

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
SWARM TECHNOLOGIES INC.)	
)	
Application to Modify the Authorization for the Swarm NGSO Satellite System)	File No. SAT-MOD-20200501-00040
)	
Amendment to Application to Modify the Authorization for the Swarm NGSO Satellite System)	File No. SAT-AMD-20200504-00041 Call Sign: S3041

**CONSOLIDATED RESPONSE AND OPPOSITION
OF SWARM TECHNOLOGIES, INC.**

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**CONSOLIDATED RESPONSE AND OPPOSITION
OF SWARM TECHNOLOGIES, INC.**

Pursuant to Section 25.154 of the Commission’s rules, Swarm Technologies, Inc. (“Swarm”) hereby responds to the comments of Space Exploration Holdings, LLC (“SpaceX”) and Myriota Pty Ltd. (“Myriota”) and opposes the petition to deny of ORBCOMM License Corp. (“ORBCOMM”) filed in response to Swarm’s pending applications to modify its license to launch and operate a non-voice, non-geostationary (“NVNG”) satellite system in the mobile-satellite service (“MSS”) in the Very High Frequency (“VHF”) bands.¹ As explained below, the record supports promptly granting the Modification Application, which does not present any mutual exclusivity issues, while the Commission resolves the spectrum sharing concerns raised in this processing round. To resolve those concerns, the Commission should direct ORBCOMM to comply with its obligations to coordinate sharing of the VHF NVNG MSS bands, and should designate ORBCOMM’s authorizations for inclusion in the round to the extent necessary to

¹ See Swarm Technologies, Inc., *Application to Modify the Authorization for the Swarm NGSO Satellite System*, IBFS File No. SAT-MOD-20200501-00040 (filed May 1, 2020) (“Modification Application”); Swarm Technologies, Inc., *Amendment to Application to Modify the Authorization for the Swarm NGSO Satellite System*, IBFS File No. SAT-AMD-20200504-00041 (filed May 4, 2020) (“Amendment”); *Application of Swarm Technologies, Inc.*, Memorandum Opinion, Order and Authorization, 34 FCC Rcd. 9469 (Int’l Bur. 2019) (“Swarm Grant”).

accomplish that objective. The Commission also should take practical steps to ensure that all proceeding participants contribute to an interference environment that promotes competition and the efficient use of scarce satellite spectrum.

INTRODUCTION AND SUMMARY

Swarm is the first U.S.-licensed NVNG MSS operator to enter the market in almost 25 years. Its initial batch of commercial-use satellites has completed integration and sits buckled-in and ready-to-ride to low Earth orbit (LEO) in what could be a matter of days. Excitement continues to build behind Swarm's smallest two-way communication commercial satellite design, which Swarm specifically developed to enable unique launch economics, use spectrum efficiently, and pose negligible in-orbit risks. Swarm is confident it can meet soaring demand for low-cost connectivity *and* remain a good neighbor in space. It welcomes the opportunity to work with like-minded operators who share the same basic understanding of their missions.

Swarm recently submitted two applications to further accelerate its commercial deployment and expand existing capabilities. The Modification Application would allow Swarm to implement propulsion, enhance trackability, and pursue rideshare opportunities across a wider range of deployment altitudes. The Amendment would expand the size of its constellation and the frequencies available to its users and grant a limited waiver of footnote US323, allowing Swarm to drive innovation, share spectrum more effectively, and establish U.S. leadership in the emerging commercial smallsat market.

No one opposed Swarm's Modification Application, and one commenter, SpaceX, lent its support.² Accordingly, Swarm respectfully requests that the FCC grant its Modification

² Comments of SpaceX, IBFS File Nos. SAT-MOD-20200501-00040 & SAT-AMD-20200504-00041 (filed Aug. 17, 2020) ("SpaceX Comments").

Application as soon as possible so that Swarm can enhance its already favorable safety profile and reach full deployment more rapidly—indeed, Swarm has already raised the capital and identified the launch opportunities it needs to deploy its network immediately. While ORBCOMM and Myriota filed in response to the Amendment,³ neither party provides any reason not to grant Swarm’s Modification Application.

ORBCOMM, an outdated monopolist making little use of the band, petitioned to deny the Amendment. But ORBCOMM’s pleading is a transparent attempt to restrict the entry of “new and advanced” smallsat systems like Swarm’s, which ORBCOMM apparently fears will have a “substantial negative influence” on its pricing and may even “render some or all of [its] services ... obsolete in the future.”⁴ While ORBCOMM continues to disclaim any meaningful obligation to coordinate, the FCC’s rules plainly require ORBCOMM to share VHF with new applicants like Swarm and Myriota—and ORBCOMM itself has stated that its satellites are “at like single-digit capacity”⁵ and “just one or two” VHF channels would suffice to meet its existing needs.⁶ Moreover, contrary to ORBCOMM’s claims, Swarm has done more than enough to demonstrate the compatibility of its system under the Commission’s application rules. ORBCOMM’s objection to Swarm’s request for a limited waiver of footnote US323 likewise should be dismissed out of hand. The rule was never intended to protect ORBCOMM from interference—and protecting

³ Comments of Myriota, IBFS File Nos. SAT-MOD-20200501-00040 & SAT-AMD-20200504-00041 (filed Aug. 17, 2020) (“Myriota Comments”); Petition to Dismiss or Deny of ORBCOMM, IBFS File Nos. SAT-MOD-20200501-00040 & SAT-AMD-20200504-00041 (filed Aug. 17, 2020) (“ORBCOMM Petition”).

⁴ ORBCOMM, *Annual Report and Form 10-K* 18, (2019) (“ORBCOMM 2019 10-K”), <http://investors.orbcomm.com/static-files/85211f99-d962-4601-87b7-f779c8c35aa5>.

⁵ Thomson Reuters Streetevents, *Edited Transcript, ORBC – Q1 2018 ORBCOMM Inc Earnings Call* 10 (May 3, 2018) (“ORBCOMM 1Q2018 Earnings Call Transcript”), <http://investors.orbcomm.com/static-files/71d237e3-956f-4887-9dfd-362667ef7e0e>.

⁶ ORBCOMM 2019 10-K at 12.

ORBCOMM from *competition* provides no reason to deny relief under the applicable waiver standard.

The simple truth is that more than 25 years after launching its system, and notwithstanding a years-long acquisition spree intended to generate new business, ORBCOMM’s VHF “capacity remains multiple times more capable than current demand.”⁷ To say that ORBCOMM is not using this spectrum effectively would be an understatement, and its efforts to prevent others from doing so should not be countenanced by the Commission.

Myriota does not oppose Swarm’s plans, but merely requests three-way coordination. Swarm accepts its responsibility to coordinate in good faith with other responsibly designed systems, including one operated by Myriota, and agrees that coordination discussions should involve all three operators. While Swarm has designed its system to share spectrum effectively, however, it is unclear whether Myriota plans to do so. Although Myriota proposes dynamic frequency and channel selection, it has no apparent plans to follow sharing best practices necessary to make these techniques effective. Most notably, Myriota does not appear to follow an industry best practice listen-before-talk (LBT) protocol, which is essential for multiple space and existing terrestrial systems to make intensive use of the VHF bands, and it is unclear how Myriota plans to ensure that its ground devices communicate only when a satellite is in view. Further, it is unclear if the power of their satellite system will actually remain below the ITU-defined power flux density (“PFD”) limits that trigger the need for extensive terrestrial protection and coordination activities.⁸ Myriota’s complete VHF system deployment remains years away, while Swarm’s first commercial VHF satellites are launch-ready on a rocket as of the date of this filing. Thus, to foster an

⁷ *Id.* at 11.

⁸ *See* 47 C.F.R. § 2.106 at International Footnote 5.208; ITU R.R., Appendix 5, Annex 1 ¶ 1.1.1. (2016).

interference environment in VHF that promotes competition and intensive spectrum use, the Commission should require Myriota to exchange information relevant to the formulation of an efficient and effective VHF spectrum sharing plan, including a full description of the sharing technologies and best practices that Myriota proposes to implement in its future envisioned system.

ARGUMENT

I. THE UNOPPOSED MODIFICATION APPLICATION SHOULD BE GRANTED PROMPTLY.

The Modification Application seeks authority for Swarm to (1) implement onboard propulsion (and slightly increase the mass of its satellites to support the new propulsion system), (2) replace passive Ku-band retro-reflectors with GPS antennas, and (3) operate at a slightly wider range of orbital altitudes (300 – 585 km for operation and deployment as opposed to 300 – 550 km for operation and 400 – 550 km for deployment). As Swarm explained in the application, these modifications would allow Swarm to deploy services more rapidly, because “a significant number of commercial launches with available secondary payload capacity deploy at altitudes ranging just above 550 km (and in some cases under 400 km).”⁹ They also would allow Swarm to “enhance the space safety profile of its constellation” by providing “additional maneuverability” and enabling “precise, real-time tracking of its satellites on orbit.”¹⁰ None of these benefits would come at a cost to space safety—in fact, propulsion would improve space safety and responsiveness—or otherwise affect other space operators. They would not increase interference because Swarm is “already licensed to transmit” from “an altitude of 300 km, and PFD levels on the Earth’s surface are even lower when a Swarm satellite transmits from 585 km as opposed to

⁹ Modification Application, Narrative at 2.

¹⁰ *Id.* at 1, 3-4.

550 km.”¹¹ Nor would they pose material collision risks; even assuming a “worst-case (longest-lifetime) scenario of a satellite deployed in a 585 km orbit over a minimum solar activity period, the lifetime probability of collision for a Swarm satellite” would remain “less than 4e-7,”¹² and would be “mitigated by Swarm’s maneuvering capabilities in any event.”¹³

None of the commenting parties disagree. ORBCOMM and Myriota do not contest the merits of these modifications at all, and instead focus exclusively on spectrum sharing matters raised in the Amendment. SpaceX, for its part, filed in support of Swarm’s active propulsion system designed to “enhance the safety profile” of Swarm’s NVNG system.¹⁴ Swarm anticipates including propulsion on all of its satellites as soon as possible—urging other smallsat constellation operators located at altitudes above the International Space Station to follow suit. SpaceX and Swarm have been working together in a positive coordination effort to peacefully coexist with overlapping orbital altitudes, and plan to use active propulsion and maneuvering when needed to ensure the continued responsible stewardship of space and the mitigation of orbital debris. Swarm for its part, will provide detailed ephemeris and other relevant operational data and take the concomitant actions upon a conjunction warning with SpaceX or any other operators, following best practices. These technologies and coordination principles, if followed by other operators, should allow multiple constellations to operate within the same LEO altitude bands on a non-exclusive, equal-opportunity basis.

Accordingly, the Commission should grant the Modification Application without delay. Doing so would allow Swarm to take advantage of earlier launch opportunities and reach full

¹¹ *Id.* at 11.

¹² *Id.* at 9.

¹³ *Id.* at 12.

¹⁴ SpaceX Comments at 1.

deployment as soon as possible, while improving the safety of its system. Longstanding Commission policy also favors a prompt grant of this authority, which does not implicate mutual exclusivity concerns. As explained in the Modification Application, the Commission’s rules provide that “applications for modifications of space station authorizations *will be granted*”¹⁵ where, as here, they do not “present any significant interference problem” and are “otherwise consistent with the Commission’s policies.”¹⁶ The Commission also should consider requiring current round participants to provide information about the status of their propulsion plans, if any, given that inter-operator discussions around risk reduction have already begun to take place.

II. THE COMMISSION SHOULD DENY ORBCOMM’S PETITION, DIRECT ORBCOMM TO COORDINATE IN GOOD FAITH WITH SWARM AND MYRIOTA, AND ADD ORBCOMM TO THIS PROCESSING ROUND TO THE EXTENT NECESSARY.

A. SWARM HAS SUFFICIENTLY DEMONSTRATED THAT IT CAN COEXIST WITH ORBCOMM.

The bulk of ORBCOMM’s petition argues that Swarm’s Amendment does not satisfy the requirements of 47 C.F.R. § 25.142(a)(1). These arguments are implausible in the extreme—and rest on a deliberately obtuse understanding of ORBCOMM’s obligation to share VHF with other operators.

1. Swarm provided sufficient information in its application.

Section 25.142(a)(1) requires applicants to “file information . . . showing, based on existing system information publicly available at the Commission at the time of filing, that they will not cause unacceptable interference to any non-voice, non-geostationary mobile-satellite service system authorized to construct or operate.”¹⁷ Section 25.142(b)(3), in turn, establishes a

¹⁵ 47 C.F.R. § 25.117(d)(2) (emphasis added); Modification Application, Narrative at 11.

¹⁶ *Teledesic LLC*, Order and Authorization, 14 FCC Rcd. 2261 ¶ 5 (Int’l Bur. 1999).

¹⁷ 47 C.F.R. § 25.142(a)(1).

mechanism for avoiding unacceptable interference to existing NVNG MSS licensees: intersystem coordination.¹⁸ Importantly, the obligation to coordinate applies to “[*a*ll affected applicants, permittees, and licensees,” and not just ORBCOMM’s competitive target—Swarm. And it requires all such parties to “make every reasonable effort to resolve technical problems and conflicts that may inhibit” the “effective and efficient use” of spectrum.¹⁹ Thus, where co-frequency operations are contemplated, both requirements fit hand-in-glove: an applicant must provide information showing coordination is reasonably achievable, but need not complete coordination in advance of filing, which is a two-way—or, in this case, three-way—street that requires the cooperation of *all* parties.

Swarm has more than satisfied the Commission’s application requirements. In the Amendment, Swarm explained that it is “willing to coordinate its proposed frequency usage with ORBCOMM to prevent harmful interference and ensure efficient use of limited NVNG MSS radio spectrum.”²⁰ Swarm also identified specific sharing mechanisms and system characteristics that would enable successful coordination. As Swarm explained, “the comparatively low power (and low power density) of Swarm’s transmissions in any given direction” decreases the likelihood that co-frequency transmissions will result in harmful interference.²¹ Moreover, as the Commission itself acknowledged when granting Swarm’s space station license, “Swarm uses Carrier-Sense Multiple Access media access control protocol with Collision Avoidance (CSMA/CA), which employs a ‘listen-before-talk’ protocol to verify the absence of other traffic before transmitting on a given channel” and “can also share channels by using time-division multiple access (TDMA)

¹⁸ *Id.* § 25.142(b)(3).

¹⁹ *Id.* (emphasis added).

²⁰ Amendment, Narrative at 30.

²¹ *Id.*

and by implementing geographic sharing techniques.”²² Contrary to ORBCOMM’s claims, access to the entire VHF MSS bands and additional satellites on orbit, as sought in the Amendment, would only increase Swarm’s “flexibility to avoid active channels and thus deconflict operations.”²³

2. ORBCOMM’s minimal use of the band and latency tolerance further demonstrates that coordination is feasible.

ORBCOMM nevertheless contends that harmful interference into its existing VHF operations is a foregone conclusion.²⁴ In doing so, however, ORBCOMM never describes what those operations are, and the criteria required for their protection—and for obvious reasons. During a conference call discussing 2018 Q1 earnings, Mark Eisenberg, ORBCOMM’s CEO, responded to a question from an analyst regarding launching four to six new satellites by stating: “But the clear answer is there’s not a need for them right now. . . . the satellites that are up there right now they’re sitting at like single digit capacity. They’re not flexing a muscle up there. They’re doing just fine.”²⁵ ORBCOMM goes even further in its 2019 annual report, assuring investors that it has “multiple times” more capacity “than current demand” and needs “just one or two” VHF channels to meet system requirements.²⁶

This highly inefficient use of the VHF band—at “single digit capacity”—is inconsistent with the “effective and efficient use of the radio spectrum” the Commission envisioned,²⁷ and has persisted notwithstanding ORBCOMM’s long period of incumbency. ORBCOMM’s original constellation commenced commercial operations in April 1995, and more than six years have

²² *Id.*; see also *Swarm Grant* ¶ 17.

²³ Amendment, Narrative at 31.

²⁴ ORBCOMM Petition at 12-13.

²⁵ ORBCOMM 1Q2018 Earnings Call Transcript at 10.

²⁶ ORBCOMM 2019 10-K at 11-12.

²⁷ 47 C.F.R. § 25.142(b)(3).

passed since the first of its second-generation satellites reached LEO. ORBCOMM’s attempts to add users by acquisition do not appear to have made much of a difference.²⁸

Recent developments confirm that ORBCOMM remains disinterested in developing and investing in its limited VHF business. As an initial matter, ORBCOMM has no apparent plans to replace the six second-generation “OG2” satellites launched in 2014 and 2015 affected by anomalies.²⁹ On its August 2017 investor conference call, ORBCOMM’s CEO stated that the reduction of capacity has not jeopardized service for customers, noting that “[t]here’s been little effect on message delivery times and no impact on message throughput and revenue.”³⁰ Moreover, in 2014 ORBCOMM acquired Skywave, which provides satellite-based IoT service over Inmarsat satellites, but did not acquire any satellites or operations of Inmarsat. This acquisition further demonstrates ORBCOMM’s shift away from VHF—and from being a satellite operator in the first place. And although ORBCOMM’s financial reporting became more opaque after 2012—when it stopped reporting subscriber additions by type—they continue to suggest that ORBCOMM derives the vast majority of its revenue from reselling other operators’ network capacity, and that usage on ORBCOMM’s VHF system accounts for just a small fraction of its actual service business, which has operated at a nearly perpetual net loss.³¹

²⁸ Caleb Henry, *Orbcomm, with inthinc in hand, completes tenth acquisition in five years*”, SPACENEWS (June 13, 2017), <https://spacenews.com/orbcomm-with-inthinc-in-hand-completes-tenth-acquisition-in-five-years-time/>.

²⁹ 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/>.

³⁰ Thomson Reuters Streetevents, *Edited Transcript, ORBC – Q2 2017 ORBCOMM Inc Earnings Call* 6 (Aug. 3, 2017), <http://investors.orbcomm.com/static-files/12064b31-837d-4e57-a356-218133103420>. See also ORBCOMM 1Q2018 Earnings Call Transcript at 10 (emphasizing the lack of need for more system capacity).

³¹ Thomson Reuters Streetevents, *Edited Transcript, ORBC – Q2 2018 ORBCOMM Inc Earnings Call* 10 (Aug. 1, 2018), <http://investors.orbcomm.com/static-files/08cbd7d3-51d4-45fd-97b5-fd34bd62a92f> (explaining that ORBCOMM’s satellite subscribers account for less than one-third of total subscribers); see also ORBCOMM 2019 10-K at 18.

3. ORBCOMM’s technical arguments lack merit.

ORBCOMM’s technical musings about interference are not credible in any event. ORBCOMM complains that Swarm’s use of CSMA/CA “provides no protections to ORBCOMM, unless the Swarm user terminal is within relatively close proximity” to an active ORBCOMM terminal.³² But ORBCOMM does not explain why the LBT protections built into CSMA/CA would even be necessary if terminals are separated by significant distances, where pathloss alone would be adequate to protect these distant terminals in both blocked *and* unblocked line-of-sight scenarios—only the latter of which ORBCOMM cares to consider. A properly-tuned CSMA/CA detection threshold can, in fact, protect both near and far receivers: near receivers because the CSMA/CA-equipped terminals will respectfully listen before talking, and far receivers because pathloss itself prevents interference outside the large protection radius enforced through the CSMA/CA detection threshold.

ORBCOMM likewise speculates that Swarm’s channel sizes could mean that “a single Swarm uplink transmission” might “[jam] active ORBCOMM transmissions on between 10 and 50 ORBCOMM subscriber uplink channels at one time.”³³ How this far-fetched interference scenario might occur in the real-world given ORBCOMM’s limited use of the band and meager customer base goes unmentioned, as ORBCOMM would need an over-subscribed and capacity-constrained system to realize its fantasy of 10 to 50 simultaneous uplink transmissions on its network. In any event, Swarm’s devices employ LBT and can vary channel sizes based on its subscribers’ needs and the interference environment.

³² ORBCOMM Petition at 12.

³³ *Id.*

ORBCOMM also claims, for the first time, that Swarm’s *downlink* operations threaten harmful interference.³⁴ But ORBCOMM never presented any such issue when opposing Swarm’s prior application,³⁵ and has always understood that its downlink spectrum would be shared with multiple operators.³⁶

Finally, the conspicuous absence from ORBCOMM’s petition of Myriota, who is also petitioning for access to the VHF NVNG band, shows that ORBCOMM’s arguments have more to do with slowing competition than prevailing on the technical merits. As explained below, Swarm has provided *more* information about its network than has Myriota, and Swarm’s system is *more* capable of sharing effectively than Myriota’s, based on current information.³⁷ From ORBCOMM’s perspective, the only relevant difference between the two is that Swarm’s VHF system is on the cusp of commercial deployment while Myriota’s remains years away—and thus poses a less immediate threat to the struggling ORBCOMM monopoly.³⁸

4. ORBCOMM’s legal arguments also lack merit.

ORBCOMM claims that “Swarm made no effort to coordinate with ORBCOMM before or after filing its Amendment Application.”³⁹ Not only is this untrue—Swarm has attempted to coordinate with an increasingly defiant ORBCOMM for about two years—it is also irrelevant. Swarm’s application fully recognizes that ORBCOMM and Swarm (and Myriota) must coordinate

³⁴ *Id.* at 13.

³⁵ *See Swarm Grant* ¶ 9 (“ORBCOMM does not object to Swarm’s propose use of downlink frequencies in the 137-138 MHz band.”); *see also* Petition to Deny of ORBCOMM, IBFS File No. SAT-LOA-20181221-00094 (filed Apr. 1, 2019).

³⁶ *See Amendment of Part 25 of the Commission’s Rules*, Report and Order, 13 FCC Rcd. 9111, ¶¶ 43, 79, 81 (1997).

³⁷ *See infra* Section III.

³⁸ *See* ORBCOMM 2019 10-K at 18 (noting that new and advanced systems like Swarm’s threaten Orbcmm’s “pricing flexibility” and even outright obsolescence).

³⁹ ORBCOMM Petition at 6.

overlapping operations. And the only authority ORBCOMM cites in support of its claim that such coordination must occur “pre-filing” is its *own petition* opposing Swarm’s 2018 space station application—a petition the Commission denied after rejecting ORBCOMM’s arguments.⁴⁰

ORBCOMM also disputes any obligation to coordinate because it participated in the processing rounds of the 1990s while Swarm did not.⁴¹ But this position belies the text of Section 25.142(b), which requires all existing licensees to coordinate with all applicants. Nothing in the rule exempts prior round participants from that obligation; to the contrary, the rule plainly applies to “[a]ll affected applications, permittees, and licensees[.]”⁴² In any event, the Commission already rejected ORBCOMM’s argument. In granting Swarm’s license, the Commission declined to hold Swarm to the results of processing rounds “closed more than 20 years ago,” concluding that it does “not expect,” and will not “require,” new NVNG MSS systems “to be bound” by them.⁴³ Thus, the fact that Swarm did not participate in a long-defunct round that predated its formation by decades is entirely irrelevant. To comply with the Commission’s rules, ORBCOMM must coordinate in good faith with Swarm and Myriota over shared access to its VHF spectrum.

For much the same reason, the Commission should reject ORBCOMM’s assertions of “priority rights” in its primary VHF assignments.⁴⁴ Nothing in ORBCOMM’s license states that its primary assignments are exclusive vis-à-vis new operators, and the coordination obligation in Section 25.142(b)(3) makes clear that is not the case. As explained, the obligation to “cooperate

⁴⁰ *Id.* at 6-7; *Swarm Grant* ¶¶ 12-13.

⁴¹ ORBCOMM Petition at 7 (claiming that ORBCOMM is only required to share spectrum pursuant to “previously reached mutually agreed spectrum sharing agreements in both the initial NVNG MSS processing round and Second Processing Round”).

⁴² 47 C.F.R. § 25.142(b)(3) (emphasis added).

⁴³ *Swarm Grant* ¶ 14; *see also id.* at n.43 (noting that the sharing plans emerging from the 1990s processing rounds were not incorporated into the Commission’s NVNG MSS service rules).

⁴⁴ ORBCOMM Petition at 7; *see also id.* at 2, 8, 10.

fully and make every reasonable effort” during coordination under Section 25.142(b)(3) applies equally to new “applicants” *and* existing “licensees.”⁴⁵ Moreover, while the specific spectrum sharing plan adopted in the 1990s may have provided ORBCOMM with one or two exclusive assignments, the Commission has determined that the plan does not govern ORBCOMM’s spectrum rights vis-à-vis new entrants applying 20 years later,⁴⁶ and the bulk of ORBCOMM’s assignments were always intended to be shared in any event.⁴⁷ That ORBCOMM faces no prejudice from coordinating across the band—again, it needs “just one or two” channels in VHF to operate successfully—makes its plea for special privileges even less defensible.⁴⁸

At the very least, ORBCOMM cannot *possibly* claim priority in the many frequencies that were subject to sharing even under the defunct 1990s sharing plan.⁴⁹ Those frequencies include 148.000-148.250 MHz, 148.750-148.855 MHz, 148.905-149.585 MHz, and 149.635-149.900 MHz.⁵⁰ If the Commission allows ORBCOMM to assert priority in those frequencies, it will provide ORBCOMM with an incumbent advantage that did not even exist at the time ORBCOMM was licensed. The Commission should not allow ORBCOMM to benefit *in perpetuity* from the failed launches of prior round participants by elevating its status in what was always co-equal spectrum.

⁴⁵ 47 C.F.R. § 25.142(b).

⁴⁶ *Swarm Grant* ¶ 14.

⁴⁷ *Applications of ORBCOMM License Corp.*, Order and Authorization, 23 FCC Rcd. 4804, ¶¶ 22-23 (Int’l Bur., Office of Eng’g and Tech. 2008) (“*ORBCOMM 2008 Modification Order*”).

⁴⁸ ORBCOMM 2019 10-K at 12.

⁴⁹ See ORBCOMM 2008 Modification Order ¶¶ 22-23.

⁵⁰ As the Commission reiterated last year, ORBCOMM “must limit operations to its primary assigned bands” upon commencement of operations by a qualified licensee. *Swarm Grant* ¶ 12.

B. THE COMMISSION MUST DIRECT ORBCOMM TO COORDINATE IN GOOD FAITH AND SHOULD CONSIDER DESIGNATING ITS AUTHORIZATIONS FOR INCLUSION IN THE PROCESSING ROUND.

In light of ORBCOMM’s persistent evasion of its sharing obligations, the Commission should clarify in any orders resolving this processing round that ORBCOMM must coordinate in good faith with Swarm and Myriota across all of its heavily underutilized primary assignments. In doing so, the Commission should emphasize that ORBCOMM must “make every reasonable effort to resolve technical problems and conflicts that may inhibit effective and efficient use of the radio spectrum.”⁵¹ It also should clarify that ORBCOMM has no claim of “priority” vis-à-vis Swarm and Myriota, especially in those portions of ORBCOMM’s primary assignments that were explicitly designated for sharing under the 1990s plan.

If ORBCOMM continues to resist sharing with new entrants—or if the Commission otherwise believes the procedure is necessary—the Commission should designate ORBCOMM’s authorizations for inclusion in this processing round. Doing so would eliminate any continued ability for ORBCOMM to hoard its little used VHF spectrum, and put an end to ORBCOMM’s multi-year effort to thwart competition from a smallsat segment that has emerged as a cornerstone of the Chairman’s space agenda.⁵²

These practical steps are especially critical now that ORBCOMM, a U.S. licensee, has taken its efforts to evade and deny its spectrum sharing requirements globally. In recent comments to a European CEPT Public Consultation, which would newly license Swarm (and four other smallsat systems) for European operations, ORBCOMM urged CEPT to prohibit Swarm from operating in the very frequencies that the Commission authorized Swarm to use last year, claiming

⁵¹ 47 C.F.R. § 25.142(b)(3).

⁵² *See, e.g.*, Ajit V. Pai, Chairman, FCC, Remarks Before the U.S. Chamber of Commerce at the 2nd Annual Space Summit, LAUNCH: The Space Economy (Dec. 3, 2019) (discussing the possibilities of systems like Swarm’s).

incompatibility with itself as the incumbent U.S. system.⁵³ As the Commission unequivocally explained, however, ORBCOMM must vacate those frequencies upon Swarm’s commencement of operations as a condition of ORBCOMM’s FCC satellite license.⁵⁴ ORBCOMM nevertheless asserts that there is no such restriction “on ORBCOMM uplink operations” in CEPT countries, and that the FCC’s decisions limiting ORBCOMM’s “subbands” do not apply overseas.⁵⁵ In other words, ORBCOMM has stated in no uncertain terms that it will not comply with the FCC’s existing plan for sharing VHF amongst U.S.-licensed operators in Europe and perhaps other parts of the world, even though it must do so as an FCC satellite licensee.⁵⁶ Enough is enough. The Commission cannot allow ORBCOMM to continue pretending that it holds exclusive rights to the VHF band. It should take all steps necessary to prevent ORBCOMM from further delaying and disputing the rights of licensed operators—and to ensure that ORBCOMM negotiates in good faith with Swarm and other operators.

⁵³ See European Conference of Postal and Telecommunications Administrations (CEPT) Electronic Communications Committee (ECC) Working Group SE 40 – “Space Service compatibility issues,” submission of ORBCOMM, *ORBCOMM COMMENTS Re-Draft revision of ERC/DEC/(99)06*, (submitted August 25, 2020) (“CEPT submission”), https://www.cept.org/Documents/se-40/59921/se40-20-56_orbcomm-comments-re-draft-revision-of-erc-dec-99-06-final-20aug20-3.

⁵⁴ *Swarm Grant* ¶ 12.

⁵⁵ CEPT submission at 3-4.

⁵⁶ See, e.g., *ORBCOMM 2008 Modification Order* ¶¶ 22-23 (requiring ORBCOMM to vacate secondary assignments to make room for a new U.S.-licensed entrant); *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, 32 FCC Rcd. 7809, ¶ 53 (2017) (clarifying that rules governing sharing between U.S.-licensed NGSO operators apply to both U.S. and non-U.S. operations); *Globalstar Licensee LLC, GUSA Licensee LLC, and Iridium Constellation LLC, Iridium Satellite LLC, and Iridium Carrier Services LLC*, Order of Modifications, 23 FCC Rcd. 15207, ¶ 40 (2008) (emphasizing that the Big LEO sharing plan between Globalstar and Iridium “require[s] Globalstar to continue to operate both in the United States and throughout the world pursuant to the grant of operating authority contained in its [FCC] license, as modified[.]”).

C. THE COMMISSION SHOULD GRANT SWARM A LIMITED WAIVER OF FOOTNOTE US323 CONDITIONED ON AGREEMENT WITH FEDERAL USERS.

In the Amendment, Swarm sought a limited waiver of footnote US323 to the U.S. Table of Frequency Allocations to “expand and diversify the services supported by the Swarm system.”⁵⁷ The request was modest in scope and would grant authority for individual mobile earth stations communicating with Swarm’s constellation in the 148.0–149.9 MHz band to transmit for a duration of up to 1700ms without a minimum wait time, so long as each terminal observes a 1% duty cycle within any 15-minute period and avoids frequencies actively being used by Federal terrestrial systems.⁵⁸ Swarm explained that it was working with the National Telecommunications and Information Administration (NTIA) and federal users to demonstrate that their operations would remain protected under the terms proposed.

ORBCOMM opposes the waiver, claiming that it would be unfair to ORBCOMM.⁵⁹ But waivers are appropriate where enforcing a rule would not serve the rule’s purpose⁶⁰—and the purpose of footnote US323 was not to protect ORBCOMM.⁶¹ As the Commission explained, US323 was intended “to protect *existing government users*” in VHF “from interference,”⁶² and to provide a “basis for frequency coordination between MSS mobile earth stations” and federal “*fixed and mobile operations.*”⁶³ ORBCOMM is not a terrestrial operator, and it is not a government user of spectrum. Its misgivings, in short, are simply irrelevant.

⁵⁷ Amendment, Narrative at 37.

⁵⁸ *Id.*

⁵⁹ ORBCOMM Petition at 14.

⁶⁰ *WAIT Radio v. FCC*, 418 F.2d 1153, 1157-60 & n.21 (D.C. Cir. 1969).

⁶¹ *Amendment of Section 2.106 of the Commission’s Rules to Allocate Spectrum to the Fixed-Satellite Service and the Mobile-Satellite Service for Low-Earth Orbit Satellites*, Report and Order, 8 FCC Rcd. 1812, ¶ 16 (1993).

⁶² *Id.* ¶ 16 (emphasis added).

⁶³ *Id.* ¶ 20 (emphasis added).

ORBCOMM's claim that the waiver would affect its operations is hard to fathom in any event. The waiver sought by Swarm would retain the duty cycle limitation imposed by the footnote. The only difference is that the minimum wait time would be eliminated, and the maximum transmit time slightly extended. It is inconceivable that such modest changes would thwart effective coordination with ORBCOMM where the two systems' frequencies overlap, especially given ORBCOMM's limited use of this spectrum. Where ORBCOMM and Swarm's operations do not overlap—such as in frequencies assigned to Swarm that fall outside of ORBCOMM's primary assignments—even theoretical impacts are non-existent.

The Commission also should reject ORBCOMM's request to address the waiver "in the context of a rulemaking proceeding."⁶⁴ Swarm has been working with NTIA and federal users to demonstrate that *Swarm's* system would not hinder federal operations under the specific waiver proposed. It has tailored the parameters of the waiver based on the needs of *its system*, the sharing capabilities of *its system*, and how *its system* interacts with existing federal terrestrial systems.⁶⁵ Likewise, in seeking a waiver, Swarm explained the public interest benefits as they apply to Swarm's business, which differs materially from ORBCOMM's.⁶⁶ Thus, nothing about the request suggests that the adoption of new, generally applicable rules would be appropriate or necessary. To the extent ORBCOMM believes wholesale changes to the rules are called for, it is free to petition for a rulemaking under 47 C.F.R. § 1.401 as it sees fit.

⁶⁴ ORBCOMM Petition at 14.

⁶⁵ Amendment, Narrative at 35-37.

⁶⁶ *Id.*

III. THE COMMISSION SHOULD ENSURE THAT MYRIOTA IMPLEMENTS APPROPRIATE SHARING TECHNIQUES.

Myriota filed comments asking the Commission to require Swarm, Myriota, and ORBCOMM to coordinate on a “new sharing plan.”⁶⁷ Swarm agrees that coordination among all three operators will be required. However, while Swarm has already designed its system to facilitate sharing among several operators, it remains concerned how Myriota will do the same. Given the limitations already posed by ORBCOMM’s outdated system, such a development would lead to a disastrously inefficient use of scarce satellite spectrum.

Part of the problem lies in the fact that Myriota’s VHF network remains in the early phases of system design. Myriota’s VHF application largely restates its plans for UHF without elaboration “in the interest of administrative convenience and brevity,” and Swarm has been unable to determine Myriota’s stance on best sharing practices and coordination strategy during preliminary technical discussions.⁶⁸ Thus, while Swarm agrees with Myriota that the Commission “should require Swarm, Myriota, and ORBCOMM to develop a new sharing arrangement,”⁶⁹ the Commission should direct the parties to make available the information necessary to accomplish that objective while promoting “effective and efficient use” of NVNG MSS spectrum.⁷⁰ Indeed, as matters stand, a more extensive interference study—and potentially more development progress on the part of Myriota with respect to its proposed VHF system—would be necessary to determine whether Myriota’s system can co-exist effectively with Swarm or *any* other operator that plans to deploy a significant amount of services in the VHF bands.

⁶⁷ Myriota Comments at 1, 6.

⁶⁸ See Myriota Pty Ltd, *Petition for Declaratory Ruling to Access the U.S. Market using NVNG MSS Spectrum*, IBFS File No. SAT-PDR-20191118-00135, Technical Description at 1 (filed Nov. 18, 2019) (“Myriota Application”).

⁶⁹ Myriota Comments at 2.

⁷⁰ 47 C.F.R. § 25.142(b)(3).

The situation with Myriota demonstrates the need for such a requirement. Specifically, Myriota does not appear to employ a listen before talk (LBT) technique to protect other users in these bands, which is a critical element for achieving an efficient coordination. Moreover, while Myriota’s proposal regarding coordination between Swarm and Myriota suggests “defining suitable duty cycle and power limits,”⁷¹ it has been unable to adequately clarify those characteristics of its system. Instead, all it has made available has been averaged parameters for “system-wide duty cycle,” rather than a specific downlink maximum duty cycle, and Myriota likewise provides power limits only for certain modules and not others (i.e., “less than 5 dBW EIRP” for the Myriota IoT Module and no power limit discussed for the Myriota micro-gateways).⁷² Finally, Swarm has questions about the completeness of Myriota’s ITU filing “MNSAT” filed through the Australian Administration published in BR IFIC 2878 on September 4, 2018 and the possibility that Myriota may use other filings ultimately to provide services in the U.S. Swarm needs to know the characteristics of the actual system Myriota plans to deploy in order to successfully coordinate with it.

Fortunately, the Commission can use the long lead-time behind Myriota’s VHF system to its advantage and ensure that Myriota designs its system to share effectively from the ground up. Specifically, before simply directing the parties to coordinate, the Commission should require Myriota to exchange information about its ability to co-exist with other operators as that information becomes available. That information should include whether Myriota plans to implement an LBT protocol, and if so, what kind, and how Myriota plans to ensure that its terminals do not communicate unnecessarily when no satellite would be available to receive its

⁷¹ Myriota Application, Technical Description at 5.

⁷² *Id.* at 6.

signals. That information also should provide more details regarding the specific maximum duty cycle and transmit and receive power limits for its satellites and each of its user devices for both downlink and uplink, among other parameters necessary to determine the contours of a spectrum sharing plan—and confirm that Myriota’s future system is capable of effectively sharing VHF spectrum.

CONCLUSION

The Commission should grant Swarm’s unopposed Modification Application as soon as possible. To resolve the spectrum sharing concerns raised in the processing round, the Commission should direct ORBCOMM to comply with its obligations to coordinate sharing of VHF spectrum, and include ORBCOMM’s authorizations in the round as necessary to achieve that objective. The Commission also should require Myriota to exchange information about its ability to share spectrum with other operators.

Respectfully submitted,

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September 1, 2020

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing Consolidated Opposition and Response of Swarm Technologies, Inc. was served on September 1, 2020 by First Class Mail to:

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