

July 7, 2020

BY ELECTRONIC FILING

Jose P. Albuquerque
Chief, Satellite Division
International Bureau
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, DC 20554

Re: *Space Exploration Holdings, LLC, IBFS File No. SAT-MOD-20200417-00037*

Dear Mr. Albuquerque:

Space Exploration Holdings, LLC (“SpaceX”) recently responded to several questions from the International Bureau staff with respect to the above referenced application to modify its non-geostationary orbit (“NGSO”) satellite system by lowering operational altitudes.¹ In its response to a question about potential collision risk, SpaceX used analytical tools it developed to provide higher fidelity data about its debris mitigation characteristics than could be determined from previously existing tools. As SpaceX explained, it used its own proprietary software to propagate a decay trajectory through the different debris flux levels at different altitudes that NASA’s Debris Assessment Software (“DAS”) could not adequately capture.²

Just last month, NASA released an updated version of DAS (version 3.1.0) that better accounts for the decay trajectory issue SpaceX previously identified.³ To confirm its original analysis, SpaceX used this most recent version of DAS to perform the analysis responsive to the Bureau’s collision risk question. Specifically, the Bureau asked for the in-orbit collision risk for a satellite at each of the various operational altitudes and inclinations specified in the modification application, assuming that the maneuver capability on the satellite is not available, and assuming alternative cases of a satellite for which altitude is maintained, and one that is tumbling, for both the current satellite design and the design that includes sun shade panels. The results of that analysis using DAS 3.1.0 are set forth in Table 1 below.

¹ See Letter from William M. Wiltshire to Jose P. Albuquerque, IBFS File No. SAT-MOD-20200417-00037 (May 15, 2020).

² See *id.* at 2 n.7.

³ See NASA Technology Transfer Program, “Debris Assessment Software (DAS) v. 3.1.0,” <https://software.nasa.gov/software/MSO-26690-1>.

Jose P. Albuquerque
July 7, 2020
Page 2 of 2

Altitude (km)	Current Satellite Design		Satellite with Sun Shade Panels	
	Maintained	Tumbling	Maintained	Tumbling
540	0.000069	0.000053	0.000071	0.000053
560	0.000139	0.000106	0.000142	0.000108
570	0.000138	0.000101	0.000141	0.000103

Table 1. Collision Risk Assuming No Maneuver Capability (DAS 3.1.0)

This DAS 3.1.0 analysis confirms SpaceX's prior conclusion that the proposed modification would yield collision risk metrics that are many times lower than the 0.001 benchmark recently adopted by the Commission.⁴ Given NASA's continuing efforts to improve and update its analytical tools, any DAS-reliant analysis submitted to the Commission by any satellite applicant is necessarily a snapshot based on the information available at a given time, subject to upward or downward revision based on later software releases. In this case, the debris flux data used in DAS 3.1.0 at the relevant altitudes is slightly higher than in previous versions of the software, including the one that SpaceX had incorporated into its analysis. As a result, the collision risk shown in Table 1 is slightly higher than the risk previously calculated – yet still significantly better than the benchmark.

NASA has issued five new releases to update DAS software between March 2016 (DAS 2.1.0) and June 2020 (DAS 3.1.0). While the specific results may differ with each new release, the underlying conclusion should remain the same – just as it did in this case.

Sincerely,



William M. Wiltshire
Counsel to SpaceX

cc: Karl Kensinger
Merissa Velez

⁴ See *Mitigation of Orbital Debris in the New Space Age*, 35 FCC Rcd. 4156, ¶¶ 33-34 (2020).