

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

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| In the Matter of                                | ) |                                  |
|   | ) |                                  |
| <b>Iridium Constellation LLC</b>                | ) | File No.: SAT-MOD-20080701-00140 |
|   | ) | Call Sign: S2110                 |
| Application for Modification of Big LEO License | ) |                                  |
| to Change the Orbital Debris Mitigation Plan    | ) |                                  |

**ORDER AND AUTHORIZATION**

**Adopted: July 31, 2014**

**Released: July 31, 2014**

By the Chief, Satellite Division, International Bureau:

**I. INTRODUCTION**

1. By this Order, we authorize Iridium Constellation LLC (Iridium) to operate up to ten of its non-geostationary orbit (NGSO) space stations under a revised orbital debris mitigation plan, which extends the post-mission atmospheric re-entry period from within a few months to within 25 years. We deny, at this time, Iridium’s request to operate its remaining space stations under the revised plan. This action will allow Iridium to continue seamless operation of its satellite constellation while mitigating the risks associated with the post-mission disposal of its satellites.

**II. BACKGROUND**

2. On January 31, 1995, Iridium’s predecessor-in-interest, Motorola Satellite Communications, Inc., was authorized to construct, launch, and operate a “Big LEO”<sup>1</sup> NGSO Mobile-Satellite Service (MSS) system consisting of 66 satellites and up to 12 in-orbit spares.<sup>2</sup> This original authorization for the Iridium system did not include an orbital debris mitigation plan.

3. On February 8, 2002, the International Bureau approved the assignment of the Big LEO authorization to Iridium.<sup>3</sup> The approval was based, in part, on an orbital debris mitigation plan submitted in connection with the assignment application.<sup>4</sup> Under the orbital debris plan, at the end of its useful life each Iridium satellite would be lowered through a series of maneuvers from its 778-kilometer near-circular mission orbit to an orbit with a perigee altitude of 250 km.<sup>5</sup> Due to the natural decay of this disposal orbit, Iridium satellites would re-enter the Earth’s atmosphere within a few months.<sup>6</sup> A study by

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<sup>1</sup> “Big LEO” refers to low-Earth orbit (LEO) mobile satellite services above 1 GHz. LEO generally refers to orbits at altitudes of less than 2000 km.

<sup>2</sup> Motorola Satellite Communications, Inc., *Order and Authorization*, 10 FCC Rcd 2268 (Int’l Bur. 1995), corrected, 10 FCC Rcd 3925 (Int’l Bur. 1995), affirmed in part and modified, 11 FCC Rcd 18502 (1996). The Iridium system was later authorized for up to 14 in-orbit spare satellites. Space System License, Inc., *Order and Authorization*, 14 FCC Rcd 9829 (Int’l Bur., Sat. Div. 1999).

<sup>3</sup> Space Station System Licensee, Inc., Assignor, and Iridium Constellation LLC, Assignee, et al., *Memorandum Opinion, Order and Authorization*, 17 FCC Rcd 2271 (Int’l Bur. 2002).

<sup>4</sup> *Id.* at 2290-92.

<sup>5</sup> *See id.* at 2290.

<sup>6</sup> *Id.*

the National Aeronautics and Space Administration (NASA) estimated the risk of human casualty resulting from re-entry of an Iridium satellite by this method to be 1 in 18,406.<sup>7</sup> In connection with its orbital debris plan, Iridium secured an insurance policy that provides two forms of coverage: one with a three-year term covering the planned de-orbiting of up to eight satellites per year, and a second one with an 18-month term, once triggered, covering activities related to any planned de-orbiting of the entire constellation.<sup>8</sup>

4. On June 9, 2004, the Commission adopted policies concerning the mitigation of orbital debris.<sup>9</sup> In doing so, the Commission aimed to “further the domestic policy objective of the United States to minimize the creation of orbital debris[.]”<sup>10</sup> For NGSO space stations, the Commission stated that it would continue reviewing post-mission disposal plans, on a case-by-case basis, in light of orbital debris mitigation guidelines developed by the U.S. government and the international community.<sup>11</sup> It noted that disposal plans consistent with U.S. government and international guidelines, such as those providing for the placement of satellites into an orbit from which they will re-enter the Earth’s atmosphere within 25 years, would “[a]s a general matter . . . suggest that the space station[s] will operate consistent with the public interest.”<sup>12</sup> The Commission also noted that the U.S. government guidelines provide that disposal of a spacecraft by atmospheric re-entry should present a risk of human casualty of less than 1 in 10,000.<sup>13</sup> Finally, the Commission anticipated that insurance issues would continue to play a role in our evaluation of orbital debris plans, particularly when they involve atmospheric re-entry.<sup>14</sup>

5. On July 1, 2008, Iridium filed an application to modify its Big LEO license to change the orbital debris mitigation plan.<sup>15</sup> Under the proposed plan, at end of life each Iridium satellite would be lowered, in two phases, until it reaches a disposal orbit with a perigee altitude of 600 km.<sup>16</sup> Iridium estimates that the natural decay of this disposal orbit would result in an orbital lifetime of less than 25 years.<sup>17</sup> Based on the methodology used by NASA in its study of the original Iridium orbital debris plan, Iridium calculates the risk of human casualty resulting from the revised plan to be approximately 1 in 13,000.<sup>18</sup> In response to inquiries by the Satellite Division,<sup>19</sup> Iridium provided supplementary information

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<sup>7</sup> *Id.*

<sup>8</sup> *Id.* The United States was listed as an additional insured party on the policy. *Id.*

<sup>9</sup> Mitigation of Orbital Debris, *Second Report and Order*, 19 FCC Rcd 11567 (2004) (*Orbital Debris Order*).

<sup>10</sup> *Id.* at 11568-69.

<sup>11</sup> *Id.* at 11601-02. *See also id.* at 11572- 74 (discussing U.S. government and Inter-Agency Space Debris Coordination Committee guidelines); U.S. Government Orbital Debris Mitigation Standard Practices, *available at* [http://orbitaldebris.jsc.nasa.gov/library/USG\\_OD\\_Standard\\_Practices.pdf](http://orbitaldebris.jsc.nasa.gov/library/USG_OD_Standard_Practices.pdf).

<sup>12</sup> *Id.* at 11602.

<sup>13</sup> *Id.* at 11603. This guideline was incorporated from a NASA Safety Standard, NSS 1740.14. *Id.*

<sup>14</sup> *Id.* at 11613-14. Under international law, the U.S. government could potentially be held liable for certain damage that may result from private space station operations, including disposal, maneuvering, and the generation of orbital debris. *Id.* at 11612-13.

<sup>15</sup> Iridium Constellation LLC, Application for Minor Modification, File No. SAT-MOD-20080701-00140 (July 1, 2008) (Application). We placed the Application on public notice on February 28, 2014. Policy Branch Information, Satellite Space Applications Accepted for Filing, *Public Notice*, Report No. SAT-00999 (Feb. 28, 2014). No comments were filed.

<sup>16</sup> Application, Appendix A at A-3.

<sup>17</sup> *Id.*

<sup>18</sup> Letter to Robert G. Nelson, Chief, Satellite Division, from Donna Bethea-Murphy, Vice President, Regulatory Engineering, Iridium Constellation LLC, at 3 (Oct. 3, 2011) (October 2011 Supplement). In calculating this figure, Iridium assumes that its last existing first-generation satellite will begin de-orbit by 2020. *Id.*

about its proposed orbital debris plan and the health of its satellite constellation.<sup>20</sup>

6. On December 27, 2013, Iridium filed an application to modify its Big LEO license to launch and operate a second-generation satellite constellation.<sup>21</sup> The application proposes to wholly replace the current operating constellation shortly after the last planned launch of new satellites in May of 2017.<sup>22</sup> Thereafter, Iridium asks to reserve the option to retain some of the current satellites as potential in-orbit spares for the new constellation.<sup>23</sup>

7. On May 22, 2014, the Satellite Division granted, in part, a request by Iridium to extend the license term for its existing satellite constellation.<sup>24</sup> The license term ends January 31, 2018.

8. Since first proposing its revised orbital debris plan, Iridium has continued to operate several satellites beyond the fuel reserve necessary for de-orbit under the original plan. Currently, seven satellites lack sufficient fuel to comply with the original orbital debris plan.<sup>25</sup> All have enough fuel to de-orbit consistent with the revised plan.

### III. DISCUSSION

9. We find it is in the public interest to grant, in part, Iridium's request to modify its orbital debris mitigation plan. Iridium's revised post-mission disposal plan contemplates atmospheric re-entry within 25 years, consistent with both the U.S. government and international guidelines.<sup>26</sup> Using NASA methodology, Iridium estimates that the casualty risk from its revised disposal method is 1 in 13,000, within the U.S. government guideline of less than 1 in 10,000.<sup>27</sup> Additionally, pursuant to an agreement

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<sup>19</sup> Letter to Donna Bethea-Murphy, Vice President, Regulatory Engineering, Iridium Constellation LLC, from Robert G. Nelson, Chief, Satellite Division (May 9, 2011); Letter to Donna Bethea-Murphy, Vice President, Regulatory Engineering, Iridium Constellation LLC, from Jose P. Albuquerque, Chief, Satellite Division (Apr. 15, 2014).

<sup>20</sup> Letter to Robert G. Nelson, Chief, Satellite Division, from Donna Bethea-Murphy, Vice President, Regulatory Engineering, Iridium Constellation LLC (June 30, 2011); Aerospace Corporation, De-Orbit Collision Risk Assessment and Casualty Risk Assessment Report (June 30, 2011) (Aerospace Report); October 2011 Supplement; Letter to Marlene H. Dortch, Secretary, FCC, from Jennifer D. Hindin, Counsel for Iridium Constellation LLC (May 15, 2014). Iridium requested that complete versions of the June 30, 2011 letter and Aerospace Report and May 15, 2014 letter be accorded confidential treatment. Letter to Marlene H. Dortch, Secretary, FCC, from Jennifer D. Hindin, Counsel for Iridium Constellation LLC (June 30, 2011); Letter to Marlene H. Dortch, Secretary, FCC, from Jennifer D. Hindin, Counsel for Iridium Constellation LLC (May 15, 2014). It submitted redacted versions of the June 30, 2011 letter and May 15, 2014 letter for public viewing.

<sup>21</sup> Iridium Constellation LLC, Application for Modification of NGSO Authorization to Launch and Operate Replacement Satellites, File No. SAT-MOD-20131227-00148 (Dec. 27, 2013) (Second Generation Application).

<sup>22</sup> *Id.*, Engineering Statement at 9.

<sup>23</sup> *Id.*

<sup>24</sup> Iridium Constellation LLC, *Stamp Grant*, File No. SAT-MOD-20101001-00207 (granted in part and deferred in part May 22, 2014) (License Extension Grant).

<sup>25</sup> *See* Iridium Constellation LLC, Application for Special Temporary Authority, File No. SAT-STA-20140612-00062 (granted July 29, 2014); Iridium Constellation LLC, Application for Special Temporary Authority, File No. SAT-STA-20140612-00063 (granted July 29, 2014). The Satellite Division has granted and periodically extended special temporary authority (STA) for Iridium to operate satellites consistent with the revised plan. *See, e.g.*, Iridium Constellation LLC, *Stamp Grant*, File No. SAT-STA-20140612-00062 (granted July 29, 2014) (180-day STA for six satellites); Iridium Constellation LLC, *Stamp Grant*, File No. SAT-STA-20140612-00063 (granted July 29, 2014) (180-day STA for one satellite).

<sup>26</sup> Application, Appendix A at A-3; *Orbital Debris Order*, 19 FCC Rcd at 11601-02.

<sup>27</sup> October 2011 Supplement at 3; *Orbital Debris Order*, 19 FCC Rcd at 11603.

with the U.S. government, Iridium is required to maintain an insurance policy covering the de-orbiting of its satellite constellation.<sup>28</sup> Iridium's policy covers risks associated with de-orbiting the constellation for up to 12 months once requested by Iridium.<sup>29</sup> The policy has been renewed annually since the expiration of the original policy's three-year term in 2003.<sup>30</sup> The U.S. government is a named beneficiary of the policy.

10. Grant of the revised orbital debris plan for up to ten first-generation satellites will allow Iridium to continue to operate, consistent with U.S. government guidelines, the seven satellites which currently lack enough fuel to comply with the original plan. It also will allow Iridium between now and January 31, 2018, to continue operating up to three satellites beyond the point at which Iridium would have been required to dispose of them under the original plan.

11. We deny, at this time, Iridium's request to authorize the modified disposal plan for Iridium's remaining first-generation satellites. Iridium's license term ends on January 31, 2018,<sup>31</sup> more than six months after it separately proposes to have completely replaced its current operating constellation.<sup>32</sup> Moreover, based on the record developed in this proceeding, these remaining satellites will have enough fuel to operate well beyond the end of their license term under their current disposal plan. Because of this, authorizing a disposal plan that involves their continued presence on orbit as uncontrolled objects over up to 25 years, instead of over a few months, would increase the on-orbit collision risks associated with disposal without a counterbalancing public benefit in extended service.

#### IV. CONCLUSION AND ORDERING CLAUSES

12. We conclude that grant of the revised orbital debris mitigation plan for up to ten, first-generation Iridium satellites will serve the public interest by allowing Iridium to continue seamless operation of its satellite constellation consistent with U.S. government guidelines. We deny Iridium's request to operate its remaining first-generation satellites under the revised plan because the increased risks associated with the longer disposal period are not outweighed by a competing public benefit in extended service.

13. Accordingly, IT IS ORDERED that the application of Iridium Constellation LLC to modify its authorization for a non-geostationary orbit Mobile-Satellite Service constellation, File No. SAT-MOD-20080701-00140, IS GRANTED IN PART and DENIED IN PART. Iridium is authorized to operate up to ten first-generation space stations under the revised orbital debris mitigation plan. Iridium's remaining first-generation space stations must continue to operate under the orbital debris plan approved in Space Station System Licensee, Inc., Assignor, and Iridium Constellation LLC, Assignee, et al., *Memorandum Opinion, Order and Authorization*, 17 FCC Rcd 2271 (Int'l Bur. 2002).

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<sup>28</sup> Iridium Communications Inc., SEC Form 10-K at 16 (Mar. 4, 2014) (Iridium 2014 10-K). *See also* Iridium Communications Inc., SEC Form 8-K, Exhibit 10.1 (Sept. 29, 2009) (copy of 2000 Iridium contract with the U.S. government); Iridium Communications Inc., SEC Form 10-Q, Exhibit 10.7 (Nov. 9, 2010) (copy of 2010 contract modification).

<sup>29</sup> Iridium 2014 10-K at 31, 79.

<sup>30</sup> Iridium 2014 10-K at 16.

<sup>31</sup> License Extension Grant.

<sup>32</sup> Second Generation Application, Engineering Statement at 9.

14. This Order is issued pursuant to Section 0.261 of the Commission's rules on delegations of authority, 47 C.F.R. § 0.261, and is effective on release.

FEDERAL COMMUNICATIONS COMMISSION

Jose Albuquerque  
Chief, Satellite Division  
International Bureau