April 20, 2021

BY ELECTRONIC FILING

Marlene H. Dortch
Secretary
Federal Communications Commission
45 L Street, N.E.
Washington, DC 20554

Re: *IBFS File No. SAT-MOD-20200417-00037*

Dear Ms. Dortch:

On April 20, 2021, representatives from Space Exploration Holdings, LLC ("SpaceX") and representatives from WorldVu Satellites Limited ("OneWeb") had a conference call with staff from the International Bureau. A full list of participants is provided in Attachment A. During the call, SpaceX corrected the record regarding recent press reports regarding physical coordination between SpaceX and OneWeb. SpaceX presented the attached fact sheet with an accurate chronology of events that demonstrates the coordination was successful and there was never a risk of a collision.

Despite recent reports to the contrary, the parties made clear that there was no "close call" or "near miss." SpaceX and OneWeb agreed that they had conducted a successful coordination, resulting in a positive outcome. The probability of collision never exceeded the threshold for a maneuver, and the satellites would not have collided even if no maneuver had been conducted. As further detailed in the attached fact sheet, and despite OneWeb's previous public claims, SpaceX's autonomous collision avoidance system was and remains fully functional at all times. SpaceX only turned off the capability at OneWeb's explicit request after OneWeb decided to conduct a maneuver.

SpaceX expressed its disappointment to the Commission that OneWeb's officials chose to publicly misstate the circumstances of the coordination. Ongoing successful coordination depends on trust and transparency between the operators and the types of tactics used in this case by OneWeb result in a less safe space environment as they detract from the technical work needed to manage a satellite constellation safely. SpaceX was therefore grateful that OneWeb offered in the meeting with the Commission to retract its previous incorrect statements. SpaceX looks forward to hearing confirmation from OneWeb when those retractions have been made.

OneWeb's misleading public statements coincide with OneWeb's intensified efforts to prevent SpaceX from completing a safety upgrade to its system. For instance, immediately after the first inaccurate quotes came out in media accounts, OneWeb met with Commission staff and

Commissioners demanding unilateral conditions placed on SpaceX's operations.[1] Ironically, the conditions demanded by OneWeb would make it more difficult to successfully coordinate operations going forward, demonstrating more of a concern with limiting competitors than with a genuine concern for space safety.

These tactics are just the latest escalation of a disturbing trend by non-U.S. operators to influence U.S. regulators and policy makers with respect to space safety. Similarly, Viasat has been making misrepresentations about space safety and demanding unilateral restrictions on competitors in scores of Commission filings and public statements. At the same time, both Viasat and OneWeb have argued forcefully that they should be exempt from Commission rules for orbital debris mitigation due to their status as non-U.S. operators. The Commission can help curb this hypocritical behavior by acting swiftly on SpaceX's petition to extend its orbital debris rules to all operators, including those like OneWeb and Viasat, that choose to license their systems overseas but seek to provide service in the U.S. market. This unified regime will help align all operators' interests in a sustainable space environment.

Finally, SpaceX discussed the importance of transparent operations. SpaceX is proud to be the first operator to provide both its ephemerides and covariance data to the 18th Space Control Squadron for all operators to access. Maintaining a sustainable space environment is a shared responsibility and it is incumbent on all operators to take their responsibility seriously.

Sincerely,

/s/ David Goldman

David Goldman
Director of Satellite Policy

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cc: FCC Participants

Attachments

[1] *See* Letter from Brian D. Weimer to Marlene H. Dortch, IBFS File No. SAT-MOD-20200417-00037 (Apr. 14, 2021).

ATTACHMENT A

FCC Participants

Karl Kensinger
Jameyanne Fuller
Joe Hill
Marissa Valez
Jennifer Gilsenan
Troy Tanner
Tom Sullivan

SpaceX

Tim Hughes
Patricia Cooper
Mat Dunn
David Goldstein
Erik Babcock
Jeff Tooley
Kevin Wu
David Goldman

OneWeb

Brian Weimer
John Guiney
Ruth Pritchard-Kelly
Eric Graham

Attachment B

FACT SHEET

Operator to Operator Physical Coordination: SpaceX-OneWeb

Recent Successful Technical Coordination: No Close Call and Inaccurate Information Provided to Media

- OneWeb's head lobbyist recently made demonstrably inaccurate statements to the media about recent coordinations of physical operations. Specifically, Mr. McLaughin of OneWeb told the Wall Street Journal that SpaceX switched off its AI-powered, autonomous collision avoidance system and "they couldn't do anything to avoid a collision." Rather, SpaceX and OneWeb were working together in good faith at the technical level. As part of these discussions, OneWeb itself requested that SpaceX turn off the system temporarily to allow their maneuver, as agreed by the parties, per the chronology, below.
- The recent technical coordination with OneWeb was not an exceptional event and the Starlink team has successfully conducted similar coordinations with other satellite owner/operators.
- Technical data indicates that this event was neither a "close call" and not "urgent" nor as reported in the press, presumably based on information provided by OneWeb.
- According to the valid conjunction data messages ("CDM"), the probability of conjunction was between 1 in 10,000 (1e-4) and 1 in 100,000 (1e-5) during the time of the interaction, which is near the floor of the maneuver threshold of 1 in 100,000 (1e-5).
- All operator-to-operator interactions between SpaceX and OneWeb to date have involved open, constructive technical discussions.

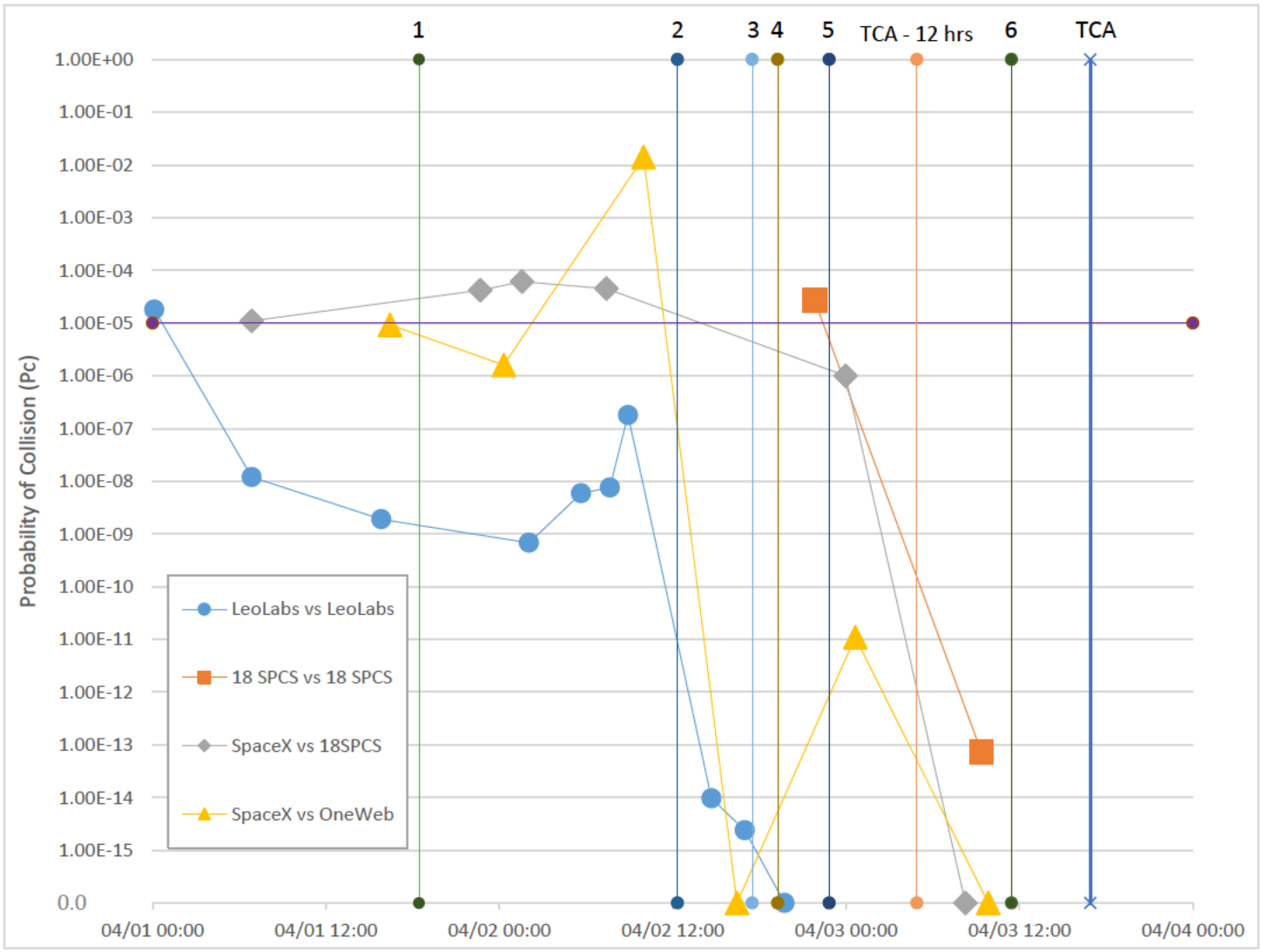
Chronology

1. OneWeb contacted SpaceX by email on 4/1/2021 at 18:26 UTC (see timeline below with corresponding numbers) regarding a notice from the United States Space Force's 18th Space Control Squadron ("18 SPCS"), SpaceX responded within minutes and communicated to OneWeb that Starlink-1546 was/is maneuverable.
2. OneWeb asked SpaceX via email on 4/2/2021 12:20 UTC for more detail, and SpaceX responded minutes later to explain that.
    - the maneuver threshold for Starlink satellites is 1e-5 and that maneuvers occur approximately 12 hours before the predicted closest approach of the satellites.
    - Starlink-1546 was maneuverable and its autonomous collision avoidance system was functioning nominally.
    - if a maneuver was needed, typically a single in-track burn would be conducted to reduce collision probability.
3. SpaceX and OneWeb conducted a call on 4/2/2021 at 17:30 UTC.
    - The 18 SPCS had provided no new CDMs at this point, but LeoLabs CDMs showed low probability of collision ("Pc").
    - OneWeb stated that OneWeb-0178 was not maneuvering at that time.
    - OneWeb acknowledged that the covariance (i.e., accuracy) in its propagated ephemerides (i.e., predicted location of satellites) are biased low and this bias is a known issue.
    - Given the acknowledged issues with OneWeb covariance data, SpaceX de-weighted/discounted the validity of SpaceX vs OneWeb CDMs (yellow triangles in plot below).
    - SpaceX volunteered to perform a manual maneuver, but both parties agreed to wait for the next CDM.

4. SpaceX and OneWeb had a second call on 4/2/2021 at 19:15 UTC.
    - 18 SPCS had provided no new CDMs at this point.
    - SpaceX reiterated its recommendation to wait for another CDM from 18 SPCS before planning a maneuver because SpaceX systems indicated this was the least risky approach.
    - OneWeb satellites need more time to coordinate and plan their maneuvers than Starlink satellites require, so OneWeb did not want to wait and chose instead to maneuver OneWeb-0178.
    - Because OneWeb decided to plan a maneuver, it asked SpaceX to turn off Starlink-1546's autonomous conjunction avoidance system. SpaceX obliged this request and confirmed to OneWeb that the system had been turned off.
5. OneWeb sent an email to SpaceX on 4/2/2021 at 22:50 UTC with the maneuver plan and the ephemerides they had screened by 18 SPCS.
    - After the maneuver was planned, 18 SPCS provided its latest CDM that showed Pc below standard maneuver thresholds.
    - All subsequent CDMs show continued lowering Pc. In other words, the probability of collision was already below any threshold that required a maneuver and kept dropping.
6. While all CDM Pc values remained below the maneuver threshold, OneWeb-0178 maneuvered on 4/3/2021 at 11:27 UTC.
    - 18 SPCS reported actual miss distance as 1,120 m.
    - LeoLabs reported actual miss distance as 1,072 m.
    - Both 18 SPCS and LeoLabs reported final Pc below 1e-20—one in one hundred million million million—**this was not a close call or a near miss**.

Background

- The 18 SPCS sends satellite operators alerts whenever satellites have conjunctions that have (i) a time of closest approach within 72 hours, (ii) a probability of collision greater than 1/10,000 (1e-4), and (iii) a miss distance less than 1 km.
- If the notice is for two maneuverable satellites, the satellites' operators contact each other to coordinate potential collision avoidance maneuvers, i.e., maneuvers that reduce collision probability
- The first satellite operations coordination between SpaceX and OneWeb was over a year ago on March 12, 2020.
    - 18 SPCS provided notice of a conjunction between ONEWEB-0052 and Starlink-1057, and the parties held coordination discussions.
    - Based on these discussions, Starlink-1057 did an autonomous conjunction avoidance maneuver for this case.
- Between March 2020 and prior to the early April 2021 conjunction with OneWeb, Starlink satellites have conducted many autonomous maneuvers to reduce collision probabilities, with no issues.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Probability of Collision (Pc)
LeoLabs vs LeoLabs
18 SPCS vs 18 SPCS
SpaceX vs 18SPCS
SpaceX vs OneWeb
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