



August 9, 2016

**VIA IBFS**

Ms. Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 12th Street, S.W.  
Washington, D.C. 20554

**Re: Ex Parte Letter – File Nos. SAT-MOD-20150802-00053; SAT-LOA-20151123-00078; SAT-STA-20150821-00060**

Dear Ms. Dortch:

ORBCOMM License Corp. (“ORBCOMM”) hereby responds to the July 26, 2016, Planet Labs Inc. (“Planet Labs”) submission regarding the above-captioned applications (the “Planet Labs Letter”). The Planet Labs Letter included two new technical exhibits: (1) a Conjunction Assessment analyzing in-orbit collision risks arising from the proposed Spaceflight, Inc. (“Spaceflight”) SHERPA mission, both among proposed SHERPA mission spacecraft (including the SHERPA vehicle itself), and between proposed SHERPA mission spacecraft and ORBCOMM’s fleet of Generation 2 (“OG2”) satellites; and (2) a Spaceflight letter confirming the accuracy of assumed parameters for the proposed SHERPA mission used in the new Planet Labs Conjunction Assessment.<sup>1</sup> As explained below, ORBCOMM believes that in light of its preliminary analysis of the additional information provided by Planet Labs, and with appropriate license conditions, the Commission may be able to grant Planet Labs’ request to launch 56 Planet Labs Flock 2c satellites on Spaceflight’s proposed SHERPA secondary satellite payload deployment mission. In this regard, the Planet Labs Letter clearly underscores the need for ORBCOMM, Spire Global, Inc. (“Spire”), Planet Labs, and Spaceflight to work in a collaborative manner towards forging reasonable, mutually-acceptable solutions that the Commission can implement to address several important unresolved questions and concerns.

ORBCOMM appreciates the significant work that Planet Labs has undertaken to address the issues and concerns that still must be resolved in connection with the above-referenced applications.<sup>2</sup> Nevertheless, the record is clear that the above-referenced contested proceedings

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<sup>1</sup> Planet Labs also cross references the July 26, 2016, submission of Spire Global, Inc. (“Spire”) relating to the above-referenced applications (the “Spire Letter”). Planet Labs Letter at n. 5.

<sup>2</sup> However, ORBCOMM must object to the Planet Labs Letter assertions insinuating that ORBCOMM has not been acting in good faith. *See, e.g.*, Planet Labs Letter at p. 1 (labeling ORBCOMM’s objections as “speculative and unsupported”); Planet Labs Letter at p. 3 (accusing ORBCOMM of “moving the goalpost” by introducing new and different concerns).



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result from the fact that, as originally filed, each of the underlying applications – including the Planet Labs application- failed to include critically important information and analyses required by the Commission’s rules. Of greatest concern from ORBCOMM’s perspective, these defects raised material questions that the Commission must address to quantify and mitigate in-orbit collision and debris hazard risks, including the possible risks of collisions with ORBCOMM’s fleet of OG2 satellites.<sup>3</sup> As a result, ORBCOMM was left with no choice but to petition the Commission to address and resolve these deficiencies. From the time of its initial filing regarding the above-referenced applications, ORBCOMM has consistently acted in good faith, and expended significant time and resources to try to forge a mutually acceptable way forward.

Following the formal pleadings, ORBCOMM engaged in productive discussions with Planet Labs with respect to an acceptable level of risk in a probabilistic analysis, communication on ephemeris and conjunction alerts, and limits on future intersecting orbits. Several drafts of an agreement were exchanged, but those discussions were put on hold when ORBCOMM learned about the planned inclusion of 56 Planet Labs satellites (and 8 Spire spacecraft) on Spaceflight’s proposed SHERPA mission secondary payload satellite manifest, consisting of a total of 90 or so satellites to be deployed in a proposed single-plane elliptical orbit that intersects with the authorized orbits of ORBCOMM’s entire OG2 satellite fleet. ORBCOMM filed its May 11, 2016, submission objecting to the Spaceflight application because the application was flawed and defective. The application did not provide relevant technical information on the proposed SHERPA mission plan, or with respect to the proposed SHERPA mission secondary satellite payloads. The Spaceflight application also failed to provide any analysis of the risk of collision with OG2 satellites posed by the proposed SHERPA mission, including the possible risks associated with SHERPA mission in-plane collisions, which could substantially increase the possibility of damage to ORBCOMM’s satellites from resulting debris. ORBCOMM never "moved the goalposts," but did indicate that the risk of the SHERPA mission needed to be analyzed, and that Spaceflight appeared to be the only party that had all the relevant information to conduct such analyses. However, Spaceflight was uncooperative, simply maintaining that it

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<sup>3</sup> ORBCOMM also raised legitimate concerns about the undue one-sided collision avoidance burden placed on ORBCOMM due to Planet Lab’s and Spire’s decision not to include spacecraft propulsion and Planet Labs’ reliance on ranging for location information. Due to ORBCOMM’s concerns about the lack of accurate location information, Planet Labs did subsequently upgrade GPS capabilities that apparently had existed but had not been fully developed. Planet Labs Letter at p. 3 (“Moreover, to address ORBCOMM’s demand for more refined ephemerides, Planet reallocated technical teams to accelerate the development of its onorbit satellite GPS capabilities.”).

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had no responsibility for conducting any analyses of the 90 or so satellites it seeks authorization to deploy on the proposed SHERPA mission.<sup>4</sup>

On May 23, 2016, Planet Labs provided ORBCOMM with an analysis of the probability of in-plane collision risks associated with the SHERPA mission. After a thorough technical review of this study, on June 14, 2016, ORBCOMM provided Planet Labs with a detailed written response that identified specific material flaws in the study. ORBCOMM's response provided calculations indicating that these flaws resulted in an understatement of the proposed SHERPA mission in-plane collision risk by a factor of at least 4,095. As a good faith gesture, ORBCOMM did not file its assessment of the Planet Labs study with the Commission, but instead tried to give Planet Labs the opportunity to revise its analysis and continue working cooperatively with ORBCOMM. Unfortunately, Planet Labs chose to largely ignore ORBCOMM's analysis, and did not engage ORBCOMM on these matters. More than one month later, the Planet Labs Letter was filed with the Commission.

ORBCOMM appreciates that Planet Labs has now placed into the record refined analyses of the various collision risks and additional information on the SHERPA planned deployments. ORBCOMM also acknowledges that such studies required significant effort. As discussed in greater detail below, however, ORBCOMM does have some concerns and questions regarding those studies. At the same time, ORBCOMM believes that this proceeding is not the appropriate forum for addressing issues that are better addressed in a rulemaking of general applicability. Indeed, the small satellite "revolution" raises many significant issues that go beyond just the risk of collision between Planet Labs proposed new satellites and ORBCOMM's satellites. These concerns raise potential orbital debris issues that broadly impact the entire non-geostationary satellite industry. These broader issues include flexibility in orbit selections to take advantage of opportunistic launches, use of random, uncontrolled deployment mechanisms,<sup>5</sup> incorporation of propulsion capabilities, required demonstrations, acceptable levels of projected collision risks

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<sup>4</sup> See, Spaceflight, Inc. Response to Informal Comments of ORBCOMM on Application of Spaceflight, Inc., Request for Special Temporary Authority, File No. SAT-STA-20150821-00060 (May 13, 2016).

<sup>5</sup> According to the Spaceflight website website (<http://www.spaceflight.com/sherpa/>), the SHERPA does have the capability to operate "as a propulsive free-flyer spacecraft [...], separating from the launch vehicle and operating [...] under its own power, propulsion and attitude control". For the proposed SHERPA mission of concern in the instant case, however, SHERPA is being operated "as a non-propulsive free-flyer spacecraft", so the satellite deployments will be much more random. While such randomness results in a lower calculated probability of collision (because the satellites could go almost anywhere), that may not be the best way to actually lower the risk of collisions.

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and requirements for information sharing. Such a rulemaking can also address the fact that simply minimizing costs for smallsat operators may not account for “negative externalities” that such operations can impose.

As mentioned above, ORBCOMM does have some questions and concerns with regard to the refined analyses submitted with the Planet Labs Letter, and in the Spire Letter.<sup>6</sup> With regard to the two new collision studies submitted with the Planet Labs Letter, as ORBCOMM understands these two new analyses, the Monte Carlo simulation methodology chosen by Planet Labs considers the risk of collision among randomly selected pairs of spacecraft. However, for the proposed SHERPA mission (and for the proposed Planet Labs and Spire mission sub-components), the risk of collision is not just between any two spacecraft. At the mission level, the actual risk of collision is among any one of the proposed SHERPA mission spacecraft (including the SHERPA vehicle itself) and *all* of the OG2 satellites, and among any one of the proposed SHERPA mission spacecraft and *all* of the other proposed SHERPA mission spacecraft. Thus, adjusting for this difference suggests that the new Planet Labs Monte Carlo simulations demonstrate that the risk of collisions associated with the proposed SHERPA mission are higher than the values asserted in the study conclusions, which are based on just the risk of any two objects colliding.<sup>7</sup>

Based on the foregoing, there are still clearly several unresolved matters with respect to the conjunction assessments and debris hazard analyses relating to the above-referenced

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<sup>6</sup> One of ORBCOMM’s questions is the extent to which the Planet Labs collision analyses incorporated the new Orbital Decay Analysis submitted with the Spire Letter. By a separate concurrently filed submission, ORBCOMM is also addressing apparent flaws in that Spire study.

<sup>7</sup> As ORBCOMM calculates, one run of a complete SHERPA mission consists of (90 SHERPA deployed satellites + the SHERPA spacecraft) x 17 OG2s = 1,547 pairings, so 10M runs represents 6,464 mission simulations. Given the two collisions found in the new Planet Labs study, the resulting actual collision probability is at least  $2/6,464=3.1 \times 10^{-4}$ , or 3-in-10,000. With respect to assessing the in-plane SHERPA mission collision risk, given that one instance of a complete mission has 4,095 possible pairings, the 18 million trials with 14 collisions reported in the new Planet Labs study suggests a probability of collision among the SHERPA objects of at least  $3.18 \times 10^{-3}$ . It is also not clear if all of the spacecraft that may be deployed on the proposed SHERPA mission are included in Planet Labs’s new analyses. Apparently, at least one of the spacecraft proposed for SHERPA mission deployment will itself release at least one additional satellite. *See, e.g.*, Raytheon Missile Systems, Experimental License, File No. 0540-EX-PL-2015, ODAR at p. 3 (“Approximately three weeks after deployment of the Phoenix/eXCITE satellite, the SeeMe satellite will be released into its orbit.”).

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applications, and ORBCOMM recognizes that time is of the essence.<sup>8</sup> ORBCOMM has always been, and remains, willing to work cooperatively with all of the parties in these proceedings. ORBCOMM is hopeful that the parties can renew their efforts to work “off the record” to reach agreement on the correct values for a reasonably acceptable level of probabilistic risk, confirmation of the required spacecraft parameter information, and a valid method for analyzing what those probabilistic risks are for the satellites in question. However, based on the unfortunate tone and tenor of the Planet Labs Letter and the Spire Letter, and Spaceflight’s continuing lack of participation in these matters, it may be necessary for the Commission to compel further submissions, and/or adjudicate these issues based on the established record of the above-referenced applications.

But reaching agreement on the reasonableness of the collision risk probabilities for the proposed SHERPA mission satellites is not enough by itself. It is also critical that the parties reach an agreement on the exchange of information once the satellites are launched, so that ORBCOMM can take any necessary evasive maneuvers in the case of a conjunction alert. ORBCOMM does not think that this should be a significant problem, however, because Planet Labs acknowledges that it and ORBCOMM had previously reached an agreement in principle on the conditions that would allow the proposed SHERPA mission 56 satellite Flock 2c deployment to proceed without objection (Planet Labs Letter at p. 3). ORBCOMM thus anticipates being able to quickly finalize such an agreement. ORBCOMM believes that proceeding in the manner recommended herein will most efficiently resolve this dispute.

Respectfully submitted,



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cc: Parties of Record

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<sup>8</sup> It does not appear, however, that the Commission needs to address these issues by the August 15, 2016, deadline claimed by the Spire letter. Spire Letter at p. 1. The Spire ODAR included in the Spire Letter indicates that the “anticipated launch date is October 15, 2016. The anticipated integration date is September 15, 2016.” Spire ODAR at Section 1.