SPACEX

April 24, 2025

BY ELECTRONIC FILING

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

Re: *ELS File No. 0284-EX-CN-2025*

Dear Ms. Dortch:

AST & Science, LLC's ("AST") recent experimental license application for the FM-1 satellite contains worrying discrepancies in its orbital debris mitigation plan that require clarification before granting authorization to launch. If after reviewing those clarifications the Commission ultimately decides AST is capable of operating its large satellite safely and sustainably, any authorization should ensure AST follows the same requirements that the Commission unanimously found in the public interest when authorizing SpaceX's second-generation system.

As an initial inconsistency in AST's analysis, AST describes the minimum possible disposal timeline during the height of solar activity as its "nominal" plan, even though that is not physically possible. Specifically, AST claims that the "Nominal Deployment" post-mission disposal timeline for its FM-1 satellite is only 2.93 years,[1] yet an analysis using NASA's Debris Assessment Software ("DAS") reveals that 2.93 years reflects the *minimum* time at solar maximum. But at the solar minimum, just several years into their seven-year design life, applying the same analysis with AST's own assumptions reveals a 6.6-year disposal timeframe. Critically, this analysis shows that even in nominal conditions at solar minimum, AST plans to violate the Commission's five-year disposal rule. Before the Commission can approve AST's application, AST should explain how it will meet the Commission's rules during solar minimum.

This standard DAS analysis also uncovers another troubling inconsistency, this time leading to an *order of magnitude* increase in risk of collision. In its orbital debris mitigation plan, AST relies on the passive decay collision probability from the year of launch—i.e., at solar maximum when the probability of collision is lowest—to claim that its FM-1 satellite complies with the applicable limits. But looking beyond the first year toward the expected total lifetime of the FM-1 satellite reveals a very different risk profile. Calculating the passive decay collision probability of the FM-1 satellite using AST's own assumptions, including area-to-mass ratio, DAS v. 3.2.6, and the March 28, 2025 solar flux data, and averaging the probability across the entire seven-year lifetime of the satellite, shows that the actual collision probability of the FM-1 satellite is close to *ten times higher* than AST reports. Doing a proper risk analysis demonstrates that AST has dramatically understated to the Commission the actual risk of its nearly 6,000 kg FM-1 satellite.[2]

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[1] See FM-1 – Orbital Debris Assessment Report (ODAR) at 12, File No. 0284-EX-CN-2025 (filed on Mar. 21, 2025) ("FM-1 ODAR")

[2] FM-1 ODAR at 15

Further, AST relies on conflicting claims and unrealistic assumptions. For example:

- AST states on page 8 of its orbital debris mitigation plan that the area of the FM-1 phased array antenna is "approximately 223 m2," but states on page 6 of the application narrative that the antenna is "approximately 199 m2."[3] Such a difference in surface area could substantially affect AST's results for both collision risk and post-mission disposal timeline;

- AST assumes that if its satellite fails, the satellite will still maintain attitude control, which ignores the physical reality that a typical dead satellite cannot maintain its attitude, or that one with a gargantuan phased-array antenna like FM-1 is even more likely to tumble;

- AST fails to account for the worst-case area-to-mass ratio of the FM-1 satellite, particularly because its solar arrays will gimbal.

Additionally, AST underestimates the risk to the orbits in which it would operate, while overestimating its own capabilities. For instance, AST approximates that only "160 functioning satellites" operate near its proposed orbit.[4] In fact, over 3,000 space objects cross FM-1's proposed orbit, including nearly 600 satellites (of which 95 are Chinese satellites), 1,067 pieces of debris, 516 rocket bodies, and 849 other objects still-to-be-categorized by Space-Track.org.[5] At the same time, AST overestimates its own orbital determination capabilities, claiming to be able to provide propagated ephemeris accurate to 10-20 meters, 12 hours in advance. Such tight accuracy is difficult to achieve for any large satellite, especially during the upcoming unpredictable solar activity. But more to the point, AST has not demonstrated any ability to provide this quality of data using its existing operational satellite.

Strikingly, AST makes no effort to explain how it can mitigate the harm the "largest commercial phased array antenna in LEO" will cause for optical astronomy. At the very least, AST—and indeed all operators—should follow SpaceX's lead and complete coordination with the National Science Foundation on optical astronomy prior to launching its satellites. AST should also report publicly on whether it was able to develop any sort of brightness mitigations prior to launch.

SpaceX continues to urge the Commission to adopt bright-line, performance-based rules to promote and preserve space sustainability. But in the meantime, the Commission should ensure that all systems—including enormous experimental satellites like FM-1—operate according to common requirements. The Commission has adopted a series of conditions on SpaceX's Gen2 authorization to promote space sustainability, and the Bureau has applied these conditions to subsequent authorizations.[6] If the Commission receives a satisfactory and compliant orbital debris mitigation plan, it should apply those conditions to any experimental authorization of the FM-1

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[3] FM-1 ODAR at 8. FM-1 – Narrative at 6, File No. 0284-EX-CN-2025 (filed on Mar. 21, 2025).

[4] *See* FM-1 ODAR at 12.

[5] *See generally* Space-Track.org.

[6] *See, e.g., Space Exploration Holdings, LLC*, 37 FCC Rcd. 14882, ¶¶ 135z, 135aa, 135cc, 135ee-gg (2022); *ICEYE US, Inc.*, 38 FCC Rcd. 7887, ¶¶ 3-5 (SB 2023); *Hawkeye 360, Inc.*, 39 FCC Rcd. 2393, ¶¶ 3-6 (SB 2024); *Planet Labs PBC*, 39 FCC Rcd. 4700, ¶¶ 3-5 (SB 2024).

satellite to ensure that such grant would promote the public interest.

Sincerely,

/s/ Jameson Dempsey

Jameson Dempsey
Director of Satellite Policy

SPACE EXPLORATION TECHNOLOGIES CORP.
1155 F Street, NW
Suite 475
Washington, DC 20004
Tel: 202-649-2641
Email: jameson.dempsey@spacex.com