ORBCOMM

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-LOA-20151123-00078; SAT-STA-20150821-00060; SAT-MOD-20150802-00053

Dear Ms. Dortch:

ORBCOMM License Corp. ("ORBCOMM") hereby responds to the July 26, 2016, Spire Global, Inc. ("Spire") submission regarding the above-referenced applications (the "Spire Letter"). The Spire Letter included two new technical exhibits relating to eight Spire Lemur-2 satellites currently included on the proposed Spaceflight, Inc. ("Spaceflight") SHERPA mission secondary payload satellite deployment manifest – a new orbital decay analysis, and a new Orbital Debris Assessment Report ("ODAR"). In addition, the Spire Letter relies on separate analyses included in a concurrently-filed July 26, 2016, Planet Labs Inc. ("Planet Labs") submission (the "Planet Labs Letter"). As explained below, ORBCOMM believes that in light of its preliminary analysis of the additional information provided by Spire and Planet Labs, and with appropriate license conditions, the Commission may be able to grant Spire's request to include eight Lemur-2 satellites on the proposed SHERPA secondary satellite payload deployment mission. In this regard, the new Spire and Planet Labs submissions clearly underscore the need for ORBCOMM, Spire, Planet Labs, and Spaceflight to continue working towards forging reasonable, mutually-acceptable solutions that the Commission can implement to address several important unresolved questions and concerns.

As an initial matter, ORBCOMM disagrees with many of Spire's assertions of what ORBCOMM, Planet Labs and/or Spire has said or done, and mischaracterizations of our motivation. Spire attempts unfairly and inaccurately to portray ORBCOMM as not acting in good faith. Nothing could be further from the truth.

First, we want to remind the Commission of how this dispute arose. As ORBCOMM explained in its Petition to Dismiss, Deny or Hold in Abeyance, the application filed by Spire (the "Spire Application") was flawed and did not comport with the Commission's rules in many respects. The Spire Application sought authority to launch as many as 900 satellites into a variety of orbits, including one that intersected with ORBCOMM's entire fleet of second generation ("OG2") satellites. However, the Spire Application did not include an ODAR for any orbit above 650 km, and so did not take into account the overlap with ORBCOMM. Moreover, that ODAR only considered the requested 175 active satellites, not the up to 900 satellites that

Spire sought authority to launch.[1] In addition, ORBCOMM objected to the undue burden imposed on ORBCOMM by the lack of propulsion in the Spire satellites, which means that ORBCOMM would be the one burning fuel to take evasive actions in the event of a conjunction alert.

Following the filing of our Petition, ORBCOMM and Spire had limited conversations. However, there was never any unwillingness by ORBCOMM to engage, nor any delays in responding. Spire asserts that ORBCOMM's and Spire's counsel had a conference call in which ORBCOMM purportedly acknowledged that the eight Lemur-2 satellites manifested on the proposed SHERPA mission would not create an unacceptable risk of collision with OG2 satellites. (Spire Letter at p. 2). That characterization is not accurate. During that call, ORBCOMM's counsel indicated that ORBCOMM did not yet know what an accurate estimated risk of collisions between OG2 satellites and the eight Lemur-2 satellites was, but that ORBCOMM was willing to enter a conjunction alert procedure agreement, and concurred that such an agreement could be modeled on the Planet Labs conjunction alert procedure agreement that was in negotiation. That was the last direct contact between ORBCOMM and Spire with regard to a conjunction alert procedure agreement.

The Spire Letter also asserts that "ORBCOMM's greater concern was Spire's future launch plans. ORBCOMM sought detailed orbital parameters for launches that might occur up to ten years in the future. In response, Spire indicated that it did not know and could not provide details on upcoming launches more than twelve to eighteen months from the present." (Spire Letter at p. 2). That is also an inaccurate description of ORBCOMM's concerns. ORBCOMM did not mention any ten year horizon. What ORBCOMM discussed was the need to quantify the number of Spire satellites for which authorization is sought under the Spire Application that might be launched into orbits intersecting with ORBCOMM. When Spire indicated it did not know, ORBCOMM indicated that it would be okay with proceeding under the grant in part/defer in part approach taken thus far by the Commission as details of new Spire satellite launches become known.

With respect to the SHERPA mission, Spire also claims that "ORBCOMM asked Spire to address: (1) the risk of in-plane collisions for the 90-odd payloads on the Spaceflight, Inc. ("Spaceflight") Sherpa mission over which Spire has no control; and (2) the risk that a second-stage ignition of a Falcon-9 rocket that Spire does not control could pose to OG2 satellites." (Spire Letter at p. 2). This is another mischaracterization of ORBCOMM's position. ORBCOMM did not ask Spire (or Planet Labs) to conduct a study of the risks that the proposed SHERPA mission poses with respect to in-plane collisions or collisions with the ORBCOMM

[1] Spire filed an updated ODAR in its Opposition. However, that analysis claimed to include an assessment of a 450 x 720 km orbit (ODAR Section 1), but the run data included with that ODAR reflects a 425 x 750 km orbit.

satellites. ORBCOMM has consistently maintained that this is Spaceflight's responsibility, because it alone has control over the proposed SHERPA mission satellite deployments, as well as the information necessary to conduct the analyses.[2] In addition, ORBCOMM's concern was not with a "second-stage ignition of a Falcon-9 rocket," but rather that ORBCOMM wanted to be sure that the Commission specifies clear criteria for aborting SHERPA separation from the Falcon 9 second stage, as well as release of the SHERPA mission secondary payload satellites, in the event of a launch mission anomaly that precludes release of these spacecraft in the authorized insertion orbit.[3]

ORBCOMM appreciates that Spire (and Planet Labs) have now placed into the record refined analyses of the various collision risks. And ORBCOMM recognizes that such studies require significant effort. However, as discussed in greater detail below, ORBCOMM does have 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 the Spire satellites and the ORBCOMM satellites that impact orbital debris and the satellite industry more broadly. These broader issues include flexibility in orbit selections to take advantage of opportunistic launches, use of random, uncontrolled deployment mechanisms,[4] incorporation of propulsion capabilities, required demonstrations, acceptable levels of projected collision risks[5] and requirements for

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[2] Spaceflight has asserted that it has no responsibility to conduct any such analyses (Spaceflight Opposition, filed May 13, 2016), and the Spaceflight Letter dated July 22, 2016, appended to the Planet Labs Letter of July 26, 2016, is the first indication ORBCOMM has seen of any cooperation by Spaceflight.

[3] *See*, Informal Comments of ORBCOMM on the Application of Spaceflight, Inc., Request for Special Temporary Authority, File No. SAT-STA-20150821-00060 (May 11, 2016), at p. 4.

[4] According to the Spaceflight 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 current proposed SHERPA mission, however, the SHERPA vehicle is proposed to be operated "as a non-propulsive free-flyer spacecraft", so the satellite deployments will be directionally random. While such randomness may result in modeling calculations showing low probabilities of collision (because the satellites could go almost anywhere), random, directionally uncontrolled deployments should not thus be concluded to be a safe mission profile.

[5] To the extent Spire claims that the projected risks indicated in ODAR analyses submitted in connection with the OG2 FCC authorization ought to establish the appropriate values (Spire Letter at pp. 5-6), ORBCOMM notes that there is a significant material difference between the OG2 and Lemur-2 satellites, insofar as the OG2 include propulsion capabilities and the Lemur-2

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 by Spire and Planet Labs. The Spire Orbital Decay Analysis appears to incorporate too aggressive of a factor for drag in their modeling. We are on the downslope of the solar cycle, and would expect the coming months to have the lowest drag of the past several years. Their base value for ap index is higher than the average for the last 18 months, and their base value for F10.7 appears to reflect the maximum of this solar cycle, which would put it at least a year out of date. ORBCOMM is also uncertain as to whether this projected, more rapid orbital decay was incorporated in the collision analyses performed by Spire and Planet Labs.[6] ORBCOMM additionally has some concerns with respect to the two new collision studies submitted with the Planet Labs Letter (and relied on by Spire). ORBCOMM is addressing those issues in a separate letter being filed concurrently in response to the Planet Labs Letter.

As set forth above, and in ORBCOMM's concurrently filed response to the Planet Labs Letter, there are still clearly several unresolved matters with respect to the conjunction assessments and debris hazard analyses relating to the above-referenced applications, and ORBCOMM recognizes that time is of the essence.[7] ORBCOMM has always been, and remains, willing to work cooperatively with all of the parties in these proceedings. Although it may be more efficient for the parties to continue working "off the record" to reach agreement on conjunction assessment matters, based on the unfortunate tone and tenor of the Spire Letter and

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spacecraft do not. Thus, the projected risk calculations do not account for the fact that ORBCOMM can avoid any actual collision, so that with the careful monitoring that ORBCOMM employs, the actual risk of collision is zero. ORBCOMM also objects to Spire's attempt (at n. 28) to compare the mass and surface area of the ORBCOMM and Spire constellations. Despite the fact that Spire is requesting authority to launch up to 900 satellites, its comparisons assume only 660 (or 441) Lemur-2 satellites. Moreover, the number of satellites in a constellation affects the risk of collision – by way of analogy, a single bowling ball creates less of a risk of collision than a bunch of pebbles with the same total surface area and mass.

[6] ORBCOMM also has some questions with regard to that study's use of two argument of perigee cases (0˚ and 180˚) to "encompass all of the possible orbit scenarios." Spire Orbital Decay Analysis at p. 2

[7] However, it does not appear that the Commission must address these issues by the August 15 integration date deadline claimed in 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).

the Planet Labs Letter, and Spaceflight's continuing lack of participation in these proceedings, 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 proper analytical methodology *and* the reasonableness of the collision risk probabilities is not enough by itself. It is also critical that ORBCOMM and Spire reach an agreement on the exchange of information once Spire's proposed SHERPA mission satellites are launched, so that ORBCOMM can take any necessary evasive maneuvers in the case of a conjunction alert. ORBCOMM does not believe that this should be a problem, however, because Spire appears to agree with such a requirement. (Spire Letter at p. 5). Finally, ORBCOMM continues to object to Spire's request for open-ended authority to launch additional satellites without knowing the particulars of the number of satellites, launch mission plan, or targeted operational orbits. Given that Spire has made it clear that it is unable to provide this information, ORBCOMM suggests instead that the Commission continue with its practice of granting in part and deferring in part the Spire Application. Such a procedure will allow the Commission (and interested parties) to review the specific characteristics of specific future proposed deployments, consistent with the Commission's rules.

Respectfully submitted,

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cc: Parties of Record