

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of

Streamlining Licensing Procedures for Small
Satellites

IB Docket No. 18-86

REPLY COMMENTS OF IRIDIUM COMMUNICATIONS, INC.

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August 7, 2018

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INTRODUCTION AND SUMMARY

Iridium Communications, Inc. (“Iridium”) continues to support the Commission’s efforts to facilitate the deployment of commercial small satellites (“smallsats”) operating in non-geostationary satellite orbit. The record is clear, however, that the Commission must also minimize the risks associated with space debris, collisions, and interference from smallsat communications. After all, this proceeding, if successful, will expand dramatically the number of spacecraft circling the Earth, many of which will be minimally tested prior to entering orbit. The Commission must ensure that its new rules support a thriving and competitive U.S. satellite industry—not the rapid emergence of a new era of space junk.

As explained below, the Commission should adopt firm eligibility criteria that ensure only low-risk systems requiring minimal scrutiny benefit from its streamlined smallsat licensing procedure. If smallsat applicants that do not meet these criteria believe their systems nevertheless pose acceptable risks, they should press their case in an application for a standard Part 25 satellite license. Moreover, when authorizing smallsat uplinks in the L-band that operate independently of Big LEO systems, the Commission should focus, as the NPRM proposed, on frequencies that do not support incumbent time division duplex (“TDD”) operations.¹

In addition, the FCC should tailor the authorization of space-to-space relay operations in the Big LEO band to their intended purpose, by permitting them as an application of the mobile-satellite service (“MSS”) rather than by creating a new radio service allocation. And if it entertains Inmarsat’s proposal to permit similar operations between NGSO and GSO satellites in other parts of the L-band, the Commission should ensure that existing MSS services, including

¹ *Streamlining Licensing Procedures for Small Satellites*, Notice of Proposed Rulemaking, FCC 18-44 ¶ 69 (rel. Apr. 17, 2018) (“NPRM”).

Iridium's adjacent-band operations, remain protected. In all cases, regularly-licensed MSS services, both co-frequency and adjacent, should be protected from (and have no responsibility to protect) new smallsat operations authorized under the streamlined procedures.

I. THE RECORD SUPPORTS PRECISE ELIGIBILITY CRITERIA THAT ACCOUNT FOR RISKS TO OTHER SPACE-BASED OPERATORS.

In its comments, Iridium supported the Commission's proposal to streamline licensing for certain smallsat systems, but urged the Commission to limit its new procedure to systems that pose low risks to other space-based operators. Iridium also urged the Commission to implement a mechanism for halting further launches in the event of smallsat failures. As explained below, the record supports these common-sense proposals, and counsels against expanding eligibility beyond the criteria proposed in the NPRM.

A. The Commission Should Adhere to Strict Size, Trackability, Debris, and Collision Risk Requirements.

In the NPRM, the Commission proposed to limit streamlined processing to applicants seeking to license ten or fewer satellites with a maximum mass of 180 kg each.²

Numerous commenters supported size and mass limits at least as strict as those proposed in the NPRM. EchoStar urged the Commission "to limit the size of the small satellite constellations eligible for streamlined processing to 10 satellites per system," and "to require that the small satellites be limited to 180 kg in size," explaining that these requirements would "ensure that the small satellite constellations eligible for streamlined processing are least likely to interfere with other Part 25 licensed satellite systems."³ SpaceX likewise "agree[d] that" a

² NPRM ¶ 32.

³ Comments of EchoStar at 3-4, IB Docket No. 18-86 (filed July 9, 2018) ("EchoStar Comments").

ten-satellite limit “would be an appropriate way to identify a group of applicants whose operations are limited enough in scope that it would not serve the public interest to apply certain of the more complex standard Part 25 procedures.”⁴ ORBCOMM suggested an even lower mass limit, though it did not object to “the proposed limit of ten satellites” so long as the Commission ensures that applicants do not evade the limit by filing multiple applications.⁵ Even CSSMA, which represents the commercial smallsat industry, agreed that “ten satellites is sufficient” to ensure commercial viability.⁶

The record also supports the Commission’s proposal to ensure that eligible smallsats are trackable, produce no operational debris, and pose a very low risk of collision in orbit and at end of life.⁷ SpaceX supported “limit[ing] streamlined processing to smallsats that are at least 10 cm x 10 cm x 10 cm and include a unique telemetry marker.”⁸ So did EchoStar, which explained that “[w]hen a satellite is trackable, proper action can be taken by satellite operators in the event that a conjunction warning involving an active satellite is received requirement that eligible smallsats.”⁹ Boeing also “agree[d] that each Small Commercial Satellite should be capable of being tracked,”¹⁰ and the Open Research Institute likewise explained that “no object should be licensed for launch if its radar-reflective profile in any orientation is close . . . to the minimum

⁴ Comments of SpaceX at 7, IB Docket No. 18-86 (filed July 9, 2018) (“SpaceX Comments”).

⁵ Comments of ORBCOMM at ii, IB Docket No. 18-86 (filed July 9, 2018) (“ORBCOMM Comments”); *see also* SpaceX Comments at 7 (proposing a rule against multiple pending applications).

⁶ Comments of the Commercial Smallsat Spectrum Management Association at 6-7, IB Docket No. 18-86 (filed July 9, 2018) (“CSMMA Comments”).

⁷ *See* NPRM ¶¶35-37.

⁸ SpaceX Comments at 6.

⁹ EchoStar Comments at 5.

¹⁰ Comments of Boeing at 13, IB Docket No. 18-86 (filed July 9, 2018) (“Boeing Comments”).

tracking capability of NORAD, the U.S., or Canada.”¹¹ As EchoStar added, eligible smallsats also should “be designed to minimize the risk of collision throughout the satellite’s lifetime and at the end-of life,” and to “release no operational debris,” because the “burdens” of these requirements would be “more than outweighed by the greater certainty to the Commission and other satellite operators that the risk of collision posed by . . . small satellites has been adequately addressed and minimized.”¹² Again, even commercial smallsat interests agreed that a 10cm-cube minimum size “would not overly restrict the number of applicants eligible for the Streamlined Process,”¹³ and that the proposed operational debris and risk-of-collision limits are “important requirements for all satellite operators[.]”¹⁴

A few commenters favored more expansive criteria,¹⁵ routine exceptions in the name of “flexibility,”¹⁶ or even the elimination of specific eligibility requirements altogether.¹⁷ The Commission should reject these proposals. As an initial matter, none of these commenters balanced risk against reward under the assumption that smallsats will launch in extremely large numbers, as the Commission expects. Moreover, if the Commission transforms firm criteria into

¹¹ Comments of Open Research Institute at 9, IB Docket No. 18-86 (filed July 9, 2018) (“ORI Comments”); *see also* ORBCOMM Comments at 11 (supporting adoption of a tracking requirement).

¹² *See* EchoStar Comments at 4-5; *see also* Boeing Comments at 12 (agreeing that “the streamlined process . . . should only be available” for systems that “release no debris during their operations,” limit “risk of explosions,” and adhere to a “risk of collision” requirement conforming to NASA guidance).

¹³ CSSMA Comments at 18.

¹⁴ *Id.* at 17.

¹⁵ *See* Boeing Comments at 9 (proposing a 30-satellite system size limit); Comments of Moon Express at 2, IB Docket No. 18-86 (filed July 9, 2018) (suggesting a “relax[ed]” satellite mass limit); Comments of Commercial Spaceflight Federation at 5, IB Docket No. 18-86 (filed July 9, 2018) (“CSF Comments”) (opposing a zero-casualty risk standard).

¹⁶ CSSMA Comments at 4, 13, 15.

¹⁷ *See generally* Comments of Analytical Space, Inc., IB Docket No. 18-86 (filed July 9, 2018) (“ASI Comments”); *see also* CSF Comments at 5.

loose, aspirational guidelines, applicants would be forced to litigate the merits of every aspect of system design before the FCC, undermining the efficiencies of a streamlined procedure. Finally, the Commission should recognize that streamlined licensing for large numbers of smallsats that will share orbital and spectrum resources with satellite systems that are subject to more rigorous application processing is an extraordinary industry accommodation. Any streamlined process should err on the side of ensuring a safe operating environment in space. Indeed, applications that raise serious concerns about the risks to space-based systems can always be processed through the standard Part 25 licensing procedure—and should be to ensure the public interest is served.

B. The Commission Should Ensure Adequate Maneuverability—or Limit Streamlined Applications to Systems Below the ISS.

As the Commission recognized, smallsats deployed at higher orbital altitudes pose greater risks to other space objects, including the ISS. For that reason, and because smallsat propulsion systems are relatively new and untested, Iridium proposed that the Commission either require “a more significant showing concerning the adequacy of maneuverability and deorbit systems” for smallsats higher than 400 km, or “process applications to launch smallsats above 400 km under the standard Part 25 licensing procedure.”¹⁸

Other commenters shared Iridium’s concerns, and offered similar proposals. ORBCOMM agreed that the “400 km altitude cap for the contemplated new category of small satellite systems seems reasonable,” and urged the Commission to require “sufficient maneuvering capabilities” should it permit operations above 400 km on streamlined basis.¹⁹

¹⁸ Comments of Iridium at 5-6, IB Docket No. 18-86 (filed July 9, 2018) (“Iridium Comments”).

¹⁹ ORBCOMM Comments at 12.

SpaceX likewise suggested that the Commission “[l]imit[] access to streamlined license processing to those smallsats that are launched at or below the altitude of the ISS (or any other manned spacecraft),” explaining that the requirement would “go a long way toward safeguarding such platforms and NGSO satellite systems that operate at higher altitudes.”²⁰ SpaceX also proposed that the Commission require “sufficient propulsion capabilities to perform collision avoidance maneuvers – regardless of . . . deployment altitude.”²¹

Similarly, EchoStar proposed requiring streamlined applicants to “provide relevant information to the Commission”²² about all aspects of debris and collision avoidance, thus sharing Iridium’s concern that mere certifications may prove insufficient on these important issues. Indeed, as Phase Four explained, “[s]everal subsystems need to work in concert to execute collision avoidance and de-orbit maneuvers,” and considerable testing remains before the industry can even “identify certification guidelines.”²³ The responsible way to address these uncertainties is not to defer the imposition of a propulsion requirement, as Phase Four suggests, but rather to require streamlined licensees to demonstrate that their propulsion systems are adequate until technologies are more fully developed.

Here, too, a few commenters suggested looser orbital altitude and maneuverability requirements, citing “precedent” from one NASA-approved mission, and expressing fear that a propulsion requirement will “push [smallsat operators] to apply in other countries[.]”²⁴ But the possibility that *some* smallsats will deploy successful maneuverability techniques that do not rely

²⁰ SpaceX Comments at 9.

²¹ *Id.* at 10.

²² EchoStar Comments at 4.

²³ Comments of Phase Four, Inc. at 3, IB Docket No. 18-86 (filed July 9, 2018).

²⁴ CSF Comments at 6; Boeing Comments at 11-12; ASI Comments.

on propulsion does not imply that *all* of them will. To the contrary, the Commission must anticipate that a diversity of operators employing a diversity of technologies will take advantage of streamlined procedures—and that some will be more viable than others. Moreover, the Commission should establish itself as the global leader on smallsat policy, and not as a rote participant in a global race to the bottom. Accordingly, the Commission should pursue eligibility criteria that serve the public interest, even if other administrations take a different approach.

C. License Terms and In-Orbit Failures

In its comments, Iridium supported the Commission’s proposal to adopt a five-year license term, but urged the Commission to adopt rules allowing it to terminate authorizations in the event of in-orbit smallsat failures.²⁵

The record supports Iridium’s proposal. As the commercial smallsat industry acknowledges, “small satellite operators are often subject to launch failures (including launch failures that cause on-orbit anomalies).”²⁶ Boeing recognized the risk of “unforeseen . . . on-orbit . . . failures” by smallsats,²⁷ and the Open Research Institute likewise explained that smallsats “can, and should, be expected to be used until failure renders them uncontrollable.”²⁸

The policy response to these risks of failure should not be to create a license “extension process,”²⁹ or to permit operators whose equipment failed to launch additional units of the same equipment. Instead, the Commission should ensure that the streamlined procedure, when combined with the near certainty of smallsat failures, does not result in a mushrooming

²⁵ Iridium Comments at 6-7.

²⁶ CSSMA Comments at 13; *see also* CSF Comments at 4.

²⁷ Boeing Comments at 2.

²⁸ ORI Comments at 10.

²⁹ *See* CSF Comments at 4.

accumulation of unmanageable space debris. As Iridium explained, the Commission must plan for the success of this proceeding, which could result in the rapid proliferation of smallsat missions—some successful, others not so much. And the “legacy” of the Commission’s space policy should be a vibrant ecosystem of satellites of all kinds—not a “21st Century[] Age of Space Junk.”³⁰

II. THE COMMISSION SHOULD NOT PERMIT SMALLSAT UPLINKS IN THE 1616-1626.5 MHZ BAND.

In its comments, CSSMA briefly suggests that the Commission go beyond the NPRM and consider “the overall MSS band between 1613.8 and 1626.5 MHz . . . for small satellite” earth-to-space communications.³¹

The Commission should decline to consider CSSMA’s out-of-scope proposal. As observed in the NPRM, Iridium uses the 1616-1626.5 MHz band for service links, and employs TDD technology to serve user terminals in both the uplink and downlink directions in this spectrum.³² Moreover, as the Commission previously has recognized, Iridium’s use of TDD technology makes it difficult to share meaningful amounts of its service-link spectrum with other satellite systems.³³ CSSMA does not even address this issue. To the contrary, the technical analysis provided merely explores the possibility that smallsats using *CDMA* technology may coexist with Globalstar’s *CDMA* system. Accordingly, if the Commission does not dismiss

³⁰ “Space junk threatens our economic and national security. We need rules to head off chaos,” Matt Desch, USA TODAY (May 14, 2018 5:53AM), <https://www.usatoday.com/story/opinion/2018/05/14/space-junk-satellites-security-threat-trump-address-column/606030002/>.

³¹ CSSMA Comments at 48.

³² NPRM ¶ 68.

³³ *See Amendment of the Commission’s Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands*, Report and Order, 9 FCC Rcd. 5936 (1994); *Spectrum & Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands*, 22 FCC Rcd. 19,733, 19,741 ¶ 17 (2007).

CSSMA's proposal as beyond the scope of the NPRM, it should reject the proposal because it lacks record support.

III. SMALLSAT SPACE-TO-SPACE LINKS SHOULD BE AUTHORIZED AS AN APPLICATION OF THE MSS AND SHOULD NOT INTERFERE WITH EXISTING MSS SERVICES.

The Commission also proposes to provide for the authorization of smallsat space-to-space operations in most of the Big LEO band.³⁴ Iridium supports this proposal, so long as it does not put existing MSS services at risk.

As the Commission recognizes, space-to-space operations in the Big LEO band can “encourag[e] relay operations using Iridium, Globalstar, or other systems” and thus “alleviate some of the difficulties faced by small satellite operators[.]”³⁵ To provide for the authorization of these relay operations, however, which also should be made available for launch vehicles, the Commission should tailor its rules to the NPRM's objective. Thus, the Commission should not add an entirely new intersatellite radio service allocation. Doing so could encourage uses of the Big LEO bands that exceed the relay operations that the Commission proposes to facilitate. The Commission has not even sought comment in the NPRM on the suitability of the identified bands for these other uses.

Instead, the Commission should provide for the authorization of relay operations through a footnote to the U.S. Table. The footnote would designate certain bands for space-to-space relay communications as an application of the MSS.³⁶

³⁴ NPRM ¶ 72.

³⁵ *Id.*

³⁶ *See id.* ¶ 73.

The record supports the tailored approach supported by Iridium. Inmarsat “believes that the approach of adding a parenthetical ‘space-to-space’ to the existing MSS allocations is appropriate to provide the required status for inter-satellite operation.”³⁷ Globalstar likewise supports “adding a ‘space-to-space’ directional indicator to the MSS spectrum allocations at 1613.8- 1626.5 MHz and 2483.5-2500 MHz,” and otherwise clarifying that smallsat “‘space-to-space’ operations . . . constitute an ‘application’ of the mobile satellite service” in this spectrum.³⁸ The smallsat industry also identified “a footnote” as “the best way forward to authorize communications for small satellites (and large ones)” in the L-band.³⁹

Iridium emphasizes, however, that the Commission should ensure that licensed Big LEO constellations, including those that operate in spectrum adjacent to any space-to-space relay operations, remain protected. As Iridium explained, existing technical rules that protect MSS space stations against out-of-band-emissions (“OOBE”) from earth stations may be insufficient with respect to OOBE from smallsats in low-Earth orbit, which would be located significantly closer to Iridium and Globalstar satellites. New technical rules, including revised OOBE limits or separation requirements between smallsats and Big LEO satellites, may be required.

Inmarsat proposes that the Commission permit space-to-space relay operations between GSO and NGSO satellites using L-band frequencies licensed to Inmarsat.⁴⁰ Iridium does not object to Inmarsat’s proposal in principle—so long as Iridium’s adjacent-band services are protected. Again, existing rules were not designed to account for space-to-space

³⁷ Comments of Inmarsat at 3, IB Docket No. 18-86 (filed July 9, 2018) (“Inmarsat Comments”).

³⁸ Comments of Globalstar at 7, IB Docket No. 18-86 (filed July 9, 2018).

³⁹ CSSMA Comments at 53.

⁴⁰ Inmarsat Comments at 2-4.

communications. The Commission should not expand permitted uses of L-band spectrum until it develops technical rules that ensure new operations will not interfere with existing systems.

IV. SMALLSATS ELIGIBLE FOR STREAMLINED PROCESSING SHOULD BE AUTHORIZED ON A NON-INTERFERENCE, UNPROTECTED BASIS.

The Commission sought comment on whether it should provide for the streamlined authorization of smallsats in frequencies allocated to the MSS on a “non-interference, unprotected basis, or whether the operations may have status in the frequency band, provided that the satellites operate consistent with any limitations on the MSS allocations and have demonstrated compliance with the small satellite process in section 25.122.”⁴¹

Iridium believes that all smallsat operations authorized in the MSS bands pursuant to the streamlined procedure should be licensed on a non-interference, unprotected basis, at least with respect to other Part 25 licensees. Smallsat operators that believe their systems need status in an MSS band should be required to apply through the standard Part 25 application procedure. As several commenters observed, secondary operations would provide an important safeguard to standard Part 25 licensees, and would help ensure that the certifications required from streamlined applicants hold true in the real world.⁴² Moreover, as the FCC acknowledged in the NPRM, the streamlined application procedure would be inappropriate for systems that require anything close to “full-time uninterrupted availability of assigned spectrum” in any event.⁴³

In addition, the Commission should be mindful that its proposal could result in uses that do not conform to the Radio Regulations and other requirements and recommendations of the

⁴¹ NPRM ¶ 62.

⁴² See EchoStar Comments at 2, 5-6; Boeing Comments at ii, 5.

⁴³ See NPRM ¶ 45; SpaceX Comments at 11.

International Telecommunication Union (“ITU”). This is especially the case given the ITU’s ongoing examination of smallsat-related issues, which could result in future action by the World Radiocommunication Conference on revisions to the International Table of Allocations, service definitions, and technical and operational restrictions.

CONCLUSION

The record in this proceeding supports a balanced path forward that eliminates barriers to entry for the smallsat industry while preserving a safe operating environment in space. Thus, the Commission should decline proposals to expand the eligibility criteria for streamlined licensing, and should retain the right to terminate streamlined authorizations in the event of smallsat in-orbit failures. In addition, the Commission should reject unsupported calls to allow smallsat uplinks in the 1616-1626.5 MHz band, and should provide for the authorization of smallsat space-to-space operations through a footnote to the U.S. Table of Allocations, while protecting co-frequency and adjacent-band MSS services. All smallsat operations in MSS bands licensed through the streamlined procedure should be required to operate on an unprotected, non-interference basis.

Respectfully submitted,



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