

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)

Mitigation of Orbital Debris in the)
New Space Age)

IB Docket No. 18-313

REPLY COMMENTS OF SPACE EXPLORATION TECHNOLOGIES CORP.

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SUMMARY

As one of the world's fastest growing providers of launch services and as a licensee of a non-geostationary orbit ("NGSO") satellite system, maintaining a clean orbital environment is fundamental for every aspect of SpaceX's business. To ensure the continued success of these services, SpaceX proposed in its initial comments that the government adopt strong, straightforward objectives to minimize space debris. Further, any rules imposed to accomplish these objectives should be applied evenly across the space industry. In contrast to complicated and prescriptive regulations that will quickly become outmoded and even counterproductive, properly designed overarching policies bring incentives for industry to leverage the ingenuity that sparked a revolution in commercial space to sustain the orbital environment into the future.

The government should pursue the following strong requirements:

1. Operators should not create new persistent debris.
2. Operators should limit their satellites' time on orbit following the end of their mission lifetime.
3. Systems operating in orbits near and above the International Space Station ("ISS") must perform to higher standards of capability that protect human life and important assets.

These interlocking policies will ensure a safer space environment into the future. But no policy—regardless of how strong—can be effective unless it is applied evenly both on a per-satellite basis and to all systems operating in the United States, regardless of which country granted a system's initial license.

First, while commenters did not agree on much in this proceeding, most recognized the importance of the government applying any new rules on a per-satellite basis. As demonstrated throughout the record, aggregate metrics harm consumers by effectively capping the service that operators can deliver, without a corresponding benefit in safety. As constellations grow to meet

the expanding demands of consumers, aggregate requirements will prevent operators from adding satellites to match customer needs. But while aggregate metrics will constrain operators licensed in the United States, they will not effectively promote the overall safety of space as incumbent operators and new entrants move to more lax overseas regulatory fora. Moreover, aggregate metrics will leave many satellites less safe than others, depending not on the proper safety characteristics of the mission but on who operates the spacecraft. Tellingly, the few commenters that supported aggregate metrics in the record also asked for loopholes like foreign exemptions that would keep their own systems—including thousands of satellites—from being subject to those requirements.

But the Commission already knows that aggregate deployment limits are not an effective way to encourage broadband deployment, which is why it does not impose them on 5G small cells or other broadband technologies. To the contrary, the Commission smartly adopts policies that actually encourage deployment of more extensive terrestrial network infrastructure to reach every corner of the country. Heavy-handed regulations imposed in the aggregate would discourage operators from investing in high-capacity evolving networks, ultimately leading to less service for consumers.

Finally, the Commission should help safeguard the broader space environment by applying its own strong orbital safety and debris rules equally to U.S.-licensed systems as well as foreign-licensed systems seeking U.S. market access. Rules applied selectively only to U.S. licensees will encourage satellite operators to forum shop among other countries, leading to satellite systems with the worst safety profile seeking licenses in countries with the loosest or least mature rules. At the same time, SpaceX understands the importance of comity underlying the Commission's existing rules allowing non-U.S.-licensed satellite systems to demonstrate that

their plans are subject to effective oversight by their foreign national licensing authority.¹ If the U.S. government continues this practice, it should extend only to countries with truly equivalent regulations and transparent processes. Too often, foreign operators use the Commission's open and transparent processes as a cudgel against U.S. competitors while hiding their own applications in a shroud of international secrecy. The Commission should make clear that transparency is an essential element of direct and effective oversight sufficient to satisfy the Commission's rules.

¹ See 47 C.F.R. § 25.114(d)(14)(v).

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Space Exploration Technologies Corp. (“SpaceX”) hereby replies to the Commission’s request for comment on its comprehensive reexamination of existing orbital debris mitigation rules.² As noted in its initial comments, SpaceX supports the Commission’s efforts to improve and clarify its licensing rules to reflect the revolution in commercial space that has taken place since the Commission last updated its rules fifteen years ago. The Commission is right to explore whether its rules for debris mitigation accurately reflect its legal authority, developments in technology, and changes the market.

INTRODUCTION

Since its inception, SpaceX has leveraged American innovation, technical savvy, and its integrated, iterative culture to provide the most advanced launch and spacecraft systems in history. Through these efforts, SpaceX’s Falcon family of launch vehicles has provided dependable and affordable rides to space for the National Aeronautics and Space Administration

² *Mitigation of Orbital Debris in the New Space Age*, Notice of Proposed Rulemaking and Order on Reconsideration, 33 FCC Rcd 11,352 (2018) (“NPRM” or the “Proposal”). Unless otherwise noted, all comments cited herein were filed in ET Docket No. 18-313 on April 8, 2019.

(“NASA”), the Department of Defense, and the world’s most sophisticated commercial satellite manufacturers and operators. SpaceX is now taking its nearly two decades of experience in cost-effectively deploying large, complex space systems for other operators to develop its own broadband non-geostationary orbit (“NGSO”) satellite constellation from the ground up. Maintaining a clean orbital environment is fundamental for each of these essential aspects of SpaceX’s business, which is why SpaceX is committed to spacecraft designs and operational practices that safeguard all operating spacecraft and preserve orbital resources for future exploration and development.

SpaceX supports the government’s broader effort to ensure a safe orbital environment, based on the foundation laid out last year in the President’s Space Policy Directive-3 (“SPD- 3”) National Space Traffic Management Policy.³ Within this larger context, the Commission is properly taking this opportunity to reconsider both its authority and how its licensing actions interact with efforts at other agencies.⁴ As with its initial comments, SpaceX takes no position here on the best approach for expert agencies to interact, though it continues to strongly support any efforts towards interagency coordination and the pooling of expertise across space operations for sensible and effective regulation and policies. This collaboration can ensure that the multiple agencies that oversee companies operating in space apply consistent and well-grounded principles across the U.S. government and establish which federal agency has the appropriate lead for a given activity, consistent with their statutory authority. This effort will aid space

³ *Space Policy Directive-3, National Space Traffic Management Policy*, Presidential Memorandum (June 18, 2018), <https://www.whitehouse.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/>.

⁴ SpaceX agrees with the Commission’s suggestion that it should closely review the statutory basis of its authority to regulate the release of orbital debris. NPRM at 11,358-59 ¶¶ 15-16. Robust regulatory safeguards are critical to ensure the continued safety of space. The Commission must ensure that any rules it adopts are based on clear statutory authority that is appropriately integrated within any broader federal regulatory regime.

innovation and yield a better regulatory framework by avoiding confusion, eliminating regulatory duplication and inefficiencies, streamlining processing and approvals, and averting discrepancies in requirements across agencies.

SpaceX is taking the opportunity here in the public docket created by the Commission to offer its views. As with its initial comments, these reply comments relate only to spacecraft regulated by the Commission and do not necessarily apply to spacecraft such as second stages of launch vehicles that are regulated by other agencies.

I. THE RECORD DEMONSTRATES WHY THE COMMISSION SHOULD SET HIGH-LEVEL REQUIREMENTS FOR INDUSTRY TO ACHIEVE.

While filled with well-meaning proposals and ideas, the record in this proceeding has nonetheless become a tangle of varied approaches, regulations, and technical requirements. This divergent record demonstrates why the surest path for the U.S. government towards safe space is to start with the adoption of clear, strong, and straightforward objectives. Unduly prescriptive or specific regulations will become antiquated and even counterproductive overnight, potentially forcing industry to build to regulations rather than innovating its way to a shared goal of a safer orbital environment. Instead, clear overarching policies can create incentives for industry to invest in new technologies and methods that mitigate debris and improve the orbital environment.

Specifically, the government should establish the following guiding policies:

1. Operators should not generate new persistent debris.
2. Operators should limit their satellites' time on orbit following the end of their mission lifetime.
3. Systems operating in orbits near and above the International Space Station must perform to higher standards of capability that protect human life and important assets.

By setting out these attainable and measurable objectives, the government will not only protect current orbital operations, but also provide the certainty that is needed for companies to invest and innovate toward large-scale objectives like making humanity a truly spacefaring species.

II. THE RECORD SHOWS THAT RULES MEASURED ON A PER-SATELLITE METRIC WILL BE MORE EFFECTIVE THAN ARBITRARY AGGREGATE METRICS.

Despite the various conflicting views in the record, commenters did reach consensus on some issues. Most notably, there is widespread agreement that if the government decides to adopt additional rules, it should impose those requirements on a per-satellite basis rather than applying aggregate requirements that would limit the services offered by a few operators with little or no positive impact on the orbital environment.⁵ The U.S. will not be able to meet its space leadership and innovation goals by using this type of piecemeal approach that regulates satellites differently depending on who is operating them. In contrast, rules applied evenly on a per-satellite basis can ensure all stakeholders participate in the effort to maintain a safe environment while still providing sufficient incentives for operators to invest in cutting-edge services to benefit consumers.

Unlike more evenly applied per-satellite requirements, aggregate requirements would not be an effective way to keep space safe. When the government chooses to apply regulations to only a portion of the market, inevitably some market players look for steps to avoid those regulations. In this instance, operators may be given an incentive to disguise the true size of their constellations by applying for separate licenses for smaller components of their system, solely for the purpose of evading the orbital debris rules, resulting in multiple systems that are

⁵ See, e.g., Comments of the Boeing Company at 10-11; Comments of LeoSat MA, Inc. at 3; Comments of the National Aeronautical and Space Administration at 3; Comments of Telesat Canada at 3.

harder to track and harder to find the true owner. Similarly, aggregate metrics will result in uneven rules allowing some satellites to be less safe than others, depending not on the proper safety characteristics of the mission but on who operates the spacecraft. For example, aside from the impossibility of using current technology to verify whether collision risk will be no greater than 0.001,⁶ an aggregate metric could impose widely-varying requirements on satellites that are otherwise operationally equivalent. Once again, the result would be less stringent regulations applying to some satellites than others, based only on how many satellites are covered by that operators' license—not on the actual safety profile of the spacecraft. This record strongly supports the straightforward conclusion that the best approach to a safe space environment is for the government to adopt strong rules and apply them on a per-satellite basis.

But aggregate metrics are not just ineffective—they can harm consumers by effectively capping the service that operators ultimately can deliver, without a corresponding benefit in safety. As constellations grow to meet the expanding demands of consumers, aggregate requirements will be increasingly difficult to verify or enforce—and virtually impossible to meet. As a practical matter, aggregate metrics will deter operators from adding satellites to their constellations to meet customer needs, effectively constraining operators from improving service for American consumers over time. And while an aggregate cap will constrain the number of satellites of any one operator licensed in the United States, it will not effectively promote the overall safety of space as incumbent operators and new entrants move to more lax overseas regulatory fora.

⁶ See NPRM at 11,361-62 ¶ 26. Note, however, that if the Commission does adopt a standard on a per-satellite basis, it should be more stringent than just 0.001.

But the Commission is already aware that aggregate deployment limits are not an effective way to encourage broadband deployment, which is why it does not impose them on 5G small cells or any other broadband technology. In fact, the record does not include a single example of the U.S. government actually imposing aggregate metrics on broadband deployment or explain how they could result in faster or safer deployment of broadband network infrastructure. To the contrary, in recent years the Commission has taken steps to encourage broadband operators to deploy more extensive terrestrial network infrastructure such as small cells to reach every corner of the country. Even beyond terrestrial broadband, the record does not include a single example of regulatory or industry bodies having ever embraced aggregate metrics as an effective way to enhance space safety. As the Commission knows, these types of heavy-handed regulations imposed in the aggregate would discourage operators from investing in high-capacity evolving networks, ultimately leading to less service for consumers.

Tellingly, the few commenters that supported aggregate metrics also argued their own systems should be exempted from those requirements.⁷ Even proponents of aggregate metrics contend that they should be laden with legal loopholes such as ignoring foreign-licensed systems, effectively overlooking thousands of satellites. If proponents of aggregate metrics truly believed aggregate regulations are the safest approach, they would agree to include their own constellations under the requirements. In contrast to this complex patchwork approach advocated by a few commenters, the record overwhelming shows that simple, strong rules applied on a per-satellite basis properly align incentives across all satellite operators.

⁷ See, e.g., Comments of WorldVu Satellites Limited at 15-18, 32-34.

III. THE RECORD SHOWS THAT APPLYING THE SAME RULES TO U.S.-LICENSED SYSTEMS AND FOREIGN SYSTEMS SEEKING U.S. MARKET ACCESS WILL MAKE SPACE SAFER AND DISCOURAGE FORUM SHOPPING.

The cross-border nature of space has brought many benefits to American consumers, but that characteristic also means that solutions to address the space environment cannot work if applied to U.S.-licensed commercial satellite operators alone. As many commenters recognized, orbital safety goals and corresponding rules will be undermined unless they apply to all systems⁸—or at least as many systems as possible, including satellites operated by federal entities. As an important step towards that end, the Commission should ensure that any updates to its space safety requirements apply to both U.S.-licensed systems as well as foreign-licensed systems approved for U.S. market access.

Operators of satellite systems have a responsibility to protect the orbital environment, even when this responsibility adds cost to operations. Applying rules to reflect this responsibility solely to U.S.-licensed systems would deter satellite operators from applying for licenses in the U.S. While SpaceX is proud to be licensed in the U.S., other systems may try to shirk their responsibility and avoid these costs by seeking a license in a country with less rigorous orbital debris requirements.

As the record shows, the U.S. can combat this tendency by applying its rules to any system wishing to provide service in the U.S.⁹ Because many operators will continue to seek access to consumers and other business opportunities in the U.S. market, applying rules equally both to U.S.-licensed systems and those seeking market access can ensure the effectiveness of the Commission's policies and avoid arbitrarily applying different regulatory burdens to

⁸ See, e.g., Comments of Keplerian Technologies Inc at 17; Comments of Telesat Canada at 12.

⁹ See NPRM at 11,381 ¶ 85.

competing systems serving the same U.S. market. The Commission should therefore apply mitigation rules and require orbital debris plans that comply with U.S. objectives for all systems seeking Commission approvals to provide services or operate facilities within the U.S.

Under the Commission's existing rules, non-U.S.-licensed satellite systems can satisfy the orbital debris mitigation requirements by demonstrating that their debris mitigation plans are subject to direct and effective regulatory oversight by their foreign national licensing authority.¹⁰ While SpaceX understands the importance of comity, if the U.S. government decides to exempt constellations with a foreign license, this exemption should extend only to countries with truly equivalent approaches to safe space. For example, if the U.S. were to adopt a calculated casualty rate of zero, it should exempt only those operators who are licensed from countries with the same casualty rate requirement. Similarly, comity should be extended only to countries that use equivalent processes that are as transparent as those in the U.S. Too often, foreign operators use the Commission's open and transparent processes as a cudgel against U.S. competitors while hiding their own applications in a shroud of international secrecy. The Commission should make clear that such transparency is a required element of direct and effective oversight sufficient to satisfy the Commission's rules.

¹⁰ See 47 C.F.R. § 25.114(d)(14)(v).

CONCLUSION

SpaceX supports the Commission's efforts to maintain a safe space environment for today and into the future. To accomplish this shared goal, the government should set overarching objectives. But if the government adopts additional rules, they should be applied equally to all operators on a per-satellite basis and to all operators providing service in the U.S. Together, government and industry can work as partners to protect space and maintain the U.S. position as the leader in commercial space.

Respectfully submitted,

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