Inmarsat will make additional spectrum available to LightSquared at an initial annual cost of $115 million.[103]

(ii) 2 GHz MSS Band

55. We license MSS systems domestically in the 2000-2020 MHz band and the 2180-2200 MHz segments of the S-band. Previously, the 2 GHz MSS band included 70 megahertz, but in 2003, the Commission reallocated 30 megahertz of spectrum in the band from MSS to terrestrial services.[104]

56. The Commission adopted MSS rules for the 2 GHz bands in 2000.[105] In 2001, the Bureau authorized eight satellite operators to provide MSS in the 2 GHz band. By the end of 2004, three of those satellite operators had their licenses cancelled for failure to meet milestone obligations.[106] In early 2005, another three 2 GHz MSS satellite operators – Iridium, Boeing, and Celsat – surrendered their licenses.[107] This left only two satellite operators, DBSD (then known as ICO) and TerreStar (then known as TMI), with spectrum reserved to provide MSS in the 2 GHz band.

57. In December 2005, the Commission adopted an *Order* reassigning the spectrum formerly assigned to Iridium, Boeing, and Celsat to DBSD and TerreStar. As a result, DBSD and TerreStar each have access to 20 megahertz of spectrum in the 2 GHz band.[108]

58. Both TerreStar and DBSD are now in bankruptcy and awaiting action on pending applications to have their respective licenses acquired by DISH Network Corporation.[109]

(a) TerreStar Debtor-in-Possession (DIP)

59. On July 1, 2009, TerreStar launched TerreStar-1[110] and completed in-orbit testing on

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[103] *See* LightSquared Press Release, "LightSquared Delivers Notice To Inmarsat Triggering Phase 2 of Re-Banding Of L-band Radio Spectrum In North America," (January 28, 2011), http://www.lightsquared.com/press-room/press-releases/lightsquared-delivers-notice-to-inmarsat-triggering-phase-2-of-re-banding-of-l-band-spectrum-in-north-america/.

[104] *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile & 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, 18 FCC Rcd 2223, 2238, ¶ 28 (2003). Prior to this decision, the 2 GHz MSS band was 1990-2025 MHz and 2165-2200 MHz. *Id.* at 2225, ¶ 3.

[105] *Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band*, 15 FCC Rcd 16127, 16128, ¶ 1 (2000).

[106] The three licensees were Mobile Communications Holdings, Inc., Constellation Communications Holdings, Inc., and Globalstar.

[107] Specifically, Iridium LLC surrendered its authorization on March 16, 2005, the Boeing Company on March 28, 2005, and Celsat America, Inc., on April 12, 2005.

[108] *See Use of Returned Spectrum in the 2 GHz Mobile Satellite Service Frequency Bands*, IB Docket Nos. 05-220 and 05-221, Order, 20 FCC Rcd 19696 (2005), *recon. pending*.

[109] *DISH Network Corporation Files to Acquire Control of Licenses and Authorizations Held By New DBSD Satellite Services G.P, Debtor-in-Possession and TerreStar License Inc., Debtor-in-Possession*, DA 11-1557, Public Notice (Int'l Bur., rel. September 15, 2011).

[110] *See TerreStar Corporation, Form 10-K/A, Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934, for the fiscal year ended 31 December 2009*, page 1. *See also* Comments of TerreStar Networks Inc., ET Docket No. 20-142, September 15, 2010, p.2. TerreStar-1 operates at 111.0 degrees W.L. TerreStar Networks (Canada) Inc. holds title to TerreStar-1. Epstein Declaration, Oct. 19, 2010, n. 12, at 7.

August 27, 2009. In September 2009, TerreStar entered into an agreement with AT&T Mobility, where AT&T would offer certain TerreStar satellite communications services to its government and enterprise customers.[111] On January 13, 2010, the Bureau granted TerreStar ATC authority for use of 20 MHz of S-band spectrum with its mobile wireless network.[112] TerreStar-2 is under construction and, prior to bankruptcy, completion was scheduled for October 2011.[113]

60. TerreStar entered into several spectrum agreements with Harbinger. For example, in September 2009, TerreStar leased Harbinger, with an option to purchase, certain 1.4 GHz terrestrial spectrum.[114] In January 2010, TerreStar and Harbinger negotiated an exclusive agreement related to TerreStar's S-band spectrum. That exclusive agreement expired on April 26, 2010, without an agreement for the use of TerreStar's S-band spectrum being executed.[115] On May 6, 2010, TerreStar and LightSquared entered into two agreements: the first was a 90-day exclusive agreement whereby both parties agreed to negotiate in good faith on a pooling arrangement for the S-band spectrum;[116] and the second was an agreement for LightSquared to purchase satellite minutes of voice and data transmission and satellite capacity on TerreStar-1.[117]

61. On October 19, 2010, TerreStar announced that TerreStar Networks, Inc. and other affiliates were filing petitions for reorganization under Chapter 11 of the U.S. Bankruptcy Code. TerreStar Networks entered into an agreement with EchoStar Corporation, a secured creditor, to provide TerreStar with a $75 million debtor-in-possession financing facility which would be used to continue operations during the restructuring process.[118]

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[111] *See TerreStar Corporation, Form 10-K/A, Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934, for the fiscal year ended 31 December 2009*, page 2.

[112] *See* Order and Authorization, TerreStar Networks Inc., Application for Blanket Authority to Operate Ancillary Terrestrial Component Base Stations and Dual-Mode MSS-ATC Mobile Terminals in the 2 GHz MSS Bands, File Nos. SES-LIC-20061206-02100, SES-AMD-20061214-02179, SES-AMD-20070309-00336, SES-AMD-20070508-00582, SES-AMD-20070723-00978, SES-AMD-20070907-01253, SES-AMD-20080229-00217, SES-AMD-20091117-01464, Call Sign: E060430, available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-10-60A1_Rcd.pdf. *See also* TerreStar Press Release, "FCC Grants TerreStar ATC Authority: License Enhances TerreStar's Next Generation Mobile Wireless Network in US," January 14, 2010, available at http://www.terrestar.com/press/20100114.html.

[113] According to the Epstein declaration, TerreStar-2 is 90 percent complete and they have paid approximately 95 percent of the construction costs. Access to a completed and operational ground spare is currently a requirement for TerreStar's ATC authorization.

[114] *See* TerreStar 10K for the period ending Dec. 31, 2009, at 6. *See also*, Epstein Declaration, October 19, 2010, at 10-11.

[115] *See* TerreStar 10K for the period ending Dec. 31, 2009, at 6, and TerreStar 10-Q for the period ending June 30, 2010, at 20.

[116] *See* Epstein Declaration, at 11-12. During that 90-day period, TerreStar agreed not to solicit or encourage any proposal relating to the S-band spectrum or enter into an agreement relating to the S-band spectrum.

[117] *See* TerreStar 8-K filed May 7, 2010.

[118] *See* TerreStar Press Release, "TerreStar Networks Restructures to Strengthen Financial Position," October 19, 2010, available at http://www.terrestarinfo.com/Press%20Release%20Restructuring%20_1019.pdf.

(b) DBSD Debtor-in-Possession (DIP)

62. In 2004, ICO formed DBSD North America (DBSD NA)[119] to develop an integrated MSS/ATC system. New DBSD is a wholly-owned, indirect subsidiary of DBSD NA and is authorized to provide MSS. In May 2009, DBSD NA and eight other affiliated companies, including New DBSD, filed for bankruptcy protection under Chapter 11 of the United States Bankruptcy Code[120]; and on October 26, 2009, the bankruptcy court approved the debtors' proposed reorganization plan.[121] On December 11, 2009, New DBSD DIP filed applications to transfer control of earth station licenses for operations of its 2 GHz mobile satellite service system to DBSD[122] (the licenses include an authorization for ATC).[123] On September 29, 2010, the International Bureau granted New DBSD DIP's license transfer request.[124] Following additional court proceedings, on March 15, 2011, DISH Network received approval from the bankruptcy court to acquire a 100 percent stake in DBSD North America.[125]

(iii) Big LEO Bands

63. The Big LEO bands are the 1610-1626.5 MHz band and the 2483.5-2500 MHz band. The Commission adopted rules for the Big LEO bands in 1994.[126] At that time, five parties were seeking licenses in these bands. One of the five parties proposed to use Time Division Multiple Access ("TDMA") while the other four proposed Code Division Multiple Access ("CDMA").[127] The

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[119] ICO Global Communications formed DBSD NA in 2004 to develop an integrated MSS / ATC system. New DBSD is a wholly-owned, indirect subsidiary of DBSD NA. *In re DBSD North America, Inc.*, 419 B.R. 179 (S.D.N.Y. 2009).

[120] *See* ICO Global 10Q for quarter ended June 30, 2010. On May 15, 2009, DBSD filed voluntary petitions for reorganization under Chapter 11 of Title 11 of the United States Bankruptcy Code (Chapter 11 cases) in the United States Bankruptcy Court for the Southern District of New York (Bankruptcy Court). On October 26, 2009, a decision was issued ruling in favor of confirmation of the Plan of Reorganization, and the Bankruptcy Court entered its order on November 23, 2009. On March 24, 2010, the Federal District Court for the Southern District of New York denied all appeals and affirmed the Bankruptcy Court order. *In re DBSD North America*, Inc. 427 B.R. 245 (S.D.NY. 2010).

[121] *In re DBSD North America*, Inc., 419 B.R. 179 (S.D.N.Y 2009). *In re DBSD N. Am., Inc.*, 421 B.R. 133 (Bankr. S.D.N.Y., Nov. 23, 2009)(NO. 09-13061)(REG), *aff'd* Memo. and Order, *In re DBSD N. Am., Inc.*, Case Nos. 09-10156, 09-10372, 09-10373 (S.D.N.Y. Mar. 24, 2010).

[122] File Nos. SES-T/C-20091211-01575 and SES-T/C-20091211-01576.

[123] http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-09-38A1.pdf, *See also*, Press Release, ICO, "ICO Approved for Ancillary Terrestrial Component Use by FCC," January 15, 2009, available at http://investor.ico.com/releasedetail.cfm?ReleaseID=359524.

[124] *New DBSD Satellite Services G.P., Debtor-In-Possession*, DA 10-1881, Order, 25 FCC Rcd 13664 (2010).

[125] http://www.bloomberg.com/news/2011-03-15/dish-network-s-revised-offer-for-bankrupt-dbsd-wins-court-s-approval.html.

[126] *See Amendment of the Commission's Rules to Establish Rules & Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands*, CC Docket No. 92-166, Report and Order, 9 FCC Rcd 5936 (1994) (*1994 Big LEO Order*), *recon.*, 11 FCC Rcd 12861 (1996).

[127] The TDMA technique assigns each remote earth station a different time to transmit and receive information. CDMA prevents interference between remote earth stations by assigning a different digital code to different earth stations. For a more detailed discussion of TDMA and CDMA, *see 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum* (continued....)

Commission determined that the four CDMA operators could share spectrum with each other, but that their systems would not be compatible with the TDMA system.[128] Consequently, the Commission adopted a band plan for Big LEO systems that designated the 1621.35-1626.5 MHz band for bi-directional TDMA operations. The Commission also designated the 1610-1621.35 MHz and the 2483.5-2500 MHz bands for shared CDMA operations.[129] At that time, the Commission considered the possibility that not all of the proposed CDMA systems would ultimately be built and launched, and pledged to revisit its spectrum assignments in the event that only one CDMA system was launched.[130]

(a) Globalstar and Iridium

64. Iridium and Globalstar are the only licensees in these frequency bands. Globalstar operates a CDMA system, and Iridium operates a TDMA system. In October 2008, the Commission adopted an Order modifying Iridium's and Globalstar's licenses to be consistent with earlier revisions that it made in the Big LEO frequency band assignments.[131] Specifically, the Commission shifted some spectrum from Globalstar to Iridium.

65. Globalstar is now authorized to operate in the 1610-1617.775 MHz frequency band on an exclusive basis, and Iridium is authorized to operate in the 1618.725-1626.5 MHz band on an exclusive basis. Globalstar and Iridium are required to share the frequency band located between their two respective exclusive frequency assignments, *i.e.*, the 1617.775-1618.725 MHz frequency band.[132] In addition, Globalstar is authorized to operate in 2483.5-2500 MHz band. Globalstar has been granted ATC authority[133] while Iridium has not yet requested it.

66. Iridium, with its constellation of 66 satellites, provides mobile voice and data[134] communications services with global coverage. The U.S. government, directly and indirectly, is Iridium's largest customer, generating approximately 23.6 percent of its revenue. Iridium's customers include government and commercial operators who, in turn, provide service to maritime, oil and gas, mining, forestry, construction and transportation industries, as well as to first responders. Services include

(Continued from previous page)
Usage by, Satellite Network Earth Stations and Space Stations, IB Docket No. 00-248, Notice of Proposed Rulemaking, 15 FCC Rcd 25128, 25206-10 (App. E) (2000).

[128] *1994 Big LEO Order*, 9 FCC Rcd at 5954, ¶ 43.

[129] *Id.* at 5955, ¶ 44.

[130] *Id.* at 5959-60, ¶¶ 54-55.

[131] *Globalstar Licensee, LLC*, FCC 08-248 Order of Modifications, 23 FCC Rcd 15207 (2008).

[132] *Spectrum and Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands, Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands,* Second Order on Reconsideration, Second Report and Order, and Further Notice of Proposed Rulemaking, IB. Docket Nos. 07-253 and 02-364, 22 FCC Rcd 19733, 19741-42 ¶¶ 18-19 (2007) (*2007 Big LEO Spectrum Sharing Second Reconsideration Order*).

[133] *Application of Loral/Qualcom Partnership, L.P. for Authority to Construct, Launch, and Operate Globalstar, a Low Earth Orbit Satellite System to Provide Mobile Satellite Services in the 1610-1626.5 MHz/2483.5-2500 MHz,* Order and Authorization, 10 FCC Rcd 2333 (Int'l Bur. 1995).

[134] The high-speed maritime data service, Iridium OpenPort, introduced in October 2008 provided speeds of up to 128 kbps and up to three voice lines which can be used simultaneously, and also allowed for data rates to be adjusted up or down. *See Iridium Communications, Inc., Form 10-K, Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1924, for the year ended December 31, 2009, filed March 16, 2010,* p. 10.

telephony, e-mail and data transfer services in areas inadequately served by terrestrial networks.[135]

67. Iridium's next-generation constellation, Iridium NEXT, described as including new product and service offerings as well as upgrades to Iridium's current services including higher data rates, is expected to launch in 2015 and be fully deployed in 2017.[136]

68. Globalstar's constellation experienced degradation in 2007, which caused the downlinks in the 2483.5-2500 MHz band to become intermittent and unreliable. Globalstar was thus unable to provide reliable voice and duplex data services with that constellation. Globalstar continued to use the 1610-1618.725 MHz capabilities of its first-generation constellation while working on the launch of its next-generation constellation.[137] Globalstar's current data services are used for asset and personal tracking, data monitoring, and supervisory control and data acquisition applications.[138]

69. Globalstar's next-generation constellation will consist of 24 new NGSO satellites, along with the 8 replacement satellites that were launched in 2007. As of July 13, 2011, Globalstar has launched 12 of the 24 second-generation satellites. Globalstar has contracted for construction of an additional 24 second-generation satellites that it will be keep as ground spares. With this new constellation, Globalstar states that it will provide advanced voice, two-way data, and messaging services, with uplink speeds of 256 kbps and downlink speeds of up to 768 kbps (fixed service) or up to 256 kbps (mobile service).[139]

70. Globalstar has also used its ATC authorization by partnering with Open Range Communications, Inc. Open Range began providing wireless broadband service to rural subscribers in northern Colorado in November 2009, although Globalstar was not yet in compliance with the ATC gating criteria. On June 25, 2010, Open Range requested special temporary authority to continue operating on the spectrum allocated to Globalstar. On September 14, 2010, Open Range was permitted to provide terrestrial fixed and mobile service in this frequency band, limited to a listed set of markets, under a temporary authorization.[140] Globalstar's request for a 16-month extension to come into compliance with the Commission's ATC rules, however, was denied.[141]

(iv) Little LEO Bands

71. The Little LEO bands are the 137-138 MHz and 400.15-401 MHz bands. Originally,

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[135] *Id.* at 1.

[136] Iridium Comments at 5. *See also* http://www.iridium.com/About/IridiumNEXT.aspx. The Iridium NEXT constellation will include 66 operational LEO satellites, as well as 6 in-orbit spares and 9 ground spares.

[137] Globalstar Comments at 3. *See also Globalstar 10-Q, Quarterly Report Pursuant to Section 13 or Section 15(d) of the Securities and Exchange Act of 1934 for the period ended June 30, 2010,* at 27. Globalstar launched its eight spare satellites in 2007. All of the satellites launched prior to 2007 experienced anomalies over time, which has resulted in periods of time during which no two-way voice or data service is available. This did not adversely affect one-way data transmission services Globalstar was providing.

[138] Globalstar Comments at 4.

[139] Globalstar Comments at 5.

[140] *See In the Matter of Globalstar Licensee LLC Application for Modification of License to Extend Dates for Coming into Compliance with Ancillary Terrestrial Component Rules,* DA 10-1740, Order, 25 FCC Rcd 13114 (2010).

[141] *Id.* "We conclude that Globalstar has not justified its request for a further extension of time. Specifically, we find that Globalstar has not established that its failure to come into compliance with the ATC gating criteria within the established timeframe was due to circumstances beyond its control or other sufficient justifications."

three satellite system licenses were issued for these bands.[142] Later, the Commission concluded that there was sufficient spectrum available to authorize additional Little LEO systems.[143] In subsequent years, all the Little LEO licensees have either lost or surrendered their licenses with one exception – ORBCOMM. ORBCOMM has been operating since 2007.[144] The Little LEO systems are restricted to non-voice services because of the relatively small uplink bandwidth and the fact that they must operate in spectrum shared with terrestrial mobile operations.[145] The Little LEO systems are operationally restricted to low data rates. As a result, the ORBCOMM Little LEO MSS system is a niche system and will not be discussed further here.

3. SDARS Operators

72. SiriusXM is the sole company providing satellite digital audio radio service (SDARS) to the contiguous United States.[146] A recent Commission staff decision, however, identified various emerging consumer alternatives to SiriusXM, which include Pandora Media, Inc., Rhapsody, Slacker, Last.fm, and iheartradio. Additionally, Ford, Toyota, MINI, GM, Mercedes-Benz, and Hyundai are introducing Internet-based streaming radio in their vehicles.[147] Prior to the merger between Sirius and XM in 2008, Sirius (sometimes written as "SIRIUS") and XM operated separate SDARS networks. XM commenced service in September 2001, and Sirius began service in February 2002.[148]

73. In July 2008, Sirius' wholly owned subsidiary, Vernon Merger Corporation, merged with XM Satellite Radio Holdings Inc. On August 5, 2008, Sirius Satellite Radio Inc. changed its name to

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[142] *See Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Non-Voice, Non-Geostationary Mobile Satellite Service*, CC Docket No. 92-76, Report and Order, 8 FCC Rcd 8450 (1993).

[143] *See Amendment of Part 25 of the Commission's Rules to Establish Rules and Policies Pertaining to the Second Processing Round of the Non-Voice, Non-Geostationary Mobile Satellite Service*, Report and Order, 13 FCC Rcd 9111, at 9122 ¶ 25 (1997) (*Second Processing Round Report and Order*).

[144] ORBCOMM 2010 10-K at 1.

[145] 47 C.F.R. § 25.142(b)(1).

[146] SiriusXM provides satellite digital audio radio services in the 2320-2345 MHz band. The Commission originally licensed XM to launch and operate two geostationary satellites for SDARS. *See American Mobile Radio Corporation Application for Authority to Construct, Launch, and Operate Two Satellites in the Satellite Digital Audio Radio Service*, Order and Authorization, DA 97-2210, Order and Authorization, 13 FCC Rcd 8829 (Int'l Bur. 1997). The Commission originally licensed Sirius to launch and operate two satellites in geostationary orbit at the 80° and 110° West Longitude orbital locations. *See Satellite CD Radio, Inc. Application for Authority to Construct, Launch, and Operate Two Satellites in the Satellite Digital Audio Radio Service*, Order and Authorization, DA 97-2191, Order and Authorization, 13 FCC Rcd 7971 (Int'l Bur. 1997). Sirius later requested, and was granted, authority to change its satellite configuration from two geostationary satellites to three satellites in non-geostationary satellite orbits (NGSO). *See Sirius Satellite Radio Inc., Application for Minor Modification of License to Construct, Launch and Operate a Non-Geostationary Satellite Digital Audio Radio Service System*, Order and Authorization, DA 01-639, Order and Authorization, 16 FCC Rcd 5419 (Int'l Bur. 2001). SDARS is commonly referred to as "satellite radio." The Commission's rules define SDARS as "[a] radio communication service in which audio programming is digitally transmitted by one or more space stations directly to fixed, mobile, and/or portable stations, and which may involve complementary repeating terrestrial transmitters, telemetry, tracking and control facilities." 47 C.F.R. § 25.201.

[147] *See XM Sirius Transfer Order,supra*, fn. 3.

[148] Consolidated Application for Authority to Transfer Control of XM Radio Inc. and Sirius Satellite Radio Inc., XM Satellite Radio Holdings Inc., Transferor, and Sirius Satellite Radio Inc., Transferee (Mar. 20, 2007), MB Docket 07-57, at 3, 5. (Merger Application).

SiriusXM Radio.[149] SiriusXM broadcasts music, sports, news, talk, entertainment, traffic, and weather channels in the United States for a subscription fee through two proprietary satellite radio systems — the SIRIUS system and the XM system. SDARS radio receivers are used in cars, trucks, boats, aircraft, and homes, and are available for portable use. SiriusXM also provides content to subscribers using streaming audio over the Internet as well as DBS and wireless networks.[150] In 2009, there were approximately 19 million subscribers, and as of December 31, 2010, SiriusXM had 20.2 million subscribers.[151]

a. Revenues and Earnings

74. The primary source of revenue for SiriusXM is subscription fees. In 2009, SiriusXM earned $ 2.5 billion in revenue.[152] In 2010, revenues increased to $2.8 billion.[153] Over the same time period, operating expenses increased from $2.2 billion to $2.4 billion.[154] In 2009 operating cash flow was $434 million, increasing in 2010 to $513 million.[155] Over the same time period, free cash flow increased from $185 million to $210 million.[156]

b. Programming

75. SiriusXM offers more than 135 channels of music, sports, news, talk, entertainment, traffic, and weather. Subscribers with a la carte-capable radios may customize the programming they receive through their a la carte subscription packages. SiriusXM offers two a la carte programming options to consumers with eligible radios. SDARS radio receivers are used in cars, trucks, boats, aircraft, and homes, and are available for portable use. SiriusXM also provides content to subscribers using streaming audio over the Internet as well as DBS and wireless networks.[157] Prior to the merger in 2008, the fee charged by each of SDARS operator for its basic audio service was $12.95 per month.[158]

76. SiriusXM's primary means of distributing satellite radios is through the sale and lease of new vehicles. SiriusXM has agreements with every major automaker[159] to offer either SIRIUS or XM satellite radios as factory or dealer-installed equipment in their vehicles. As of December 31, 2009,

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[149] Sirius Satellite Radio Inc. was incorporated in the State of Delaware as Satellite CD Radio, Inc. on May 17, 1990. *See* SiriusXM Radio, Inc. SEC Form 10-K for the Fiscal Year Ended Dec. 31, 2009 (SiriusXM 2009 10-K.) at 2.

[150] *Applications for Consent to the Transfer of Control of Licenses, XM Satellite Radio Holdings Inc., Transferor, to Sirius Satellite Radio Inc., Transferee.*, MB Docket 07-57, Memorandum Opinion and Order and Report and Order, 23 FCC Rcd 12348 (2008) (*Sirius XM Merger Order*).

[151] http://files.shareholder.com/downloads/SIRI/1338727714x0x463472/95E4B18E-37F5-48B1-B929-9445105FFAD6/Sirius_Proxy_and_Annual_Report.pdf (visited Oct. 27, 2011).

[152] SiriusXM 2009 10-K at 25 and 27.

[153] SiriusXM 2010 10-K at 26.

[154] SiriusXM 2010 10-K at 26.

[155] SiriusXM 2010 10-K at 40.

[156] SiriusXM 2010 10-K at 36, 48.

[157] See generally *Sirius XM Merger Order*, *supra* note 154.

[158] Merger Application at ii.

[159] Automakers offering pre-installed Sirius/XM radios include: Acura/Honda, Aston Martin, Audi, Automobili Lamborghini, Bentley, BMW, Chrysler, Dodge, Ferrari, Ford, General Motors, Honda, Hyundai, Infiniti/Nissan, Jaguar, Jeep, Kia, Land Rover, Lincoln, Lexus, Toyota, Scion, Subaru, Maybach, Mazda, Mercedes-Benz, Mercury, MINI, Mitsubishi, Porsche, Rolls-Royce, Volvo and Volkswagen. *See* SiriusXM 2009 10-K at 3.

satellite radios were available as a factory or dealer-installed option in substantially all vehicle models sold in the United States.

77. Post-merger, Sirius XM continues to operate Sirius and XM as separate networks, due to the technical challenges of unifying its space and ground systems. As of 2010, the Sirius satellite system consists of four in-orbit satellites in highly-elliptical orbits (HEO), over 125 terrestrial repeaters that receive and retransmit signals, and satellite uplink facilities and studios. The XM system consists of five in-orbit satellites,[160] over 650 terrestrial repeaters that receive and retransmit signals, satellite uplink facilities, and studios. Both satellite radio systems are designed to provide clear reception in most areas despite variations in terrain, buildings, and other obstructions. Subscribers can receive transmissions in all outdoor locations where the satellite radio has an unobstructed line-of-sight with an SDARS satellite, or is within range of a terrestrial repeater. Sirius does not maintain in-orbit insurance for three of its four operating satellites. XM currently has in-orbit insurance for two of its five satellites.[161]

c. FCC Conditions

78. The Sirius XM merger was approved subject to conditions[162] regarding programming, public interest and qualified-entity channels, equipment, subscription rates, and other service commitments.[163] Specifically, the conditions adopted in the *Sirius XM Merger Order* required SiriusXM to:

a. Offer a la carte, family friendly, mostly music, news, sports and talk, and best of both programming options for subscribers at specified prices.[164]

b. Enter into long-term leases or other agreements to provide to a Qualified Entity or Entities – defined as an entity or entities that are majority-owned by persons who are African American, not of Hispanic origin; Asian or Pacific Islanders; American Indians or Alaskan Natives; or Hispanics – rights to four percent of the full-time audio channels on the SIRIUS platform and on the XM platform. The Qualified Entity or Entities will not be required to make any lease payments for such channels, and SiriusXM will have no editorial control over these channels.[165] The Commission stated it would determine the implementation details at a later date.[166]

c. Make available four percent of the full-time audio channels on the SIRIUS platform and on the XM platform for noncommercial educational and informational programming for programmers that qualify under the DBS set aside rules.[167]

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[160] XM primarily provides its service directly to subscribers via five satellites in geostationary orbit at or near the 85° W.L. and 115° W.L. orbital locations. *See* SiriusXM 2009 10-K at 4.

[161] SiriusXM 2010 10-K at 5.

[162] SiriusXM 2009 10-K at 7.

[163] See generally *Sirius XM Merger Order*, *supra* note 154 and SiriusXM 2009 10-K at 7.

[164] *Sirius XM Merger Order*, 23 FCC Rcd at 12385, 12387, ¶¶ 79, 85.

[165] *See Sirius XM Merger Order*, 23 FCC Rcd at 12407-12411, ¶ ¶ 131-35.

[166] *See Sirius XM Merger Order*, 23 FCC Rcd at 12410, ¶ 135. In adopting the implementation details for the Leasing Condition, the Commission defined the term "Qualified Entities" to ensure that lessees are independent from SiriusXM and to make the criteria for selection of lessees race-neutral. The Commission also revised the condition to involve SiriusXM in the lessee selection process, with responsibility for making timely selections of entities that are both qualified for the set-aside and technically compatible with the SDARS platform. *See Applications for Consent to the Transfer of Control of Licenses*, MB Docket No. 07-57, Memorandum Opinion and Order, 25 FCC Rcd 14779 (2010).

[167] *Sirius XM Merger Order*, 23 FCC Rcd at 12413-15, ¶¶ 142-46.

d. Provide, on commercially reasonable terms, the intellectual property necessary to permit any device manufacturer to develop equipment that can deliver their satellite radio services. Chip sets for satellite radios, which include the encryption, conditional access and security technology necessary to access our satellite radio services, may be purchased by licensees from manufacturers in negotiated transactions with such manufacturers.[168]

e. Not raise the retail price for the basic $12.95 per month subscription package, the a la carte programming packages or new programming packages until July 28, 2011.[169]

f. Offer for sale an interoperable radio, and began offering such radio in early 2009.[170]

C. Input Suppliers

79. This *Third Report* includes, for the first time, a discussion of the input suppliers to the communications satellite services industry, *i.e.*, those firms that supply fixed and mobile satellite operators with spacecraft, terminal equipment, earth stations, finance, insurance, and launch services.

1. Spacecraft Manufacturers

80. Overview of the Satellite Manufacturing Industry The major U.S. corporations that manufacture large satellites for commercial satellite operators are Boeing Company, Space Systems Loral, and Lockheed Martin. Northrop Grumman, manufactures satellites but restricts its business to government satellites. Orbital Science Corporation manufactures small and medium- sized satellites. Internationally, two major manufacturing corporations are EADS Astrium and Thales Alenia, both European aerospace conglomerates. These companies are listed in Table III.7.[171]

81. Regarding the companies listed in Table III.7,[172] Boeing manufactures medium and high power FSS and MSS communication satellites, weather satellites, GPS satellites, and military communications satellites; Lockheed Space Company produces human space flight systems, remote sensing, navigation, meteorological and communications satellites, space observatories and interplanetary spacecraft among others;[173] Space Systems Loral (SS/L) supplies commercial market segments and government, including all satellite-based applications. SS/L designs, manufactures and integrates high power satellites systems for commercial and government customers worldwide; Orbital Science Corporation (OSC) provides service engineering, production and technical services for NASA, DoD,

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[168] *See Sirius XM Merger Order*, 23 FCC Rcd at 12404, ¶ 126.

[169] The Commission stated it would review the price cap condition six months prior to its expiration and determine whether to it should be modified, removed, or extended. *See Sirius XM Merger Order*, 23 FCC Rcd at 12395, ¶ 108. In July 2011, the Media Bureau determined that the price cap condition should not be extended beyond three years. *See Applications for Consent to the Transfer of Control of Licenses, XM Satellite Radio Holdings Inc., Transferor, to Sirius Satellite Radio Inc., Transferee.*, MB Docket 07-57, Memorandum Opinion and Order, 26 FCC Rcd 10539 (MB 2011).

[170] SiriusXM also committed not to originate local programming or advertising through their repeater networks. *See Sirius XM Merger Order*, 23 FCC Rcd at 12415 ¶ 145. SiriusXM further committed to file applications to provide SIRIUS service to Puerto Rico using terrestrial repeaters and to promptly introduce such service upon the Commission's grant of permanent authority to operate these repeaters. *Sirius XM Merger Order*, 23 FCC Rcd at 12415 ¶ 147.

[171] Smaller manufacturers such as Mitsubishi Electric Corp in Japan, ISS-Reshetnev Company in Russia, OHB technology in Germany, and Surrey Satellite Technology Ltd in the U.K. also produce satellites.

[172] Smaller manufacturers such as Mitsubishi Electric Corp in Japan, ISS-Reshetnev Company in Russia, OHB technology in Germany, and Surrey Satellite Technology Ltd in the U.K. also produce satellites.

[173] *See* http://www.Lockheedmartin.com/SSC.

commercial and academic space programs; EADS Astrium develops and markets communications systems, missiles, space rockets, satellites, and related systems;[174] and Thales Space manufactures commercial GSO and NGSO satellites, and builds large scientific modules for the International Space Station.

TABLE III.7

MAJOR FIRMS IN THE GLOBAL SPACECRAFT MANUFACTURING INDUSTRY
(Total Sales, All Activities, Billions of US$)

Firm	Country	Total Sales 2009
Boeing Company[175,176]	U.S.	33.7
Lockheed Martin[177]	U.S.	45.7
Space Systems/ Loral[178]	U.S.	1.0
Orbital Sciences Corporation[179]	U.S.	1.1
EADS	Pan-Europe	66.2
Thales Group	Pan-Europe	20.4

82. Nature of Services/Products Provided. The services and products supplied by the major satellite manufacturers vary from customer to customer depending on the specific requirements specified in the satellite construction contract. Previously, the satellite manufacturing process typically involved manufacturing and delivering a satellite to a storage facility[180] with the customer obtaining title to the satellite during storage. The customer was then responsible for obtaining the launch contract and on-orbit technical support. Today the satellite manufacturer more typically supplies a "turn-key" satellite system, in which the satellite is delivered on-orbit and the primary satellite tracking, telemetry and command (TT&C) earth station, or stations, is built by the satellite manufacturer. In addition to constructing the satellite, the manufacturer usually supplies the TT&C software and hardware required to operate the satellite and, often, the satellite contract will require the manufacturer to train a specified number of satellite operating technicians. It is also possible for the satellite buyer to enter into a long term contact with the satellite manufacturer, or another entity, for services related to the day-to-day operation of the satellite.

[174] *See* http://www.astrium.eads.net/.

[175] Boeing Networks and Space Div. $2.3B in 1Q2010 – chart 23; 2009 revenues 33.7 $B – chart 3 and backlog of 64.2 $B 1Q10 chart 4. This is 32% of total Boeing revenue-chart 23 [Investors Conference Presentation by President & CEO of Boeing Defense Space and Security, May 20, 2010]).

[176] *See* http://www.boeing.com/defense-space/space/bss/index.html.

[177] *See* Lockheed Martin 2009 SEC 10K.

[178] *See* Space Systems Loral IPO Registered with the SEC on June 9, 2010.

[179] Orbital Science Corporation 2009 Annual Report.

[180] Often the title to the satellite would change hands while the satellite was in storage in a state that had no sales tax, such as Delaware.

83. Entry Into Satellite Manufacturing. Entry into the satellite manufacturing industry requires substantial investment in facilities, technology, and highly specialized personnel. These costs make entry difficult for firms without substantial financial resources and technical expertise in the space communications industry. For example, impediments to entry include large capital requirements needed to design, test, and build satellites to diverse specifications. Moreover, the process of designing and manufacturing satellites requires a high degree of technical and scientific expertise that may limit new entrants into the industry.

84. Customers of Satellite Manufacturers. Entities buying manufacturing services include satellite operators and many other entities, private and governmental. The private entities are the satellite operators identified in this *Third Report* (such as Intelsat, SES, Sirius, and TerreStar); companies that launch satellites with a primary mission other than communications, such as remote sensing satellites; and companies that serve foreign markets (such as Eutelsat and Asia Satellite Telecommunications Co., Ltd.).[181] The government entities include parts of the U.S. government and foreign governments, including the Russian Federal Space Agency and the European Space Agency.

85. Nature of the Competitive Process. Satellite buyers generally do not own manufacturing facilities and must obtain spacecraft from manufacturers. In some instances, buyers require "turn-key" systems that take the process from design and manufacture, through launch, and provision of ground control operations post-launch. Others buyers have substantial physical and knowledge infrastructure that require far less involvement by the manufacturer after the completion of the manufacturing stage.

86. Satellite manufacturers compete on price and quality. While price is an important consideration, quality competition implies that buyers have varying requirements and often look for innovative solutions that require significant expertise and resources. Thus, while some buyers seek a straightforward solution that implies price competition dominates, others have more stringent technological requirements that call for greater technical expertise (quality) and expense.

2. Earth Station and Terminal Equipment Suppliers

87. Overview of Earth Station and Terminal Equipment Producers. There are numerous classes of earth stations and satellite user terminals. In general, there are three different general types of earth stations or terminals used with satellite systems: (1) telemetry, tracking and control (TT&C) earth stations; (2) feeder-link earth stations; and (3) user earth stations or terminals. TT&C earth stations provide the satellite system operator with a means to monitor and control the satellite(s). Feeder link earth stations used in the MSS and hub earth stations used in the FSS are used to connect the communication traffic flowing to and from the satellite to the public switched telephone network (PSTN), the Internet or a particular customer's premises, providing a means for the system users to communicate beyond the satellite system itself. Feeder link earth stations are sometimes combined with the TT&C station facility.

88. User earth station or user terminals connect the user directly with the satellite. These earth stations and terminals are different shapes and sizes depending upon the type of service provided. For example, FSS system user terminals can vary from the small antennas associated with ubiquitous VSAT, point-of-sale, and Internet distribution systems to the much larger antennas associated with industrial "teleports." FSS earth stations may be directly owned by the corporations renting satellite

[181] U.S. Federal Aviation Administration, *Quarterly Launch Report, 2nd Quarter 2009*, available at http://www.faa.gov/about/office_org/headquarters_offices/ast/media/2Q2009%20Quarterly%20Report.pdf (visited Sept. 9; 2010); *Semi-Annual Launch Report, Second Half of 2009* at A-1 to -2, available at http://www.faa.gov/about/office_org/headquarters_offices/ast/media/10998.pdf (visited Sept. 9, 2010); *May 2010* at A-1, available at http://www.faa.gov/about/office_org/headquarters_offices/ast/media/semi_annual_launch_ report _051810.pdf (visited Sept. 9, 2010) (collectively, "*FAA Reports*").

transponder bandwidth or by satellite teleport operators.

89. MSS systems utilize small laptop computer or mobile phone-like user terminals that are often sold by VARs (where the satellite manufacturer is a wholesale service provider). Newer MSS systems are being combined with ATC systems, and the user terminals for these systems can differ from some of the other MSS systems in that they are designed to operate with both the satellite and the terrestrial ATC system. While some of these operators are not directly developing user terminals, they are developing chip-sets that can access both the satellite and the terrestrial system and partnering with a terrestrial cellular system and/or mobile phone manufacturer to complete the dual system.

90. Entry Into Earth Station and Terminal Equipment Business. Barriers to entry into the manufacturing and fabrication of earth stations and terminal equipment used in satellite communications are moderate relative to other input suppliers, such as launch services. Efficient production is achieved at moderate levels of production, and the expertise and technical knowledge required to enter this supplier segment of the satellite communications industry is widely available. Firms producing earth stations and terminal equipment for commercial satellite communications are located around the globe.[182]

91. Nature of Competitive Process. The bidding process generally involves multiple vendors bidding to a functional specification produced by the system operator; most components are obtained through multiple vendors by competitive bidding or through multiple VARs. The post-contract award negotiation with satellite operators is unknown since the terminals are treated as consumer products and there are multiple potential vendors. There are probably no post-contract negotiations.

3. Launch Services (Including Manufacture of Launch Vehicles)

92. Overview of the Launch Services Industry.[183] In 2008-09, the following firms offered launch services: Arianespace; International Launch Services, Inc. ("ILS"); Sea Launch Co. LLC ("Sea Launch"); Space Exploration Technologies Corp. ("SpaceX"); Orbital Sciences; and Land Launch (affiliated with Sea Launch). Sea Launch's presence in the market was reduced by a launch failure in 2007 that idled it.[184] Sea Launch entered Chapter 11 bankruptcy in mid-2009[185] and the United Launch

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[182] *See, e.g., 2011 International Satellite Directory* (Sonoma, CA: Satnews Publishers, 2011), vol. 1 - The Satellite Industry, Chapter 1.

[183] Several launch service providers urge that we not examine the launch services sector, noting that past *Reports* specifically eschewed such examination. Comments of International Launch Services filed September 24, 2010 (ILS Comments) at 1-2 and Comments of Arianespace, Inc. filed September 24, 2010 (Arianespace Comments) at 7-8, citing *First Report*, 22 FCC Rcd at 5957, ¶. 10 n.7; *Second Report*, 23 FCC Rcd at 15173, ¶ 8. Arianespace correctly notes that launch services are not within the scope of a "communications satellite system" as defined in 47 U.S.C. § 702(1). The scope of this *Third Report* is "satellite communications services," 47 US.C. § 703(a). Our assessment of the competitive constraint on the exercise of market power by satellite operators requires an assessment of the bargaining power of critical suppliers of inputs to the production of satellite communications services, and launch services are a critical input to satellite communications services.

[184] Michael A. Taverna, *Booster Blues: Difficulties of Launcher Supplier No. 3 Could Trigger Boeing Exit*, Aviation Week & Space Technology at 37 (June 29, 2009) (stating that at one point Sea Launch accounted for "about 15% of commercial spaceflights"); *see also* Alex Derber, *Sea Launch prepares to exit Chapter 11 & restart operations*, FLIGHTGLOBAL, http://www.flightglobal.com/articles/2010/05/25/342384/ sea-launch-prepares-to-exit-chapter-11-and-restart-operations.html (May 25, 2010) (visited Aug. 22, 2010).

[185] In late 2010, Sea Launch emerged from bankruptcy mostly Russian-owned. Peter B de Selding, *Divergent Satellite Market Forecasts Spark Debate*, Space News (Sept. 10, 2010) available at http://www.spacenews.com/satellite_telecom/091010divergent-satellite-market-forecasts-sparks-debate.html (visited September 20, 2011).

Alliance ("ULA"), U.S. companies Lockheed-Martin and Boeing,[186] market their launch services almost exclusively to the U.S. government.[187]

93. Launch services consist of the following activities: designing and building the rocket (or "launch vehicle"); building and operating a launch site,[188] receiving rockets and satellites at the launch site, mounting them onto the launch pad, fueling the rocket, performing final testing, performing the launch (perhaps including recovering the rocket), cleaning up after the launch, and (optional) having insurance against accidents. In some cases, the launch services provider also obtains the spacecraft (communications satellite) for the satellite operator. The launch services provider itself is primarily an integrator, obtaining the rocket and the launch site from other entities: ILS, for example, has only sixty employees.[189]

94. It appears that, in 2008-2009, the available commercial launch capacity was sufficient to meet the total demand for commercial launches.[190] Further, there appears to be some excess capacity on the supply side of the launch services market available to satellite operators.[191]

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[186] Technically, Lockheed Martin addressed commercial customers through Lockheed Martin Commercial Launch Services.

[187] EchoStar Comments at 2 (in 2008 virtually all of ULA's capacity was used by the U.S. Government and therefore unavailable to private entities); Peter B. de Selding, *Sea Launch Bankruptcy Stokes Fears of Rising Prices*, Space.com (June 29, 2009), available at http://www.space.com/news/090629-busmon-sealaunch-bankruptcy.html (visited Sept. 20, 2011) (ULA's "two principal U.S. rockets, Atlas and Delta, have in effect removed themselves from the market to focus on more profitable U.S government business"); *CSIS Report* at 14 ("ULA has supported only two commercial launches in the past four years").

Another facet of these entities' commitment to serving the U.S. government is that they give low priority to commercial launches. Commercial customers are subject to delay and preemption by higher priority (government) missions, which may endanger their Commission-mandated deadlines for launch and operation.

[188] The major launch sites discussed herein are owned by governments, not companies that provide launch services.

[189] International Launch Services, *About Us*, http://www.ilslaunch.com/about-us (visited Sept. 8, 2010) (*ILS Web Page*). Rocket manufacturers are largely integrators themselves, often obtaining most of their components from subcontractors.

[190] U.S. Federal Aviation Administration, Quarterly Launch Report, 2nd Quarter 2009, available at http://www.faa.gov/about/office_org/headquarters_offices/ast/media/2Q2009%20Quarterly%20Report.pdf (visited Sept. 9; 2010); Semi-Annual Launch Report, Second Half of 2009 at A-1 to -2, available at http://www.faa.gov/about/office_org/headquarters_offices/ast/media/10998.pdf (visited Sept. 9, 2010); May 2010 at A-1, available at http://www.faa.gov/about/office_org/headquarters_offices/ast/media/semi_annual_launch_ report _051810.pdf (visited Sept. 9, 2010) (collectively, "FAA Reports").

[191] *Id.*

95. These facts about launch services companies are displayed in Table III.8.

TABLE III.8

CAPACITIES OF LAUNCH SERVICES PROVIDERS, 2008-09 (LARGE GEOSTATIONARY SATELLITES)

Launch Services Company	Launch Pads[192]	Estimated Annual Launch Capacity[193]
Arianespace	2	12
ILS	3	18
Sea Launch	1	6

96. Buyers of Launch Services. The buyers of launch services include commercial satellite operators, manufacturers, and other entities, including governments. The process by which a satellite operator chooses a launch services provider typically takes from two months to a year and begins with the issuance of a Request for Proposal ("RFP"). One common method is for the satellite operator to issue an RFP for a "turnkey" operation in which the winning launch services provider will obtain rockets and a launch site, and will conduct all the other activities described above. It is also common for a relatively experienced satellite operator to perform some of these activities itself and issue an RFP for relatively few activities. In another common variation, the commercial operator chooses the manufacturer of its satellites and that manufacturer issues the RFP and does the primary bargaining with launch services companies.[194]

97. In their responses to the RFP, competing launch services providers indicate launch price, launch site availability,[195] payment schedule, technical characteristics of their launch vehicles, value-added services, and the reliability of their launches.[196] Negotiations then occur between the satellite operator and the competing bidders. The satellite operator or its agent then makes its decision.[197]

98. Most decisions award the entire launch operation to one bidder, but split awards to several providers sometimes occur especially when many satellites are being launched. The contract

[192] For SpaceX, *see www.spacex.com/downloads/spacex-brochure.pdf*; for the others, Prashant Butani, *The Emerging Launch Market Threat?*, http://www.satmagazine.com/cgi-bin/display_article.cgi?number =1249759337 (Oct. 2008) (visited Sept. 21, 2011) (*Butani*).

[193] This assumes constant operation and 6 launches per pad annually (*see* note ["Sea Launch has a theoretical capacity"]-[two down] *infra*).

[194] In this variation, the satellite manufacturer may agree to transfer title to the operator only when the satellite is in proper orbit (delivery in orbit).

[195] *CSIS Report* at 16.

[196] *See, e.g.,* Arianespace *2008 Annual Report* at 8 (attributing growth in orders in 2008, "despite average prices higher than the competition, [to] Ariane 5's quality and reliability").

[197] *See generally* Arianespace at 5-6.

typically specifies a fixed price, which puts on the launch services provider the risk of currency fluctuation (a potentially significant factor for the French and Russian providers). Satellite operators with more than average bargaining power are able to inject into their contracts provisions for performance-based penalties, bonuses, liquidated damages, and "walk-aways." Performance of a contract for launch services typically requires more than 18 months.[198]

99. A satellite operator faces no substantial switching costs in changing from one supplier of launch services for one fleet to another for the next fleet. Indeed, sometimes a satellite operator will make one agreement with one launch services provider and a "back-up" agreement with another in case of an unforeseen problem involving the first one.[199]

100. Providers of launch services offer a relatively undifferentiated product to satellite operators, and derive a substantial share of their revenue from the commercial sector. Although some providers have more launch sites than others and some rockets have greater capacity than others, no provider of launch services has a lock on any satellite operator.

101. As indicated above, there appears to have been a modest excess of supply over demand for launch opportunities available to satellite operators in 2008-09. Consequently, it appears that launch suppliers have not unduly constrained the supply of launch services.

4. Launch Insurance Vendors

102. Overview of Launch Insurance Vendors. The space insurance industry consists of brokers, underwriters, re-insurers, and retrocessionaires. Brokers evaluate the insurance needs of satellite operators, and then engage underwriters who formally construct and finance the insurance policy. Underwriters typically engage re-insurers, who provide additional financial support for the policy. Re-insurers "insure" insurance companies, by providing additional financial resources once the insurance companies establish the parameters of the coverage.[200] Re-insurance allows the underwriters to diversify risk both by (a) shedding much of the risk of any particular contract and also by (b) releasing financial resources that permit the underwriter to write additional contracts.

103. In addition to brokers, underwriters, and reinsurers, retrocessionnaires provide "re-insurance" to reinsurers. Reinsurers and retrocessionaires often construct diversified packages of insurance policies into financial instruments that are then sold to private investors. These packages of insurance assets, sometimes referred to as "sidecars," provide buyers of packaged re-insurance with assets uncorrelated with other financial assets, hence providing diversification.

104. Globally, over thirty companies provide launch and in-orbit coverage. The ten largest companies provide approximately sixty percent of the total insurance coverage.

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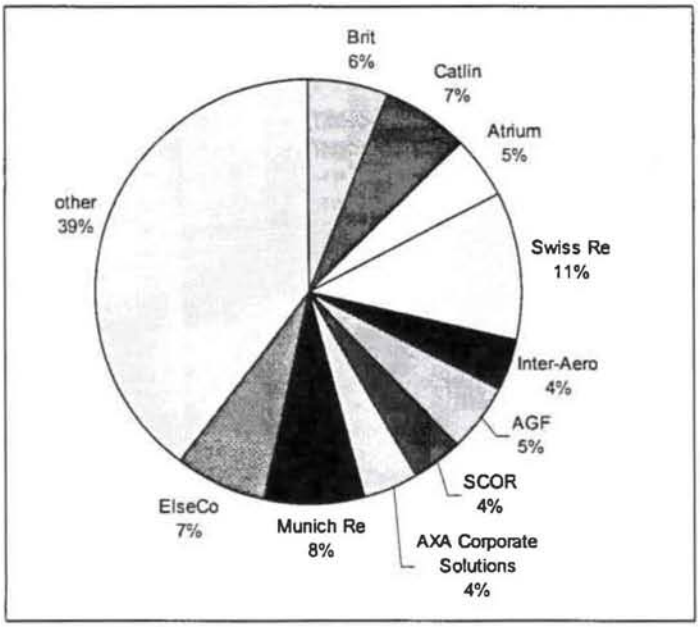
[198] The descriptions of the bargaining process in this paragraph, as well as other aspects of the satellite launch business, were obtained in conversations with executives at the Satellite Industry Association on June 16, 2010; Intelsat on August 19, 2010; Arianespace on August 19 and September 20, 2010; ILA on August 31, 2010; Lockheed Martin on September 1, 2010; Euroconsult on September 21, 2010. *See also Edwards.*

[199] In these cases, the satellite operator's contract with its satellite manufacturer may call for the satellites to be compatible with several rockets.

[200] Powers and Shubik suggest a square-root rule for reinsurers, *i.e.*, the optimal number of reinsurers is given by the square root of the number of primary insurers. Powers and Shubik, *A Note on a "Square-Root Rule" for Reinsurance*, Cowles Foundation for Research in Economics, Yale University, 2005.

FIGURE III.3

SPACE INSURANCE, COMPANY REVENUE SHARE[201]



105. Entry Into Launch Insurance Business. When profits rise in the space insurance industry, relative to the industry average, entry by small new firms is common. Many of the new entrants are, however, undercapitalized, and exit is frequent in the industry following losses of spacecraft.[202]

106. Buyers of Launch Insurance. Insurance can be purchased to cover satellite production, transportation, pre-launch, launch, and in-orbit operation. The most important types of insurance coverage are pre-launch, launch, and in-orbit insurance.[203]

107. In Figure III.4, cost of coverage is shown by the maximum, minimum, and average rates from 1969 to 2009. Rates are determined by the associated risk, which includes the track record of the technology and the expertise and success rates of the insured.

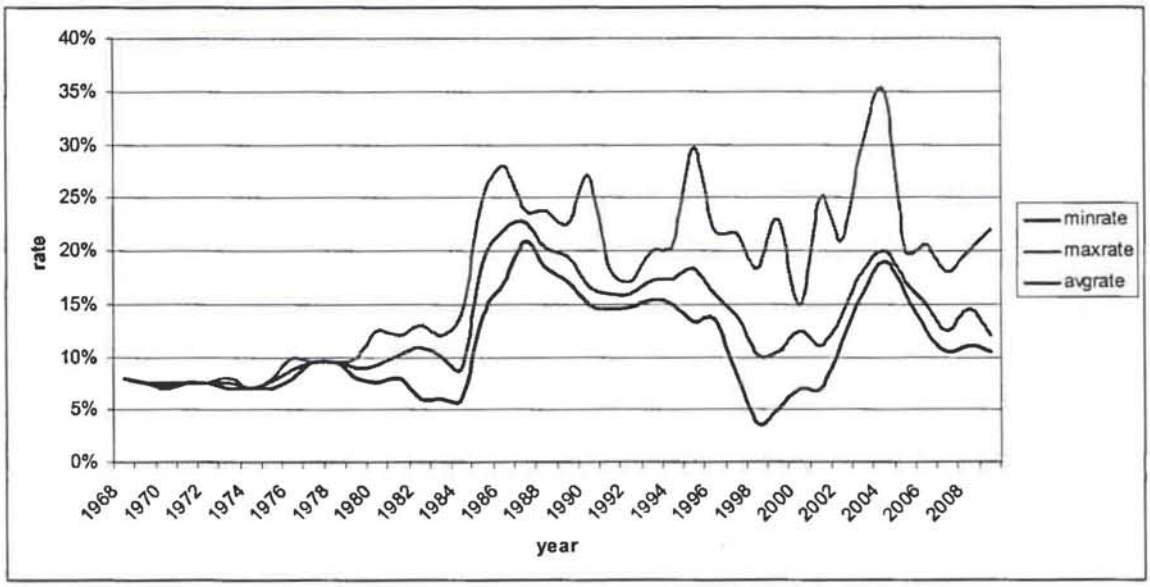
[201] Data from Piotr Manikowski, Poznan University, 2010, and Manikowski, Piotr and Mary A. Weiss, "*The Satellite Insurance Market and Underwriting Cycles*," 2007.

[202] Jeff Poliseno, CEO, ISB, *The Future of the Space Insurance Industry*, World Space Risk Forum, Dubai, March 2010.

[203] Schoffski, O. and Andre Wegener, "*Risk Management and Insurance Solutions for Space and Satellite Projects*," The Geneva Papers on Risk and Insurance, Vol. 24, No. 2, April, 1999.

FIGURE III.4

COST OF LAUNCH INSURANCE COVERAGE, 1969-2009[204]



108. Once a satellite is deployed and operational, much of the risk has been borne, and subsequent losses are less than total. For new satellites, the full coverage in-orbit period is typically between one and three years, after which the policy is renewed annually at lower coverage levels.[205]

109. Launch vehicle failure rates for geostationary satellites averaged approximately 7.9 percent for the period between 2002 and 2009.[206] First year failure rates for geostationary satellites launched since 2000 are approximately 6.6 percent, while second and subsequent years are approximately 1.8 percent.[207] Most losses occur either at launch (43 percent) or in the first month in orbit (43 percent).[208]

110. Approximately 130 insured satellites account for a total insurance coverage of $17 billion and all but $1 billion of these assets are in geostationary orbit.[209] This works out to about $130 million of average insured value per insured satellite.[210] Total insurance premiums for the industry range between $800 million and $1 billion annually. Thus, the annual premiums for extent coverage average

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[204] Costs are expressed as a fraction of payload value. Data from Piotr Manikowski, Poznan University of Economics, 2010, and Manikowski, Piotr and Mary A. Weiss, "*The Satellite Insurance Market and Underwriting Cycles*," 2007. Data for 2010 are not available.

[205] *Satellite Communications: Arbitrator Perspective*, International Commercial Arbitration Practice: 21st Century Perspectives, Chapter 39 (LexisNexis 2010).

[206] Kunstadter, World Space Risk Forum, Dubai, 2010.

[207] *Id.*

[208] *Id.*

[209] Insurance Day, November 13, 2009.

[210] Insurance Day, November 4, 2009. The average is computed by dividing $17 billion by 130.

approximately 6 percent of the average value of in-orbit satellites.[211] One estimate of new launch plus one year in space coverage puts the cost at 13 percent of the cost of the satellite plus the cost of the launch.[212]

111. On average, the industry experiences two or three total losses per year.[213] If we assume that each loss ranges from $100 to $200 million and that there are 2.5 losses per year, total average annual losses are $375 million, which is consistent with recent reported industry loss figures of approximately $400 million.[214] Industry profits for 2009 are estimated at $400 million.[215]

112. Alongside relatively generic or recurring risks related to design, manufacturing, and launching, satellite operators and insurers confront random or individual risk in solar flares, meteors, and in-orbit collisions, including collisions with space debris, among other things.

113. Competition in the space insurance industry is cyclical. Profitability attracts new entrants who compete in price to gain market share. Rates fall to the point where premiums are inadequate relative to losses (as shown in Figure III.5), leading to bankruptcies and exit. Consequently, price competition softens and profitability is restored.

[211] Taking the high end of $1 billion, and dividing by $17 billion, yields 5.9 percent.

[212] *Satellite Communications: Arbitrator Perspective*, International Commercial Arbitration Practice: 21st Century Perspectives, Chapter 39 (LexisNexis 2010).

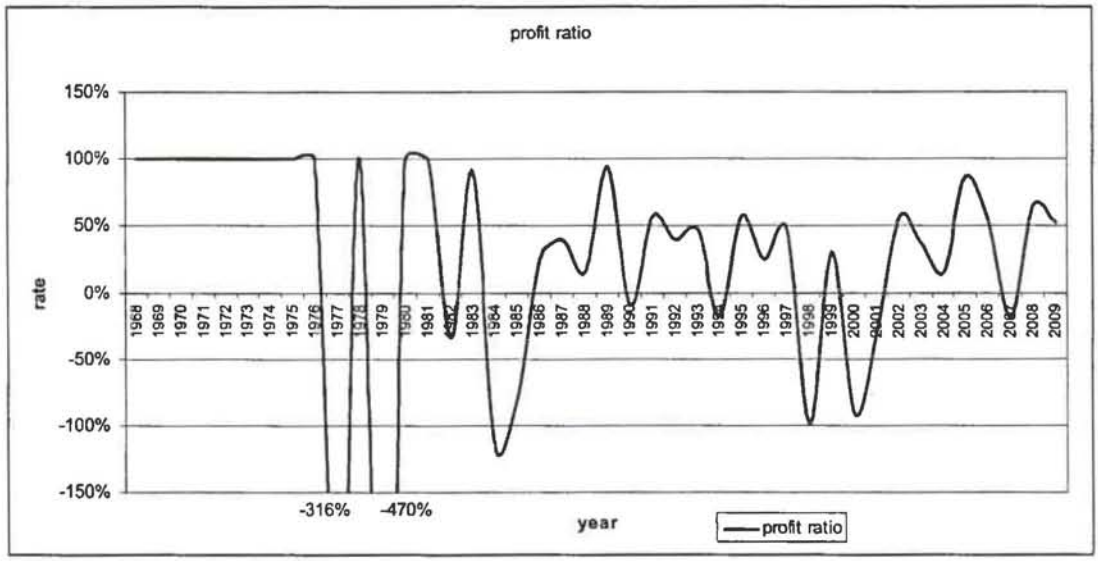
[213] Insurance Day, November 4, 2009.

[214] Insurance Day, November 30, 2009. For example, the industry reported total losses of approximately $400 million in 2009.

[215] Insurance Day, November 30, 2009.

FIGURE III.5

INDUSTRY PROFITABILITY[216]



114. Alternatives to Purchasing Insurance. Firms can choose to partially or fully self-insure.[217] Intelsat appears to choose a higher level of self-insurance. Self-insurance places the potential liability costs on the firm, and the decision to self-insure should occur only if the expected costs of insurance exceed the expected costs of self-coverage.

115. Insurance promotes technological innovation by protecting firms and venture capital from large losses and by providing expertise that helps the industry better understand the sources of failure.[218]

5. Industry Financing

116. The two largest firms in the FSS industry are Intelsat and SES. Each firm controls approximately 25 percent of the total global industry.[219]

117. Intelsat is the largest fixed-satellite operator when measured by revenue and is privately held. The company operates 52 satellites in geostationary orbit,[220] and 17 earth stations that provide tracking, telemetry, and control services for these satellites.[221] Of the 54 satellites, five are covered by in-

[216] Data from Piotr Manikowski, Poznan University of Economics, 2010, and Manikowski, Piotr and Mary A. Weiss, "*The Satellite Insurance Market and Underwriting Cycles*," 2007.

[217] For example, SES largely insures its entire fleet (and leverages the group coverage into lower rates), but retains part of the in-orbit risk. *See* SES Investor Day, Finance Update, 2008, at 9, and SES Annual Report, 2009, at 55.

[218] Schoffski, O. and Andre Wegener, "*Risk Management and Insurance Solutions for Space and Satellite Projects*," The Geneva Papers on Risk and Insurance, Vol. 24, No. 2, April, 1999.

[219] Space News, June 30, 2008.

[220] Intelsat S.A., 10-K, at14, 2010.

[221] *Id.* at 19.

orbit insurance,[222] eleven are in inclined orbit,[223] and three are operating at reduced transponder capacity.[224]

118. SES, the second largest fixed-satellite operator in the world when measured by revenue, was established by the Luxembourg government in 1985 as Europe's first private satellite operator. It currently has 47 geostationary satellites in orbit and another 13 satellites in production that are scheduled to be launched by 2014.[225]

119. Capital structure in the fixed-satellite industry is heterogeneous. By capital structure, we refer to the choice of debt or equity to finance operations. Some firms, such as Intelsat, use all debt to gain cash flow to finance their operations, while others, such as SES, primarily use equity. SES is a publicly-traded corporation, while Intelsat is (majority) held by BC Partners, a private equity firm.

120. In 2009, Intelsat reported revenues of $2.51 billion, operating expenses of $1.97 billion, total interest expense of $1.36 billion, and a net loss of $780 million.[226] Cash flow from operating activities was $870 million, and free cash flow from operations was (negative) $70 million.[227] Intelsat S.A. reported EBITDA (earnings before interest, taxes, depreciation, and amortization) of $1.4 billion.[228] The data are given in Table III.9.

121. In 2010, Intelsat reported revenues of $2.54 billion, operating expenses of $1.63 billion, and total interest expense of $1.38 billion, and a net loss of $510 million.[229] Cash flow from operating activities was $1.02 billion, and free cash flow from operations was $.36 million. Intelsat S.A. reported EBITDA of $1.7 billion.[230] The data are given in Table III.9.

122. In 2009, SES reported revenues of $2.23 billion, operating expenses of $590 million, and total interest expense of $300 million.[231] Cash flow from operating activities was $1.50 billion, and free cash flow from operations was $490 million. SES reported EBITDA of $1.66 billion.[232] The data are

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[222] *Id.* at 20. Nine percent of Intelsat's fleet has in-orbit insurance, which implies the remaining 91 percent is self-insured.

[223] *Id.* at 16. Thus, approximately 20 percent of Intelsat's extant fleet is in inclined orbit. A satellite is in inclined orbit when the orbit varies from zero degrees with the equatorial plane. Satellites in inclined orbit are typically older satellites that are running short of station-keeping fuel, and drift along their north-south (and east-west) axis in a quasi-figure eight pattern to save fuel. This drift increases the cost of ground tracking, and reduces the value of transponder service.

[224] *Id.* at 21.

[225] http://www.ses.com/ses/PDFs/MediaRoom/Corporate/SES_Brochure_shanghai_E.PDF (visited Sept. 21, 2011).

[226] Intelsat S.A., 10-K, at 44, 2010.

[227] Intelsat S.A., News Release, 2010-7, 2010. Free cash flow is net cash from operating activities minus payments for satellites and other property and equipment, including capitalized interest. Free cash flow is a non-GAAP measure.

[228] EBITDA, a non-GAAP measure, is constructed by adding interest, taxes, depreciation, and amortization back into net income. EBITDA is a popular measure used in a variety of technology and communications industries financial reports, among others, and proponents of the measure claim it provides a useful intra-firm benchmark.

[229] Intelsat S.A., 10-K, 2011.

[230] *Id.*

[231] SES, Annual Report, 2009.

[232] *Id.*

summarized in Table III.9.

123. In 2010, SES reported revenues of $2.31 billion, operating expenses of $580 million, and total interest expense of $300 million. Cash flow from operating activities was $1.47 billion, and free cash flow from operations was $260 billion. SES reported EBITDA of $1.72 billion.[233] The data are summarized in Table III.9.

[233] SES, Annual Report, 2010.

TABLE III.9

2009-2010 FINANCIAL DATA: INTELSAT AND SES[234]
(Millions US$,[235] except where noted)

	INTELSAT		SES	
	2009	2010	2009	2010
Revenues	2,513	2,545	2,252	2,309
Operating Expenses	1,968	1,633	593	584
Interest Expense	1,363	1,379	291	316
Net Gain or Loss	(782)	(508)	664	648
Cash Flow[236]	876	1,018	1,496	1,472
EBITDA	1,391	1,723	1,659	1,724
Free Cash Flow[237]	(163)	31	448	259
EBIT[238]	545	912	1,659	1,725
Operating Profit[239]	(259)	113	979	1,031
Ratios				
Debt/EBIDTA[240]	10.9	9.3	2.99	2.91
EBITDA/Interest Expense[241]	1.02	1.23	5.33	5.38

[234] Intelsat 10-K, 2009, 2010; SES, Annual Report, 2009, 2010.

[235] Data for SES converted from Euros using the average annual exchange rate given at http://www.federalreserve.gov/releases/g5a/current/.

[236] From operating activities.

[237] Operating cash flow minus capital expenditures

[238] Revenues minus operating expenses.

[239] EBIT minus depreciation and amortization.

[240] The total debt to EBIDTA (Earnings Before Interest, Depreciation, Taxes, and Amortization) ratio is a measure of long-term financial risk. The ratio provides a "snapshot" of the time (measured in years) it would take for a firm to retire its indebtedness at current EBIDTA levels. Lower values of the ratio imply lower financial risk, since indebtedness can be repaid sooner to bondholders. This reduces lenders' exposure to default or bankruptcy by the borrower. Higher values of the ratio imply the converse. An expanded discussion of this ratio is provided by Richard Brealey, Stewart Myers, and Alan Marcus, Fundamentals of Corporate Finance, (McGraw-Hill/Irwin, 2010), Chapter 4.

[241] The EBIDTA (Earnings Before Interest, Depreciation, Taxes, and Amortization) to interest expense ratio is a measure of short-term financial risk. This ratio yields a measure of the ease by which a firm can cover its annual interest expense. Higher ratio values imply lower financial risk for lenders, since the firm has ample resources to cover debt obligations. Lower values of the ratio imply the converse. An expanded discussion of this ratio is (continued....)

124. Government credit guarantees also play a role in the fixed-satellite industry. For example, France's export-credit agency Coface (the French counterpart of the Export-Import Bank of the United States), has been active in providing export credit facilities for SES (as well as Globalstar and Iridium).[242]

125. Other innovations in funding commercial spacecraft include contracting with a government partner, such as the military, to share in the cost of construction and launching commercial satellites. Such arrangements can provide the government partner with transponder capacity or other capabilities, provide the government partner cost savings relative to standalone spacecraft procurement, and reduce the financing requirements that the commercial satellite operator would otherwise have to meet.[243]

6. Technical Personnel

126. Technical personnel are essential inputs in the production of satellite communications services as well as the manufacturing of spacecraft and earth segment facilities that originate and terminate satellite communications. The skill levels required in the satellite communications industry vary from highly-trained engineers with degrees in a number of different engineering disciplines to skilled technicians with some formal training but years of hands-on operating experience in deploying, maintaining, and supporting complex communications satellite networks. These technical personnel perform many, diverse functions, including designing and engineering of spacecraft payloads, antennas, and launch vehicles; installing ground network facilities; managing and operating network control facilities; working for domestic and international regulatory changes, training staff and clients; testing and troubleshooting circuit problems; developing technical documentation; designing hybrid satellite-terrestrial communications network solutions for customers; and performing other technical functions essential to supplying and maintaining highly reliable transmission paths using satellites positioned around the globe. Additionally, satellite operators also retain highly-specialized consultants to assist satellite operator staff in the design, manufacturing and testing of new spacecraft, extend the marketing reach of the satellite operator, assist with the deployment of ground segment, and many other very specialized but perhaps non-recurring special projects.

127. Notwithstanding the highly specialized, even unique skills and knowledge required to qualify for employment in the satellite communications industry, the labor market for such skilled personnel tends to resemble many other labor markets for highly-trained workers. For a number of skill categories, communications satellite operators may today recruit worldwide for highly-trained professional staff, since many nations now have, or are developing, a domestic satellite communications industry. One consequence of this international dimension of the labor market for satellite communications is that labor shortages when demand exceeds supply are unlikely to persist for a substantial period of time.

128. Although highly-skilled technical personnel are generally well-compensated in the satellite communications industry, there is no evidence that such technical personnel taken as a whole are able to exercise sufficient bargaining power relative to the satellite operator such that the profitability of the satellite operator is appreciably constrained by the compensation expectations or salary negotiations

(Continued from previous page)
provided by Richard Brealey, Stewart Myers, and Alan Marcus, Fundamentals of Corporate Finance, (McGraw-Hill/Irwin, 2010), Chapter 4.

[242] Satellite Today, Jan.24, 2011, Investors: Finding Safety in Satellite Again.

[243] *Australia's Intelsat Hosted IS-22 Satellite,* Defense Industry Daily (April 28, 2010), available at http://www.defenseindustrydaily.com/?s=Intelsat+Australian+Defense+Forces.

of technical personnel. For the most part, satellite operators are able to recruit most staff from specific labor markets, often global in scope, that tend to be reasonably competitive when viewed from a longer term perspective.

7. Government Regulation of Spectrum and Orbital Resources

129. In the United States, the federal government is the only entity able to allocate spectrum. The regulatory responsibility for the radio spectrum (the radio frequency portion of the electromagnetic spectrum) is divided between the Commission and the National Telecommunications and Information Administration (NTIA), which is a part of the Commerce Department. The Commission administers spectrum for non-federal use (*i.e.*, state, local government, commercial, private internal business, and personal use) while NTIA administers spectrum for federal use (*e.g.*, military, federal agencies). Within the Commission, the Office of Engineering and Technology (OET) provides advice on technical and policy issues pertaining to spectrum allocation and use.

130. The Commission assigns, licenses,[244] and authorizes frequencies and associated orbital locations for radiocommunications consistent with the Commission's Table of Frequency Allocations ("Allocations Table").[245] The Allocations Table is a compilation of the U.S. Table of Frequency Allocations and the International Table of Frequency Allocations (in the International Table, the ITU has divided the world into three Regions, with the United States in Region 2).

131. One of the prime motivations behind the licensing policy established by the Commission is to expedite the licensing process and the delivery of services to consumers. With regard to issuing licenses, the Commission has two different licensing frameworks: a modified processing round approach for non-geostationary satellite orbit (NGSO)-like systems, and a "first-come, first-served" procedure for geostationary satellite orbit (GSO)-like systems.[246] Prior to Commission adoption of these licensing frameworks, licensing processing time could take two-to-three years; now, the vast majority of licenses is granted in less than one year.[247]

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[244] *See In the Matter of Amendment of the Commission's Space Station Licensing Rules and Policies, Mitigation of Orbital Debris*, IB Docket No. 02-34, First Report and Order and Further Notice of Proposed Rulemaking, 18 FCC Rcd 10760, 10764 (Rel. May 19, 2003) (*Space Station Reform Order*).

[245] *See* 47 U.S.C. §§ 2.104-2.106. The general rules for reading the Table are: Primary services for a specific frequency or band of frequencies are printed in "capitals," *e.g.*, FIXED.

1. Secondary services are printed in "sentence case or normal characters," *e.g.*, Mobile. Stations of a secondary service:
    - Shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date;
    - Cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date; and
    - Can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date

[246] *See In the Matter of Amendment of the Commission's Space Station Licensing Rules and Policies, Mitigation of Orbital Debris*, IB Docket No. 02-34, First Report and Order and Further Notice of Proposed Rulemaking, 18 FCC Rcd 10760, 10764 (Rel. May 19, 2003) (*Space Station Reform Order*).

[247] Changes in the satellite industry necessitated a change by the Commission, *e.g.,* more satellites were operating in two or three frequency bands; satellites increased their capacity and power levels; the ITU revised its procedures to require satellite operators to bring planned systems into use within seven years rather than nine as was allowed previously; MSS and NGSO applications could result in particularly long and complex licensing proceedings; and delays impose costs on service providers and customers. *First Space Station Reform Order* at 10765.

D. Major Customer Groups

132. Some of the major customer groups that utilize FSS include: content providers and broadcasters; direct-to-home (DTH) operators; government (military, weather, disaster relief); corporations; telecommunications providers; transportation; construction and energy companies.

133. Below we provide an illustrative list of the type of customers that used FSS and MSS in 2009. We also supply the percentage of revenues that these customers represented for the satellite operators listed below.

TABLE III.10

CUSTOMERS OF FSS OPERATORS[248]

	Intelsat[249]		Eutelsat		Telesat		SES	
	2009	2010	2009	2010	2009	2010	2009	2010
Video	31%[250]	31%	71%	69%	52%	55%	61%	63%
Network Services	49%[251]	49%	19%	21%	44%	41%	29%	28%
Government	17%[252]	19%	9%	10%	4%	4%	9%	8%

[248] Chart data for the FSS operators has been provided by Futron Inc.

[249] In particular, for the year ended December 31, 2009, ten of Intelsat's customers and their affiliates represented 20 percent of Intelsat's revenues. *See Intelsat Prospectus,* dated May 11, 2010, *available at* http://www.sec.gov/Archives/edgar/data/1156871/000119312510115820/d424b3.htm. Intelsat's customers include media companies, wireline and wireless telecommunications operators, data networking service providers, multinational corporations, and internet service providers. It also provides commercial satellite capacity to the U.S. government and other military organizations and contractors. According to Intelsat, "the span of [its] business ranges from global distribution of content for media companies to essential network backbones for communications providers in high-growth emerging markets." *Intelsat Prospectus* at 90.

[250] Intelsat's video or media customers include national broadcasters, content providers and distributors, cable programmers and direct-to-home platform operators. *Id.*at 95.

[251] Intelsat's network services customers include wireline and wireless telecommunications carriers, including global, regional and national providers, corporate network service providers, value-added services providers, such as those serving the oil and gas and maritime industries, and multinational corporations. *Id.* at 93.

[252] Intelsat's government customers include the U.S. military, civilian agencies, and commercial customers serving the defense industry. *Id.*at 97.

TABLE III.11

CUSTOMERS OF MSS OPERATORS, BY PERCENTAGE OF REVENUE[253]

	Inmarsat		Iridium		Globalstar[254]	
	2009	2010	2009	2010	2009	2010
Maritime Voice	15	13				
Maritime Data	36	36				
Land Mobile Voice	1	1				
Land Mobile Data	20	20				
Aeronautical	11	14				
Leasing	15	15				
Commercial[255]			50	54		
Government[256]			24	18		
Subscriber Equipment			26	28		
Government (including federal, local and state)						
Public Safety and Disaster Relief					24	23
Recreation and Personal					18	19
Maritime and Fishing					6	6
Other[257]					19	20

[253] Inmarsat and Iridium chart data for 2009 provided by Futron Inc. 2010 Inmarsat chart data based on Inmarsat's 2010 annual report. *See Inmarsat Annual Report and Accounts 2010 available at* http://www.inmarsat.com/Downloads/English/Investors/Inmarsat_Annual_Report_Accounts_2010.pdf?language=EN&textonly=False. Iridium chart data based on Form10-K for 2010 *available at* http://edgar.brand.edgar-online.com/EFX_dll/EDGARpro.dll?FetchFilingHTML1?ID=7780530&SessionID=aw-eHqvBONNlh47. Globalstar chart data based on Globalstar's combined operations within the United States and Canada. *See Globalstar, Inc., Form 10-K, Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 for year ended December 31, 2009, available at* http://www.sec.gov/Archives/edgar/data/1037388/000119312510051613/d10k.htm (*Globalstar 2009 Form 10-K*). Globalstar chart data based on Form 10-K for 2010 *available at* http://investing.businessweek.com/research/stocks/financials/drawFiling.asp?docKey=136-000114420411019122-28DI43PPHB4RN57LR3FSUQJ2S4&docFormat=TXT&formType=10-K.

[254] The data in this column does not sum to 100 percent since it is restricted to business activity in the United States and Canada and does not reflect other international business activities of Globalstar.

[255] Commercial-based buyers are located in markets such as emergency services, maritime, utilities, oil and gas, mining, construction, forestry, and leisure. *See Iridium Communications Inc., Form 10-K, Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 for the year ended December 31, 2009, available at* http://www.sec.gov/Archives/edgar/data/1418819/000119312510058393/d10k.htm (*Iridium 2009 Form 10-K*).

[256] According to Iridium, the U.S. government is its largest customer. U.S. government customers include the Department of Defense (customer since 2000), the State Department and the Federal Emergency Management Agency. *See Iridium 2009 Form 10-K* at 1, 3.

[257] The remaining 19 percent of customers operate in the telecommunications, oil and gas, natural resources, construction and utilities markets. *See Globalstar 2009 Form 10-K.*