Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

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

COMMENTS OF GLOBALSTAR, INC.

Globalstar, Inc. ("Globalstar") hereby comments on the Federal Communications Commission's ("Commission's") Notice of Proposed Rulemaking regarding streamlined licensing procedures for small satellite systems.[1] Globalstar appreciates the Commission's effort to eliminate regulatory obstacles to the development of robust commercial small-satellite operations in the United States and globally. Globalstar agrees that neither the Commission's existing Part 25 licensing procedure nor its experimental licensing framework is an appropriate mechanism for authorizing small-satellite operations, and it supports the proposed streamlined Part 25 licensing rules for these systems. The Commission should also pursue the domestic and international allocation changes necessary to accommodate Part 25-authorized inter-satellite communications between small satellites and Globalstar's mobile satellite service ("MSS") constellation. Globalstar opposes standalone small-satellite operations in the 1610.6-1613.8 MHz band, however, because such operations would constitute a serious threat of harmful interference to Globalstar's safety-of-life satellite offerings.

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[1] *Streamlining Licensing Procedures for Small Satellites*, IB Docket No. 18-86, Notice of Proposed Rulemaking, FCC 18-44 (rel. Apr. 17, 2018) ("*NPRM*").

I. Background

Globalstar's MSS business. Globalstar is a leading provider of global mobile satellite voice and data services. Globalstar is licensed for uplink transmissions (mobile earth stations to satellites) in the Big LEO band at 1610-1618.725 MHz (the "Lower Big LEO band"), and for downlink transmissions (satellites to mobile earth stations) at 2483.5-2500 MHz (the "Upper Big LEO band").[2] In 2013, Globalstar completed the launch of a $1 billion, second-generation non-geostationary ("NGSO") satellite constellation, and it continues to invest in ground infrastructure upgrades and an expanded line of enterprise, consumer, and government products. Globalstar is dedicated to providing state-of-the-art, mission-critical, and safety-of-life services to over 700,000 consumers, businesses, and governmental and public safety users in over 120 countries around the world, including in remote, unserved, and underserved areas not reached by terrestrial deployments. Overall, utilizing its second-generation constellation and ground facilities, Globalstar continues to provide the highest voice quality, fastest truly mobile data speeds, and most affordable service in the MSS industry.

Globalstar's MSS network provides critical back-up capabilities for public safety personnel during disasters, when terrestrial networks can be rendered inoperable. Public safety entities involved in relief efforts in North America and around the world have relied on Globalstar's satellite services after earthquakes, hurricanes, and other disasters. In

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[2] *Application of Loral/Qualcomm Partnership, L.P. for Authority to Construct, Launch, and Operate Globalstar, a Low Earth Orbit Satellite System, to Provide Mobile Satellite Services in the 1610-1626.5 MHz/2483.5-2500 MHz Bands*, Order and Authorization, 10 FCC Rcd 2333 (1995); *see also Spectrum and Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands; Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands*, Second Order on Reconsideration, Second Report and Order, and Notice of Proposed Rulemaking, 22 FCC Rcd 19733, ¶¶ 8, 18-20 (2007).

addition, over the past decade, Globalstar has focused on the development of affordable, consumer-oriented devices and services that have significant public safety benefits. This "SPOT" family of MSS devices is responsible for initiating almost 6,000 rescues around the world since the 2007 introduction of this product. Globalstar's subscribers transmitted more than 1.3 billion SPOT and other simplex messages last year, and that figure continues to grow at a significant rate year over year.

Small-satellite use of Globalstar's MSS network. In the *NPRM*, the Commission states that since 2013 it has received an increasing number of experimental licensing applications for small satellite systems, primarily involving "CubeSat" spacecraft.[3] As the Commission recognizes, many of these experimental applications have sought authority for small-satellite communications with Globalstar's existing MSS satellite constellation, to enable indirect data communications between the small spacecraft and ground networks.[4] For these experimental operations, the small satellites (which have all been CubeSats) are equipped with Globalstar-provided transceivers developed for mobile terminal communications with Globalstar's MSS constellation. The CubeSats transmit to Globalstar's satellites in Globalstar's licensed uplink spectrum at 1615-1618.725, and some of these small satellites are able to receive Globalstar's licensed downlink transmissions at 2483.5-2495 MHz. Small-satellite transmissions below 1615 MHz have not been permitted in order to protect the Radioastronomy Service ("RAS").

In conjunction with these CubeSat projects, Globalstar and its small-satellite partners – including commercial interests and universities and other educational institutions – have

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[3] *NPRM* ¶ 9. The Commission's experimental application and licensing requirements are contained in Part 5 of the Commission's rules. *See* 47 C.F.R. §§ 5.1-5.602.

[4] *NPRM* ¶ 71.

obtained Part 5 experimental authorizations for over twenty spacecraft. Examples of CubeSat systems utilizing Globalstar's MSS network include the following:

- **"MakerSat-1"** is a one-unit CubeSat spacecraft developed by Northwest Nazarene University in Idaho that will be assembled and deployed into low-earth orbit from the International Space Station ("ISS") in November 2017. This multi-project satellite supports up to four science payloads. In an upcoming technology proof-of-concept mission, MakerSat-1 will be used to measure the reduction in mass of certain manufactured polymers while in orbit, due to monoatomic oxygen radicals, ultraviolet (UV) radiation, ionizing radiation, and outgassing.

- **"TestSat-Lite" ("TSAT")** was a two-unit CubeSat spacecraft designed and built by engineering students at Taylor University in Indiana. TSAT was a dual-mission satellite designed to demonstrate (i) a reliable, global CubeSat system and (ii) a satellite bus design for Space Weather research. TSAT was launched in 2014 through the National Aeronautics and Space Administration's ("NASA's") Educational Launch of Nanosatellites program.

- **"GEARRS-2"** was an experimental satellite launched to investigate the use of Globalstar's system for command and control of a CubeSat in low earth orbit. The GEARRS-2 project relied on technology developed for the TSAT project. This satellite was deployed from the ISS in March 2015.

- The **"Open Orbiter"** project is intended to create a one-unit CubeSat spacecraft that will represent the "Open Prototype" for Educational NanoSats. This CubeSat model, scheduled to be deployed from the ISS in 2019, will be made available to entities worldwide to facilitate the creation of other low-cost CubeSat programs (budget below $5,000 excluding payload specific components). A new CubeSat design has been developed for this project, involving a larger payload area in the center of the spacecraft as well as the use of a low-cost software defined radio.

- **"Asgardia-1"** is a small satellite that was deployed from the ISS in December 2017 into a near-circular orbit around the equator. The Asgardia-1 will be used to investigate the effects of the radiation exposure environment in low earth orbit on long-term data storage. These experiments should be completed within two years of deployment.

II. The Commission Should Adopt Streamlined Part 25 Licensing Procedures for Small Satellite Systems

Globalstar commends the Commission's effort to adopt licensing procedures for small satellites that will reduce application processing times, decrease regulatory burdens for

applicants, promote spectrum efficiency, and safeguard critical communications links with appropriate interference protection.

The Commission should adopt its proposed streamlined Part 25 application procedures for small satellite systems. As indicated above, Globalstar and its small-satellite partners to date have been forced to rely on the Commission's Part 5 experimental licensing procedures. Going forward, such experimental licensing does not make sense for small-satellite systems. First, small-satellite operations are likely to become increasingly commercial in nature, and full-blown commercial services are not permitted under experimental authorizations. In addition, experimental licenses are granted only on a non-interference basis. Globalstar expects that small-satellite operations – including commercial services and mission-critical functions such as telemetry, tracking, and command – will increasingly need meaningful interference protection.

Meanwhile, as the Commission recognizes, its existing Part 25 licensing framework for NGSO satellites is also unsuitable for small-satellite operations.[5] The NGSO licensing procedures are simply too expensive and burdensome for small-satellite operators. As the Commission points out, small satellite systems typically include fewer satellites, are far less costly, and have a much shorter orbital lifespan than large-scale NGSO constellations (such as the Globalstar and Iridium networks). The Commission's application and regulatory fees for NGSO systems will often exceed the other developmental and deployment costs for small-satellite projects. The application fee for a new NGSO satellite system, for instance, is almost

[5] *Id.* ¶ 13.

$500,000.[6] The Commission's extended, complex NGSO processing-round procedures also appear inapt for small-satellite applicants.

Given the problems associated with Part 5 experimental licensing and the existing Part 25 NGSO rules, Globalstar supports the streamlined licensing procedures in proposed Section 25.122.[7] In place of processing-round procedures, small-satellite applicants should be able to make the various certifications contained in this proposed rule, including that their satellites meet the Commission's small-satellite criteria and will not interfere with existing satellite operations or unreasonably preclude other future satellite operators from utilizing the band in question. Globalstar also agrees that Part 25-authorized small-satellite operations should be protected from harmful interference in a manner consistent with the relevant service allocation for the spectrum utilized.

III. The Commission Should Pursue Domestic and International Allocation Changes Necessary to Support Inter-Satellite Communications Between Small Satellites and Globalstar's Big LEO Constellation

As the Commission recognizes, its proposed streamlined licensing procedures are not sufficient to support small-satellite operators' increasing reliance on Globalstar's MSS constellation for indirect communications with ground facilities.[8] To fully accommodate this small-satellite use of Globalstar's network, the Commission must pursue changes to the domestic and international spectrum allocations in the Big LEO bands. At the same time, Globalstar opposes the Commission's proposed addition of new, separate international and

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6 47 C.F.R § 1.1107, item 9.a.; *see also* FCC International and Satellite Services Fee Filing Guide at 17, § II.9.a. (Aug. 30, 2016), https://docs.fcc.gov/public/attachments/DOC-340982A1.pdf. NGSO licensees are also required to post an initial surety bond, an obligation that many small satellite operators may find difficult to meet.

7 *See NPRM* ¶ 62 and Appendix A, Proposed Rules, § 25.122.

8 *NPRM* ¶ 71.

domestic allocations for inter-satellite service links in this spectrum. Such allocations could result in extensive inter-satellite transmissions between non-Globalstar satellites and threaten substantial harmful interference to Globalstar's licensed MSS offerings.

Rather than undertake new inter-satellite service allocations in the Big LEO bands, the Commission should address the existing domestic and international allocations for MSS in this spectrum. First, domestically, the Commission should amend the U.S. Table of Allocations by adding a "space-to-space" directional indicator to the MSS spectrum allocations at 1613.8-1626.5 MHz and 2483.5-2500 MHz.[9] The Commission should also add a use footnote to the U.S. Table stating that authorized small satellite "space-to-space" operations in this Big LEO spectrum would constitute an "application" of the mobile satellite service.[10] At the International Telecommunications Union ("ITU"), the Commission should advocate for similar amendments to the international table of allocations.[11] In combination with streamlined licensing procedures, these domestic and international allocation changes should enable robust,

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[9] Currently, in the U.S. Table of Allocations (47 C.F.R. § 2.106), the domestic MSS allocations covering 1610-1626.5 MHz (including Globalstar's Big LEO service uplink spectrum at 1610-1618.725 MHz) include the "Earth-to-space" directional indicator, while the domestic MSS allocation at 2483.5-2500 MHz (Globalstar's service downlink spectrum) contains the "space-to-Earth" directional limitation.

[10] In the *NPRM*, the Commission proposed that standalone small-satellite operations in the 1610.6-1613.8 MHz band (if authorized under proposed Section 25.122) be considered an "application of the mobile-satellite service (Earth-to-space)." *NPRM* Appendix A, Proposed Rules (proposed amendment to § 2.106). As explained below at IV, Globalstar opposes rules that would permit standalone small-satellite transmissions in this band segment, due to the threat of harmful interference to Globalstar's MSS offerings.

[11] Without a change to the international table of allocations, these inter-satellite communications will be non-conforming to the ITU Radio Regulations and subject to the condition that these operations shall not cause harmful interference to, and shall not claim interference protection from, another station operating in accordance with the ITU Radio Regulations. ITU Radio Regulation No. 4.4, http://life.itu.int/radioclub/rr/frr.htm.

interference-protected commercial communications between small satellites and Globalstar's MSS constellation.

Commission action to accommodate these inter-satellite communications will generate important benefits for small-satellite operators. Small-satellite operators will be able to maximize operational efficiency by utilizing Globalstar's existing MSS network to connect to ground facilities, obviating the need to invest in expensive earth station infrastructure or secure dedicated frequencies for Earth-to-space and space-to-Earth links.

Globalstar does recognize, however, that inter-satellite transmissions from small satellites below 1613.8 MHz could pose a threat of interference to the RAS. Accordingly, any amendments to the U.S. and international allocation tables should not permit small-satellite communications with Globalstar's satellites within the 1610-1613.8 MHz band segment.

IV. The Commission Should Not Permit Standalone Small-Satellite Operations in Globalstar's Licensed MSS Spectrum at 1610.6-1613.8 MHz

While Globalstar supports streamlined licensing for small-satellite systems, the Commission should not permit standalone small-satellite operations in Globalstar's licensed MSS spectrum at 1610.6-1613.8 MHz. In the *NPRM*, the Commission does not explain why it believes that the 1610.6-1613.8 MHz band, relative to other bands, is particularly conducive to small-satellite operations. In fact, small-satellite uplink transmissions at 1610.6-1613.8 MHz would create an unreasonable threat of harmful interference to Globalstar's co-channel MSS operations.

If the Commission permitted standalone small-satellite operations at 1610.6-1613.8 MHz, the resulting harmful interference to Globalstar's MSS offerings would have a detrimental impact on public safety in the United States and throughout the world, given the

importance of Globalstar's global MSS network to public safety and emergency communications. As described above, Globalstar's MSS network provides critical back-up capabilities for public safety personnel during disasters, when terrestrial networks can be rendered inoperable. In addition, the "SPOT" product line has been used to initiate thousands of rescues around the world and should continue to play this crucial public safety role years into the future. The Commission should also bear in mind that interference from U.S.-licensed small-satellite operations to Globalstar MSS outside the United States would be contrary to the Commission's obligations under the treaty-level ITU Radio Regulations.[12]

Significantly, there are no technical restrictions that would lower the risk of harmful interference from small-satellite operations to Globalstar's MSS offerings. Given the dynamic nature of NGSO operations, directional antenna requirements for small-satellite systems are not feasible and would be ineffective. Nor is there a viable means of coordination that would enable the successful coexistence of small-satellite systems and Globalstar MSS at 1610.6-1613.8 MHz. Even if the Commission permitted only a small number of U.S. earth stations to operate in this spectrum, continuous transmissions from those earth stations to potentially a large number of small satellites traversing North America would generate a substantial threat of harmful interference to Globalstar's MSS network.

Standalone small-satellite operations at 1610.6-1613.8 MHz would threaten harmful interference not only to Globalstar's safety-of-life MSS offerings, but also to the RAS. Notably, while Globalstar's MSS network can comply with Part 25 exclusion zone requirements around U.S. RAS facilities, it is uncertain whether small-satellite systems offering

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12 *See* ITU Radio Regulation No. 4.2, http://life.itu.int/radioclub/rr/frr.htm.

mobile services would have a similar technical capability. Finally, it appears that standalone small-satellite systems at 1610.6-1613.8 MHz would themselves be highly vulnerable to harmful interference from Globalstar's MSS uplink operations at 1610-1618.725 MHz.

V. Conclusion

The Commission should adopt streamlined Part 25 licensing rules for small-satellite operations and pursue the domestic and international allocation changes necessary to accommodate robust commercial communications between small satellites and Globalstar's MSS constellation. The Commission should not allow standalone small-satellite operations in the 1610.0-1613.8 MHz band, however, because this decision would likely result in harmful interference to Globalstar's safety-of-life MSS offerings, the small-satellite services themselves, and the RAS.

Respectfully submitted,

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