

\*\* RE-ISSUED + REVISED ON 12/07/16 \*\*

SAT-STA-20150821-00060  
Spaceflight, Inc.  
SHERPA

IB2015001561



File # SAT-STA-20150821-00060

Call Sign \_\_\_\_\_ Grant Date 10/25/16

(or other identifier)

From see conditions To: see conditions

Approved: *Stephen J. Duall*

Approved by OMB  
3060-0678

Date & Time Filed: Aug 21 2015 7:13:16:996PM  
File Number: SAT-STA-20150821-00060  
Callsign:

\* with conditions

Stephen J. Duall  
Chief, Satellite Policy Branch

FEDERAL COMMUNICATIONS COMMISSION  
APPLICATION FOR SPACE STATION SPECIAL TEMPORARY AUTHORITY  
FOR OFFICIAL USE ONLY


APPLICANT INFORMATION

Enter a description of this application to identify it on the main menu:  
SHERPA space station STA

1. Applicant

<b>Name:</b>	Spaceflight, Inc.	<b>Phone Number:</b>	202-262-1825
<b>DBA Name:</b>		<b>Fax Number:</b>	
<b>Street:</b>	PO Box 1922	<b>E-Mail:</b>	IHornsby@SpaceflightIndustries.com
<b>City:</b>	Bellevue	<b>State:</b>	WA
<b>Country:</b>	USA	<b>Zipcode:</b>	98009 -
<b>Attention:</b>	Ms Indra Hornsby		

**ATTACHMENT TO GRANT**  
 Spaceflight Inc.  
 IBFS File No. SAT-STA-20150821-00060

<b>IBFS File No(s):</b>	SAT-STA-20150821-00060 <sup>1</sup>	<p><b>GRANT – With Conditions</b></p>  <p><b>International Bureau Satellite Division</b></p>
<b>Licensee/Grantee:</b>	Spaceflight Inc.	
<b>Satellite Name:</b>	SHERPA	
<b>Orbital Location: (required station-keeping tolerance)</b>	NGSO in an elliptical orbit with a perigee altitude of 450 km, apogee altitude of 720 km, and 97.4° inclination.	
<b>Administration:</b>	United States of America	
<b>Nature of Service:</b>	Space Operations	
<b>Scope of Grant:</b>	Authority to operate one non-geostationary satellite for a period not to exceed 12 hours, in order to deploy the spacecraft described in the SHERPA manifest. <sup>2</sup>	
<b>Service Area(s):</b>	Three earth stations <sup>3</sup> located in North Pole, Alaska, Tukwila, Washington, and Wallops Island, Virginia.	
<b>Frequencies:</b>	Command frequency: 450.2 MHz (Earth-to-space)  Telemetry and Tracking frequency: 401.5 MHz (space-to-Earth)	
<p><b>Operations under this grant must comport with the legal and technical specifications set forth by the applicant or petitioner and with Federal Communication Commission’s rules not waived herein. This grant is also subject to the following conditions:</b></p> <ol style="list-style-type: none"> <li>1. All operations under this grant of special temporary authority must be on an unprotected and non-harmful interference basis, <i>i.e.</i>, Spaceflight must not cause harmful interference to, and shall not claim protection from interference caused to it by, any other lawfully operating station.</li> <li>2. In the event of any harmful interference under this grant of special temporary authority, Spaceflight must cease operations immediately upon notification of such interference and must inform the Commission, in</li> </ol>		

<sup>1</sup> The application was placed on public notice on Jan. 22, 2016. *Policy Branch Information Satellite Space Station Applications Accepted for Filing*, Public Notice, Report No. SAT-01130 (Jan. 22, 2016).

<sup>2</sup> See Letter from Jonathan L. Wiener, Goldberg, Godles, Wiener & Wright LLP, to Jose P. Albuquerque, Chief, Satellite Division, FCC International Bureau, Attach. at 1 (filed Nov. 2, 2015) (on file in IBFS File No. SAT-STA-20150821-00060) (listing 90 satellites for planned deployment from SHERPA); Letter from Henry Goldberg and Jonathan L. Wiener, Goldberg Godles, Wiener & Wright LLP, to Marlene H. Dortch, Secretary, FCC, at 1 (filed June 17, 2016) (indicating that the Pathfinder-1 satellite previously scheduled to be deployed by the SHERPA was removed from the manifest). An additional satellite, the SeeMe satellite, will be deployed from the eXCITE satellite three weeks after the deployment of the eXCITE spacecraft, but until then will remain part of the eXCITE spacecraft. See OET Experimental File No. 0540-EX-PL-2015, Exhibits, ODAR at 1-2 (granted April 25, 2016), grant later modified in other respects by OET Experimental File No. 0089-EX-ML-2016 (granted June 29, 2016). On July 22, 2016, Spaceflight indicated that no additional spacecraft would be added to the manifest. See Letter from Tony Lin, Counsel, Hogan Lovells US LLP, to Marlene H. Dortch, Secretary, FCC, at Exh. B (filed July 26, 2016) (enclosing letter from H. Indra Hornsby, General Counsel, Spaceflight, Inc. to Mike Safyan, Director of Launch and Regulatory Affairs, Planet Labs, Inc., July 22, 2016). On November 14, 2016, Spaceflight informed that the 56 Planet Labs satellites scheduled for deployment by the SHERPA had also been removed from the manifest, leaving a total of 34 satellites that would be deployed from the SHERPA. Letter from Henry Goldberg and Jonathan L. Wiener, Attorneys for Spaceflight, Inc., to Jose P. Albuquerque, Chief, Satellite Division, International Bureau, FCC, at 1 (filed Nov. 14, 2016) (Spaceflight Nov. 14, 2016 *Ex Parte*).

<sup>3</sup> See IBFS File Nos. SES-STA-20150824-00549, SES-STA-20150824-00550, and SES-STA-20150821-00051.

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writing, immediately of such an event.

3. We waive, on our own motion, Section 25.113(g) of the Commission's rules, requiring orbital deployment approval and a license to be applied for and granted prior to orbital deployment and operation of a space station.<sup>4</sup> We find that the special circumstances presented here, including the short operational lifetime of the space station, and the similarity of the space station to an upper stage launch vehicle,<sup>5</sup> justify waiver of the rule. Further, waiver of the rule would not undermine the policy objective of the rule. The Commission has described the intent of the rule to be "that the approval process [for space stations] involves a public interest review of proposed space station operation and debris mitigation plans before a space station is launched into orbit."<sup>6</sup> Consistent with the intent of the rule, we have reviewed the description of space station operations and orbital debris mitigation plan submitted by Spaceflight, and make a finding that granting the requested STA is in the public interest. In light of these specific circumstances, we conclude that waiver would serve the public interest. The rule is waived herein without prejudice to any future applications by Spaceflight, or by any other operators seeking authority to operate space stations designed to deploy satellites.
4. On May 11, 2016, ORBCOMM License Corp. (ORBCOMM) filed Informal Comments requesting that the Commission defer grant of this STA request.<sup>7</sup> ORBCOMM objected to grant of STA on the basis that the SHERPA spacecraft and satellites planned for deployment from SHERPA would use altitudes and orbital planes that would intersect with the authorized 47 degree-inclined 715 km circular target operational orbits for its ORBCOMM Generation 2 Satellites.<sup>8</sup> ORBCOMM's concern is that it will be required to perform an unacceptably large number of collision avoidance maneuvers, thereby impacting the service life of its satellites, as a result of potential collisions between its satellites and the SHERPA and SHERPA-deployed satellites.<sup>9</sup> ORBCOMM is also concerned that the SHERPA and the SHERPA-deployed satellites may collide with each other, thus creating debris that would affect ORBCOMM.<sup>10</sup> We find, based on the conditions placed on this authorization and on the additional information filed in the record, including technical analysis placed in the record by Planet Labs Inc. (Planet Labs) and confirmed by Spaceflight,<sup>11</sup> that we can proceed with grant of Spaceflight's request for STA to operate the SHERPA spacecraft. Although the 56 Planet Labs satellites will no longer be deployed from the SHERPA,<sup>12</sup> the analysis conducted by Planet Labs remains relevant.

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<sup>4</sup> 47 CFR § 25.113(g).

<sup>5</sup> An upper stage launch vehicle would not be licensed by the Commission, to the extent that the vehicle falls within the authority of the Federal Aviation Administration (FAA). *See Mitigation of Orbital Debris*, Notice of Proposed Rulemaking, 17 FCC Rcd 5586, 5592-93, paras. 14-15 (2002) (citing the Commercial Space Launch Act of 1984, as amended, 49 U.S.C. § 70101 *et seq.*, and the FAA's implementing regulations, codified at 14 CFR Ch. III, § 400 *et seq.*); *see also Mitigation of Orbital Debris*, Second Report and Order, 19 FCC Rcd 11567, 11611, para. 105 (2004) (noting the Commission's prior observation that "matters addressed under the Commercial Space Launch Act and its implementing regulations are most appropriately addressed by the FAA").

<sup>6</sup> *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Further Notice of Proposed Rulemaking, 29 FCC Rcd 12116, 12155, para. 133 (2014).

<sup>7</sup> ORBCOMM License Corp., Informal Comments at 1 (filed May 11, 2016) (on file in IBFS File No. SAT-STA-20150821-00060) (ORBCOMM Informal Comments).

<sup>8</sup> *Id.* at 2.

<sup>9</sup> *Id.* at 3-4.

<sup>10</sup> *Id.* at 2.

<sup>11</sup> *See* Letter from Tony Lin, Counsel, Hogan Lovells US LLP, to Marlene H. Dortch, Secretary, FCC, at 1, Exhs. A, B (filed July 26, 2016).

<sup>12</sup> Spaceflight Nov. 14, 2016 *Ex Parte* Letter at 1.

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a. With respect to ORBCOMM's concern with an unacceptably large number of collision avoidance maneuvers, the Commission authorization granted to Spire is conditioned on Spire performing certain actions in the event it receives a conjunction warning from the Joint Space Operations Center (JSpOC) or other source.<sup>13</sup> These actions should assist ORBCOMM in reducing the number of collision avoidance maneuvers to an acceptable level. With respect to the concern with collisions among the spacecraft in the SHERPA mission, the analysis provided by Planet Labs concluded that the risk of in-plane collisions over a two year period for any pair of objects is  $7.8 \times 10^{-7}$ .<sup>14</sup> In an *ex parte* letter filed on August 9, 2016, ORBCOMM argued that since there were 4,095 possible pairs of objects, the aggregate probability of in-plane collision would be  $3.18 \times 10^{-3}$ .<sup>15</sup> However, of the satellites planned for deployment from SHERPA at the time of the analysis, 56 would have been operated by Planet Labs, and these will be replaced by mass simulators that will not be deployed into orbit.<sup>16</sup> Eight of the satellites still planned for deployment will be operated by Spire, Inc., which has stated that its satellites can perform collision-avoidance maneuvers using differential drag and an on-board attitude determination and control system.<sup>17</sup> Four other satellites are equipped with propulsion.<sup>18</sup>

b. We conclude that although the collision risk as calculated by ORBCOMM correctly assesses risk based on multiple collision pairs, the figure derived by ORBCOMM overstates the actual risk because collisions will be less likely than assumed in the Planet Labs' analysis, and the total number of objects has been reduced because of the withdrawal of the Planet Labs' satellites. In order to derive a more realistic estimate of the aggregate probability of collision, including the effect of removal of the Planet Labs satellites, we consider two different scenarios. In scenario 1, we assume that the 12 objects identified above with some means of maneuvering do not collide among themselves. In scenario 2, we assume in addition that these 12 objects also do not collide with any of the other 23 objects (22 satellites plus SHERPA). This allows us to conclude that, starting from the probability of collision for any pair of objects, as estimated by Planet Labs ( $7.8 \times 10^{-7}$ ), the aggregate probability of collision is bounded by  $0.20 \times 10^{-3}$  (scenario 2) and  $0.41 \times 10^{-3}$  (scenario 1).

c. This range does not include collision risk with respect to the "background" large object debris population. Exhibit A, Appendix B of the *ex parte* filing submitted by Planet Labs on July 26, 2016 contains such an analysis, prepared using NASA's Debris Assessment Software (DAS), for the entire SHERPA mission.<sup>19</sup> Adding up the probabilities of collision originally calculated by Planet Labs for the

<sup>13</sup> See Planet Labs Inc., IBFS File No. SAT-MOD-20150802-00053 (granted Sept. 15, 2016); Spire Global, Inc., IBFS File No. SAT-LOA-20151123-00078 (grant-in-part and defer-in-part Oct. 14, 2016).

<sup>14</sup> Letter from Tony Lin, Counsel, Hogan Lovells US LLP, to Marlene H. Dortch, Secretary, FCC, at 3 (filed July 26, 2016). This figure provides an approximation, as it was arrived at based on Planet Labs' participation in the deployment.

<sup>15</sup> Letter from Walter H. Sonnenfeldt, Regulatory Counsel, ORBCOMM License Corp. & Vice President, Regulatory Affairs, ORBCOMM Inc. to Marlene H. Dortch, Secretary, FCC, at 4, n.7 (filed Aug. 9, 2016) (filed as "Response to 7/26/16 Planet Labs Letter").

<sup>16</sup> Spaceflight Nov. 14, 2016 *Ex Parte* Letter at 1-2).

<sup>17</sup> Application of Spire Global, Inc., File No. SAT-LOA-20151123-00078, Exhibit A at 5-6 (Nov. 23, 2015).

<sup>18</sup> See OET Experimental File No. 0586-EX-PL-2015, Exhibits, Revised ODAR v.3.1 at 8-10 (granted Jan. 27, 2016) (describing propulsion system on the two identical Aerocube-7 spacecraft); OET Experimental File No. 0829-EX-PL-2014 Exhibits, Orbital Debris Assessment at 8 (granted Dec. 28, 2015) (describing propulsion system on the BlackSky Global Pathfinder satellites, including the Pathfinder-2 spacecraft) grant later modified in other respects by OET Experimental File No. 0053-EX-ML-2016 (granted April 11, 2016); Su-A Song, Yeona Yoo, Soyeon Koo, Seungkeun Kim, and Jinyoung Suk, *System Design and Dynamic Analysis for Sail Deployment for Cube Satellite CNUSAIL-1*, 54th AIAA Aerospace Sciences Meeting, AIAA SciTech (2016), <http://dx.doi.org/10.2514/6.2016-0964> (describing planned solar sail propulsion for Chungnam University's CNUSAIL-1 spacecraft).

<sup>19</sup> Letter from Tony Lin, Counsel, Hogan Lovells US LLP, to Marlene H. Dortch, Secretary, FCC, Exh A. at 10-59 (filed July 26, 2016).

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91 objects planned for deployment (ninety satellites plus SHERPA), and subtracting the probability of collision for the 56 Planet Labs satellites that will no longer be deployed by SHERPA, we arrive at an aggregate probability of collision with the background of  $0.18 \times 10^{-3}$ . Therefore, we estimate the overall probability of collision for the entire SHERPA mission, based on the approximate collision probability per satellite pair, to be bounded by  $0.38 \times 10^{-3}$  and  $0.59 \times 10^{-3}$ . The Planet Labs analysis also included an estimate of the probability of collision of any of the previously planned 91 objects in the SHERPA mission and any of the ORBCOMM satellites.<sup>20</sup> This calculation is relevant in assessing the burden that will be imposed on ORBCOMM as a result of maneuvers required to avoid collisions. However, we have not included it in our estimate of the overall probability of collision because such collisions will be avoided.

5. Spaceflight must take all steps within its control to ensure that it and the launch provider, SpaceX, abort the separation of the SHERPA deployer from the SpaceX Falcon 9 launch vehicle in the event that a SpaceX Formosat-5 launch mission anomaly precludes lowering the Falcon 9 second stage from the Formosat-5 720 km circular release orbit to the specified 450 x 720 km SHERPA release orbit. If, despite Spaceflight taking all steps within its control, SHERPA is separated from the SpaceX Falcon 9 launch vehicle at an orbit other than the specified 450 x 720 km SHERPA release orbit, SHERPA must not deploy any satellites.
6. NOAA conducted an analysis for any SHERPA operations prior to November 30, 2016, which was provided to Spaceflight on October 24, 2016. Since the launch will occur after the November 30, 2016 date, Spaceflight must provide notification to the following point of contact at the earliest possible date prior to launch, so that additional orbit analysis can be accomplished.

Richard Kelley  
Alion Science and Technology for U.S. Department of Commerce and NOAA/NESDIS  
NOAA Satellite Operations Facility  
Suitland, MD  
phone 01.301.817.4636  
[rkelly@alionscience.com](mailto:rkelly@alionscience.com) [richard.kelley@noaa.gov](mailto:richard.kelley@noaa.gov)

7. Prior to the start of operations, Spaceflight must contact the Air Force Spectrum Management Office and supply a stop buzzer point of contact (POC). This POC must be available any time testing is being performed.

Air Force Spectrum Management Office  
6910 Cooper Ave  
Ft George G. Meade, Maryland

Jennifer Corzo  
Phone: 301-225-3719  
[Jennifer.corzo.2@us.af.mil](mailto:Jennifer.corzo.2@us.af.mil)

8. This authorization is limited to operations of the SHERPA spacecraft and does not in any way grant authority for operations or express a view concerning the status of any satellite that will be deployed from SHERPA.
9. Spaceflight shall not integrate any satellite into the SHERPA deployer unless, for any space station on such satellite requiring FCC authorization, the operator has either obtained an FCC license for such space station, or in the case of an amateur space station, has submitted pre-launch notifications to the FCC, and

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<sup>20</sup> See *id.* at 3.

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the FCC has confirmed that the space station is considered documented pursuant to Section 97.5(a)(3) of the Commission's rules, 47 CFR § 97.5(a)(3).

10. Operations of the SHERPA spacecraft must begin no later than 15 days following launch of the spacecraft. Upon commencement of operations, Spaceflight must file a notification within one (1) day certifying to the Commission that the space station has been successfully placed in orbit and its operations fully conform to the terms and conditions of this grant.

Licensee/grantee is afforded thirty (30) days from the date of release of this action to decline the grant as conditioned. Failure to respond within this period will constitute formal acceptance of the grant as conditioned.

This action is taken pursuant to Section 0.261 of the Commission's rules on delegated authority, 47 CFR § 0.261, and is effective upon release.

Station licenses are subject to the conditions specified in Section 309(h) of the Communications Act of 1934, as amended, 47 U.S.C. § 309(h).

**Action Date:** October 25, 2016

**Term Dates**    **From:** see conditions

**To:** see conditions

**Approved:**



Stephen J. Duall  
Chief, Satellite Policy Branch

\*\* RE-ISSUED ON 12/07/16 \*\*  
+  
REVISED

2. Contact

<b>Name:</b>	Jonathan L. Wiener	<b>Phone Number:</b>	202-429-4900
<b>Company:</b>	Goldberg Godles Wiener & Wright LLP	<b>Fax Number:</b>	202-429-4912
<b>Street:</b>	1229 19th Street, NW	<b>E-Mail:</b>	jwiener@g2w2.com
<b>City:</b>	Washington	<b>State:</b>	DC
<b>Country:</b>	USA	<b>Zipcode:</b>	20036 -2413
<b>Attention:</b>		<b>Relationship:</b>	Legal Counsel

(If your application is related to an application filed with the Commission, enter either the file number or the IB Submission ID of the related application. Please enter only one.)

3. Reference File Number or Submission ID

4a. Is a fee submitted with this application?

- If Yes, complete and attach FCC Form 159. If No, indicate reason for fee exemption (see 47 C.F.R. Section 1.1114).
- Governmental Entity     Noncommercial educational licensee
- Other (please explain):

4b. Fee Classification    CXW – Space Station (Non-Geostationary)

5. Type Request

- Change Station Location                       Extend Expiration Date                       Other

6. Temporary Orbit Location

7. Requested Extended Expiration Date

8. Description (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.)

Spaceflight Inc., pursuant to Section 25.120 of the Commission's Rules, hereby requests Special Temporary Authority to permit it to communicate with a spacecraft, known as SHERPA, and corresponding earth stations for a duration of up to twelve (12) hours to take place in a single occurrence between January 15, 2016 and April 15, 2016.

9. By checking Yes, the undersigned certifies that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. See 47 CFR 1.2002(b) for the meaning of "party to the application"; for these purposes.  Yes  No

10. Name of Person Signing  
Indra Hornsby

11. Title of Person Signing  
General Counsel

12. Please supply any need attachments.

Attachment 1: Request for STA

Attachment 2: ODAR

Attachment 3:

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



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