

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

In the Matter of)	
)	
Streamlining Licensing Procedures for Small)	IB Docket No. 18-86
Satellites)	

**REPLY COMMENTS OF
THE COMMERCIAL SMALLSAT SPECTRUM MANAGEMENT ASSOCIATION**

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I. INTRODUCTION

The Commercial Smallsat Spectrum Management Association (“CSSMA”) is incredibly excited by the overwhelming support expressed by a diverse set of constituents for small satellites and the innovation they promise. It is clear from the vast majority of comments that the public supports not just small satellites in general but also a streamlined process under Part 25 for small satellites (the “Streamlined Process”) that is more broadly applicable and contains fewer restrictive requirements than currently proposed in the *Smallsat NPRM* in the above-captioned docket.¹ It is impressive to note not just the number of commentators but also the number of trade associations, which represent the views of dozens of companies have responded favorably to this proceeding. For instance, Commercial Spaceflight Federation (“CSF”) has over sixty members.²

¹ See generally *Streamlining Licensing Procedures for Small Satellites*, IB Docket No. 18-86, Notice of Proposed Rulemaking, FCC 18-44 (rel. Apr. 17, 2018) (“*Smallsat NPRM*”).

² See *Members*, Commercial Spaceflight Federation, <http://www.commercialspaceflight.org/members/> (last viewed Aug. 5, 2018).

Below CSSMA provides its Reply Comments to a number of comments made in response to the *Smallsat NPRM* and also summarizes areas where the public support of a position is clear.

II. STREAMLINED PROCESS FOR SMALL SATELLITES

A. Characteristics of a Satellite or System Qualifying for Streamlined Process

1. Number of Spacecraft

It is clear from comments that the broad weight of public opinion is that the Streamlined Process should allow for at least ten satellites, or possibly more, per license.³ As CSSMA stated in its own Comments, it believes a limit of ten satellites per license would support the purposes of the Streamlined Process.⁴

In addition, the majority of commentators agree with CSSMA that it is not necessary to adopt limits on the number of applications that may be filed.⁵ Virtually the only outlier to the

³ See Comments of EchoStar Satellite Operating Corporation and Hughes Network Systems, LLC, IB Docket No. 18-86, at 3 (filed July 9, 2018) (supporting the Commission's proposal to limit the size to 10) ("EchoStar/Hughes Comments"); Comments of ORBCOMM, Inc., IB Docket No. 18-86, at 4 (filed July 9, 2018) (stating 10 could be a suitable limit) ("ORBCOMM Comments"); Comments of University Small-Satellite Researchers, IB Docket No. 18-86, at 8-9 (filed July 9, 2018) (supporting a limit of 10) ("University of Small-Satellite Researchers Comments"); Comments of Space Exploration Technologies Corp., IB Docket No. 18-86, at 7 (filed July 9, 2018) (stating that a limit of 10 would be appropriate) ("SpaceX Comments"); Comments of Iridium Communications, Inc., IB Docket No. 18-86, at 2 (filed July 9, 2018) (supporting a limit of 10) ("Iridium Comments"); Comments of The Boeing Company, IB Docket No. 18-86, at 9 (filed July 9, 2018) (suggesting an upper limit of 30) ("Boeing Comments"); Comments of HybridX LLC, IB Docket No. 18-86, at 2 (filed July 1, 2018) (suggesting there should be no limit) ("HybridX Comments"); Comments of Analytical Space, Inc., IB Docket No. 18-86, at 7 (filed July 9, 2018) (proposing no limit) ("ASI Comments").

⁴ See Comments of CSSMA, IB Docket No. 18-86, at 7 (filed July 9, 2018) ("CSSMA Comments").

⁵ See HybridX Comments at 2 (suggesting there should be no limit); ASI Comments at 7 (proposing no limit); Comments of Commercial Spaceflight Federation, IB Docket No. 18-86, at 3 (filed July 9, 2018) (seeing no reason that is in the public interest for limiting the number of applications per organization) ("CSF Comments"); Boeing Comments at 9 (supporting 30 satellites which would be at least 3 x 10 satellite licenses); University Small-Satellite Researchers Comments at 8 (noting a ten-satellite limit should be by orbital plane).

consensus position is ORBCOMM, so CSSMA responds more fully to the ORBCOMM comments.⁶ ORBCOMM believes that “if any new policies do not address aggregation of ‘small satellite system’ licenses which could allow applicants to unfairly game the process and create larger satellite constellations, then the presumed minimization of risk that justifies streamlined treatment would be unwarranted.”⁷ Via footnote, ORBCOMM offers math that would suggest that fifteen planes of ten satellites could obtain Streamlined Process treatment without financial penalty vis-a-vis a non-streamlined conventional application.⁸ CSSMA finds ORBCOMM’s math to be flawed as it does not account for license term. A Part 25 license has a 15-year license term; whereas, the Commission suggests a 5-year license term for the Streamlined Process. Therefore, to keep service commensurate with a Part 25 license term, a Streamlined Process applicant would need to file three times the number of applications, meaning that an applicant would only be able to obtain five planes of ten satellites at a fee of \$30,000 per license. ORBCOMM also ignores the fact that each license has preparation and coordination costs, which usually run even higher than the actual application fee. Applying for five licenses under the Streamlined Process and coordinating those five licenses would have appreciable transaction costs and would not accord the applicant the same level of certainty as a Part 25 license covering fifty satellites. Given that, an applicant will reach a “financial penalty” by using the Streamlined Process far quicker than fifty satellites.

CSSMA continues to agree with the vast majority of commentators that there is no benefit to, and the public interest is not served by, capping number of licenses under the

⁶ See ORBCOMM Comments at 4. SpaceX takes a slightly different approach and would seem to allow for multiple licenses as long as a previous system has been constructed and launched. See SpaceX Comments at 7 (recommending that the Commission apply Section 25.159(b) to small satellite applicants).

⁷ See ORBCOMM Comments at 4.

⁸ See ORBCOMM Comments at 4-5 n.6.

Streamlined Process. The financial costs of the Streamlined Process and the lower level of spectrum rights accorded will continue to ensure that it is not used in place of a full Part 25 license application.

2. Planned On-Orbit Lifetime

CSSMA agrees with commentators that on-orbit lifetimes longer than the Commission's proposal of five years are warranted.⁹ CSSMA reiterates that orbital lifetime limits restrict launch opportunities and an overly conservative limit may make the Streamlined Process commercially impracticable. CSSMA proposes a limit that leaves sufficient commercially practicable launches available to applicants, and it should apply on a satellite-by-satellite basis, and not to all satellites under a given license, to allow for launch delays, launch spacing, and technology iteration all on one license.

CSSMA reiterates that a satellite that cannot meet the orbital lifetime requirement adopted by the Commission could still qualify for the Streamlined Process if it demonstrates a "capability to de-orbit" during the required period. This capability could include both active (*e.g.*, propulsion) or passive deorbit devices.

Some commentators support the five-year orbital lifetime requirement based on concerns about orbital debris.¹⁰ Like many other commentators,¹¹ CSSMA believes that orbital debris

⁹ See CSF Comments at 4 (supporting a 5-year operational lifetime and up to five years of disposal); HybridX Comments at 2 (stating the business models being considered by space entrepreneurs extend well beyond the proposed 5-year license term).

¹⁰ See ORBCOMM Comments at 5 (stating that the requirement helps minimize the risk of orbital collisions).

¹¹ See ASI Comments at 10-11 (stating if there is to be a change in the standards that should be handled in a separate orbital debris rulemaking and be applicable to all satellites); CSF Comments at 6 (recommending small satellites retain the same orbital debris standards as other satellites and that if those standards need to be updated that they be handled in as separate rulemaking applicable to all satellites); Iridium Comments at 7 (proposing the Commission should clarify that criteria could change based on future orbital debris proceedings).

issues should be dealt with in a larger proceeding applicable to all satellites. In any event, orbital lifetime limitations are an extremely poor method of mitigating debris risk, which as CSSMA explains below, is driven by a number of factors.

3. License Term

Several commentators agreed with CSSMA that a license term of five years is far too short especially if it encompasses disposal periods.¹² CSSMA believes it would be hard for the Commission to set a license term that applied well in all situations. CSSMA sees little public interest being served by a fixed license period that would then require amendments, re-filings, and extensions for launch delays or other unexpected events. Instead, the Commission should merely require that all satellites be launched within two years of commencement of operations in orbit of the first satellite under the license. The public interest in minimizing orbital debris can be achieved through the separate orbital lifetime requirement.

4. License Extension and Replacement Satellites

CSSMA agrees that replacement satellites are not warranted in this situation. The prohibition on replacement satellites is a key incentive to transition to a full Part 25 operator license and a key reason why the Commission can demonstrate more flexibility on numbers of satellites and license term.

The Commission should retain flexibility to provide for license extensions especially if it adopts a more limiting rule with respect to license term. Any broadly applicable and short license term (*e.g.*, 5 years) will cause a number of applicants to require license extensions (for

¹² See CSF Comments at 4; HybridX Comments at 2.

launch delays or other reasons that either benefit the public interest or are outside of the applicant's control).

5. Applicability to Other Types of Missions

Of the few commentators who commented on the Commission's inquiry as to whether the Streamlined Process should apply to missions beyond Earth's orbit, there appears to be consensus that the answer is yes and that suitable changes would need to be made for disposal options, license terms, mass, and naming conventions.¹³

6. Maximum Spacecraft Size

CSSMA notes a broad consensus on a 180 kg satellite limit, with certain exceptions for non-Earth orbiting missions,¹⁴ for the Streamlined Process.¹⁵ Some commentators mentioned that size itself is not a meaningful criteria and that instead orbital debris, re-entry hazard, and/or spectrum needs should be directly addressed.¹⁶ CSSMA agrees that size may not be a meaningful requirement, and these other concerns mentioned are addressed by separate

¹³ See Comments of Moon Express, IB Docket No. 18-86, at 2 (filed July 9, 2018) (noting that different standards would be needed for license terms and disposal and relaxation of mass requirement) ("Moon Express Comments"); Comments of Robert Ehresman Jr., IB Docket No. 18-86, at 1 (filed May 14, 2018) (recommending that solar orbit or lunar impact options be considered for disposal).

¹⁴ See Moon Express Comments at 2 (stating the Commission may want to consider relaxing the proposed mass requirement or only including dry mass); CSSMA Comments at 14.

¹⁵ See EchoStar/Hughes Comments at 4 (stating the Commission should adopt its proposal to require that small satellites be limited to 180 kg in size); University Small-Satellite Researchers Comments at 8-9 (agreeing with the Commission's assessment that following NASA's demarcation should be enough); Iridium Comments at 2 (supporting the 180 kg limit).

¹⁶ See CSF Comments at 5 (stating size is likely not the right metric); ORBCOMM Comments at 6-7 (stating the Commission should consider establishing a streamlined processing qualification envelope based more concretely on spectrum and orbit utilization); Boeing Comments at 11 (stating no size limit should be imposed and concerns, such as re-entry hazard, should be addressed in other provisions); ASI Comments at 12 (stating other requirements make the mass requirement extraneous).

requirements of the Streamlined Process. If the Commission sees no other concerns that are addressed by mass, it should drop this requirement as it is superfluous.

7. Deployment Orbit and Maneuverability

With the exception of SpaceX and Iridium, CSSMA sees almost unanimous agreement among commentators that propulsion, whether above, at, or below the International Space Station (“ISS”) orbit, should not be a requirement for the Streamlined Process.¹⁷ Most commentators propose a more general and flexible standard, such as “a demonstration of maneuverability,”¹⁸ a “mobility requirement,”¹⁹ or, as CSSMA has proposed, “a method of collision avoidance that is sufficiently reliable to meet any then existing requirements of the ISS program with respect to small satellites that cross the ISS orbit.”²⁰ As CSSMA has stated before, it is important to keep regulations, which take a long time to change, flexible enough to accommodate developing technologies and also developing concerns of the ISS program.

CSSMA addresses the two parties that believe propulsion should be required in more depth. First, Iridium states that in the orbits above 400 km propulsion should be required because there is an increased risk of collision in these “more congested” portions of low-Earth

¹⁷ See HybridX Comments at 1 (supporting Spire’s statement that “propulsion-less satellites could be licensed under the new licensing process and deployed above 400 km...if they meet [NASA’s] standards...”); CSF Comments at 6 (stating that the propulsion requirement seems contrary to existing ISS and NASA approvals of missions); University Small Satellite Researchers Comments at ii (recommending elimination of the propulsion requirement entirely); Boeing Comments at 11 (stating the Commission should require a demonstration of maneuverability but should not require propulsion); Comments of Phase Four, IB Docket No. 18-86, at 2 (filed July 9, 2018) (stating that a broader “mobility requirement” should be applicable) (“Phase Four Comments”); ORBCOMM Comments at 12 (proposing that an operator be able to act on conjunction warnings, by propulsion, or some other means).

¹⁸ See Boeing Comments at 11.

¹⁹ See Phase Four Comments at 2.

²⁰ See CSSMA Comments at 16.

orbit.²¹ Similarly, SpaceX evokes the provocative image of a future involving a “steady rain” of uncontrolled de-orbiting small satellites.²² It is clearly true that the higher one goes up in altitude the more congested the orbits are; it takes longer and longer for the objects in higher orbits to be “cleansed” by atmospheric drag. But, equating this fact of physics with more risk misses the entire point. The question should be about “risk” of a debris event, which is driven not just by spatial density of an orbit, but also by all the factors that go into probability of collision and all the factors that go into consequence of that collision. These factors include areal cross section, spatial density, relative velocity, mass, satellite component makeup, whether highly volatile propellant is onboard, etc. Distilling risk down to one factor (altitude) and solving it with one mandated solution (propulsion) is not scientifically sound and would make for extremely bad policy. After all, one of the biggest debris events in history involved an active and propulsive satellite. Propulsion is not a panacea.

Iridium further argues that deorbiting from higher altitudes may exceed the five-year term proposed by the Commission.²³ While CSSMA strongly disagrees with a five-year orbital lifetime requirement, it does think that even a five-year orbital lifetime requirement would allow many types of small satellites to go above 400 km and still meet the orbital lifetime requirement with passive or other means, so the orbital lifetime requirement in and of itself does not mandate propulsion.

Instead of looking at altitude or numbers in isolation, CSSMA instead suggests that the Commission consider all of the above factors that go into orbital debris risk in determining what is required for a deployment above 400 km. If such an inquiry would be too burdensome on an

²¹ See Iridium Comments at 5.

²² See SpaceX Comments at 10.

²³ See Iridium Comments at 5.

application-by-application basis, then the Commission should conduct a Further Notice of Proposed Rulemaking prior to final regulations being promulgated for the Streamlined Process and establish categories of requirements based on categories of risk. For instance, requirements for a 150 kg satellite with a 3.5 m² cross section might very well be different than a 3U cubesat with a 0.09 m² cross section. These satellites have quite different orbital debris profiles.²⁴ CSSMA looks forward to working with the Commission on crafting requirements based in scientific fact and making the Streamlined Process commercially practicable for small satellite companies.

As CSF, Phase Four, and CSSMA have warned, limiting the Streamlined Process to commercially impracticable orbits or imposing a requirement that cannot easily be met today with commercially available and flight tested/certified hardware would simply cause companies to go to other countries that do not have such a requirement.²⁵ This potential movement would be antithetical to the public interest.

CSSMA reiterates that it would be surprised if the requirement for propulsion is coming from NASA due to concerns with the ISS as NASA itself has both approved and sponsored missions above the ISS without propulsion. CSSMA believes the Commission should verify with NASA what actual concerns of the ISS program need to be addressed and work with satellite operators to find innovative and practicable solutions.

²⁴ See, e.g., Jonathan Rosenblatt et al., *Examination of Constellation Deployments Relative to Debris Mitigation in Low Earth Orbit*, IAC-17-A6,10-B4.10,3,x36041 (2017).

²⁵ See CSF Comments at 6 (stating the propulsion requirement will push applicants to apply in other countries); CSSMA Comments at 10 (noting that if the Commission does not allow any satellites to go above the ISS, the likelihood of such process being used at all is extensively diminished).

Finally, CSSMA strongly disagrees with Iridium’s proposal that the Commission build terms into its licenses a provision unique to small satellites allowing for termination of the license in the event of satellite failures.²⁶ According to Iridium, small satellite operators are utilizing technology that has undergone only minimal testing, which can therefore pose a risk to other spacecrafts.²⁷ While satellite failures can be dangerous to other spacecrafts and should be avoided where possible, no new technology is altogether without risk, even with extensive tests. Building in a provision to the streamlined license that would terminate the license should a satellite fail will only serve to raise costs and increase the difficulty of entering the market, which is exactly contrary to the goal of this rulemaking. Additionally, the risk of failure is not particular to small satellites as was seen with the failure of the geostationary satellites AMOS-5 in 2015²⁸ and AMC-9 in 2017²⁹ or the failure of several ORBCOMM OG2 satellites.³⁰ There should not be a double-standard for failure between small satellites and larger satellites as Iridium proposes.

8. Operational Debris and Collision Risk

CSSMA also sees broad support for the Commission’s proposal that the Streamlined Process be limited to those satellites that can certify (i) that they will release no operational debris during their mission lifetime, (ii) for which the satellite operator has assessed and limited

²⁶ See Iridium Comments at 5.

²⁷ See *id.*

²⁸ See *AMOS-5 suffers sudden onboard Failure, likely complete Loss*, Spaceflight101 (Nov. 25, 2015), <https://spaceflight101.com/amos-5-suffers-sudden-onboard-failure-likely-complete-loss/>.

²⁹ See Eric Berger, *A Large Satellite Appears to be Falling Apart in Geostationary Orbit*, Ars Technica (July 2, 2017), <https://arstechnica.com/science/2017/07/a-large-satellite-appears-to-be-falling-apart-in-geostationary-orbit/>.

³⁰ See Caleb Henry, *Three Orbcomm OG2 satellites malfunctioning, fate to be determined*, SpaceNews (Aug. 3, 2017), <https://spacenews.com/three-orbcomm-og2-satellites-malfunctioning-fate-to-be-determined/>.

the probability of accidental explosions, and (iii) for which the probability of each satellite's risk of collision with large objects is less than 0.001.³¹ All of the foregoing are already required of Part 25 licensees, and there is no public interest served by allowing small satellites under the Streamlined Process to not make the foregoing certifications, which do not impose a substantial burden.

CSSMA agrees with other commentators that additional orbital debris requirements are not warranted unless and until a separate proceeding is undertaken to determine orbital debris requirements for all satellites.³²

Again, ORBCOMM appears to stand on its own asking for additional vague requirements to be levied specifically and only on small satellites. ORBCOMM proposes that the Commission should ensure that the applicant "affirmatively chooses an orbit that minimizes the risk of collision."³³ ORBCOMM alleges the use of opportunistic launches could impose negative externalities that "unquestionably can have real world consequences."³⁴ ORBCOMM fails to offer any quantitative standard or point out any of these unquestionable real-world consequences that have occurred based on a small satellite launch. It is worth noting that even at the altitude limits proposed by most commentators, there would be no intersection between small satellites under the Streamlined Process and ORBCOMM's OG2 fleet until ORBCOMM begins end-of-

³¹ See CSSMA Comments at 17; EchoStar/Hughes Comments at 4 (agreeing with the Commission's proposal that applicants certify that the risk of collision with large objects is less than 0.001 and that satellites will not release operational debris in a planned manner during their mission lifetime); Boeing Comments at 12.

³² See ASI Comments at 10-11 (stating if there is to be a change in the standards that should be handled in a separate orbital debris rulemaking and be applicable to all satellites); CSF Comments at 6 (recommending small satellites retain the same orbital debris standards as other satellites and that if those standards need to be updated that they be handled in as separate rulemaking applicable to all satellites); Iridium Comments at 7 (proposing the Commission should clarify that criteria could change based on future orbital debris proceedings).

³³ See ORBCOMM Comments at 12.

³⁴ See ORBCOMM Comments at 13.

life disposal for the OG2 satellites still capable of such disposal maneuvers (at which point it serves the public interest that all operators take care of mitigating collision risk with operating satellites during the disposal phase).

ORBCOMM goes even further and “urg[es] the Commission to require any new small satellite system applicant to complete spectrum and orbit resource coordination with incumbent operators before any such applicant is authorized to launch or operate any satellites so as to eliminate risks of harmful interference and orbital collisions.”³⁵

Adoption of ORBCOMM’s proposed vague standards in favor of incumbents is certainly not in the public interest as it would significantly delay application processing time, allow incumbents to engage in anti-competitive behavior, and impose significant extra costs on applicants.

CSSMA is pleased that ORBCOMM raised the FORMOSAT-5 issue amongst Planet, Spire, Spaceflight, and ORBCOMM, which unquestionably shows a series of negative externalities imposed on small satellites by incumbents that are allowed to hold up launches based on vague subjective standards. In early 2016, ORBCOMM filed a Petition to Dismiss, Deny, or Hold in Abeyance the Part 25 license application of Spire.³⁶ At the same time, ORBCOMM filed the same pleading against the Part 25 modification application of Planet.³⁷ ORBCOMM’s position was fairly straightforward and very similar to what it offers for the current Streamlined Process. Planet and Spire must show that their deployments “will not create

³⁵ See ORBCOMM Comments at 16.

³⁶ See ORBCOMM, Petition to Dismiss, Deny, or Hold in Abeyance, File No. SAT-LOA-20151123-00078 (filed Feb. 22, 2016) (“ORBCOMM Petition”).

³⁷ See ORBCOMM, Petition to Dismiss, Deny, or Hold in Abeyance, File No. SAT-MOD-20150802-00053 (filed Jan. 19, 2016).

an unacceptable risk of collision with ORBCOMM's non-geostationary orbit [(“NGSO”)] satellite system or impose unreasonable obligations on ORBCOMM to avoid such collisions.”³⁸ This action by ORBCOMM resulted in the delay of Spire's and Planet's applications by seven and eight months respectively and resulted in significant extra licensing costs for Spire and Planet before ORBCOMM ultimately conceded its position. FORMOSAT-5 was not an “opportunistic launch.” It was the only U.S. launch to a non-ISS orbit available to commercial small satellites in a 4-year period from 2013 to 2017.

The Commission's International Bureau, Satellite Division had a front seat to the FORMOSAT-5 proceedings and can make its own determination as to whether the public interest would be served by adopting vague orbital debris requirements applicable only to small satellites that favor incumbents such as ORBCOMM.

9. Trackability

Again, the broad weight of comments supports CSSMA's position that a more flexible standard should be adopted rather than a minimum size limit of 10 cm x 10 cm x 10 cm. Technology is rapidly developing and the *Smallsat NPRM* final rules and regulations will be unlikely to change for many years. The standard adopted must be able to keep up with the innovation of the U.S. space industry. CSSMA reiterates its proposed standard that the operator show that its satellite can be tracked reliably by widely available tracking technology.³⁹

³⁸ See, e.g., ORBCOMM Petition at 1.

³⁹ See CSSMA Comments at 18; Iridium Comments at 7 (mentioning active means such as laser retro-reflectors or radar-cross section enhancements that would allow active tracking); Boeing Comments at 13 (suggesting that other means may be available by which the applicant demonstrates it will enable tracking); University Small-Satellite Researchers Comments at 11 (urging the Commission to adopt a more functional approach to trackability); CSF Comments at 5 (noting that previous satellites have shown to be trackable at smaller dimensions than 10 cm x 10 cm x 10 cm and that applicants should prove that satellites are in fact trackable without dictating how); EchoStar/Hughes Comments at 5 (stating that

10. Casualty Risk

CSSMA agrees with Boeing and CSF that casualty risk for applicants in the Streamlined Process should be the same as for other satellites.⁴⁰ CSSMA further agrees with the CSF that these standards, if changed, should be changed in a separate rulemaking applicable to all satellites.⁴¹

11. Cessation of Emissions

Few parties commented on this rule. CSSMA concurs with Boeing that again the Commission should adopt a more flexible approach than mandating cessation upon receipt of a command from a ground station. As Boeing mentions and as CSSMA stated in its comments, there are more reliable approaches to cessation of emissions than ground transmitting commands.⁴²

B. Small Satellite Application Processing

CSSMA supports University Small-Satellite Researchers' suggestion that the Commission implement an application progress tracker,⁴³ further reducing administrative burdens for the Commission and providing needed transparency to Streamlined Process applicants during the application processing stage. The Commission could implement a tracking system that could be added to the myIBFS database for both Streamlined Process and Part 25 Process applicants. Such an addition would reduce the number of inquiries coming into the

satellites should be trackable from the ground by active means); Comments of Alba Orbital, IB Docket No. 18-86, at 1 (filed Apr. 2, 2018) (stating satellites under 10 cm can be tracked and that new space fence will be able to track objects 5 cm and greater).

⁴⁰ See Boeing Comments at 13; CSF Comments at 6.

⁴¹ See CSF Comments at 6.

⁴² See Boeing Comments at 13; CSSMA Comments at 20-21.

⁴³ See University Small-Satellite Researchers Comments at 13.

Commission regarding any application and provide applicants better status detail, which they can easily pass on to company executives, investors, and anyone else concerned with the respective regulatory licensing process.

Similar to CSSMA, other commenters, such as SpaceX and Globalstar, support elimination of processing rounds for Streamlined Process applicants as there will be a requirement that small satellite applicants certify that their systems will not interfere with existing operations or unreasonably preclude future operators from using the same frequency band.⁴⁴

CSSMA also concurs with SIA that “any potential federal coordination or application decision periods associated with the Streamlined Process should not detrimentally affect or delay the Commission’s consideration of Part 25 Process applications.”⁴⁵

C. Application Requirements

1. Schedule S and Form 312

EchoStar/Hughes asserts that the Commission should maintain the Form 312 and a Schedule S along with certifications demonstrating the applicant’s compliance with Part 25 rules instead of the full narrative that typically accompanies a satellite application.⁴⁶ SIA supports maintaining the Form 312.⁴⁷ CSSMA agrees with both commenters for the reasons it outlined previously in its Comments.⁴⁸ Maintaining the Form 312 and Schedule S (along with CSSMA’s

⁴⁴ See *Smallsat NPRM* ¶ 34; see also SpaceX Comments at 11; Globalstar Comments at 6; CSSMA Comments at 21 (supporting application certifications (of use of spectrum non-exclusively) in lieu of processing rounds).

⁴⁵ See SIA Comments at 4.

⁴⁶ See EchoStar/Hughes Comments at 8.

⁴⁷ See SIA Comments at 2.

⁴⁸ See CSSMA Comments at 22-23.

suggested revisions)⁴⁹ allows the Commission and others to “fully review the proposed operations” as EchoStar/Hughes points out.⁵⁰ Additionally, certifications will limit the amount of narrative text Streamlined Process applicants submit and that the Commission has to review. Such certifications, in lieu of additional narrative text, would also allow the Commission to satisfy the University of Small-Satellite Researchers’ request that the Commission reduce the required paperwork to alleviate the regulatory burden on small satellite operators, reflecting the short duration and low impact nature of small satellite systems.⁵¹

2. Narrative

SIA agrees with CSSMA that the Commission should require submission of a streamlined ODAR, allowing the Commission and other operators to review the assumptions and analysis that goes into the certifications, particularly those around collision risk, casualty risk, and other orbital debris matters.⁵²

SIA further proposes that the Commission allow Streamlined Process applicants the ability to identify ground station requirements or ground station options rather than specify a complete ground station plan in the narrative, allowing more flexibility for small satellite missions.⁵³ Potential operational changes often happen due to changing launch schedules and iterating of small satellite designs, so a Streamlined Process applicant shall not have to provide a complete ground station plan in its narrative during application submission. Instead, it can later provide the plan in a supplemental filing and/or through direct communications with other

⁴⁹ See CSSMA Comments at 22-23.

⁵⁰ See EchoStar/Hughes Comments at 8.

⁵¹ See University Small-Satellite Researchers Comments at 13.

⁵² See SIA Comments at 3.

⁵³ See SIA Comments at 3.

operators during the process of any coordination as SIA has suggested.⁵⁴ CSSMA supports SIA's position.

D. Revised Bond Requirement

Most commenters⁵⁵ agree with CSSMA's position that no bond requirement is necessary as spectrum warehousing is not a concern for Streamlined Process licensees. The Commission has previously noted bond and milestone requirements are only necessary when spectrum warehousing is a concern.⁵⁶ Small satellite operators use frequency bands on a non-exclusive basis, meaning future applicants have unencumbered use of similar frequency bands as the applicant, spectrum warehousing is not a concern, and bond/milestone requirements can be eliminated altogether for small satellites licensed under the Streamlined Process.⁵⁷ In addition to CSSMA's previous Comments supporting the elimination of a bond requirement, CSSMA agrees with other commenters' positions that a bond imposition will only serve to increase the cost of satellites,⁵⁸ make financing more difficult for entrepreneurs,⁵⁹ and would be administratively burdensome on Streamlined Process licensees.⁶⁰ Additionally, Boeing notes that "legal process

⁵⁴ See SIA Comments at 3.

⁵⁵ See, e.g., ORBCOMM Comments at 7; Boeing Comments at 7-9; ASI Comments at 11; CSF Comments at 6.

⁵⁶ See *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 7809 ¶ 62 (2017); *Amendment of the Commission's Space Station Licensing Rules and Policies*, First Order on Reconsideration and Fifth Report and Order, IB Docket No. 02-34, FCC 04-147 ¶ 5 (2004); *Amendment of the Commission's Space Station Licensing Rules and Policies*, First Report and Order, 18 FCC Rcd 10760 ¶ 167 (2003).

⁵⁷ See, e.g., ORBCOMM Comments at 7; Boeing Comments at 7-9.

⁵⁸ See HybridX Comments at 3.

⁵⁹ See HybridX Comments at 3.

⁶⁰ See Boeing Comments at 8.

and administrative costs of implementing a bond pursuant to the Commission's rules is not insignificant."⁶¹

CSF and ASI also support the elimination of the bond requirement for Streamlined Process applicants.⁶²

CSSMA further agrees with ORBCOMM that Commission should consider a broader streamlining of bond requirements for all NGSO authorizations in cases where launch and operation are reasonably non-preclusive of other future entrants.⁶³

If, however, the Commission believes a bond requirement is necessary, then CSSMA agrees with University Small-Satellite Researchers and Boeing that some grace period should be permitted before a bond posting is required.⁶⁴ In particular, CSSMA agrees with Boeing's 2-year grace period being sufficient as it would provide a potential Streamlined Process licensee adequate time to receive an authorization after coordination with all Federal/non-Federal operators; manufacture, design, and test equipment; and schedule launches, which can easily all take more than one year to complete.⁶⁵

E. Frequency Considerations for Small Satellites

1. Optical and Inter-Satellite Links

CSSMA notes that CSF and Analytical Space, Inc. ("ASI") both agree with CSSMA's position that optical links are not yet at a maturity level that they can be relied on as primary data communications links.⁶⁶ CSSMA looks forward to the promise that one day these links may

⁶¹ See Boeing Comments at 8.

⁶² See ASI Comments at 11; CSF Comments at 6.

⁶³ See ORBCOMM Comments at 7.

⁶⁴ See University of Small-Satellite Researchers Comments at 14.

⁶⁵ See Boeing Comments at 8-9.

⁶⁶ See CSF Comments at 7; ASI Comments at 14-15; CSSMA Comments at 35.

provide significant augmentation to radio links when the technology and ground services mature, but until then, these cannot be a replacement for the use of conventional radiofrequency links in the Streamlined Process.

EchoStar/Hughes asserts there are a number of frequency bands already allocated for Inter-Satellite Service⁶⁷ and that such operations be permitted only in bands specifically allocated to space-to-space operations. The majority of these bands are in the Ka-band and higher frequency millimeter wave bands; they require additional hardware and are not a practical addition for small satellites operating in the lower frequency bands (*i.e.*, VHF-band, UHF-band, L-band). The one L-band allocation for Inter-Satellite Service is limited to distress and safety communications⁶⁸ and therefore is not applicable for most commercial small satellites. The similar space-to-space allocations in the UHF-band, L-band, and C-band regions are afforded only to Space Research and Radionavigation-Satellite Services (“RNSS”) and therefore again are not applicable for most commercial small satellites. Only two lower allocations in S-band (2025-2110 MHz and 2200-2290 MHz) remain currently allocated for space-to-space communications and may be useful to small satellite operators; however, non-Federal users in the United States are excluded from the latter band.

Most other commenters, on the topic of inter-satellite links, express support for use of certain MSS bands for Inter-Satellite Service.⁶⁹ Inmarsat in particular notes it has already developed and offers an Inter-Satellite Data Relay Service to NGSO satellite operators,⁷⁰ and

⁶⁷ See Echostar/Hughes Comments at 6.

⁶⁸ See 47 C.F.R. § 2.106 n.5.375.

⁶⁹ See CSF Comments at 7; Comments of Globalstar, Inc., IB Docket No. 18-86, at 6-8 (filed July 9, 2018) (“Globalstar Comments”); Comments of Inmarsat Inc., IB Docket No. 18-86, at 2-4 (filed July 9, 2018) (“Inmarsat Comments”); Iridium Comments at 11.

⁷⁰ See Inmarsat Comments at 2.

Globalstar notes several missions utilizing Globalstar's MSS network.⁷¹ Both Inmarsat and Globalstar urge the Commission to authorize inter-satellite operations by adding a 'space-to-space' parenthetical to the existing MSS allocations.⁷²

Additionally, the CSF⁷³ and ASI⁷⁴ offered a proposal in line with CSSMA's own proposal⁷⁵ to align, in addition to the abovementioned S-Band allocations, the X-band Earth Exploration-Satellite Service allocation by adding a 'space-to-space' direction in 8025-8400 MHz.

CSSMA supports the positions of Globalstar, Inmarsat, CSF, and ASI and urges the Commission to promote the adoption of these allocations by the International Telecommunication Union.

2. Compatibility and Sharing with Federal Users

Like CSSMA, SIA also acknowledges that federal spectrum coordination is one of the biggest barriers to getting a license quickly.⁷⁶ CSSMA again supports SIA's arguments that the Commission (i) "mandate pre-coordination meetings taking place between applicants and representatives of all affected Federal agencies after application fee payment submission and (ii) submit a Streamlined Process application for formal coordination to the National Telecommunications and Information Administration ("NTIA") (coordinating on behalf of the U.S. Federal agency operators) concurrently with the placement of the Streamlined Process on

⁷¹ See Globalstar Comments at 4.

⁷² See Inmarsat Comments at 3; Globalstar Comments at 7.

⁷³ See CSF Comments at 7.

⁷⁴ See ASI Comments at 4.

⁷⁵ See CSSMA Comments at 57.

⁷⁶ See SIA Comments at 3-4.

public notice.”⁷⁷ Leaving an elongated and uncertain Federal spectrum coordination process does truly “prejudice commercial small satellite companies by causing missed launches and lower service levels to customers and missing time-to-market advantages.”⁷⁸

3. Discussion of New Small Satellite Operations in Select Bands

a) 137-138 MHz and 148.0-150.05 MHz

ORBCOMM expressed its concerns about the very limited bandwidth available in the proposed VHF bands and the prospect of allowing small satellite operations in those bands.⁷⁹ While CSSMA acknowledges this concern is true, it had proposed a detailed methodology in its comments⁸⁰ showing that many additional users can be accommodated and maintain compatibility with ORBCOMM, which includes the use of signals that “look like” ORBCOMM and a similar Dynamic Channel Activity Assignment System (“DCAAS”) that ORBCOMM uses and noted in its own comments.⁸¹ All of the specific technical concerns ORBCOMM expressed are also identified and mitigated in the aforementioned CSSMA comments. CSSMA reiterates that it proposes to use and share the segment of the bands not exclusively allocated to ORBCOMM,⁸² and CSSMA appreciates ORBCOMM’s conclusion that sharing may be possible.⁸³ CSSMA looks forward to engaging with ORBCOMM in discussions to realize this feasibility.

⁷⁷ SIA Comments at 3-4; *see also* CSSMA Comments at 37-40.

⁷⁸ SIA Comments at 4.

⁷⁹ *See* ORBCOMM Comments at 14.

⁸⁰ *See* CSSMA Comments at 59-68 (Annex 1).

⁸¹ *See* ORBCOMM Comments at 14.

⁸² *See* CSSMA Comments at 61 (Annex 1).

⁸³ *See* ORBCOMM Comments at 16.

b) 1610.6-1613.8 MHz

Iridium proposes the Commission “consider developing rules that would ensure the location and density of small satellite terminals do not pose a threat of harmful interference into Iridium’s terminals”;⁸⁴ however, Iridium did not propose any particular rules or technical basis for such rules. CSSMA previously commented that compatibility with Globalstar can be achieved in the Earth-to-space direction using signals that are ‘Globalstar’ like with similar power density levels and a CDMA-type system,⁸⁵ which is established to be compatible with Iridium in the adjacent band. Also, CSSMA previously acknowledged that any system must protect the RNSS and Radio Astronomy (“RAS”) operations in the 1610.6-1613.8 MHz band⁸⁶ and noted the current Commission rules⁸⁷ already in place to ensure that. CSSMA believes additional rules are not necessary beyond these existing rules and practices, ensuring compatibility amongst operators and services such as Globalstar, Iridium, RNSS, and RAS services.

Globalstar opposes standalone small-satellite operations in the 1610.6-1613.8 MHz band due to a potential threat of harmful interference to Globalstar⁸⁸ without recognizing that such compatibility could be achieved with systems sharing the same characteristics of its own system. Globalstar points out that there are over 700,000 consumers using the Globalstar system, which dwarfs the potential quantity of small satellite operations. As noted above, CSSMA believes compatibility can be achieved using a Globalstar-like CDMA system at similar power density

⁸⁴ See Iridium Comments at 10.

⁸⁵ See CSSMA Comments at 50-51.

⁸⁶ See CSSMA Comments at 51.

⁸⁷ See 47 CFR §§ 25.213, 25.216.

⁸⁸ See Globalstar Comments at 1.

levels and proposes additional methodology for channel sharing including the use of directive antennas.⁸⁹ These systems would be a fractional addition to the spectrum use in the band.

Noting that the 1610.6-1613.8 MHz band is allocated Earth-to-space, CSSMA reiterates here the importance of there being a complementary space-to-Earth band such as 1525-1535 MHz available for the downlink of data and telemetry.⁹⁰ Such a band pairing alleviates the complications of coordinating and sharing the band with the existing MSS operators.

4. Other Bands

CSSMA agrees with the comments from the Radio Amateur Satellite Corporation⁹¹ and American Radio Relay League⁹² that the amateur radio bands under Part 97 rules are not appropriate for commercial use and should not be considered under the proposed small satellite licensing rules for a commercially oriented system.

CSSMA also reiterates that the Commission should consider other bands as set forth in its Comments.

F. Market Access

SIA supports “foreign applicants being able to apply for U.S. market access under the Streamlined Process if they are subject to all the same requirements as U.S. applicants under the Streamlined Process and applicable reciprocity market access requirements under the Part 25 Process.”⁹³ CSSMA also supports this proposal. Nascent foreign small satellite operators, seeking to land signals in the U.S., face the same financial and licensing constraints that U.S.

⁸⁹ See CSSMA Comments 69-71 (Annex 2).

⁹⁰ See CSSMA Comments at 56.

⁹¹ See Comments of Radio Amateur Satellite Corporation, IB Docket No. 18-86, at 6 (filed July 9, 2018).

⁹² See Comments of ARRL, IB Docket No. 18-86, at 6 (filed July 9, 2018).

⁹³ See SIA Comments at 6.

small satellite operators face. As such, the Streamlined Process should also apply to foreign small satellite operators if they meet the Streamlined Process and applicable reciprocity market access requirements.

G. Maintenance of Part 5 and 97 Processes

Boeing and University Small-Satellite Researchers ask the Commission to clarify that Streamlined Process for small satellites is an alternative path to and not a replacement for Part 97 and Part 5 licensing.⁹⁴ CSSMA supports this clarification request. Indeed, the Part 5 process is important for on-orbit testing and providing customer confidence and the Part 97 process is important for university small satellite research and innovation, particularly for new schools with fewer resources to fly small satellites.⁹⁵

⁹⁴ See Boeing Comments at 2-3; University of Small-Satellite Researchers Comments at 6-7. They state “the use of an on-orbit test bed provides significant direct and indirect financial benefits and risk reduction for future satellite programs and for public safety” and that “if the streamlined Part 25 approach becomes the only path for small satellites, it will effectively prevent university small satellite research and innovation, particularly for new schools with fewer resources to fly small satellite missions, if it is not properly calibrated to facilitate the types of missions currently served by Part 97 and Part 5.” See *id.*

⁹⁵ See *id.*

III. CONCLUSION

CSSMA, like most other commenters, encourages the Commission to institute a Streamlined Process, which is broadly applicable and contains fewer restrictive requirements than currently proposed in the *Smallsat NPRM*.

Respectfully submitted,

CSSMA

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