

When the Assembly Line Breaks Down:¹ Reassessing FCC Licensing of Next- Generation Satellite Systems

James E. Dunstan²

The FCC's Space Bureau wants to create an "assembly line" for processing satellite applications. But assembly lines work only if the component parts are ready for assembly, and then once off the assembly line, the end product can be delivered to users.

Without firm rules requiring rapid deployment on strict timelines, the FCC's assembly line process will be choked by paper applications that not only delay processing of genuine, high-fidelity applications but also undermine the Commission's carefully calibrated spectrum sharing rules for next-generation satellite systems. Under the current system which has been gamed through the use of extensive deployment extension requests, there is every incentive to file as early as possible to gain interference protection, at the same time when the applicant really isn't fully prepared to deploy consistent with Section 25.164 of the FCC's rules. Deployment milestones are a critical first line of defense against these premature, speculative, and oversized applications.

This paper poses alternatives to relieve this chokepoint, including the status quo of either freezing constellation sizes to those satellites launched at the end of six years or granting extensions to the six-year milestone, removing Section 25.164(b) completely, or moving all undeployed satellites into a later processing round.

¹ Sung to the tune of "The Merry-go-Round Broke Down," aka the theme from Looney Tunes, written by Joshua Moshier and Carl Johnson. WatchTower Music, *Looney Tunes Official Soundtrack*, YOUTUBE (July 10, 2020), https://www.youtube.com/watch?v=GTY6ubgC5-c&list=RDGTY6ubgC5-c&start_radio=1.

² James E. Dunstan is Senior Counsel at TechFreedom, a nonprofit, nonpartisan technology policy think tank. He is also teaches outer space law as an adjunct professor of law at the Antonin Scalia Law School at George Mason University and the Sandra Day O'Connor School of Law at Arizona State University. He can be reached at jdunstan@techfreedom.org.

TABLE OF CONTENTS

An Assembly Line for Satellites?	1
I. The Current Licensing Regime for NGSO Satellites	2
A. NGSO Processing Rounds	4
B. Current Rule Mechanisms to Minimize Speculative Applications	5
1. Bond Requirements	5
2. Deployment Milestone Requirements	6
a. A Never-Ending Cascade of Extension Requests	9
b. Milestone Extensions in the New Space Age	10
II. Possible Solutions to the Deployment Problem	11
A. Continue the Status Quo, Grant Ad Hoc Milestone Deployment Extensions	11
B. Eliminate or Significantly Modify the Interim Deployment Milestone	12
C. Adopt a “Cap and Defer” Approach to Deployment	13
Conclusion	15

AN ASSEMBLY LINE FOR SATELLITES?

The stated goal of the FCC, and its Space Bureau, is to create an “assembly line” for satellite applications.

[O]ur proposal in this Notice designs a “licensing assembly line” to process space and earth station applications with great efficiency and at the speed and scale required by the 21st century space economy. Like a physical assembly line, we seek to move standardized application materials in direct paths from one stage of the review process to the next in a highly predictable way. Given the nature of our licensing duties, our assembly line will be designed so applications can be routed along different paths and segmented for review based on specific aspects of a request. By modernizing processes in our rules, we aim to set the stage for increasing automation over time. In this way, we expect—like actual assembly lines—that the space review processes can become more efficient and dramatically accelerated while improving the quality of the Commission’s licensing work for the American people.¹

When we visualize an assembly line, naturally we think back to Henry Ford, and how he revolutionized automobile manufacturing by creating a long assembly line where components (everything from engines to fenders) were prepositioned and then welded or bolted in place as the chassis traversed the ever-moving line in 84 distinct steps.² In 1913, a car was rolling off the assembly line every 24 seconds!³



All artwork generated using AI

But for the assembly line to work, all those components had to be ready. If the shipment of left fenders was late, the assembly line shut down. “Synchronizing the movement of parts and tasks across the line required careful planning and adjustments to avoid bottlenecks and downtime.”⁴ Unless everything was perfect, the assembly line stopped, or worse.

¹ Space Modernization for the 21st Century, Notice of Proposed Rulemaking, SB Docket No. 25-306, ¶ 3, adopted Oct. 28, 2025 (“Space Modernization NPRM” or “NPRM”).

² See John Bell Rae, *Ford and the assembly line*, BRITANNICA (Feb. 27, 2026), <https://www.britannica.com/technology/automotive-industry/Ford-and-the-assembly-line>.

³ *Henry Ford: Production of History*, <https://henryfordturningpoint.weebly.com/assembly-line-and-model-t.html> (last visited Apr. 6, 2026).

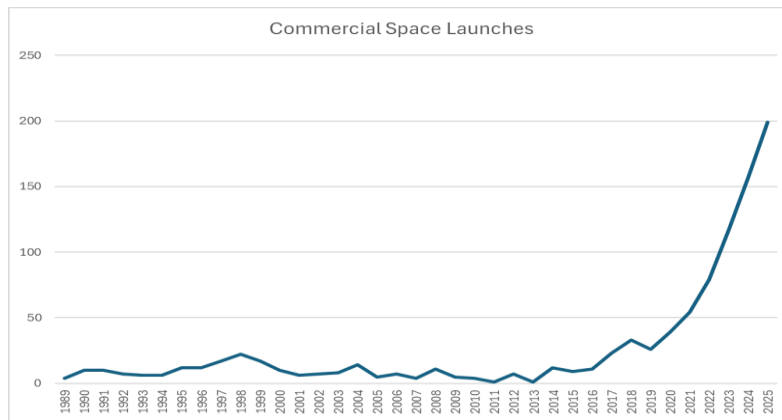
⁴ Daniel Croft, *Henry Ford’s Assembly Line*, LEARNLEANSIGMA (Dec. 24, 2024), <https://www.learnleansigma.com/improvement-methodology/henry-fords-assembly-line/>.



And even if the Ford assembly line worked perfectly, the process didn't end when the cars rolled off the assembly line. Those cars had to be distributed—delivered to the customer. What's the use of turning out two cars a minute if they pile up at the end of the line? That's where the FCC's analogy to an assembly line may already be broken.

I. The Current Licensing Regime for NGSO Satellites

First, it is critical to understand that many of the FCC's rules related to satellite systems were created based on the space economy in the 1980s. "Many of the current rules in 47 CFR part 25 were the result of the codification of the Commission's ad hoc processes in the early 1990s."⁵ As the Space Modernization NPRM stated: "The Commission received 295 space station applications and 2,684 earth station applications in 2024. In contrast, the Commission received only 124 space station applications and 974 earth station applications in 2016."⁶ To put this into proper context, since the FCC deals with licensing commercial satellites (as opposed to satellites using government frequencies such as NASA and DOD operations), the chart below depicts the number of FAA authorized commercial rocket launches that deliver these commercial payloads. This provides a better proxy for the licensing burdens on the FCC:



Source: https://www.faa.gov/data_research

⁵ Space Modernization NPRM, n. 18 (citing Amendment of Part 25 of the Commission's Rules and Regulations, First Report and Order, FCC 91-136, 6 FCC Rcd 2806 (1991); New Rules for Part 25 – Satellite Communications, Public Notice, DA 91-763, Report No. DS-1097, 6 FCC Rcd 3738 (1991); Implementation of New Part 25 Regulations, Public Notice, DA 97-1967, Report No. SPB-104, 12 FCC Rcd 13850 (1997)).

⁶ Space Modernization NPRM ¶ 5 (footnotes omitted).

Thus, at the same time the FCC was forming the current satellite licensing rules, the FAA was authorizing single digit launches per year. Last year, the FAA authorized 199 launches. But even that number masks the true nature of what’s happening. Whereas a decade ago an application might specify one or just a few satellites, the FCC now receives applications that call for the deployment of huge constellations (sometimes referred to as megaconstellations),⁷ thousands, tens of thousands, and yes, even a million satellites. These large constellations are driving the increased flight cadence.⁸

The need for updated rules for space has been evident for some time,⁹ with calls coming from both sides of the aisle.¹⁰ But the need for reform isn’t just about increasing the throughput of the FCC processes, we need to also fully understand where the chokepoints exist in the entire ecosystem.

⁷ There is no clearly accepted definition of “megaconstellation,” nor is it critical to define for the purposes of this paper. For simplicity, we will simply define a “megaconstellation” as a constellation of at least 200 satellites. The FCC has used this demarcation in at least one instance: proposing to eliminate bonding requirements for satellite systems with fewer than 200 satellites. Space Modernization NPRM ¶ 176. According to at least one source, there currently are authorizations for at least nine 200+ megaconstellations, although a number of those are licensed outside of the United States, and some most likely will not seek market access with the FCC. *Largest satellite constellations*, FUTURETIMELINE, <https://futuretimeline.net/data-trends/23-largest-satellite-constellations.htm> (last visited Apr. 6, 2026).

⁸ See Space Bureau Accepts For Filing SpaceX’s Application For Orbital Data Centers, ICFS File No. SAT-LOA-20260108-00016, DA 26-113, released February 4, 2026 (SpaceX’s application calls for the deployment of up to one million satellites).

⁹ See James Dunstan, *Regulating Outer Space: Of Gaps, Overlaps, and Stovepipes*, THE CTR. FOR GROWTH AND OPPORTUNITY 15 (July 10, 2023), <https://www.thecgo.org/research/regulating-outer-space-of-gaps-overlaps-and-stovepipes/> (hereinafter GAPS, OVERLAPS) (“In many cases, there is a clear acknowledgement that the U.S. space regulatory system is broken, or at least so outdated that it can’t keep up with the pace of space progress.”).

¹⁰ See, e.g., Vice President Kamala Harris, Remarks at Chabot Space and Science Center: Supporting the Commercial Space Sector (Aug. 12, 2022), <https://www.whitehouse.gov/briefing-room/speeches-remarks/2022/08/12/remarks-by-vice-president-harris-on-supporting-the-commercial-space-sector/> (“To that end, we understand that we have got to update the rules, because they’re just simply outdated. They were written for a space industry of the last century.”); Chairman Brendan Carr, *Spectrum Is Back—Again!*, FCC BLOG (Apr. 4, 2025), <https://www.fcc.gov/news-events/blog/2025/04/04/spectrum-back-again> (“Unfortunately, new innovations have been held back by FCC technical rules that we adopted thirty years ago. Power limits developed in the 1990s to protect geostationary satellite systems from interference continue to restrict the performance of non-geostationary satellite systems, even though advancements in sharing technology arguably make the rules of the past no longer necessary. To fuel the growth of these new satellite broadband services, the Commission will vote to take a fresh look at the decades-old spectrum sharing regime between geostationary and non-geostationary satellite systems in these spectrum bands. Nerds and non-nerds alike may soon rejoice as they get even better service from space.”).

A. NGSO Processing Rounds

For NGSO systems (the bulk of new constellation applications), the Commission has adopted a “processing round” framework.¹¹ A new processing round is triggered by a lead application, which then establishes a cut-off date for the filing of other applications to be considered as part of that round.¹² The importance of the processing round regime is that each granted application in a processing round receives interference protection as against future processing rounds, and all grantees within a processing round must coordinate with each other for spectrum sharing/interference purposes. Critically, at the start of each processing round, the Commission must determine whether sufficient spectrum exists in the frequency band to accommodate all the qualified applicants under its default sharing rules. If insufficient spectrum exists, then the Commission divides spectrum equally among all qualified applicants.¹³ As discussed below, having fully formed applications at the initiation of a processing round is critical for the entire process.

The first processing round of the large LEO satellite constellations era, initiated by OneWeb in 2016, saw eleven competing applications. This was followed by three more rounds in 2017, 2020, and 2021, resulting in a total of 43 NGSO FSS satellite applications.¹⁴ Because satellite systems often operate over different spectrum bands, each processing round does not necessarily involve the same spectrum.

Thus, there is every incentive for any company contemplating launching a satellite system to board that merry-go-round and file in response to a lead application in a processing round. Historically, unfortunately, this has led to the filing of applications by companies which simply are not ready to build and launch (so-called “paper satellites”), both

¹¹ See Space Modernization NPRM ¶ 132 (citing Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems, IB Docket No. 21-456, RM-11855, Order and Notice of Proposed Rulemaking, 36 FCC Rcd 17871, ¶ 3 (2021) (2021 NGSO FSS Sharing Order)).

¹² 47 C.F.R. § 25.157(c). In the Space Modernization NPRM, the Commission is proposing to move to an annual processing round cycle, ¶¶ 132-139. TechFreedom has questioned whether this change, by itself, will actually improve the “assembly line” concept. See Comments in Space Modernization for the 21st Century, SB Docket No. 25-306, 31-32 (Jan. 20, 2026), <https://techfreedom.org/wp-content/uploads/2026/01/TechFreedom-Comments-Space-Modernization-1-20-26.pdf> (“More important, the discussion in paragraphs 132-139 fails to lay the fundamental predicate: exactly what is the problem the proposed rule will solve? It also fails to consider or analyze whether the solution will introduce unintended consequences that make the cure worse than the disease.”).

¹³ Consideration of Applications for NGSO-like satellite operation, 47 C.F.R. § 25.157(e)(1).

¹⁴ Argyris Kriezis, *NGSO Fixed Satellite Service Spectrum Priority in the US*, PAYLOAD (Dec. 18, 2024), <https://payloadspace.com/status-of-ngso-fixed-satellite-service-spectrum-priority-in-the-us-payload-research/>.

at the FCC and internationally.¹⁵ Yet the Commission’s rules require it to assess whether sufficient spectrum exists without foreknowledge of which applications are paper satellites and which are genuine, and to grant all licensees equal rights among each other and against future applicants.

B. Current Rule Mechanisms to Minimize Speculative Applications

Warehousing spectrum is nothing new. In virtually every frequency band, the FCC has had to contend with applicants not ready, willing, and able to deploy licensed spectrum.¹⁶ Satellite spectrum has been no different.¹⁷ The FCC has attempted to combat warehousing through two major mechanisms: bonds and milestones.

1. Bond Requirements

Under current FCC rules, space station licensees are required to post a surety bond covering the potential payment liability to the U.S. Treasury in the event of a milestone default.¹⁸ The Commission recently described the need for bonding:

The Commission adopted the application-stage surety bond requirement to establish a market-based mechanism for ensuring that licensees are financially willing and able to proceed with satellite construction and to discourage warehousing of scarce spectrum resources.¹⁹

For NGSO systems, licensees pay a bond based on the following formula:

¹⁵ See, e.g., Iulia-Diana Galeriu, “Paper Satellites” and the Free Use of Outer Space, *GLOBALLEX* (Apr. 2018), https://www.nyulawglobal.org/globalex/paper_satellites_free_use_outer_space1.html (“The issue of paper satellites was first recognized in 1990 when the Tongan Government filed for 16 GSO positions with the ITU, ultimately acquiring only 6 the following year, without a specific and realistic plan of launching its own satellites.”).

¹⁶ See, e.g., Report and Order in GEN Docket No. 91-2, 7 FCC Rcd 1630, 1640 (1992) (build-out requirements were intended “to reduce the filing of speculative applications by entities that have no real intention of implementing [IVDS] systems and to avoid the potential for warehousing of IVDS spectrum.”) (“IVDS Order”).

¹⁷ See Comprehensive Review of Licensing and Operating Rules for Satellite Services, Second Report and Order, 30 FCC Rcd 14713 at ¶ 30 (2015) (“[a]n application-stage bond requirement is necessary to ensure that applicants are qualified at an early stage of the licensing process and committed to and able to proceed with the project, when by their filing they may preclude the use of spectrum and orbital resources by other entities that are financially willing and able to proceed.”).

¹⁸ 47 C.F.R. §§ 25.165(a), (b).

¹⁹ Space Modernization NPRM ¶ 175.

$A = \$1,000,000 + \$4,000,000 * D/2192$, where A is the amount to be paid and D is the lesser of 2192 or the number of days that elapsed from the date of license grant until the date when the license was surrendered.²⁰

It should be noted that the Commission is contemplating eliminating the bonding requirement for satellite systems with fewer than 200 satellites that are not part of a processing round,²¹ and to modify the bond requirement equation from an escalating bond to a deescalating bond.²²

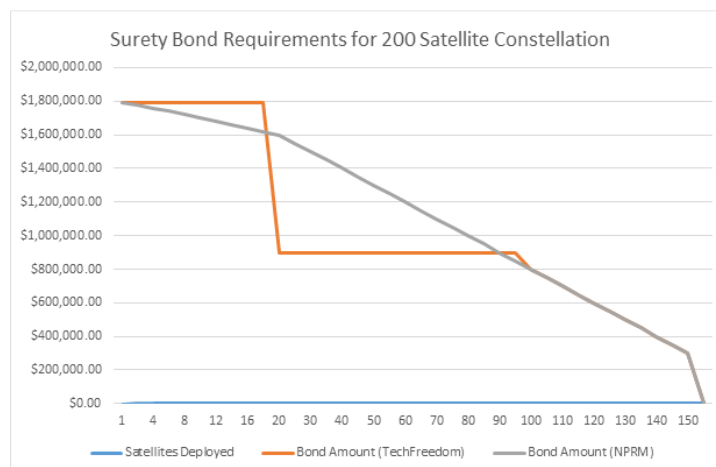
2. Deployment Milestone Requirements

The other way the FCC has countered warehousing is through strict deployment milestones.²³ As with other services for which the initial license term is ten years, NGSO satellite operators are required to deploy at least half of their satellites within six years of grant, and the remainder by nine years after grant.²⁴ When it adopted these milestones in 2017, the FCC said:

²⁰ 47 C.F.R. § 25.165(a)(1).

²¹ Space Modernization NPRM ¶ 176.

²² *Id.* ¶ 179 (“We believe that these proposed calculations, where the total amount of the surety bond would decrease based on the number of satellites deployed in an authorized system, would provide a more effective incentive structure to support satellite operators in reaching full deployment, rather than requiring payment of the surety bond based on compliance with deployment milestones.”). TechFreedom filed comments suggesting a stepped approach to the deescalating bond requirement to better capture failure points in the deployment cycle of large satellite systems. *See* Space Modernization comments, *supra* note 12, at 38. We submitted a graph that showed how this could work:



²³ *See* IVDS Order, *supra* note 16.

²⁴ 47 C.F.R. § 25.164(b)(1). Indeed, prior to 2017, FCC rules required satellite licensees to deploy 100 percent of their satellites within six years of grant. Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters, 32 FCC Rcd. 7809, ¶ 66 (2017) (“NGSO Update Order”).

First, it should be simple, clear, and easy to administer. Second, ***it should discourage applicants from seeking authorizations for oversized, unrealistic constellations***, even if those applicants eventually provide substantial service to the public. Proposals that allow applicants to set their own milestone objectives, that set more complex milestones, or that re engage the Commission in construction determinations would not achieve our dual milestone goals.²⁵

This statement, in hindsight, was beyond prophetic. When the FCC undertook to modify its rules to accommodate larger satellite constellations beginning in 2016, the only large constellation that had been licensed had been Teledesic, which initially proposed an 840 satellite system,²⁶ which later was reduced to 288 satellites,²⁷ and ultimately returned its license to the FCC in 2003 after deploying a single test satellite.²⁸

The Commission also adopted a clear approach to what happens if a licensee misses the interim milestone: “If a licensee fails to meet this milestone, its authorization will be reduced to the number of satellites in use on the milestone date, and the bond will be forfeit.”²⁹ The Commission went on to say that in that instance, “If the licensee wished to operate a greater number of satellites in the future, it would be required to file a license modification application.”³⁰ Any such modification application would have to demonstrate that it would not cause any additional interference to both systems licensed in the same processing round as well as subsequently filed applications.

For the reasons discussed below, we find the proposed modifications to Teledesic's space segment do not, in themselves, create any significant interference problems to other systems or make sharing between Teledesic and other NGSO FSS systems significantly more difficult. In so finding, we disagree with Teledesic that we should evaluate its modification application only in reference to its impact on the NGSO FSS system on file before Teledesic filed its modification application, and not by reference to its impact on other proposed second round Ka-band systems. The Commission stated in the Ka-

²⁵ NGSO Update Order, *supra* note 24, ¶ 66 (emphasis added, footnotes omitted).

²⁶ See Teledesic Corporation, Order and Authorization, 12 FCC Rcd. 3154 (Int'l Bur. 1997) (“Teledesic Licensing Order”).

²⁷ See Teledesic LLC, DA 99-267, released Jan. 29, 1999.

²⁸ *Teledesic Relinquishes License*, VIASATELLITE (July 14, 2023), <https://www.satellitetoday.com/uncategorized/2003/07/14/teledesic-relinquishes-license/>.

²⁹ NGSO Update Order, *supra* note 24, ¶ 67.

³⁰ *Id.* n. 148.

band Service Rules Report and Order that we expect all NGSO FSS systems "to bear some portion of the technical and operational constraints necessary to accommodate multiple non-homogeneous NGSO FSS systems."¹⁹ Nowhere in that Order did we suggest that this burden would be limited only with respect to NGSO FSS systems licensed or applied for by a certain date. Consequently, we will evaluate Teledesic's proposed modifications with respect to all pending NGSO FSS applications, and with licensed systems operating in shared frequency bands.³¹

Finally, the Commission has made clear that processing rounds (and by implications, its "assembly line" approach to licensing), are inextricably tied to the milestone requirements.

We believe that the protection afforded to an earlier-round system by a later-round system should work in concert with our deployment milestones for NGSO systems to relieve earlier round grantees of the uncertainty of near-term, equal sharing with new entrants while also giving later round systems an equal opportunity after they have demonstrated their commitment to provide service and completed their final deployment milestone. To accomplish these goals, the sunset date should be tied to the date of authorization of systems in a subsequent processing round, and define the period during which they will be required to protect any earlier-round systems. With each new processing round, therefore, incumbents will be ensured of a period of time during which they will be protected by systems approved in that processing round, and may plan to accommodate those systems as they proceed through deployment, before the time that they will be required to share spectrum on an equal basis in the absence of a coordination agreement.³²

This approach, in theory, has allowed the FCC to address multiple processing rounds of applications, allowing for the washing out of speculative systems and providing significant legal and operational clarity to other licensees and down-round applicants. We've dubbed this the "gym membership" model of satellite licensing.³³ Like anyone running a gym, the FCC assumes that many (if not most) will ever show up to use the equipment. The FCC has simply

³¹ See Teledesic LLC, Order and Authorization, 14 FCC Rcd 2261, ¶ 7 (Int'l Bur. 1999) ("Teledesic Modification Order").

³² In the Matter of Revising Spectrum Sharing Rules for NonGeostationary Orbit, Fixed-Satellite Service Systems, Report and Order and Further Notice of Proposed Rulemaking, FCC 23-29, IB Docket No. 21-456, ¶ 30 (Apr. 21, 2023), <https://docs.fcc.gov/public/attachments/FCC-23-29A1.pdf>.

³³ Comments of TechFreedom In the Matter of Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems, NPRM, IB Docket No. 21-456, filed Aug. 7, 2023.

assumed that its milestone and bonding systems will protect against overly optimistic applicants and spectrum warehousing.

a. A Never-Ending Cascade of Extension Requests

Simple enough, right? Except that there has been a significant breakdown in a system that was designed to scrub slow and recalcitrant licensees: extensions. According to Amazon Leo, which currently has the largest extension request ever in terms of satellites that will not be launched within the six-year milestone window of Section 25.164,³⁴ the Commission has granted some 21 milestone waivers or extensions for satellites dating back to 1997.³⁵ If extensions are too common or their application too lax, then the milestones lose all bite, and the cost of speculation falls to nothing.

Back to the assembly line analogy; extensions and waivers represent that late-arriving left fender. The line grinds to a halt as the fender must be physically lugged down the line and attached to the car, while the rest of the assembly line workers idly watch. Progress stops. And those otherwise relying on the assembly line to work—truckers waiting at the end of the line to pick up and deliver the new vehicles? They bear the brunt of the cost in lost time and efficiency.

The same thing happens with milestone waivers at the FCC. Commission resources must be redirected from the assembly line of new application processing to address the issue of whether to grant a waiver of a completely clear rule. For the FCC, the resource drain is far more dramatic than assembly line workers standing idle. The Commission must also consider oppositions and comments to the waiver requests. And let's not kid ourselves that a certain degree of intramural scrumming and moat building isn't further mucking up the works.³⁶ Meanwhile, satellite operators have to act as if everything is running smoothly and undertake the costs of good faith coordination efforts with systems that likely won't be deployed consistent with FCC rules, some possibly wondering why they should follow the rules of others aren't required to.

³⁴ In the Matter of Application of Kuiper Systems LLC for Extension or Waiver of the Milestone Deadline, ICFS File Nos. SAT-MOD-20210806-00095, et al., Call Sign S3051 (Jan. 30, 2026) (“Amazon Milestone Extension Request”). Amazon LEO has stated that it hopes to launch only about 700 of the 3,232 authorized satellites before it's July 30, 2026, milestone deadline, leaving it over 2,500 satellites short.

³⁵ Amazon Milestone Extension Request, n. 30.

³⁶ See Brendan Carr (@BrendanCarrFCC), X (Mar. 11, 2026, 10:59 AM), <https://x.com/BrendanCarrFCC/status/2031746827645562940> (“Amazon should focus on the fact that it will fall roughly 1,000 satellites short of meeting its upcoming deployment milestone, rather than spending their time and resources filing petitions against companies that are putting thousands of satellites in orbit.”).

b. Milestone Extensions in the New Space Age

The problem with the 21 extensions cited by Amazon Leo is that the vast majority of waivers related to single GSO satellite with a known geostationary slot,³⁷ and the rest involved a very small number of satellites.³⁸ Both of those scenarios involve vastly different interference and coordination situations than posed in the case of large constellations. Satellite operators can easily coordinate and/or protect GSO slots—they literally do not move relative to the Earth and NGSO operators. Likewise, operators can take account of extensions related to a small number of LEO satellites.

Modern large constellations are a completely separate creature. The all-against-all coordination that satellite operators must conduct is expensive and time-consuming. And without knowing if or when or how many extensions the FCC will grant, operators have to treat all constellations as if they will be built and deployed within the milestone time periods. The FCC gets the benefit of assuming a gym membership model and no “oversized, unrealistic constellations,” but satellite operators must assume that every gym patron will show up, every day.

Further, as constellation sizes grow, potentially up to a million satellites, the ability to deploy 50 percent of the constellation within six years of grant will be impossible. The number can’t work.³⁹ Remember that “hockey stick” graph of FAA commercial launch

³⁷ See Amazon Milestone Extension Request, *supra* note 34. We count at least 15 waivers related to GSO satellites in this list. Intelsat Order (for Intelsat 10-02); Intelsat LLC, Order and Authorization, 17 FCC Rcd 2391 (IB 2002) (for Intelsat 903); GE American Communications, Inc., Order and Authorization, 16 FCC Rcd 11038 (IB 2001) (“GE Americom Order”) (for GE-7, later known as SES AMC-7); GE American Communications, Inc. and Alascom, Inc., Memorandum Opinion, Order and Authorization, 15 FCC Rcd. 23583 (IB 2000) (for nine satellites of SES predecessor GE Americom); GE American Communications, Inc., Memorandum Opinion and Order, 7 FCC Rcd 5169 (IB 1992) (for GE-1, later known as SES AMC-1); Loral Order (for Telstar 8, now known as Intelsat Galaxy 28); DIRECTV Order (for the DIRECTV RB-2 satellite); later operated by DIRECTV); AT&T Co., Order and Authorization, 5 FCC Rcd 5590 (1990) (“AT&T Order”) (for AT&T Telstar 401, 402, and 403); EchoStar Satellite Corp., Order and Authorization, 18 FCC Rcd 15975, ¶ 9 (IB 2003) (for EchoStar 9) (“EchoStar Order”); New ICO 2007 Order (for ICO G1, now known as EchoStar G1); Hughes Network Order (extending milestone for EchoStar Jupiter 3, which remains unbuilt); TerreStar Networks, Inc., Memorandum Opinion and Order, 22 FCC Rcd 17698 (2007) (“TerreStar Order”) (for EchoStar T1); ViaSat Order (extending milestone for VIASAT-3 based on partial completion of a single satellite); Viasat Inc., Order, 36 FCC Rcd 18160 (IB 2021) (same); Viasat Inc., Order, 37 FCC Rcd 13054 (IB 2022) (same).

³⁸ *Id.* See also EarthWatch Inc., Order and Authorization, 12 FCC Rcd 19556 (IB 1997) (“EarthWatch First Order”) (four satellites total); EarthWatch Inc., Order and Authorization, 15 FCC Rcd 13594 (IB 2000) (“EarthWatch Second Order”); EarthWatch Inc., Order and Authorization, 15 FCC Rcd 18725, (IB 2000) (“EarthWatch Third Order”); WildBlue Holdings, Memorandum Opinion and Order, 20 FCC Rcd 10846 (IB 2005) (“WildBlue Order”) (one satellite); Space Norway AS, Order and Declaratory Ruling, 38 FCC Rcd 9244 (SB 2023) (“Space Norway Order”) (two satellites).

³⁹ Taking SpaceX’s million orbital data center satellite model, for example, even if SpaceX had a rocket on the pad ready to launch the day its application was granted, it would have to launch 456 satellites *every day for*

licenses? To accommodate the total number of potential satellites from megaconstellations to be launched within six years of grant, that number would probably need to increase by a factor of five. In all likelihood, megaconstellation license holders will have to go back to the FCC to seek a waiver of the deployment rule. Thus, the deployment rules mean nothing. This must change.

II. Possible Solutions to the Deployment Problem

There are several approaches the FCC could take to address the milestone problem. These include maintaining the status quo (either freezing constellation sizes to those satellites launched at the end of six years or continuing to grant extensions), removing Section 25.164(b) completely, or moving all undeployed satellites into a later processing round.

A. Continue the Status Quo, Grant Ad Hoc Milestone Deployment Extensions

The Commission could simply continue the status quo of the gym membership model, and hope that “oversized, unrealistic constellations” simply go away. But it does so at its own peril. Indeed, in the Initial Regulatory Flexibility Act Analysis to the Space Modernization NPRM,⁴⁰ the FCC justifies reforms based on the savings that will be enjoyed through its assembly line:

We attribute these potential savings to limits on the cases in which operators are required to submit modification filings and STA requests, ***elimination of the need for applicants to request certain waivers and provide associated showings***, elimination of the need for operators to meet certain milestone requirements, elimination of the need for applicants to resubmit an FCC Form 312 – Main Form in certain circumstances, ability for applicants to submit an ITU filing without the need for prior filings with the Commission, and elimination of the bond requirement for certain space station operators.⁴¹

But if past is prolog, extension requests of the deployment milestone of Section 25.164 will only increase, especially as to megaconstellations without actual enforcement of that

six years. If it were to continue to use its Falcon 9 rocket to deploy, and the ODC satellites were roughly the form factor of Starlink satellites, that would require 16 launches ***per day***. *SpaceX Launches 29 Starlink Satellites on Falcon 9's 15th Flight*, BASENOR (Apr. 2, 2026), <https://www.basenor.com/blogs/news/spacex-launches-29-starlink-satellites-on-falcon-9s-15th-flight>. Assuming Starship were ready on day one after grant for commercial launches, that would still require a starship to fly more than once a day. Adam Butcher, *How Many Starlink Satellites Can Starship Launch?*, AEANET (Aug. 28, 2024), <https://www.aeanet.org/how-many-starlink-satellites-can-starship-launch/>.

⁴⁰ Yes, the Appendix B to every rulemaking that is statutorily required but no one ever actually reads.

⁴¹ Space Modernization NPRM, 205 (emphasis added).

section. Those 21 extension cases cited by Amazon Leo will increase exponentially in terms of the number of satellites that are subject to milestone extensions.⁴² This leaves satellite operators in an untenable situation of having no idea what satellite system they will have to coordinate with or protect. The more the already awkward processing round system breaks down, the more satellite operators will respond with more and more legerdemain and litigation.

B. Eliminate or Significantly Modify the Interim Deployment Milestone

The second alternative would have the FCC eliminate completely the interim deployment milestone of Section 25.164(a)(1). Under this approach, a licensee would have nine years out of the initial ten year license term to launch 100 percent of its satellites. In theory, this would eliminate the problem of the timeframe required to design and build satellites, often cited in waiver requests.⁴³ That might be true for extension requests for GSO satellites or very small constellations where the constraining factors are design and construction, but does nothing to solve the sheer logistical hurdle—from mass manufacturing to launch cadence—of deploying a megaconstellation which most likely will drive future waiver requests.

Alternatively, the FCC proposes in the Space Modernization NPRM to align the FCC rules with the ITU deployment rules which require only a single satellite be deployed during the first seven years after license grant, a mere 10 percent of the constellation by year nine, 50 percent with twelve years and 100 percent by year fourteen.⁴⁴

The problem with both of these scenarios is that we will not possibly know in six years if a satellite system is real; we must wait long after to see if the licensee's plans come to fruition. That defeats the very purpose of the milestone requirement. And there is nothing to keep a satellite licensee from seeking to extend the final deployment milestone of Section 25.164(a)(2), as we have seen in several extension requests. Satellite operators will remain

⁴² Further, there does not seem to be a consistent timeframe in these extension requests, they vary significantly as between licensee requests.

⁴³ See, e.g., TerreStar Networks, Inc., Memorandum Opinion and Order, 22 FCC Rcd 17698, ¶¶ 14–18 (IB 2007) (granting extension based on delays in satellite construction and integration); EarthWatch Inc., Order and Authorization, 15 FCC Rcd 13594, ¶¶ 10–12 (IB 2000) (explaining that additional time was needed to complete satellite design, manufacturing, and testing); WB Holdings 1 LLC, Memorandum Opinion and Order, 20 FCC Rcd 10846, ¶¶ 7–9 (IB 2005) (granting milestone relief due to delays in completing construction of WildBlue-1); New ICO Satellite Services G.P., Order, 22 FCC Rcd 209, ¶¶ 12–15 (IB 2007) (finding that satellite manufacturing delays justified extension of construction and launch milestones).

⁴⁴ See Space Modernization NPRM ¶ 171. TechFreedom opposes that approach to milestones. See Space Modernization Comments, *supra* note 12, 34-35.

in limbo, an extended one, and the proverbial can gets kicked down the road to when the assembly line breaks down, crushed by waiver requests of the final deployment milestone.

In fact, a one-shot milestone appears to get things entirely backwards. If the goal is to prevent warehousing from applicants prematurely claiming processing round rights, a more effective milestone rule would adopt *more* incremental deployment milestones over the deployment period, not less. Doing so would ensure that an operator applying for a license only applies when it is ready with a satellite design and a plan to manufacture and deploy them. This in turn would increase the fidelity of applications before the Commission, the likelihood that an operator has a plan to manufacture and deploy its system at scale and on time, and the integrity of individual processing rounds.

C. Adopt a “Cap and Defer” Approach to Deployment

SpaceX has proposed a solution that is worthy of significant study. As to both its own V-band applications,⁴⁵ and Amazon Leo’s interim deployment extension request,⁴⁶ SpaceX suggests that the FCC treat milestone extension request for what they are—requests to modify a license to increase the number of authorized satellites beyond those deployed by the milestone date—and defer all undeployed satellites to a later processing round:

A deferral of the undeployed satellites of an NGSO system that has not met its 50% milestone to a subsequent round would preserve the integrity of the Commission’s recently modernized NGSO processing round framework by ensuring that operators that do not meet their milestones are not rewarded with extensions that upend the expectations, relative rights, and interference environment for other operators in a given frequency band. Doing so also presents a more straightforward and consistent approach than milestone extension requests because applying the long-standing *Teledesic* standard does not involve case-by-case assessment of novel facts and arguments or bespoke conditions that invite competitive gamesmanship and requests for special treatment.⁴⁷

⁴⁵ Application to Modify Authorization for the SpaceX V-Band NGSO Satellite System, Call Signs S2992/S3069 (Aug. 13, 2024) (“SpaceX V-Band Modification”).

⁴⁶ Comments of SpaceX on Request to Extend or Waive Interim Milestone for the Amazon LEO Constellation (Jan. 30, 2026), <https://cdn.geekwire.com/wp-content/uploads/2026/01/Leo-Request.pdf>.

⁴⁷ SpaceX V-Band Modification, *supra* note 45, 2-3 (citing *Teledesic LLC*, 14 FCC Rcd. 2261, ¶ 5 (IB 1999)). *See also* SpaceX Amazon LEO Comments, *supra* note 46, 14-15 (“If Amazon’s request is appropriately treated as a modification application under the existing *Teledesic* precedent, Amazon can continue deploying its undeployed satellites in a new processing round. In other words, the assertion that enforcement of the Commission’s existing rules and precedent would somehow override the fundamental purpose of the rules

This approach, “cap and defer,” is worthy of significant consideration, further study, and industry comment and appears to align most closely with the FCC’s intent when it adopted the interim milestone requirement in 2017.⁴⁸ Facially, it appears to “thread the needle” of both adhering to existing rules and policy, while at the same time not punishing licensees which have been unable to deploy their entire constellations because of circumstances beyond their control. It also can be implemented with minimal paperwork or industry burdens. A licensee would request a license modification before the six-year mark, and then the undeployed portion of the constellation would automatically be modified to specify the next (or pending) processing round.⁴⁹

If this approach is adopted, the Commission should also firmly enforce the final deployment milestone at nine years under Section 25.164(a)(2). In that case, the constellation should have a final cap of satellites equal to all satellites deployed in the first nine years after grant.⁵⁰

As we look at this proposal, we believe it should be limited in two respects. First, the FCC should make clear that it applies only to NGSO systems. By definition, NGSO systems are the only satellite licenses subject to processing rounds.⁵¹ Second, we believe it should be applied only to larger constellations, either megaconstellations of 200 or more satellites or those with a significant percentage of that many satellites. In this way, the FCC can get at the deployment problem.

We believe that such a regulatory regime is workable from both an intra-round coordination and inter-round protection standpoint. Satellite operators must already

themselves is nonsensical.”). We take no position on whether SpaceX’s reading of the “Teledesic standard” is correct.

⁴⁸ To this end, we are filing this paper in both the Space Modernization docket as well as in response to Amazon Leo’s pending waiver request.

⁴⁹ Which processing round the undeployed satellites would go into is open to debate. Presumably, those undeployed satellites would be assigned to a processing round the licenses for which were granted such that the undeployed satellites are still within the interim deployment window. Following this to its logical conclusion, those satellites not deployed during the subsequent processing round interim milestone period would again be deferred to a still-further processing round until the end of the ninth year of the initial grant, at which point they would be removed from the constellation license entirely.

⁵⁰ By way of example, let’s assume a constellation of 200 satellites. By the year-six interim deployment milestone, the licensee has launched 100 satellites. The remaining satellites would have licenses modified to provide interference protection equivalent with the next processing around. At year nine, the licensee has deployed an additional 50 satellites. At that point the license would be modified to authorize 150 satellites (those deployed) as part of the system. The licensee could then apply for a new license to cover the last 50 satellites, and that application would be placed in the then-current processing round.

⁵¹ Under this scenario, GSO licensees unable to deploy would continue to file waiver requests and be required to show why deployment within the rule requirements was unavoidable.

account for different interference protection priorities within satellite systems that have satellites using frequencies for which licenses were acquired in different processing rounds. It does not seem technically more difficult to differentiate between satellites in the same constellation that have different interference protection priorities. This is the key question the FCC should pose to industry.

Most fundamentally, this approach protects against “oversized, unrealistic constellations.” Applicants can still dream big, but their licenses must be adjusted to the reality of their ability to design, build, and deploy satellites.

CONCLUSION

With companies now creating their own assembly lines for satellite construction,⁵² the FCC is guaranteed to encounter applications with an ever-increasing numbers of satellites per application. What will follow in six years will undoubtedly be an increasing number of milestone waiver requests involving more and more satellites. Either adopt something akin to this “cap and defer” stratagem, or the assembly line of FCC processing will surely break.

TechFreedom therefore encourages the FCC to take a hard look at how it can reform its satellite licensing systems to address the deployment problem. Otherwise, the assembly line dies, killed by a wayward left fender.⁵³



⁵² See Space Modernization Comments, *supra* note 12, at 5 (“Even as the price to orbit is decreasing, the price to build payloads is also dropping. Gone are the days of one-off hand-built satellites costing hundreds of millions of dollars. Companies such as Starlink are building satellites on an assembly line, substantially reducing the cost of producing each satellite. Even established companies such as Lockheed Martin are updating and upgrading their satellite manufacturing processes. And new players are jumping in—something virtually impossible as little as a decade ago when rides to space were so expensive, clamping down demand for satellites systems.”) (footnotes omitted).

⁵³ Yes, we realize the image depicts a right fender. It’s only AI, after all. That doesn’t bode well for an autonomous vehicle knowing the difference between a left and right turn, however.