilities in the same bands allocated to MSS and subject to the same frequency selection, assignment, and coordination procedures established for their MSS systems."[577]

221. Because we will grant ATC authority by modifying MSS operators' rights under their existing authorizations, and we decline to allow terrestrial operations separate from MSS operations in

[572] *Id.* §§ 4.4, 8.5.

[573] IMT-2000 stands for International Mobile Telecommunications-2000 and it is sometimes referred to as third generation mobile systems (3G) or advanced mobile systems.

[574] *See* Provisional Final Acts of WRC-2000 Article S5.351A and Resolution 225, *Use of Additional Frequency Bands for the Satellite Component of IMT-2000*.

[575] *See, e.g.*, Celsat Comments at 9-10; Loral Comments at 8-9; MCHI Comments at 3-5; ICO Reply at 12.

[576] *Flexibility Notice*, 16 FCC Rcd at 15549, ¶ 39.

[577] Constellation Comments at 20-21; *see also* Loral Comments at 10-14; ICO Comments at 38; MSV Comments at 26, 34-35; MSV Reply at 19-20; Constellation Reply at 5-8; Celsat Reply at 18; Globalstar Reply at 12-15; ICO Reply at 12-13.

bands used by MSS operators, we conclude that our decision today precludes any possibility of the filing of mutually exclusive applications that would implicate the auction provisions of section 309(j)(1).[578] As we have explained, we find, based on the record and our analysis, that establishing shared usage of the same frequency band by separate MSS and terrestrial operators would likely compromise the effectiveness of both systems, particularly satellites already operating in the L-band and Big LEO band. Faced with a choice of either making limited terrestrial authority available to MSS operators or declining to grant any terrestrial rights in the MSS bands, we find that to withhold all terrestrial rights in these bands would not be in the public interest. At the same time, we find that the integration of an ATC into authorized and existing MSS systems serves the public interest.[579] Under these circumstances, and particularly in light of the fact that only MSS operators will be able to acquire terrestrial rights in the MSS bands, we agree with those commenters who argue that section 309(j)(1)'s requirement of mutually exclusive applications will not be met.

222. Certain commenters disagree with the Commission's suggestion that the obligation to use competitive bidding under section 309(j) "does not appear to be implicated" and argue that reallocation of this spectrum by competitive bidding is required by section 309(j).[580] These commenters argue that the assertion that there is no "mutual exclusivity" in this proceeding because ATC service would be linked to pre-existing MSS authorizations is "plainly erroneous."[581] They contend that, had ancillary services been a part of the original MSS authorizations, there would have been a much larger pool of mutually exclusive applicants, and competitive bidding procedures would have been required.[582] They further assert that "section 309(j) is violated where the Commission fundamentally changes the manner in which spectrum can be used shortly after licensing, where such a change would have likely created mutual exclusivity in the first place."[583] They argue that the Commission's reliance on a prior finding of no mutual exclusivity is based upon "facts no longer in existence," and is "no more than an end run around the statutory scheme" to avoid compliance with section 309(j).[584]

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[578] 47 U.S.C. § 309(j)(1) states:

> (1) GENERAL AUTHORITY.—If, consistent with the obligations described in paragraph (6)(E), mutually exclusive applications are accepted for any initial license or construction permit, then, except as provided in paragraph (2), the Commission shall grant the license or permit to a qualified applicant through a system of competitive bidding that meets the requirements of this subsection.

[579] *See supra* §§ III(A)(1)-(4) (describing how ATC may increase MSS spectrum efficiency, foster public safety, encourage the deployment of services and reduce business inefficiencies and costs).

[580] Cingular-Verizon Comments at 7-11; AT&T Wireless Comments at 16; TDS Comments at 2, 3-7; Cingular-Verizon Reply at 3-1; Rural Telecommunications Group at 5-6; SBE Comments at 2; CTIA Comments at 7-9.

[581] Cingular-Verizon Comments at 8-9.

[582] *Id.* at 9.

[583] Cingular-Verizon Reply at ii.

[584] Cingular-Verizon Comments at 9 (quoting *Burlington N. R.R. v. Transp. Bd.*, 75 F.3d 685, 694 (D.C. Cir. 1995)). Cingular-Verizon assert that the reason for adopting the 2 GHz band plan that avoided mutual exclusivity – to expedite the development of a satellite-only service to unserved communities – no longer exists. Cingular-Verizon Comments at 8-9; *see also, e.g.,* Letter from Brian F. Fontes, Vice President, Cingular Wireless LLC, et al., to Marlene H. Dortch, Secretary, Federal Communications Commission, IB Docket No. 01-185 at 4 (filed, Dec. 26, 2002).

223. We find no merit in the argument that our decision to grant ATC authority solely to current MSS licensees requires an auction because, had ancillary terrestrial services been a part of the original MSS authorizations, there would have been a pool of mutually exclusive applicants and competitive bidding procedures would have been required.[585] The fact that mutually exclusive applications might have been filed had we originally included ATC authority in MSS licenses does not mean that we must now grant terrestrial rights in the MSS bands through procedures that allow parties other than MSS operators to apply, particularly since we find that it is in the public interest to do otherwise.

224. We also reject the argument that we are required to treat ATC authorizations as initial licenses subject to the auction requirements of section 309(j). We agree with those commenters who argue that, because the terrestrial rights associated with a grant of ATC authority to MSS operators will be directly linked to existing MSS authorizations, there will be no separate "initial" authorizations, and therefore no requirement to use competitive bidding to assign such rights.[586] We disagree with those commenters who argue that granting ATC authority to MSS operators only "would create a new terrestrial offering" that would go "far beyond mere ancillary service," and that such authority therefore is required "to be deemed 'initial' under section 309(j)."[587] As we have made clear, MSS operators will not be allowed to use ATC authority for more than ancillary service.

225. The Commission has recognized that in certain instances it may be appropriate to treat a major modification as an initial application.[588] In particular, the Commission has stated that "certain types of mutually exclusive applications to modify existing licenses . . . may be so different in kind or so large in scope and scale as to warrant competitive bidding if mutual exclusivity exists."[589] Under the rules and policies we adopt in this Order, an eligible MSS operator will have its space-station license modified to permit ATC subject to stringent requirements and service rules designed to ensure that any terrestrial components are ancillary to the principal MSS authority the Commission previously granted.[590] Thus, to implement an ATC, an MSS licensee must (1) launch and operate its own satellite facilities; (2) provide substantial satellite service to the public; (3) offer ATCs on a commercially bundled basis with MSS, including offering satellite-capable equipment at the point of sale; (4) observe existing satellite geographic coverage requirements; and (5) limit ATC operations to the authorized satellite footprint. In light of these requirements, we find that the license modifications associated with ATC will not be modifications so different in kind or so large in scope and scale as to warrant treatment as "initial" licenses subject to section 309(j)(1). We note that the modification of MSS licensees' authorizations to include ATC authority without competitive bidding is consistent with other decisions in which we have extended licensees additional operating rights without accepting competing applications that might have

[585] Cingular-Verizon Comments at 9.

[586] Constellation Comments at 20-21; Loral Comments at 10-12.

[587] Cingular-Verizon Reply at 6 (internal quotations added).

[588] *See Implementation of Section 309(j) of the Communications Act – Competitive Bidding for Commercial Broadcast and Instructional Television Fixed Service Licenses,* MM Docket No. 97-234, First Report and Order, 13 FCC Rcd 15920, 15925-8, ¶¶ 13-19 (1998) (*Broadcast/ITFS Auction First Report and Order*); *Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, PP Docket No. 93-253, Second Report and Order, 9 FCC Rcd 2348, 2355, ¶¶ 37-40 (1994) (*Competitive Bidding Second Report and Order*).

[589] *Competitive Bidding Second Report and Order*, 9 FCC Rcd at 2355, ¶¶ 37-38.

[590] *See supra* § III(C) (discussing MSS ATC service rules).

required an auction.[591]

226. We are also not persuaded that allowing MSS operators to incorporate ATCs without going through a competitive bidding process is inequitable to CMRS carriers or will unjustly enrich those MSS operators such that we must treat the modifications of their authorizations as initial licenses.[592] The modifications we permit today may indeed make MSS licenses more valuable. However, given the strict limitations we are placing on ATC authority, and the significant costs of launching and maintaining satellite operations, we do not believe that such added value will rise to a level that constitutes unjust enrichment or requires that we consider the modification of MSS licenses to include ATC authority as the assignment of initial licenses.

b. Section 309(j)(3)

227. We also find that our decision to restrict terrestrial rights in the bands used by MSS operators to the provision of ATC by MSS operators only, and our concomitant decision not to accept terrestrial applications from other parties, is consistent with the Commission's obligations under section 309(j)(3). Section 309(j)(3) states that "[i]n identifying classes of licenses and permits to be issued by competitive bidding, in specifying eligibility and other characteristics of such licenses and permits, and in designing the methodologies for use under this subsection, the Commission shall include safeguards to protect the public interest in the use of the spectrum and shall seek to promote" certain objectives, including the development and rapid deployment of new technologies, products, and services for the benefit of the public, including those residing in rural areas, and the efficient and intensive use of the electromagnetic spectrum.[593] As we have explained in detail above, we find that our decision to accept requests from MSS operators to modify their licenses to permit the provision of ATC, without allowing the provision of separate terrestrial services in the same bands, will promote these goals.

228. We find, for example, that MSS operations have the potential ability to bring new technologies and services to consumers in rural areas, and that providing MSS operators with the flexibility to incorporate ATCs in their systems should enable them to achieve this goal.[594] We also find that limiting eligibility for terrestrial rights in the MSS bands to qualified MSS operators is consistent with the goal of ensuring efficient and intensive use of spectrum because it will allow for the use of MSS

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[591] *See, e.g. CMRS Flexibility Report and Order*, 11 FCC Rcd at 8979-80, ¶ 33 (deleting footnotes US330 and US331, which prohibited PCS licensees from providing fixed service, without triggering the competitive bidding requirements of Section 309(j)); *Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licenses to Engage in Fixed Two-Way Transmissions,*13 FCC Rcd 19112 (1998), *recon.*, 14 FCC Rcd 12764 (1999), *further recon.*, 15 FCC Rcd 14566 (2000) (permitting both MDS and ITFS licensees to provide two-way services and increasing flexibility on permissible modulation types and channelization). In both the CMRS and MDS/ITFS context, the Commission did not consider accepting competing applications from non-incumbents because of the difficulties of coordinating new fixed uses with existing mobile uses in CMRS and coordinating fixed two-way transmissions with existing one-way uses in MDS/ITFS. Although we sought comment on the possibility of coordination with respect to MSS spectrum, we have concluded that, as in those prior cases, there is no practical means by which a new licensee could coordinate terrestrial uses with existing satellite rights in the spectrum.

[592] *See* Cingular/Verizon Comments at 10-11 (alleging unjust enrichment); RTG Reply at 5 (alleging windfall).

[593] 47 U.S.C. § 309(j)(3).

[594] *Id*. § (309)(j)(3)(A).

spectrum in urban areas where that spectrum is otherwise unusable.[595] We agree with those commenters that argue that it would be technically less efficient and inadvisable for different operators to provide MSS and terrestrial wireless service in the MSS bands assigned to MSS licensees.[596] Specifically, as explained above, we find merit in the argument that there are spectrum efficiency benefits to dynamic allocation and that those benefits can only be realized by having one licensee control both the MSS and terrestrial rights to the spectrum in question.

229. We recognize that section 309(j)(3) also includes as one of its objectives the avoidance of unjust enrichment. As indicated above, however, we find that a grant of ATC authority to qualified MSS operators under the conditions prescribed in this Order should not result in the unjust enrichment of MSS licensees. [597] We also do not believe that MSS, even with ATC, will be directly competitive with the terrestrial services offered by CMRS carriers. While there is always some competition on the margin between two mobile voice and data services, the operating, functional, and cost characteristics of MSS with ATC are sufficiently different from CMRS terrestrial services that we do not believe they will be close substitutes for each other for the vast majority of customers. Thus, we do not believe there is any substantial competitive inequity to CMRS carriers from our grant of ATC to MSS operators. In addition, we note that section 309(j)(3) requires us to consider a number of objectives, which we must consider together and sometimes balance against each other. Having thoroughly considered the record and our statutory obligations, we conclude that our decision today is not inconsistent with section 309(j)(3)(C) and, indeed, generally furthers the objectives of section 309(j)(3).

c. Other Matters

230. In the *Flexibility Notice*, we sought comment on how section 647 of the Open-Market Reorganization for the Betterment of International Telecommunications Act[598] would affect the authorization of terrestrial service separate from MSS authorizations and flexible terrestrial use not ancillary to MSS operations. [599] We also asked commenters to address whether the decision of the U.S. Court of Appeals for the D.C. Circuit in *National Public Radio, Inc. v. Federal Communications Commission* is in any respect applicable to the ORBIT Act exemption from competitive bidding for international and global satellite communications services and the issues raised in this proceeding.[600] In light of our decision that granting only MSS operators the right to provide terrestrial service in MSS bands does not implicate the competitive bidding provisions of section 309(j) of the Communications Act, we need not address arguments regarding the applicability or non-applicability of the ORBIT Act.

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[595] *See, e.g.*, MSV Comments at 36 (citing 47 U.S.C. §309(j)(3)(D)).

[596] *See, e.g.*, Inmarsat Supplemental Comments at 5-15; Boeing Supplemental Comments at 8; Globalstar Supplemental Comments at 4-7; Celsat Supplemental Comments at 1-5; MSV Supplemental Comments at 4-9; ICO Supplemental Comments at 3-18.

[597] Section 309(j)(3)(C) states that the Commission shall seek to recover for the public "a portion of the value of the public spectrum resource made available for commercial use and *avoidance of unjust enrichment* through the methods employed to award uses of that resource." 47 U.S.C. § 309(j)(3)(C) (emphasis added).

[598] Open-Market Reorganization for the Betterment of International Telecommunications Act, Pub. L. No.106-180, 114 Stat. 48 (enacted March 12, 2000) (ORBIT Act) (codified at 47 U.S.C. §§ 761 *et seq*.)

[599] *Flexibility Notice*, 16 FCC Rcd at 15549, ¶ 39.

[600] *National Public Radio v. Federal Communications Commission*, 354 F.3d 226 (D.C. Cir. 2001).

3. Section 332

231. Section 332 of the Communications Act addresses the regulatory treatment of mobile services, and generally requires that providers of commercial mobile service be treated as common carriers for purposes of the Act while providers of private mobile service are not treated as common carriers.[601] Section 332(d)(1) of the Act defines "commercial mobile service" as "any mobile service . . . that is provided for profit and makes interconnected service available (A) to the public or (B) to such class of eligible users as to be effectively available to a substantial portion of the public, as specified by regulation of the Commission."[602] The Commission has determined that when Congress defined CMRS, it intended the CMRS classification to apply to all mobile services that are for profit and that provide interconnected service to the public or a substantial portion of the public.[603]

232. In the *2 GHz MSS Rules Order*, the Commission addressed the regulatory treatment of mobile services delivered by satellite. The Commission concluded that it had discretion to regulate the provision of the space station segment of 2 GHz MSS on a non-common carrier basis.[604] It indicated, however, that mobile earth station licenses, if used to provide a mobile service that meets the definition of CMRS under section 332(d) of the Act, would be regulated as CMRS.[605] The Commission explained that, if the service were to be offered to the public, as described in section 332(d)(1) of the Act, then the service would fall within the statutory definition of CMRS.[606] With respect to the L-band, we note that MSV, the MSS licensee in that band, was licensed as a common carrier for both the space segment and mobile handset licenses.[607] With respect to the Big LEO band, there are two operating systems, Iridium and Globalstar. In each case, we have regulated handsets actually providing service to the general public as CMRS.[608]

233. Although MSS can qualify as CMRS under the Communications Act, the Commission has acknowledged the operational and network differences between satellite and terrestrial systems and has deferred implementation of certain CMRS carrier obligations on satellite-based CMRS licensees.[609]

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[601] *See generally* 47 U.S.C. §§ 332 (c)(1)-(c)(2).

[602] 47 U.S.C. § 332(d)(1).

[603] *See Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory Treatment of Mobile Services*, Third Report and Order, GN Docket No. 93-252, 9 FCC Rcd 7988, 7993, ¶ 2 (1994).

[604] *See 2 GHz MSS Rules Order*, 15 FCC Rcd at 16172, ¶ 93.

[605] *Id.* at 16173, ¶ 97.

[606] *Id.* at 16173, ¶ 96.

[607] *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*, GEN Docket No. 88-1234, Memorandum Opinion, Order and Authorization, 4 FCC Rcd 6041 (1989).

[608] *See Space Station System Licensee, Inc.*, Memorandum Opinion, Order and Authorization, 17 FCC Rcd 2271, 2289, ¶ 45 (2002) (*Iridium Authorization*); *Vodafone Americas Asia, Inc.*, Order and Authorization, 17 FCC Rcd 12849, 12855, ¶ 18 (2002) (*Globalstar Authorization*).

[609] *See Revision of the Commission's Rules to Ensure Compatibility With Enhanced 911 Emergency Calling Systems,* CC Docket No. 94-102, Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd (continued….)

Depending on the types of end-user services offered, however, the ATC component that MSS licensees may offer may more closely resemble traditional CMRS networks than traditional satellite networks. Accordingly, some parties have argued that to the extent ATC components resemble traditional terrestrial CMRS networks, MSS licensees should be required to meet the same CMRS obligations that terrestrial CMRS providers must observe.[610] Cingular and Sprint, for example, state that "MSS licensees [providing ATC] presumably would use mobile switches just like those of the terrestrial CMRS providers, and they also propose to sell terrestrial only handsets, which would presumably be similar to the terrestrial CMRS handsets in the market today."[611] Other parties, such as Globalstar, however, claim that the Commission should not consider ATC the regulatory equivalent of terrestrial CMRS because MSS will be used by persons living and/or working outside areas of traditional wireline or terrestrial wireless coverage for the foreseeable future.[612] As a nascent service, Globalstar asserts, the Commission should impose minimal regulatory requirements on MSS ATC.[613]

234. We reaffirm our previous findings in the *2 GHz MSS Rules Order*, and hold that, if a mobile handset authorization meets the statutory definition of CMRS in section 332(d)(1) of the Act, then the service will be regulated as CMRS. We reject the arguments of Globalstar that our decision should rest on who the likely users of the service are, the size of the handsets, the cost of the service, or our assessment of whether MSS is a true competitor in the CMRS market. If MSS licensees seek to provide terrestrial mobile service in MSS bands, then the terrestrial component of the MSS ATC service shall be subject to the same regulatory treatment as any other operator providing the same or similar services in any other band.[614] As indicated in the *2 GHz MSS Rules Order*, we continue to reserve the right to review individual applications on a case-by-case basis to determine if this regulatory classification is appropriate.[615] We also retain our authority to forbear from applying certain provisions of Title II to CMRS providers as necessary.[616] We also will address, on a case-by-case basis, whether provisions not

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18676, 18718, ¶ 83 (1996), *recon*., Memorandum Opinion and Order, 12 FCC Rcd 22665 (1997); *Amendment of Parts 2 and 25 to Implement the Global Mobile Personal Communications by Satellite (GMPCS) Memorandum of Understanding and Arrangements*, Notice of Proposed Rulemaking, 14 FCC Rcd 5871, 5907, ¶ 98 (1999); *International Bureau Invites Further Comment Regarding Adoption of 911 Requirements for Satellite Services*, Public Notice, 16 FCC Rcd 3280 (2000); *Revision of the Commission's Rules to Ensure Compatibility With Enhanced 911 Emergency Calling Systems*, Further Notice of Proposed Rulemaking, 17 FCC Rcd 25576 (2002), *available at* <http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-02-326A1.doc> (last visited Dec. 26, 2002).

[610] *See, e.g.,* Letter from Brian Fontes, Cingular Wireless LLC, and Luisa Lancetti, Sprint Corporation, to Donald Abelson et al., Federal Communications Commission, IB Docket No. 01-185 at 9-10 (filed Dec. 2, 2002) (Cingular/Sprint Dec. 2, 2002 *Ex Parte* Letter) (arguing that the Commission should confirm that providers of terrestrial services in the MSS band will be subject to the statutory requirements and regulations applicable to other terrestrial mobile services, including CALEA, E911, local number portability, number pooling and TTY).

[611] Cingular/Sprint Dec. 2, 2002 *Ex Parte* Letter at 10.

[612] *See* Globalstar Comments at 11.

[613] *Id*.

[614] Accordingly, even if an MSS licensee offers only non-common-carrier *satellite* services, the Commission will require the MSS licensee to comply with common carrier rules for its *terrestrial* component if the terrestrial component of its service offering will, in fact, be offered on a common carrier basis.

[615] *See 2 GHz MSS Rules Order*, 15 FCC Rcd at 16174, ¶ 97.

[616] *See* 47 C.F.R. § 20.15; *see also* 47 U.S.C. § 332(c)(1)(A).

required by statute to apply to all CMRS providers should be applied to specific MSS ATC offerings. However, requirements that must be applied to all common carriers will also apply to MSS CMRS.[617]

F. Modification of Table of Allocations

235. In the *Flexibility Notice*, we sought comment on whether a footnote to the U.S. Table of Allocations contained in section 2.106 of our rules indicating that MSS operators are permitted to integrate terrestrial operations into their MSS systems would be sufficient to permit such operations.[618] Commenters addressing this issue support the use of footnotes,[619] some of whom note that such an approach is consistent with the Commission's decision to add footnote US327 to the Table of Allocations for terrestrial service in DARS.[620]

236. A licensee's authorized MSS assignments are conditioned on coordination agreements and based on the ITU Radio Regulations. MSS coordination agreements and the ITU Radio Regulations provide varying regulatory statuses to terrestrial operations in the frequency bands in which we permit ATC.[621] Due to our decision today that ATC networks are to be closely tied to a licensee's MSS network operations from a technical and operational standpoint, and our decision to allow an MSS licensee to operate an ATC network only on its frequency assignments for its satellite network, we agree with the commenters that adding footnotes to the U.S. Table of Allocations for the respective MSS bands is sufficient to permit ATC operations in the 2 GHz MSS, L-band and Big LEO MSS allocations. The new footnote, US380, reads as follows: "In the bands 1525-1559 MHz, 1610-1660.5 MHz, 2000-2020 MHz, 2180-2200 MHz, and 2483.5-2500 MHz, a non-Federal Government licensee in the mobile-satellite service (MSS) may also operate an ancillary terrestrial component in conjunction with its MSS network, subject to the Commission's rules for ancillary terrestrial components and subject to all applicable conditions and provisions of its MSS authorization."[622]

G. Licensing Requirements

1. Modification of MSS Space-Station Authorizations

237. In the *Flexibility Notice*, we sought comment on modifying a U.S.-licensee's space station license to authorize the provision of ATC. We proposed that we would license the terrestrial facilities provided that the licensee has requested a modification to its license and demonstrated that it has met the established eligibility criteria.[623] We noted, however, that the terrestrial components of MSS

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[617] *See, e.g.,* 47 C.F.R. §§ 20.63, 20.64; *Communications Assistance for Law Enforcement Act*, Pub. L. No. 103-414, 108 Stat. 4279 (1994) (codified as amended in scattered sections of 18 U.S.C. and 47 U.S.C. §§ 229, 1001-1010, 1021).

[618] *Flexibility Notice*, 16 FCC Rcd at 15559-60, ¶¶ 69-71.

[619] *See, e.g.*, MSV Comments at 32 & Reply at 26-27; Constellation Comments at 24; ICO Comments at 48-49.

[620] *See* 47 C.F.R. § 2.106 US 327; *Amendment of the Commission's Rules with Regard to the Establishment and Regulation of New Digital Audio Radio Services*, GEN Doc. No. 90-357, Report and Order, 10 FCC Rcd 2310 (1995); *see also* Celsat Reply at 17; Motient Reply at 32.

[621] *See supra* § III (E)(1)(b).

[622] *See* App. B (adopting US380, 47 C.F.R. § 2.106).

[623] *Flexibility Notice*, 16 FCC Rcd at 15553-54, ¶ 50.

operations could allow two-way traffic that could originate and terminate on the terrestrial component of the network without having to transverse the satellite component of the network. This architecture could entail a significant number of fixed stations deployed in a multi-cellular network, particularly in urban areas, that would allow traffic to be handed off from one cell to another. In the 2 GHz MSS bands, we also noted that not all incumbent fixed operations may be relocated, and that these incumbent fixed operations will remain co-primary until 2010.[624] Therefore, we sought comment on whether to authorize the terrestrial facilities separately or on a blanket licensing basis, for the U.S. coverage of the MSS space segment (i.e., the 50 states, and U.S. territories and possessions, such as Puerto Rico and the U.S. Virgin Islands) or a smaller area.[625]

238. Commenters addressing the issue generally support authorizing ATC operations by modifying an MSS operator's space station license and state that individual coordination of base stations is not needed.[626] MSV, for example, urges the Commission to adopt licensing requirements that "facilitate rapid deployment" the MSS operators' ancillary terrestrial component.[627] A few commenters supported individual licensing requirements on the grounds that doing so would promote inter-service coordination.[628] Most commenters, however, characterized our alternative proposals to require some form of site-by-site licensing for each ATC base station as redundant, burdensome and of little practical value to other licensees or the Commission. According to MSV, for example, "requiring individual licensing of [terrestrial] facilities will be burdensome and unnecessary."[629] Instead, MSV recommends adopting a procedure similar to the one used for base stations in the Wireless Communications Service, which requires individual applications only where construction or operation of the facility would have a significant environmental effect.[630] MSV recommends that the Commission extend its existing policies and rules for the geographic-area licensing of terrestrial base-stations to MSS ATC operators. Under this approach, the Commission would not routinely review the proposed construction of base-station facilities built to support transmission equipment used by MSS licensees; however, the Commission would review any towers that require either a showing of compliance with the National Environmental Policy Act (NEPA),[631] or an antenna structure registration under Part 17 of our rules.[632]

239. Geographic area licensing provides licensees the flexibility to adjust spectrum usage dynamically, depending upon market demands. Given that one of the policies behind granting ATC is to

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[624] *Id.* at 15554-55, ¶ 52.

[625] *Id.* at 15555, ¶ 52.

[626] *See, e.g.*, ICO Comments at 47; MSV Reply at 27.

[627] MSV Comments at 28-29.

[628] *See, e.g.,* SBE Comments at 3.

[629] MSV Comments at 29.

[630] *Id*.

[631] *See National Environmental Policy Act of 1969*, 42 U.S.C. § 4321.

[632] 47 C.F.R. §§ 17.1-17.58. Under Part 17 of the Commission's rules, all antenna structures of more than 200 feet in height or within the flight path of an airport must be registered with the Commission prior to construction. *See* 47 C.F.R. § 17.7(a) ("….of more than 60.96 meters (200 feet) in height above ground level."). If the antenna structure may have a significant environmental effect, as defined by section 1.1307 of the Commission's rules, *see* 47 C.F.R. § 1.1307, the applicant must file an Environmental Assessment (EA) as part of its registration application. *See* 47 C.F.R. § 1.1308; *see also Streamlining the Commission's Antenna Structure Clearance Procedure*, Report and Order, 11 FCC Rcd 4272, 4289, ¶ 41 (1995).

provide the flexibility to MSS licensees to use their licensed spectrum more efficiently, we implement geographic area licensing for all MSS ATC base stations in the United States that do not pose a potential hazard to the environment, public health, scenic and historic locations, tribal lands, aviation and related concerns.[633] Specifically, section 1.1301 and related provisions of our rules describe certain types of facilities that require additional Commission scrutiny under the NEPA.[634] These provisions apply to all Commission actions, including licensing, that may have a significant impact on the quality of the human environment.[635] Similarly, our Part 17 rules on antenna structures govern every radiating or receiving transmission system and provide detailed guidance on antenna height, location, lighting and similar issues to protect aviation.[636] As with other terrestrial transmission or reception equipment, therefore, we will require individual licensing of ATC base stations in any situation that may pose an adverse effect to the environment, public health, scenic and historic locations, tribal lands aviation or related concerns.[637]

240. We adopt a blanket authorization process to implement geographic area licensing of ATC base station facilities operating in the U.S. coverage of the MSS space segment (i.e., the 50 states, and U.S. territories and possessions, such as Puerto Rico and the U.S. Virgin Islands). Blanket ATC base station authorization shall be conditioned upon the MSS licensees' satisfaction of the requirements of this Order in providing ATC and the rules adopted herein. We will require MSS licensees to modify their space station licenses using FCC Form 312, and accompanied by the appropriate fee, to request blanket authority to construct and operate ATC base station facilities.[638] MSS licensees shall provide specific information and certifications describing the ATC operations in the following categories: information demonstrating that the terrestrial facilities will comply with the technical restrictions adopted herein; a statement that the terrestrial facilities will comply with the Commission's rules regarding environmental impact;[639] and that the terrestrial facilities will comply with Part 17 of the Commission's rules regarding antenna structure clearance with the Federal Aviation Administration; and a certification that the terrestrial facilities will be operated consistent with all international agreements. Any applications meeting these requirements will be treated as minor modifications.[640] As with any minor modification, if upon Commission review the Commission deems it in the public interest to seek comment on an MSS ATC application, the Commission at its discretion may provide public notice and opportunity for comment. We recommend that licensees seeking approval of non-conforming operations submit separate applications for blanket authority, listing the technical parameters of those individual facilities that do no meet our rule requirements to prevent delay in the grant of applications for conforming facilities filed concurrently.[641]

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[633] *See, e.g.*, MSV Comments at 29 ("Individual applications and prior Commission approval should be required only if construction and operation of the facility would have a significant environmental effect.").

[634] 47 C.F.R. § 1.1301 *et seq*.

[635] 47 C.F.R. § 1.1303.

[636] *See, e.g.,* 47 C.F.R. §§ 17.1-17.58.

[637] *See* App. B (47 C.F.R. §§ 25.147(a)(4)-(5)).

[638] As a result, authorization for ATC will run in parallel with the MSS satellite system license and will expire upon expiration of the space-station license, unless renewed.

[639] *See* 47 C.F.R. Part 1, Subpart I.

[640] *See* 47 C.F.R. § 25.151(c)(1).

[641] MSV notes that it has already applied to launch and operate a next-generation MSS system that included a request to operate ancillary terrestrial base stations. MSV Comments at 29 (citing *Application of Motient Services* (continued….)

241. We decline to impose site-by-site licensing for MSS base stations. This alternative to geographic area licensing of MSS ATC base stations would force MSS licensees and the Commission to spend considerable time and resources to assemble information that would hold little or no practical value in resolving coordination disputes that may arise.[642] While we must review and license ATC base stations individually in certain narrow circumstances to address public interest concerns, adopting an all-inclusive requirement for the individual licensing of every ATC base station does not serve the public interest and, in fact, would impose significant costs on the licensees and the Commission with little benefit to the public. Where, as here, the Commission has adopted technical limitations on adjacent-band and co-channel interference, individual licensing of transmission facilities neither decreases the likelihood of interference, nor accelerates resolution of a coordination dispute.[643] Indeed, the Commission has the authority to require the MSS licensee to terminate the base station's operations immediately, wherever located, and may impose sanctions on the licensee, including monetary forfeitures or license revocation, if appropriate.[644] In the past, moreover, the Commission has expedited licensing procedures in cases such as this one where administrative delays associated with traditional licensing schemes might prove "seriously detrimental" to provision of the proposed service.[645] In sum, the significant cost of individual licensing to the licensees and the Commission outweighs the limited benefits that might exist under these alternative regimes.

2. Foreign-Licensed MSS Providers

242. In 1997, to implement the World Trade Organization (WTO) Agreement on Basic Telecommunications (WTO Basic Telecom Agreement),[646] the Commission adopted the *DISCO II Order*, establishing procedures to evaluate applications by satellite systems licensed by other WTO-member countries to access the U.S. market.[647] Under the terms of the WTO Basic Telecom Agreement, seventy-eight WTO Members made binding commitments to open their markets to foreign competition in satellite services.[648] The United States, in particular, committed to open its satellite market to foreign systems

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Inc. and Mobile Satellite Ventures Subsidiary LLC, File No. SAT-AMD-20010302-00019 (March 2, 2001)). To the extent that MSV has already paid the appropriate fee, MSV need only amend its pending application to conform its proposal to our requirements.

642 *See, e.g.,* MSV Comments at 29 ("Requiring individual licensing of these [ATC base station] facilities will be burdensome and unnecessary."); Constellation Comments at 30 ("individual licensing would place a heavy, unnecessary administrative burden on the Commission and MSS operators").

643 MSV Comments at 29.

644 47 C.F.R. §§ 1.80-1.95.

645 *See Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions,* Report and Order, 13 FCC Rcd 19112, 19146, ¶ 61 (1998) (adopting a certification procedure for ITFS and MDS that "dramatically expedite[s] the licensing process").

646 The WTO Basic Telecom Agreement was incorporated into the General Agreement on Trade in Services (GATS) by the Fourth Protocol to the GATS (April 30, 1996), 36 I.L.M. 336 (1997) (GATS Fourth Protocol).

647 *See Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Service in the United States,* Report and Order, 12 FCC Rcd 24094 (1997) (*DISCO II Order*).

648 GATS Fourth Protocol, 36 I.L.M. at 363; *see also DISCO II*, 12 FCC Rcd at 24102, ¶ 19. The United States made market access commitments for fixed and mobile satellite services. It did not make market access commitments for Direct-to-Home (DTH) Service, Direct Broadcast Satellite Service (DBS), and Digital Audio Radio Service (DARS), and took an exemption from most-favored nation (MFN) treatment for these services as well. *See* GATS Fourth Protocol, 36 I.L.M. at 359. Generally, GATS requires WTO member countries to afford (continued….)

licensed by WTO-member countries to provide fixed and mobile satellite services (excluding direct-to-home fixed satellite service). In its *DISCO II Order* implementing the WTO Basic Telecom Agreement, the Commission concluded that providing opportunities for non-U.S.-licensed satellites to deliver services in the United States would bring U.S. consumers the benefits of enhanced competition.[649] The Commission also found that this policy would promote greater opportunities for U.S. companies to enter previously closed foreign markets and stimulate a more competitive global satellite-services market.[650] In *DISCO II*, the Commission said that requests to serve the U.S. market would be granted provided they are found to be in the public interest. In making this determination the Commission said that it would take into account factors such as competition in the United States, spectrum availability, eligibility requirements, technical requirements, and national security, law enforcement, foreign policy and trade issues.[651]

243. In our *Flexibility Notice,* we sought comment on authorizing foreign-licensed MSS providers to operate MSS ATCs within the United States by issuing or modifying existing declaratory orders, consistent with our existing *DISCO II* procedure.[652] We noted that, under *DISCO II*, foreign-licensed MSS systems may file a Letter of Intent (LOI) requesting that the Commission reserve spectrum so that a non-U.S.-licensed satellite system under development will have access to spectrum when it is completed. Such reserved spectrum is eventually licensed for use by the system's earth stations operating in the United States.[653] As an alternative to modifying a foreign-licensed MSS provider's declaratory order, we proposed to require foreign-licensed operators that provide MSS service in the United States, and wish to supplement their MSS signals using an ATC, to file an appropriate earth station application.[654] This earth station application would merely demonstrate that the foreign-licensed MSS space segment operator meets our minimum eligibility criteria, including the minimum coverage requirements, applicable to U.S.-licensed MSS operators.[655]

244. TMI, a foreign-licensed MSS provider and one of the few commenters to address in detail the issue of how best to accommodate ATC in foreign-licensed MSS systems under our rules,

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most-favored nation (MFN) treatment to all other WTO member nations. "With respect to any measure covered by this Agreement, each Member shall accord immediately and unconditionally to services and service suppliers of any other Member treatment no less favorable than that it accords to like services and service suppliers of any other country." GATS Article II, paragraph 1. Member nations are permitted to take "MFN exemptions," however, under certain circumstances specified in an annex to GATS. *See* GATS Annex on Article II Exemptions.

649 *DISCO II Order*, 12 FCC Rcd at 24097, ¶ 4.

650 *Id.* at 24099, ¶ 10.

651 *Id.* at 24100, ¶ 15.

652 *Flexibility Notice*, 16 FCC Rcd at 15554, ¶ 51. Under the *DISCO II* procedure, foreign-licensed MSS systems may file an LOI requesting that the Commission reserve spectrum so that the non-U.S.-licensed satellite system may provide service in the United States through future-licensed earth stations that may or may not be ultimately licensed to the MSS provider. The LOI procedure was developed as part of the U.S. implementation of its market access commitments in the WTO Basic Telecom Agreement to avoid the need to issue separate (and duplicative) U.S. licenses for those space stations under the jurisdiction of another licensing and coordinating administration. The Commission explained that it adopted this procedural framework in order to avoid issues of national comity and international coordination responsibilities for space stations. *DISCO II Order*, 12 FCC Rcd at 24174, ¶ 188.

653 Two foreign-licensed LOI filers participated in the initial 2 GHz MSS processing round: ICO and TMI.

654 *Flexibility Notice*, 16 FCC Rcd at 15554, ¶ 51.

655 *Id*.

proposes that "an MSS entity that has already been granted an LOI to provide satellite services should be authorized to provide terrestrial services merely upon filing a letter request seeking an appropriate modification of its existing LOI."[656] According to TMI, this procedure will achieve the type of parity between U.S.- and foreign-licensed MSS operators that the WTO Basic Telecom Agreement requires. While TMI suggests that a "radio frequency plan should not be required with the modification request because the technical rules adopted for the MSS should be sufficient to address any interference problem,"[657] TMI concedes that some form of U.S. radio station license may be necessary to govern operation of the ancillary radio transmitters located on U.S. territory. TMI suggests that the Commission require foreign-licensed MSS operators granted access to serve the United States under an LOI to file an application to use terrestrial facilities in conjunction with their foreign-licensed MSS system.[658] According to TMI, this application "should be processed in the same manner as [an] application for blanket earth station licenses."[659]

245. We agree in part with TMI's proposal for licensing ATC facilities operators by foreign-licensed MSS providers. As with the U.S.-licensed MSS entities, we shall permit an MSS operator that has been granted an LOI to provide satellite services to the United States to file an application to modify its LOI authorization to use ATC in conjunction with its foreign-licensed MSS system, once operational. The application for ATC authority will be addressed either in conjunction with an application for Title III earth station authorization, or if such an authorization has already been granted, it may be filed as a minor modification to the earth station authorization under the same procedures described above for modification of U.S.-based MSS licensees' authorization. We believe that this approach achieves parity between U.S.- and foreign-licensed MSS operators.

3. MSS ATC Handset Earth Station Licensing

246. MSS operators providing service to the United States, including foreign-licensed MSS systems, are required to obtain blanket authorizations for mobile handset earth stations.[660] Blanket licensing allows a satellite operator to apply for authorization that permits the licensee to operate a specified number and type of qualified earth stations, rather than seeking an individual license for earth stations.[661] The technical characteristics of earth stations are reviewed in this process. In comparison, for terrestrial CMRS authorizations, handsets are reviewed pursuant to the certification rules contained in Part 2, Subpart J of our rules.[662] These rules require the applicant to submit a technical report on the equipment and to provide detailed information about the device, such as its manufacturer, operating

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656 TMI Comments at 4.

657 *Id*.

658 *Id.* at 4-5; *accord* Constellation Comments at 30.

659 TMI Comments at 5.

660 *See, e.g.*, 47 C.F.R. § 25.115(d); *TMI Communications and Company, L.P. for Blanket Authorization to Operate up to 100,000 Mobile Satellite Earth Terminals (METs) though Canadian-licensed satellite MSAT-1 at 106.5 degrees W.L. in frequency bands 1631.5-1660.5 MHz (transmit) and 1530-1559 MHz (receive) throughout the Continental United States, United States Territories, Alaska, and Hawaii*, Order and Authorization, 15 FCC Rcd 18117 (Sat. Div., Int'l Bur. 2000); *Iridium U.S., L.P.*, Order and Authorization, 11 FCC Rcd 20474 (Int'l Bur. 1996).

661 *See, e.g., 18 GHz Order,* 15 FCC Rcd at 13471, ¶ 87.

662 47 C.F.R. § 2.1031 *et seq*.

mechanisms, and frequency usage.[663] In the *Flexibility Notice*, we sought comment on a requirement that handsets designed to operate using MSS ancillary terrestrial facilities be reviewed pursuant to our certification rules contained in Part 2, Subpart J of our rules.[664] In the *Flexibility Notice*, we stated that "[t]he use of equipment certification procedures for [MSS ATC] handsets would be consistent with procedures to authorize other handsets used for cellular-type service and would ensure that they satisfy any technical and safety requirements to protect co-channel and adjacent channel operations and end users."[665]

247. Most commenters that addressed the proper method of certifying MSS ATC end-user equipment support our proposal to review MSS ATC handsets under Part 2, Subpart J of our rules.[666] At least one MSS operator, however, suggested that the requirements may prove unnecessarily restrictive for MSS ATC. According to Constellation, the Commission need not adopt "an additional set of technical standards derived from conditions in the PCS bands when the current technical standards on MSS transceivers already address all potential interference cases in the MSS bands."[667] With a few exceptions, Constellation claims that "the only rule revisions . . . necessary [are those that] . . . clarify that the existing technical standards on MSS user transceivers apply to handsets whether transmitting to satellites or to terrestrial base stations."[668] WCA, however, questions Constellation's proposal to adopt only those rules that clarify that the same rules apply to handsets whether they are transmitting to the satellite or to the base station. Indeed, WCA opposes adopting our existing equipment-certification procedures on grounds that the existing requirements are too likely to lead to harmful interference to other operators in adjacent bands.[669] According to WCA, therefore, the Commission should require MSS ATC proponents to file detailed plans and technical analyses prior to authorizing MSS ATC to ensure that MSS ATC operations

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[663] *See* 47 C.F.R. § 2.1033.

[664] *Flexibility Notice,* 16 FCC Rcd at 15555, ¶ 53 (citing 47 C.F.R. § 2.1031 *et seq*.)

[665] *Flexibility Notice*, 16 FCC Rcd at 15555, ¶ 53.

[666] *See, e.g.*, ICO Comments at 48. MSV also supports requiring handsets to comply with Part 2, Subpart J of our rules, provided that MSS operators are not required to obtain a prior earth station authorization for every mobile services terminal. According to MSV, the Commission should adopt either an equipment-approval process, or a separate licensing process for MSS ATC terminals; MSS ATC providers should operate under either, but not both, of these regimes. MSV Comments at 30.

[667] Constellation Comments at 35. Constellation claims that, because MSS ATC handsets "will transmit to terrestrial repeaters at lower powers than when transmitting to satellites," these handsets "will cause no higher levels of interference than that permitted by handsets transmitting to MSS satellites." Constellation Comments at 13. "Since the current satellite mode standards adequately protect other services," Constellation claims that "there is no need to apply more stringent limits on handsets when operating with terrestrial repeaters." Constellation Comments at 13 n.21.

[668] *Id.* at 35-36. In a footnote, Constellation adds the caveat that "in the case where MSS downlink bands are used for ancillary terrestrial [Time Division Duplex] handset transmissions, the requirements of the corresponding MSS uplink band should be applied to these operations." Constellation Comments at 36 n.78. Constellation adds that in the Big LEO and 2 GHz MSS bands, the current Commission rules governing equipment certification procedures and safety and distress communications "should be applied to user transceivers when operating with terrestrial base stations, and has proposed minor amendments to the relevant rule sections to clarify this requirement with respect to user transceivers." Constellation Comments at 36.

[669] WCA "is dubious that if MSS spectrum is opened for terrestrial use, the minimal MSS handset rules can provide adequate protection against interference to nearby MDS and ITFS operations." WCA Reply at 6.

will not adversely affect services in adjacent bands, such as MDS and ITFS.[670]

248. Given our decision today that MSS licensees must provide an integrated offering of both the satellite-delivered service and the terrestrially delivered service to every customer,[671] we revise section 25.115(d) of our rules to clarify that, in addition to MSS operators requiring blanket authorization for METs operating with the satellite, MSS operators choosing to also operate ATC networks must also receive equipment certification pursuant to Part 2, Subpart J of our rules for all end user equipment. Therefore, if an MSS ATC provider or its distributors offer a single MET to the public that communicates with the satellite and the ATC network, the MET would require the blanket authorization and certification. If an MSS ATC provider or its distributors offer a MET that has separable parts, any part that communicates with the satellite would require traditional blanket authorization and certification, and the separable handset designed to operate using only MSS ancillary terrestrial facilities would require certification.[672] The use of certification procedures for these handsets is consistent with procedures to authorize other handsets used for cellular-type service and will ensure that they satisfy our technical and safety requirements to protect co-channel and adjacent channel operations and end users.

4. Construction Prior to MSS Operation

249. In the *Flexibility Notice*, we also sought comment on when authorized MSS licensees may begin construction of ATC facilities. Specifically, we asked whether we should permit construction of terrestrial facilities prior to obtaining an earth station license, at the MSS provider's own risk.[673] Many parties agree with our initial observation that "[p]ermitting advance construction and testing of terrestrial components would enable MSS operators to turn on their terrestrial service as soon as they have met their satellite coverage…requirement."[674] MSV, for example, "urges the Commission to allow construction and testing of terrestrial facilities at the MSS operator's own risk to ensure that integrated terrestrial operations commence at the earliest possible date."[675] Similarly, Constellation notes that construction of ATC base stations is a "time-consuming undertaking that requires substantial long lead time planning, site acquisition, design and manufacturing, installation, . . . testing" and similar activities.[676] Constellation also notes that delays in MSS ATC operations not only reduce the overall value of the MSS system and prevent the licensee from earning revenues and profits from the sale of its services to the public, but also prevent consumers from enjoying services that they might otherwise have acquired.[677] We agree.

250. While forcing licensees to delay construction would impose costs not only on licensees but also on consumers, authorizing early construction of authorized ATC facilities would result in little or no adverse effects either to consumers, producers or other Commission licensees. We believe that early demonstration of integrated systems will be beneficial to successful commercial introduction of services.

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[670] *Id.* at 8-9; s*ee also* Inmarsat Comments at 9-16.

[671] *See supra* § III(C) (commercial bundling discussion).

[672] ICO Comments at 17.

[673] *Flexibility Notice*, 16 FCC Rcd at 15551, ¶ 45; *id*. at 15555, ¶ 52.

[674] *See* Celsat Reply at 14; MSV Comments at 30; ICO Comments at 46; Constellation Comments at 29.

[675] MSV Comments at ii-iii.

[676] Constellation Comments at 29.

[677] *See, e.g.*, *id.* ("[s]ignificant delays in availability of a fully integrated system would delay customer ramp-up and have adverse financial impact on MSS operators").

Therefore, after an ATC authorization has been issued, at the MSS licensee's own risk and subject to the conditions specified in this Order, we will permit construction of ATC facilities after physical construction has begun on the MSS system's satellites, but prior to commencement of the provision of MSS services. For similar reasons, consistent with the rules and procedures adopted in this Order, we authorize MSS satellite operators to test ATC prior to commercial operation of their MSS systems. Specifically, during the process of constructing ATC facilities, the MSS operator, having obtained ATC authorization as described above may, without further authority from the Commission, conduct equipment tests for the purpose of making such adjustments and measurements as may be necessary to assure compliance with the terms of its ATC authorization, the technical provisions of the application, the rules and regulations and the applicable engineering standards.[678] We prohibit, however, commercial operation of ATCs before or until the MSS system is commercially operating as specified in this Order,[679] and such commercial operation of ATCs will result in enforcement action, including license revocation and/or the imposition of a monetary forfeiture.

H. Administrative Procedures

251. A few commenters question the decision-making sequence with respect to our decision to adopt this notice and our decisions in other related proceedings. Cingular and Verizon Wireless argue that the Commission cannot lawfully consider the issues raised in this docket until the Commission "fully and finally" resolves pending issues involving our licensing of 2 GHz MSS providers and denial of a petition for rulemaking seeking reallocation of 70 megahertz of 2 GHz MSS spectrum for terrestrial use.[680] According to these parties' joint comments, reasoned decision making does not permit the Commission to consider a change in the nature of the MSS band plan without first resolving whether the premises underlying the original allocation continue to be valid.[681]

252. Similarly, in an *ex parte* presentation, Iridium requests that the Commission defer acting on whether to allow MSS providers operating in the Big LEO band to provide ATC until the Commission "rectifies the spectrum inequity between Big LEO operators that has arisen due to the failure of several of the original licensees."[682] According to Iridium, competitive concerns and sound spectrum management dictate that the Commission decide on a new Big LEO band plan before adopting ATC, because Iridium would not be able to provide ATC over its portion of the Big LEO band, while Globalstar would be capable of providing ATC.[683] Iridium then sets forth proposals that would allocate to itself 11.5 megahertz of spectrum among the 1615.35-1626.5 MHz and 2495-2500 MHz bands.[684] In that regard,

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[678] *See* App. B. (47 C.F.R. § 25.143(j)).

[679] *See supra* § III(C)(4) (discussing commercial availability of MSS prior to initializing ATC).

[680] Cingular/Verizon Comments at 16.

[681] *Id.* at ii ("Reasoned decisionmaking does not allow a fundamental change in the nature of the MSS band plan without first resolving whether the premises underlying the original allocation still make any sense.")

[682] Letter from Richard E. Wiley, Counsel to Iridium Satellite LLC to Marlene H. Dortch, Secretary, Federal Communications Commission at 1 (Dec. 3, 2002) (Iridium Deferral Letter).

[683] Iridium Deferral Letter at 6-9.

[684] *Id*. at 9-12; *see also* Letter from Jennifer D. Hindin, Counsel, Iridium Satellite LLC to Marlene M. Dortch, Secretary, Federal Communications Commission, IB Docket No. 01-185 at 2-5 (filed Dec. 11, 2002) (Iridium Dec. 11, 2002 *Ex Parte* Letter).

Iridium has also filed a petition for rulemaking asking that we revise our current rules to allow Iridium (a TDMA system) to operate in 5.85 megahertz of spectrum in the 1615.5-1621.35 MHz portion of the Big LEO band, currently the upper segment of the CDMA service uplink band.[685] We seek comment on the proposal in the Iridium Petition, and other options related to the Big LEO band, *infra*, in the *Notice of Proposed Rulemaking*.

253. Below we find the claims of Cingular/Verizon and Iridium to be without merit. We have full discretion to resolve the issues in this rulemaking without first acting on the other matters that these parties discuss.

1. Further Delay Unwarranted in the 2 GHz MSS Bands

254. By way of background, on May 18, 2001, CTIA filed a petition for rulemaking asking that all 70 megahertz of 2 GHz MSS spectrum be reallocated for terrestrial use and auctioned.[686] CTIA argued that the premise behind the Commission's 70 megahertz allocation to 2 GHz MSS systems, the creation of a satellite service that would cover rural areas, was no longer realistic in light of statements made by ICO and MSV in support of their request for spectrum flexibility.[687] In its petition, CTIA requested that the Commission defer licensing 2 GHz MSS systems until the Commission reaffirmed the viability of these systems.[688] On July 17, 2001, the International Bureau granted the MSS applications.[689] The Bureau also stated that the Commission would commence the instant proceeding to consider flexibility for MSS licensees.[690]

255. Cingular, Verizon Wireless and AT&T Wireless filed a joint application for review of the license grants on August 16, 2001.[691] This application for review argued, among other things, that the International Bureau engaged in unreasoned decision making by granting the licenses before resolving questions concerning viability of MSS raised by the CTIA petition for rulemaking. In August 2001, the Commission denied in part the CTIA petition for rulemaking insofar as it requested reallocation of more than 14 megahertz of 2 GHz MSS spectrum.[692] On October 15, 2001, CTIA filed a petition for

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[685] *Amendment of Parts 2.106, 25.143, and 25.202 of the Commission's Rules to Require Operation of LEO MSS Systems Using TDMA/FDMA Techniques in the 1615.5-1626.5 MHz Frequency Bands*, Petition for Rulemaking, Iridium Satellite LLC, at 1 (filed July 26, 2002) (*Iridium Petition)*.

[686] Petition for Rulemaking of the Cellular Telecommunications & Internet Association (filed May 18, 2001) (CTIA Petition for Rulemaking). Several commenters, including CTIA, have made the same request in the instant proceeding. *See, e.g.*, CTIA Nov. 26 *Ex Parte* Letter at 1; CTIA Nov. 20 *Ex Parte* Letter at 8; CTIA Nov. 19 *Ex Parte* Letter at 8; Cingular/Sprint May 13. *Ex Parte* Letter at 15-16.

[687] CTIA Petition for Rulemaking at 2.

[688] *Id.* at 3-4.

[689] *E.g., ICO Services*, 16 FCC Rcd at 13788-9, ¶¶ 30-31.

[690] *Id.* at 13788, ¶ 30.

[691] Application for Review of AT&T Wireless Services, Inc., Cellco Partnership d/b/a Verizon Wireless, and Cingular Wireless LLC, DA 01-1631, (filed Aug. 16, 2001) (*Licensing Application for Review*).

[692] *Advanced Services Further Notice*, 16 FCC Rcd at 16055, ¶ 23.

reconsideration of the denial of its petition for rulemaking.[693] CTIA's reconsideration petition will be addressed by the Commission in a separate proceeding.[694]

256. Cingular and Verizon Wireless now claim that the Commission cannot properly consider whether to grant flexibility to 2 GHz MSS providers to integrate terrestrial components into their networks in their assigned spectrum until the Commission first resolves the application for review relating to the grant of the 2 GHz MSS licenses and CTIA's petition for reconsideration of the denial of its petition for rulemaking.[695] According to Cingular and Verizon Wireless, "to take up flexible use, before the validity of earlier actions has been resolved, is arbitrary and capricious decisionmaking."[696]

257. We conclude that Cingular and Verizon Wireless's unreasoned decision making arguments are without merit, and that we have full discretion to resolve the issues in this rulemaking without first acting on the CTIA petition for reconsideration or the application for review. The courts have repeatedly held that the Commission and other administrative agencies have extensive latitude in managing their dockets, particularly when the agency explains why it chooses to act on some issues and defer others, as was the case in the Commission actions about which Cingular and Verizon Wireless complain.[697] As the D.C. Circuit held, an agency need not "make progress on every front before it can make progress on any front."[698] Simply put, we have broad discretion to manage the order in which we dispose of issues before us. We will address the merits of Cingular, Verizon Wireless and AT&T Wireless's joint application for review in a separate order.[699]

258. We also conclude that reasoned decision making does not require us to defer action in this proceeding pending resolution of the application for review or the CTIA petition for reconsideration. While captioning their proposals differently, Cingular and Verizon Wireless essentially argue for us to stay the instant proceeding pending resolution of their and CTIA's appeals. As we have previously held, such requests, no matter how captioned, are subject to the Commission's traditional test for such extraordinary relief.[700] Cingular and Verizon Wireless's comments do not satisfy the legal requirements

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693 *See Introduction of New Advanced Mobile and Fixed Terrestrial Services; Use of Frequencies Below 3 GHz, Petition for Rulemaking of the Cellular Telecommunications & Internet Association Concerning Reallocation of 2 GHz Spectrum for Terrestrial Wireless Use*, Petition for Reconsideration, ET Docket Nos. 00-258 and 95-18; IB Docket No. 99-81 at 1 (filed Oct. 15, 2001).

694 *See AWS Third Report and Order*, ET Docket No. 00-258, FCC 03-16.

695 Cingular/Verizon Comments at ii.

696 *Id.*

697 *See, e.g., Western Union Int'l Inc. v. FCC*, 673 F.2d 539, 543-44 (D.C. Cir. 1982).

698 *Personal Watercraft Industry Ass'n v. Dept. of Commerce*, 48 F.3d 540, 544 (D.C. Cir. 1993).

699 *See Boeing Company, Celsat America, Inc., Constellation Communications Holdings, Inc., Globalstar L.P., ICO Services Limited, Iridium L.L.C., Mobile Communications Holdings, Inc, TMI Communications and Company, L.P.* Report and Order, IB Docket No. 99-81 (*2 GHz License Deferral and Application for Rulemaking*).

700 *See, e.g., Deferral of Licensing of MTA Commercial Broadband PCS*, PP Docket No. 93-253, ET Docket No. 92-100, Memorandum Opinion and Order, 11 FCC Rcd 17052 (1996). We require a party seeking to stay a Commission proceeding to demonstrate that: (1) it has a substantial likelihood of succeeding on the merits; (2) it would suffer irreparable harm absent a stay; (3) grant of a stay would not harm others; and (4) the stay would be in the public interest. *Cumulus Licensing Corp. and Clear Channel Broadcasting Licensees, Inc*., 16 FCC Rcd 1052, (continued….)

that would justify issuance of a stay. First, Cingular and Verizon Wireless have not presented any arguments or evidence that they are likely to succeed on the merits. Similarly, Cingular and Verizon Wireless have not demonstrated that they will be irreparably harmed in the absence of a stay.[701] Instead, Cingular and Verizon provide general arguments that competing demands for spectrum for advanced wireless services require that the Commission reallocate for 3G services more than the 10-14 MHz of 2 GHz MSS spectrum currently being considered for reallocation.[702] These arguments simply do not show that our failure to stay this proceeding will cause immediate, substantial harm to Cingular or Verizon Wireless. Rather Cingular and Verizon Wireless offer conjecture about events that may or may not occur in the future. Finally, a stay in this proceeding disserves the public interest by delaying the introduction of new competition and services contemplated by this order. Stay of this proceeding would also set a precedent that pending proceedings could be easily stayed by the filing of a petition for rulemaking, or a subsequent reconsideration process if such a petition is denied, even when the legal requirements for a stay have not been met. The Commission cannot permit its processes to be paralyzed by filings that make no attempt to meet the high burden of a stay. For these reasons we conclude that we need not resolve the application for review or CTIA's petition for reconsideration any more "fully and finally" than we have here and in the 2 GHz MSS licensing orders prior to granting flexibility to 2 GHz MSS operators.

2. Further Delay Unwarranted in the Big LEO Bands

259. We also decline Iridium's request to defer deciding whether to allow MSS providers operating in the Big LEO band to provide ATC until we address Iridium's petition to adjust frequency assignments in the Big LEO band. As a practical matter, our decisions to permit Globalstar to implement MSS ATCs in the 1610-1615.5 MHz and 2492.5-2498.0 MHz bands, along with our requirement that base stations be tunable across the entire 2483.5-2500 MHz band, do not prejudice our consideration of potential revision to the Big LEO band plan regarding those frequencies Iridium has suggested for its use (11.5 megahertz of spectrum among the 1615.35-1626.5 MHz and 2495-2500 MHz bands). Moreover, we find that Iridium has not met the traditional test for us to defer resolution of this proceeding. Iridium has not demonstrated that it has a substantial likelihood of success on the merits. Rather, Iridium has demonstrated merely that conditions are sufficiently different from those present at the time the Commission adopted the Big LEO band plan to justify consideration, which we address in the *Notice* portion of this item. As noted above, our decision today in no way limits Iridium's ability to obtain the rights it seeks. Further, Iridium has failed to demonstrate that failure to stay this proceeding will cause immediate, substantial harm to Iridium. It is well established that financial losses are not sufficiently irreparable to meet the traditional test. Finally, we find that stay of this preceding would not serve the public interest of allowing all parties to move forward. In this case, we find that grant of a stay would have the anticompetitive and undesirable effect of preventing one Big LEO MSS licensee from achieving immediate expanded use of its assigned spectrum (with such use resulting in operational and other benefits), simply because it chose a technology that permits implementation of the services immediately, as compared to its competitor. Iridium would have us withhold services from the public because they can only be provided by a competitor, we find no basis for such a result. Therefore, we do not defer action on ATC in the Big LEO bands pending resolution of the issues raised in the Iridium Petition.

(Continued from previous page)
1058, ¶ 20 (2001); *Washington Metropolitan Area Transit Comm. v. Holiday Tours, Inc.*, 559 F.2d 841, 842-43 (D.C. Cir. 1977).

[701] An injury qualifies as "irreparable harm" only if it is "both certain and great; it must be actual and not theoretical." *Id.* at 674. Therefore, to demonstrate irreparable harm, Cingular and Verizon must provide "proof indicating that the harm [it alleges] is certain to occur in the near future." *Id.*

[702] Cingular/Verizon Comments at 20-22.

260. Finally, we deny Iridium's *ex parte* request for access to any part of the Big LEO service downlink band (2483.5-2500 MHz) at this time.[703] Based on Iridium's current authorization, it does not appear that its satellite system is designed or authorized to operate in the Big LEO service downlink band.[704] Though Iridium does not provide any technical information about the type of system or service that it would offer in the Big LEO service downlink band, it appears from Iridium's *ex parte* filings that it seeks authority to provide an ATC-only service in those bands. Since ATC, by definition, uses the same spectrum as, and is ancillary to, an operational licensed satellite service, the issue of whether Iridium could provide ATC in bands that it is not licensed for is not ripe for discussion in this Order. Iridium is free to comment and provide additional information on the type of service it seeks to offer in response to the *Notice of Proposed Rulemaking* initiated below.

IV. NOTICE OF PROPOSED RULEMAKING

261. In this section, we initiate IB Docket No. 02-364 to seek comment on proposals for reassigning or reallocating a portion of spectrum in the Big LEO MSS frequency bands. At the time that the Commission developed the Big LEO spectrum sharing plan, it explained that it might be appropriate to re-visit the plan in the future. Since then, two systems deployed and have begun to operate, while several other systems have either surrendered their license or failed to meet the terms of their license. These changes, as well as changing traffic patterns and consumer demands, suggest that it is now appropriate to re-examine the Big LEO spectrum plan. In addition, Iridium, one of the Big LEO operators, has requested access to additional spectrum in the Big LEO band.[705] As described below, we seek comment on the original spectrum-sharing plan, Iridium's proposal, and other possible uses of the spectrum.

A. Background

262. In 1994, the Commission adopted the Big LEO spectrum sharing plan.[706] At that time, there were five applicants for Big LEO licenses: Motorola Satellite Communications, Inc., pursuing the Iridium system, Loral/Qualcomm Partnership, L.P., pursuing the Globalstar system, TRW, Inc., pursuing the Odyssey system, Mobile Communications Holdings, Inc. (MCHI), pursuing the Ellipso system, and Constellation Communications, Inc. (Constellation), pursuing the Aries system. Iridium and Globalstar both launched and are operating global Big LEO MSS systems. In 1998, TRW surrendered the Odyssey system authorization.[707] The Commission has cancelled the licenses for Constellation's and MCHI's

[703] Iridium Deferral Letter at 10.

[704] *Motorola Satellite Communications, Inc.,* Order and Authorization, 10 FCC Rcd 2268 (Int'l Bur. 1995), *erratum,* 10 FCC Rcd 3925, *recon. denied,* Memorandum Opinion and Order, 11 FCC Rcd 18502 (1996) (*Iridium License*) (authorizing Iridium to construct an MSS system capable of operating in the 1616-1626.5 MHz frequency band).

[705] Iridium Petition *supra* n.7.

[706] *Big LEO Order*, 9 FCC Rcd at 5954-59, ¶¶ 43-53.

[707] *See* Public Notice, Report No. SPB-114, File Nos. 65-SAT-P/LA-98; SAT-LOA-19971222-00230 at 3 (Jan. 15, 1998) (reporting letter from counsel for TRW, Inc. to Secretary of the Commission surrendering Big LEO authorization).

systems.[708]

263. Under the Big LEO spectrum sharing plan, the Commission found that up to four CDMA Big LEO MSS systems (Globalstar, Aries, Ellipso and Odyssey) could share 11.35 megahertz of service uplink spectrum in the 1610-1621.35 MHz band and 16.5 megahertz of service downlink spectrum in the 2483.5-2500 MHz band. The 16.5 megahertz service downlink spectrum in the 2483.5-2500 MHz band was reserved for assignment to CDMA systems. The Commission also found that one TDMA system (Iridium) could operate bi-directionally in 5.15 megahertz of spectrum in the 1621.35-1626.5 MHz band. In the *Big LEO Order*, the Commission said that it would consider reducing the 11.35 megahertz of spectrum allocated for sharing among CDMA systems in the Big LEO service uplink band to 8.25 megahertz if only one CDMA system were implemented.[709] This adjustment would make 3.15 megahertz available for re-assignment. The Commission stated that it would decide in the context of a future rulemaking proceeding whether to re-assign the spectrum to the TDMA system or to make it available to a new entrant.[710]

264. Based on recent filings, Globalstar has stated that it is operating in nine of a total of 13 CDMA channels in the Big LEO service uplink spectrum.[711] Globalstar explains that each of the CDMA channels is 1.23 megahertz wide. A small amount of spectrum is used to provide frequency clearance between the channels and at the ends of the CDMA band for a total of approximately 11.35 megahertz in use by Globalstar.[712] Iridium currently uses the 5.15 megahertz of spectrum assigned to it in the 1621.35-1626.5 MHz band for both service up and down links.[713] Due to the fact that no other CDMA system has deployed, Globalstar has exclusive use of 16.5 megahertz of spectrum in the Big LEO CDMA service downlink band at 2483.5-2500 MHz.

B. Big LEO CDMA Spectrum Proposals

265. As the Commission said in the *Big LEO Order*, at some point in the future it might be appropriate to re-examine the Big LEO spectrum sharing plan in a rulemaking based on the circumstances at the time and make additional findings to refine the use of the band to better serve the public interest.[714]

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[708] *Constellation Communications Holdings, Inc.*, Memorandum Opinion and Order, 17 FCC Rcd 22584 (Int'l Bur. 2002), *petition for recon. pending*; *Mobile Communications Holdings, Inc.*, Memorandum Opinion and Order, 16 FCC Rcd 11766 (Int'l Bur. 2001), *petition for recon. denied*, Memorandum Opinion and Order, 17 FCC Rcd 11898 (Int'l Bur. 2002), *app. for review pending*.

[709] *Big LEO Order*, 9 FCC Rcd at 5959-60, ¶ 54.

[710] *Id.* at 5959-60, ¶¶ 54-55.

[711] Letter from Timothy J. Cooney, Counsel to Globalstar, to Magalie Roman Salas, Secretary, FCC, ET-Docket 98-142 (May 14, 2001), *available at* <http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6512567466> (last visited, Jan. 9, 2003).

[712] Based on the information provided in Globalstar's filing, Commission staff has roughly calculated that Globalstar's channelization plan is as follows: 1.23 megahertz service uplink channels each, small frequency clearance between the service channels of 0.01 megahertz and adjacent user frequency clearance of 0.195 megahertz on either end of the CDMA band.

[713] The International Bureau dismissed as moot Globalstar's request for Iridium's spectrum, as Iridium is still operational. *See* Letter from Jennifer Gilsenan, Chief, Satellite Policy Branch, to William Wallace, Counsel to Globalstar (Nov. 29, 2001).

[714] *Big LEO Order*, 9 FCC Rcd at 5959-61, ¶¶ 54-57.

We have received a Petition for Rulemaking from the sole TDMA licensee, Iridium, seeking additional spectrum for use in the CDMA portion of the Big LEO band.[715] In addition, the Commission also left open the possibility of providing an opportunity for additional MSS entry in the Big LEO spectrum.[716] We believe that it is appropriate to seek comment on both the possible reassignment and possible reallocation of any returned spectrum for possible use by other services.

266. Iridium seeks reassignment of 5.85 megahertz of spectrum in the 1615.5-1621.35 MHz portion of the Big LEO band, which is currently the upper segment of the CDMA service uplink band.[717] Iridium states that it has growing demands for spectrum in the United States, has reached near-peak capacity use on its system at times in various regions of the world and that, based on projections and potential global events, it will need additional Big LEO spectrum in the near term.[718] Because only one CDMA Big LEO system has deployed, it is now appropriate to consider making at least 3.1 megahertz of additional spectrum available to Iridium. We will base our final judgment on the record established in this proceeding; however, we shorten the normal comment cycle for this *Notice* to expedite the decision-making process. Specifically, we will require comments on this *Notice* to be filed within 30 days of publication of this rulemaking in the Federal Register and reply comments to be filed within 15 days thereafter. We are taking this action to ensure that we will be in a position to act swiftly on Iridium's petition and resolve the Big LEO spectrum sharing plan issues. We acknowledge and encourage Iridium's proposal for the parties to develop cooperatively a mutually acceptable spectrum sharing plan, which could be presented to the Commission for consideration and public comment before the conclusion of the accelerated pleading cycle.[719] The presentation of a common proposal would facilitate prompt resolution of the issues; however, regardless of whether parties can reach agreement, we tentatively conclude that a rebalancing of the Big LEO band will serve the public interest and intend to proceed expeditiously on considering the appropriate amount of spectrum that each Big LEO MSS licensee should receive. We expect to complete action on this Notice prior to authorization of any ATC services in the Big LEO band.[720] In the event we are not able to do so, it may be necessary and in the public interest to specifically impose conditions on a grant of ATC authority that would preserve a full range of options concerning the Big LEO band plan and that would permit grant to Iridium of interim access to additional spectrum pending resolution of the further notice.

267. While Iridium provides anecdotal evidence of its potential need for additional spectrum,

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[715] Iridium Petition *supra* n.7.

[716] *Big LEO Order*, 9 FCC Rcd at 5960, ¶ 55.

[717] Iridium also seeks amendment of sections 2.106, 25.143, and 25.202 of the Commissions rules to facilitate its proposed change in the Big LEO assignments.

[718] *See* Letter from Richard E. Wiley, Counsel to Iridium Satellite, LLC, to Michael K. Powell, Chairman, FCC (Jan. 13, 2003) (Iridium Jan. 13, 2003 *Ex Parte* Letter).

[719] *See* Letter from Richard E. Wiley, Counsel to Iridium Satellite, LLC, to Marlene H. Dortch, Secretary, FCC (Dec. 18, 2002), *available at* <http://svartifoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6513398434 > (last visited, Jan. 9, 2003) (Iridium Dec. 18, 2002 *Ex Parte* Letter).

[720] As a practical matter, there will be a period of time before any MSS operator will be in a position to deploy ATC. As described in the Report portion of this document, MSS operators will be required to submit and obtain Commission approval of ATC based on information demonstrating compliance with our gating criteria, a request for modification to the space station license to include ATC and a request for certification of handsets before commencing ATC services.

we seek detailed comment regarding its actual current spectrum use and substantiated projections of its future spectrum requirements. Specifically, we seek additional information on the number of customers Iridium can support using its current spectrum, the demand of Iridium customers for spectrum in the United States versus other regions of the world. We also seek comment concerning how many subscribers Iridium plans to support and what type of services it plans to offer as a function of Iridium's projected spectrum requirements. In addition, we seek comment on the public interest rationale for re-assigning 5.85 megahertz of spectrum rather than the 3.1 megahertz that the Commission contemplated when it originally discussed modifying the band sharing plan.

268. We also seek technical information on Iridium's current and projected spectrum use. We seek comment on how efficiently Iridium is using its current spectrum and, if we were to make more Big LEO spectrum available, exactly how much additional spectrum would be appropriate. For instance, has Iridium been able to develop more efficient spectrum use as a result of its experience operating a global MSS system? Has Iridium been able to modify its system to take advantage of any technical developments in spectrum use since the launch of its system? We note that even though Iridium's Big LEO system is authorized to operate in the 1621.35-1626.5 MHz band, the system is capable of operating across the 1616-1626.5 MHz band.[721] If authorized to use Big LEO spectrum down to 1615.35 MHz, as requested by Iridium, we seek comment on how Iridium would use the 1615.35-1616 MHz portion of the band given it was not authorized to construct a system capable of operating in that portion of the band. In addition, we seek comment on the type of system that Iridium would deploy in any additional spectrum. For instance, would Iridium use additional spectrum for CDMA or TDMA based services? If Iridium were to use CDMA technology, would there be any sharing opportunities with Globalstar or a new entrant, satellite or terrestrial?

269. In addition, we seek comment on how Globalstar is using its assigned spectrum. Is Globalstar using its entire assigned spectrum? If not, what portion of the Big LEO service bands is Globalstar using to provide service and why? What are Globalstar's projected spectrum needs in the future? In addition, we seek comment on how much spectrum Globalstar is using in the service downlink band, 2483.5-2500 MHz. Does Globalstar have a need for more spectrum in the service downlink than in the service uplink? Would it serve the public interest to allow Globalstar to use the entire downlink spectrum or should the Commission pair the uplink and downlink spectrum assignments? If Globalstar does not use or is not permitted to use the entire Big LEO service downlink spectrum, what should the Commission do with any unused spectrum? Commenters should provide a cost-benefit analysis of any proposals for the use of this spectrum.

270. More generally, we seek comment on whether changes to the Big LEO spectrum sharing plan would have any effect on GLONASS, the Russian Global Navigation Satellite System, and radioastronomy service (RAS) operations in the band.[722] We seek comment on whether there may be any opportunities for sharing between the Iridium and Globalstar systems. Does Iridium have any plans to depart from its current spectrum use architecture to one that would require separate uplink and downlink spectrum? We also seek comment on how the U.S. Big LEO spectrum sharing plan fits with international band plans for Big LEO operations and what impact changes to the U.S. plan would have on plans in other regions.

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[721] *Iridium Big LEO License,* 10 FCC Rcd at 2268, ¶ 3; *id.* at 2272, ¶¶ 24-25.

[722] In the Big LEO service rulemaking, the Commission considered and found it unnecessary to adopt protections for the GLONASS system. *Big LEO Memorandum Opinion & Order*, 11 FCC Rcd at 12865, ¶14. The Commission also established a plan for protecting RAS. *Big LEO Order*, 9 FCC Rcd at 5976-83, ¶¶ 100-121.

271. We also seek comment on the possibility of making any returned spectrum, including service downlink spectrum in the 2483.5-2500 MHz band, available in a second Big LEO processing round. We seek comment on whether there is a need for additional spectrum for new MSS systems in the Big LEO band and the level of interest in participating in a second Big LEO processing round. If we were to have a second round for Big LEO applicants, we seek comment on the type of criteria that we should use for entry. For instance, should applicants who have held Big LEO licenses in the past be eligible to participate in a second processing round? Should we continue our practice of not applying financial standards in cases where mutual exclusivity can be resolved? How much spectrum would need to be made available to provide sufficient incentive for applicants to participate in a second Big LEO processing round? Are the current Big LEO processing rules sufficient to handle a second processing round or would we need to conduct a rulemaking to develop appropriate rules for second round applicants and licensees? Should the Commission consider the possibility of permitting government use of the Big LEO spectrum to support a non-commercial Big LEO system? We seek comment on this alternative and any other relevant information that commenters believe may be helpful to the Commission.

272. Finally, we seek comment on the possibility of re-allocating any returned Big LEO spectrum. Under the plan adopted in this Order, spectrum in the 2483.5-2492.5 MHz and 2498-2500 MHz bands could be available for other uses. For instance, we seek comment on allowing unlicensed devices to operate in any returned spectrum.[723] Currently, we restrict the operation of unlicensed devices in the 2483.5-2500 MHz band to avoid interference to MSS.[724] We also seek comment on allocating these bands for site-based or critical infrastructure licensees.[725] Alternatively, we seek comment on pairing spectrum in the 2483.5-2492.5 MHz band with an equal amount of spectrum in the Big LEO service uplink band at 1610-1626.5 MHz. For example, could we pair five megahertz in each band for a total of ten megahertz to create additional spectrum for assignment to a terrestrial CMRS licensee? Commenters should provide a technical rationale for how much spectrum would need to be made available to provide enough spectrum to support a viable service and provide support for the types of services that could make use of the spectrum. Commenters should also provide technical information addressing interference and other concerns that could be raised by the incumbent MSS licensees and other users of the spectrum, e.g., radioastronomy, and adjacent spectrum users.

273. We seek comment on all of these alternatives and any other relevant proposals that commenters may raise during the course of the comment cycle in this rulemaking. In light of our decision today in the Report and Order section of this document to adopt rules to permit implementation of MSS ATCs in the Big LEO bands, we will permit ATCs in those portions of the Big LEO bands without prejudice to the outcome of this *Notice of Proposed Rulemaking*.[726] We also seek comment on implementation of ATC in the portion of the Big LEO bands beyond those portions authorized for ATC today. Specifically, whether there are any advantages or disadvantages to allowing CDMA or TDMA systems to deploy ATC in particular parts of the unresolved portions of the Big LEO service up and

[723] 47 C.F.R. § 15.247 (permitting frequency hopping and direct sequence spread spectrum intentional radiators, including for the 2400-2483.5 MHz band, meeting enumerated criteria).

[724] *See id.* § 15.205.

[725] *See* Critical Infrastructure Assurance Office, *About CIAO*, *available at* <http://www.ciao.gov/publicaffairs/about.html> (last visited, Jan. 6, 2002) (describing services).

[726] *See supra* § III(D) (clarifying that Iridium will be permitted to operate ATC in the 1621.35-1626.5 MHz band and Globalstar will be permitted to operate ATC in 1610-1615.5 MHz and 2492.5-2498 MHz Big LEO MSS bands prior to completion of this rulemaking and subject to the ATC authorization procedures that we adopt today).

downlink spectrum. Commenters should provide information on any other technical or regulatory aspects of ATC implementation that should be considered beyond the record already established in this proceeding.

C. Comment Dates

274. Pursuant to sections 1.415 and 1.419 of the Commission's Rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments on the Notice of Proposed Rulemaking in IB Docket No. 02-364 on or before 30 days after Federal Register publication and reply comments on or before 45 days after Federal Register publication. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS) or by filing paper copies.[727] All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

275. Comments filed through the ECFS can be sent as an electronic file via the Internet to http://www.fcc.gov/e-file/ecfs.html. Generally, only one copy of an electronic submission must be filed. In completing the transmittal screen, commenters should include their full names, Postal Service mailing addresses, and the applicable docket number, IB Docket No. 02-364. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to ecfs@fcc.gov, and should include the following words in the body of the message: "get form <your e-mail address>". A sample form and directions will be sent in reply.

276. Parties who choose to file by paper must file an original and four copies of each filing. If parties want each Commissioner to receive a personal copy of their filing, they must file an original plus nine copies. Paper filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail (although we continue to experience delays in receiving U.S. Postal Service mail). The Commission's contractor, Vistronix, Inc., will receive hand-delivered or messenger-delivered paper filings for the Commission's Secretary at 236 Massachusetts Avenue, N.E., Suite 110, Washington, D.C. 20002. The filing hours at this location are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building. Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capital Heights, MD 20743. U.S. Postal Service first-class mail, Express Mail, and Priority Mail should be addressed to 445 12th Street, S.W., Washington, D.C. 20054.

277. Comments and reply comments will be available for public inspection during regular business hours in the FCC Reference Center, 445 12th Street, S.W., Washington, D.C. Comments are also available on the ECFS, at http://gullfoss2.fcc.gov/cgi-bin/websql/prod//ecfs/comsrch_v2.hts.

V. PROCEDURAL MATTERS

278. *Final Regulatory Flexibility Analysis.* The Final Regulatory Flexibility Analysis for this Report and Order, pursuant to the Regulatory Flexibility Act, 5 U.S.C. § 604, is contained in Appendix D.

279. *Final Paperwork Reduction Act Analysis.* The requirements adopted in this Rulemaking have been analyzed with respect to the Paperwork Reduction Act of 1995 (the 1995 Act) and found to impose new or modified information collection requirements on the public. Implementation of any new or modified requirements will be subject to approval by the Office of Management and Budget (OMB) as

[727] *See Electronic Filing of Documents in Rulemaking Proceedings*, Memorandum Opinion and Order on Reconsideration, 13 FCC Rcd 21517 (1998); Report and Order, 13 FCC Rcd 11322 (1998).

prescribed by the 1995 Act's emergency processing provisions. OMB approval is requested to be granted no later than 30 days from the date of publication of this Rulemaking in the Federal Register. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public to comment on the information collections contained in this Report and Order, as required by the Act 1995. Public comments are due 21 days from date of publication of this Report and Order in the Federal Register. Comments should address: (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology.

280. Written comments by the public on the new or modified information collection requirements are due 21 days after publication of this Rulemaking in the Federal Register. Comments on the information collections contained herein should be submitted to Judy Boley, Federal Communications Commission, 445 Twelfth Street, S.W., Room 1-C804, Washington, D.C. 20554, or over the Internet to jboley@fcc.gov and to Edward C. Springer, OMB Desk Officer, Room 10236 NEOB, 725 17th Street, N.W., Washington, D.C. 20503 or via the Internet to edward.springer@omb.eop.gov. For additional information on the information collection requirements, contact Judy Boley at (202) 418-0214 or via the Internet at the above address.

281. For further information concerning this proceeding, contact Breck Blalock at (202) 418-8191/bblalock@fcc.gov, or Trey Hanbury at (202) 418-0766/ghanbury@fcc.gov, International Bureau, Federal Communications Commission, Washington, DC 20554.

VI. ORDERING CLAUSES

282. IT IS ORDERED that, pursuant to sections 4(i), 7, 302, 303(c), 303(e), 303(f) and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. sections 154(i), 157, 302, 303(c), 303(e), 303(f) and 303(r), this Report and Order and Notice of Proposed Rulemaking IS ADOPTED and that Part 25 of the Commission's Rules IS AMENDED, as specified in Appendix B, effective 30 days after publication in the Federal Register.

283. IT IS FURTHER ORDERED that the Petition for Rulemaking filed by Iridium Satellite LLC IS GRANTED in part to the extent described above and IS DENIED in all other respects.

284. IT IS FURTHER ORDERED that the Regulatory Flexibility Analysis, as required by section 604 of the Regulatory Flexibility Act and as set forth in Appendix D, IS ADOPTED.

285. IT IS FURTHER ORDERED that the Commission's Consumer Information Bureau, Reference Information Center, SHALL SEND a copy of this Report and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNIATIONS COMMISSION

Marlene H. Dortch
Secretary