



CONSULTATION ON LICENSING OF SATELLITE SERVICES

REPLY RESPONSES





Submitted via electronic mail
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30 May 2025

Mr. Kenva Williams
Director General
Turks and Caicos Islands Telecommunications Commission
872 Leeward Highway, Business Solutions Building
Providenciales,
Turks and Caicos Islands

**Re: Reply Comments on Public Notice 2025 – 2
Consultation Framework for the Licensing of Satellite-Based Internet Service Providers**

Kuiper Systems LLC (“Kuiper”), a wholly owned subsidiary of Amazon.com Services LLC (together, “Amazon”), appreciates the opportunity to reply to comments filed in response to the Turks and Caicos Islands Telecommunications Commission’s (“Commission”) consultation framework for the licensing of satellite-based internet service providers (“Satellite Framework”).¹ Amazon supports comments by GSOA encouraging the Commission to develop an enabling framework that facilitates satellite operator entry, increased consumer choice, and affordability. In developing such a framework, Amazon urges the Commission to reject proposals that serve little purpose other than shielding their proponents from competition by imposing unnecessary and onerous conditions on satellite-based internet service providers seeking to deploy new and innovative services. Such conditions would undermine the Commission’s effort to “establish a framework for the licensing of new and innovative satellite-based internet services . . . while observing the principles of fair competition.”²

I. Satellite Systems Like Project Kuiper Will Be Instrumental in Expanding Broadband Availability Across the Globe

Amazon’s Project Kuiper will bring high-speed, low latency broadband to unserved and underserved communities globally. Amazon began launching its constellation of non-geostationary satellite orbit (“NGSO”) satellites in low earth orbit (“LEO”) (the “Kuiper System”) in April 2025.³ Since committing to invest over 10 billion U.S. dollars in the Kuiper System, Amazon has made significant strides toward

¹ Turks and Caicos Islands Telecommunications Commission, Consultation Framework for the Licensing of Satellite-Based Internet Service Providers, Public Notice 2025-2 (Mar. 27, 2025).

² *Id.* para. 11.

³ On April 28, 2025, Amazon successfully launched Project Kuiper’s first 27 satellites. See *United Launch Alliance Successfully Launches Amazon’s First Operational Satellites*, ULA Launch Alliance, LLC (April 28, 2025), <https://newsroom.ulalaunch.com/releases/united-launch-alliance-successfully-launches-amazons-first-operational-satellites>.

deployment, including the continued expansion of its terrestrial infrastructure and unveiling of innovative customer terminals (“CTs”) that will offer high performance in small form factors at affordable price points. Amazon plans to begin offering commercial service in certain areas of the world this year and will expand coverage as it continues to deploy the Kuiper System, further advancing its goal of providing affordable, accessible, and high-quality broadband services to residential, governmental, and enterprise customers globally.

Amazon supports the Commission’s effort to adopt a framework for the licensing of satellite-based internet service providers. The Satellite Framework can help to provide a clear path for new satellite entrants, accelerating the deployment of broadband services that benefit the public.

Amazon agrees with GSOA that a flexible framework is needed and supports GSOA’s recommendation that the Satellite Framework include:

- avenues for satellite operators to provide both direct and indirect delivery of broadband services through wholesale and retail business models,⁴
- a cost-recovery approach to licensing fees,⁵
- recognition that domestic lawful intercept and network security goals can be achieved without in-country location of gateway terminals,⁶
- an exemption of Islander Control requirements for satellite broadband providers,⁷
- class licensing for customer terminals,⁸ and licence exempt operation for earth stations in motion (“ESIMs”) onboard foreign aircraft and vessels operating on a non-interference basis and that do not require connection to a local network,⁹ and
- rules for ESIMs based on international technical and operating conditions, including CEPT ECC/DEC/(15)04 for licensing of land, maritime, and aeronautical ESIMs in the Ka-band and ITU Resolution 123 (WRC-23) for maritime and aeronautical ESIMs operating co-frequency with terrestrial services in the Ka-band.¹⁰

Such an approach would enable new satellite broadband service models to emerge and thrive. This fosters competition and choice, ultimately benefiting the government, enterprise, and customers in the Turks and Caicos Islands through improved services and pricing.

⁴ GSOA Comments at 2.

⁵ *Id.* at 2-3.

⁶ *Id.* at 3-4.

⁷ *Id.* at 4-5.

⁸ *Id.* at 5-6.

⁹ *Id.* at 6-7.

¹⁰ *Id.* at 7-8.

II. Concerns Regarding NGSO Satellite Systems Are Misplaced

One commenter, Viasat, Inc. (“Viasat”), has expressed concern that new NGSO constellations pose a risk to spectrum sharing and orbital resources. Viasat’s arguments regarding spectrum sharing and space sustainability, further outlined below, continually mischaracterize the nature of NGSO operations at the expense of deploying critical broadband services to consumers. This is evidenced by Viasat’s list of proposed conditions that could add months or even years to the licensing process for NGSO services and unnecessarily limit the ability of NGSO operators to deliver services with enhanced capacity and coverage.¹¹ For example, Viasat suggests that all NGSO satellite operators must answer for the actions of one launch operator by conditioning licences on space sustainability demonstrations.¹² These measures would place unnecessary technical and administrative burdens on both the Commission and on operators, resulting in significant operational and regulatory delays, ultimately harming consumers, the broadband ecosystem, and the entrance of innovative new technologies in Turks and Caicos. Amazon encourages the Commission to join other regulators in the region, including the Utility Regulation and Competition Office of the Cayman Islands (“OfReg”), in rejecting such conditions in its own satellite licensing framework.¹³

Spectrum Sharing. Viasat’s arguments regarding the equivalent-power flux density (“EPFD”) limits are rooted in outdated and overprotective metrics that are no longer representative of the operations of modern NGSO systems—and therefore vastly overprotect incumbent GEO systems while unnecessarily throttling the operations of NGSO systems. These limits are based on a set of geostationary satellite orbit (“GSO”) reference links using 1990s technology, services, and spectrum management techniques, and designed to accommodate the operations of then-state-of-the-art NGSO systems. Today, these decades-old limits overprotect GSO systems. This overprotection comes at a great cost, substantially constraining the operations of NGSO operators and reducing their power levels and ability for spectrum reuse—even where there is no plausible impact to GSO links. A coalition of nations at the Inter-American Telecommunication Commission (“CITEL”) and the 2023 World Radiocommunication Conference (“WRC-23”) have advocated for review of the Article 22 EPFD limits.¹⁴ Efforts are underway at the ITU-R to conduct technical studies to inform discussions on GSO and NGSO spectrum sharing at the 2027 World Radiocommunication Conference (“WRC-27”).¹⁵ The United States in parallel has initiated its own

¹¹ See Viasat Comments at 11-18.

¹² *Id.* at 8.

¹³ See Utility Regulation and Competition Office of the Cayman Islands (OfReg), Draft Determination Proposed Framework for the Licensing of Satellite-Based Telecommunications Providers, ICT 2025-[1] (rel. Apr. 17, 2025), <https://www.ofreg.ky/viewPDF/documents/2025-04-17-13-16-23-2025-04-17-Consultation-on-Draft-Determination-on-Licensing-of-Satellite-Services30.pdf> (“OfReg Satellite Licensing Consultation”).

¹⁴ See, e.g., CITEL, Proposals for the Work of the Conference, Addendum 4 to Document 44 (Add.27)-E (Oct. 13, 2023); Minutes of the Eleventh Plenary Meeting, ITU Document 526-E, at 6 (Jan. 15, 2024).

¹⁵ See Radiocommunication Study Group, Working Document Towards a Draft New Report on RR Article 22 EPFD Limits Issues [EPFD_Limits_Issues], Analysis of the issues related to RR Article 22 epfd limits, Document 4A/971-E (June 21, 2023), <https://www.itu.int/md/R19-WP4A-C-0971/en>.

proceeding to reevaluate spectrum sharing rules between GSO and NGSO satellite systems operating in the 10.7-12.7 GHz, 17.3-18.6 GHz, and 19.7-20.2 GHz bands.¹⁶

Amazon encourages the Commission to refrain from imposing EPFD-specific licence conditions on NGSO satellite services, particularly as existing limits are being studied at the ITU and national levels. The goal of the studies is to ensure satellite services, both GSO and NGSO, can operate with the utmost spectral efficiency to maximize the capacity of these systems to help bridge the digital divide. By declining to adopt specific EPFD licence conditions, the Commission can ensure that any future changes to Article 22 EPFD limits at the ITU can extend to NGSO service providers in the Turks and Caicos Islands without the Commission also needing to change the terms of the underlying licence.

Space Safety and Sustainability. By requiring operators to prepare duplicative or irrelevant studies, Viasat’s proposal that the Commission require NGSO operators to submit a collision risk analysis as part of licensing or registration requirements or to operate their satellites at a specific orbital tolerance would impose unnecessary burdens and constraints without corresponding benefits. In fact, the Cayman Islands’ OfReg has said that it “recognises the need to support such initiatives however the Office does not believe that including such requirements in a licence to provide services to the Cayman Islands is an appropriate place to state them,” particularly considering that “the [ITU] and the United Nations Office for Outer Space Affairs (UNOOSA) are already taking steps to develop requirements in this respect[.]”¹⁷ Amazon encourages the Commission to take a similar approach: establish a Satellite Framework focused on the licensing of operations in the Turks and Caicos Islands, in recognition of ongoing review of space sustainability matters in other forums.

Space safety and sustainability are anchor tenets for Amazon. Because it is more likely to yield data-driven and harmonized rules over the longer term, Amazon supports an approach to space safety and sustainability based on industry best practices and international standards. These include recommendations by the International Organization for Standardization (“ISO”), AIAA Satellite Orbital Safety Best Practices, Space Safety Coalition’s Best Practices for the Sustainability of Space Operations, the Inter-Agency Space Debris Coordination Committee (“IADC”) Guidelines, and the UN COPUOS Long-Term Sustainability Guidelines (“LTS”). These guidelines and best practices are technically informed and designed to have a meaningful net-effect on the environment.

Viasat’s proposals, by contrast, rest on a series of faulty premises, ill-supported assumptions, or debunked claims. Among other things, Viasat disregards industry developments and incorrectly asserts that the entry of a single NGSO constellation would prohibit other providers from reliably sharing the same orbital resources.¹⁸ Viasat fails to recognize that commercial NGSO systems facilitate greater levels of resource sharing due to increased options for interference avoidance and improved coordination, and that continuous technological advances in NGSO operations, like beam pointing and innovative, portable, and affordable customer terminals, also advance spectrum sharing while improving the customer experience. Existing independent research further contradicts Viasat’s claims and has demonstrated that

¹⁶ See Federal Communications Commission of the United States, Modernizing Spectrum Sharing for Satellite Broadband, Notice of Proposed Rulemaking, SB Docket No. 25-157, FCC 25-23 (rel. Apr. 29, 2025), <https://docs.fcc.gov/public/attachments/FCC-25-23A1.pdf>.

¹⁷ OfReg Satellite Licensing Consultation at para. 21.

¹⁸ See Viasat Comments at 3.

LEO altitudes between 200 km and 900 km can safely accommodate up to 1.8 million active satellites, ample space for additional NGSO satellite systems.¹⁹ Viasat also repeats the now disproven claim that

commercial NGSO systems are the leading source of space debris.²⁰ This is not so. One recent study shows, for example, that commercial missions are responsible for approximately 6% of fragmentation debris, with government missions being responsible for the remaining 94% of such debris.²¹

III. Conclusion

Viasat's comments and proposed licence conditions for NGSO systems represent a blatant attempt to shield themselves from competition by hindering NGSO service deployment. Delaying the delivery of innovative new broadband services will ultimately harm customers and communities who would benefit from high-quality and affordable NGSO satellite services. Amazon urges the Commission to align with other regional leaders, such as the Cayman Islands' OfReg, and reject Viasat's proposed licence conditions for NGSO systems.

Amazon is grateful for the opportunity to contribute to the development of the Satellite Framework and looks forward to working alongside the Commission to improve broadband access. We welcome the opportunity to further discuss these comments or any other issues of interest in this submission.

Respectfully submitted,

/s/ Madeleine Lottenbach

Madeleine Lottenbach
Senior Lead, Licensing & Regulatory Affairs
Project Kuiper
On behalf of Kuiper Systems LLC

¹⁹ Miles Lifson et al., *How Many Satellites Can We Fit in Low Earth Orbit?: Capacity Integrating Risk-Based and Intrinsic Methods* 18 (Research Gate, Conference Paper AAS 22-674, 2022) (finding that an altitude range of 200-900 km and an optimized launch rate of 1.8 million over a 200-year time frame keeps the LEO orbital capacity sustainable due to the low growth of the debris population).

²⁰ See Viasat Comments at 8.

²¹ Erin Dale et al., *Quantifying Space Debris Contributions from Government and Commercial Actors* 3 (9th European Conference on Space Debris, 2025) (finding that "while the approximate number of commercial and government payloads and rocket bodies is roughly equivalent . . . the two types of missions have vastly different fragmentation debris contributions (~ 6% of fragmentation-debris is from commercial missions vs ~ 94% from government)").

CABLE AND WIRELESS

Comments on Responses to TCI Telecommunications

Commission

Public Notice 2025 – 2

Consultation Framework

for the

Licensing of Satellite-Based Internet Service Provider

1. INTRODUCTION

1.1 Cable and Wireless (TCI) Limited dba Flow is pleased to provide comments and remarks on responses to the Commission’s **Public Notice 2025 – 2 Consultation Framework for the Licensing of Satellite-Based Internet Service Provider** (the Consultation Document) published March 27, 2025.

1.2 Flow expressly states that failure to address any issue raised in the Consultation Document does not necessarily signify its agreement in whole or in part with any position taken by the Commission or respondents. Flow reserves the right to comment on any issue raised in the Consultation Document at a later date.

1.3 The complete record of Flow’s comments on responses includes its initial response to the Consultation Document dated May 5, 2025 to the Consultation Document.

1.4 Please send all responses to this Consultation Document and any matters arising to Joanne Missick at joanne.missick@cwc.com and Melesia Sutherland at melesia.sutherland@cwc.com .

2. Flow’s Comments on Responses

Technology Neutrality is the Key Principle

2.1 Flow reiterates that the requirements of licenses should be technology neutral, that is indifferent to the technology used to provide a service. This aligns with the Commission’s functions under Section 4 of the Telecommunications Ordinance which requires the Commission to:

..... (c) to regulate telecommunications in the Islands in accordance with the policy guidelines published in the Gazette from time to time and in accordance with the **principle of technological neutrality¹**; (emphasis added).

2.2 Technology Neutrality is reinforced by the definition of ‘Internet Network or Services licence’ which is defined as: “A network or service that provides users the ability to access the internet,” and the

¹ Para. 10(c) Consultation Document

Commission's interpretation that this definition *'could be considered to include satellite-based internet connectivity, as this definition does not include any restrictions on how the service must be delivered. Therefore, the Commission believes that this type of licence could be a potential placement for satellite-based internet services as it fits the Internet Network or Services description for the service that is being provisioned'*²

2.3 Technology neutrality allows providers who own infrastructure and provide services over that infrastructure to offer a range of services on the same terms and conditions, that is there are the same legal obligations for the same service. And network operators/ service providers are not restricted to using specific technology or equipment configuration in the provision of services to customers but have the flexibility to deploy the technology that would provide the most efficient and affordable service.

2.4 Historically, satellite providers have not offered services directly to residential and general business customers. Now that satellite providers are offering the same services directly to customers in TCI as terrestrial operators licensed in TCI, technology neutrality requires that satellite providers be licensed under the same licence as terrestrial providers offering the same services as the satellite providers.

2.5 A technology neutral approach, required by Section 4 of the Ordinance, allows all providers in the market to compete fairly. It is the fundamental principle by which the Commission must assess the type of licence to be granted to satellite operators. The Commission must ask itself the question, *'does this licence and the terms and conditions of the licence result in fair competition for all providers offering the same service, whether on the face of the licence or in practice?'*

Recommendations to the Commission

2.6 Further, Flow remains concerned that the business model of powerful, global satellite providers, which Flow addressed extensively in its previous submission to the Commission, could lead to global satellite providers charging below market prices, resulting in terrestrial providers exiting the TCI market

² Para 13 Consultation Document

and a return to monopoly. This is a unique challenge, for the Commission will have to regulate such providers in view of their global market power.

2.7 Flow reiterates the following recommendations to the Commission to achieve fair competition and an acceptable standard of service for customers:

- i. Promote competition:** The business model of satellite-based telecommunications providers, funded by private equity, powerful tech companies, and invested governments coupled with satellite operators' global economies of scale could enable pricing below local market sustainability levels, creating an unfair competitive advantage for satellite providers and driving terrestrial providers out of business. A return to monopoly is to be avoided. Monopoly could result in unfettered price increases for TCI Islanders.
- ii. Same Service. Same Licence:** where satellite-based telecommunications providers offer the same or similar service as terrestrial providers, and, or use, the same spectrum bands, they should be licensed within the same licensing regime as terrestrial providers and be subject to all the terms and conditions, taxes, and regulatory payments as existing terrestrial providers. It is well worth noting that in recent times, Starlink has announced that it has successfully implemented Direct-to-Device service, in partnership with T-Mobile, which means that Starlink's satellites can provide services directly to a mobile phone, without any need for modification of the mobile phone, just as a mobile operator can. The only missing piece is the allocation of mobile spectrum to satellite-based telecommunications providers so that they can provide mobile services directly to customers, without the need to partner with a terrestrial operator.
- iii. Promote employment:** With the intense competition from global tech companies, like satellite-based telecommunications providers, terrestrial providers may have to shed jobs to meet the competition. In the same way that terrestrial providers created jobs, for TCI Islanders, that power the local economy, satellite-based telecommunications providers must be required to create jobs in TCI and contribute directly to the growth of its people and economy. The Commission should not encourage jobless innovation. Satellite providers

should be encouraged to establish ground infrastructure within TCI, contributing to the local economy.

iv. Protect existing services and existing spectrum assignments from interference from satellite-based telecommunications providers: The Commission must ensure that satellite providers present robust and tested means to mitigate interference, which is agreed by existing terrestrial operators as sufficient to mitigate interference.

v. Protect Customers: the challenge that small island states could face when dealing with global tech companies, like satellite-based telecommunications providers, is that their tiny population and footprint may cause them to be overlooked. TCI is attractive to satellite-based telecommunications providers because of its high GDP, its vibrant tourism industry, and affluent population. None of these factors suggest that these providers are seeking to bridge an identified digital divide or provide disaster relief, which although achievable, and popular arguments by satellite-based telecommunications providers, are not the drivers for entry. Licence conditions to support customers in TCI must be consistent with those for terrestrial providers of similar/ same services.

2.8 Flow's recommendations aligns with the Commission's functions under Section 4 of the Telecommunications Ordinance which requires the Commission:

.....

*(c) to regulate telecommunications in the Islands in accordance with the policy guidelines published in the Gazette from time to time and in accordance with the **principle of technological neutrality;***

(emphasis added)

(d) to facilitate, maintain and promote effective and sustainable competition in telecommunications.

.....

(f) to promote the interests of consumers and to encourage licensees to operate efficiently;

.....

(j) to prescribe standards for the protection of consumers and the public;.....

END



May 30, 2025

Mr. Kenva Williams
Director General
Turks & Caicos Islands Telecommunications Commission
P.O Box 203, Business Solutions Complex
Leeward Highway, Providenciales
Turks & Caicos Islands

Dear Mr. Williams,

**RE: Digicel Response to the Public Consultation by the Turks and Caicos Islands
Telecommunications Commission on Consultation Framework for the Licensing of Satellite-Based
Internet Service Providers**

The matter at caption refers.

First, Digicel (TCI) Ltd (trading as Digicel) thanks the Turks and Caicos Islands Telecommunications Commission for the opportunity to provide our responses to the comments on consultation document "Consultation Framework for the Licensing of Satellite-Based Internet Service Providers" dated 27th March 2025 (the "Consultation").

Digicel hereby respectfully submits that we have no further comments to provide on the captioned matter further to our initial submissions dated April 25, 2025. Digicel's decision not to respond to any issue(s) raised by any party relating to the subject matter generally does not necessarily represent agreement, in whole or in part nor does any position taken by Digicel not to respond represent a waiver or concession of any sort of Digicel's rights in any way.

Please do not hesitate to refer any questions or remarks to Marlon Albarico, CFO, Digicel TCI (email: marlon.albarico@digicelgroup.com) and Sharian Hanson, Legal and Regulatory Director (Regional), Digicel Group (email: sharian.hanson@digicelgroup.com) in copy.

Yours sincerely

A handwritten signature in blue ink, appearing to be 'Marlon Albarico', written over a dotted line.

Marlon Albarico
CFO
Digicel TCI

CC: Meredith Sharples, Regional North Atlantic CEO, Digicel

May 16, 2025

Mr. Kenva Williams
Director General
Turks and Caicos Islands Telecommunications Commission
872 Leeward Highway, Business Solutions Building
Providenciales
Turks and Caicos Islands

Submitted Electronically to: Consultations@tcitelecommission.tc

Subject: Turks and Caicos Islands Telecommunications Commission Consultation Framework for the Licensing of Satellite-Based Internet Service Providers (Public Notice 2025 – 2)

Viasat is pleased to provide reply comments to the Consultation Framework for the Licensing of Satellite-Based Internet Service Providers (“Consultation”) issued by The Turks and Caicos Islands Telecommunications Commission (“Commission”) on March 27, 2025. We take this opportunity to reiterate a few aspects of our initial comments. The fact that we may not comment on a particular party’s initial comments should not be construed as an indication of our agreement with those comments. We certainly welcome the opportunity to provide any additional information to the Commission in the future.

Question 3: In what way should the Commission approach the issues associated with the fact that the provision of some parts of a satellite service occur outside its jurisdiction?

As noted in our initial comments, Viasat agrees with the Commission that there “needs to be appropriate regulatory oversight to services and networks offered in the Turks and Caicos Islands.” We urged the Commission to include relevant policy principles within the Satellite Framework relating to the safe and sustainable use of space as well as equitable access to both spectrum and orbits as they are key determinants for The Turks and Caicos Islands’ meaningful participation in the new space economy and the assurance of a competitive marketplace for satellite capacity.

Space Sustainability

We recognize that some administrations may feel that since the International Telecommunication Union (‘ITU’) and the United Nations Office for Outer Space Affairs (‘UNOOSA’) are already taking steps to develop requirements on space sustainability, it is not necessary to impose any space sustainability requirements at the licensing stage and instead abide by any internationally agreed upon rules or regulations that may be adopted in the future. However, Viasat reiterates the urgency of the Commission to impose a space sustainability requirement **at the licensing stage**.

As outlined in more depth below, while important work in the ITU and UNOOSA is ongoing, the timelines and processes for these international fora almost certainly preclude meaningful action before it is too late. Moreover, as noted in further detail below, implementation of the UN guidelines established in 2019 is voluntary, and administrations may or may not choose to incorporate elements of the guidelines into their



national framework. For the reasons outlined below, Viasat believes that The Commission is in a unique position, as the regulator of satellite services in the Turks and Caicos Islands, to adopt comprehensive and enforceable policies and rules at the national level that can lay the foundation for important considerations relating to the safe and sustainable use of space.

Viasat has a long history of and extensive expertise in designing, manufacturing, and operating satellite payloads, systems, and ground networks for communications and earth sensing missions for military and commercial users. We are a leading provider of satellite broadband and narrowband services to consumers, businesses, and national security government users, both domestically and globally.

Viasat also develops state-of-the-art payload components, modules, and subsystems for our own satellites, for other satellite operators, and for the U.S. government. Those include satellite payload and associated ground technologies used in low-Earth orbit (“LEO”) systems, medium-Earth orbit (“MEO”) systems, and geostationary orbit (“GSO”) networks, including those used for earth observation and sensing, navigation, and communications. We currently develop and operate classified and tactical LEO communications satellites, and other national security LEO missions, and anticipate that those missions will increase substantially in the future.

In light of these activities, Viasat has an obvious interest in ensuring that the orbital environment remains sustainable and safe, both in the near and long terms. Viasat has taken steps to advance that objective in the United States and globally. It is within this context that we offer the observations and comments below as we believe that The Commission should be armed with comprehensive information on this issue to be able to make an informed decision moving forward. There are numerous comprehensive studies, reports and analyses spanning thousands of pages relating to the issue of space sustainability. Viasat takes just a few pages here to outline a few key issues for The Commission’s important consideration.

Sadly, the need for administrations to develop their own policies and guidelines for the safe and sustainable use of space to ensure the safety of its citizens is no longer an academic exercise but a harsh reality. This is becoming even more urgent in the Caribbean region. As noted in our initial comments, in January of this year, The Turks and Caicos Islands experienced debris from a space rocket explosion crash into its territory.¹ This incident required immediate action by the government to ensure the safety of its citizens and to assess the extent of any physical damage. A similar incident occurred in March of this year in The Bahamas.² The threat of space orbital debris is also heightened by the proliferation of mega-constellation satellite launches taking place in Low Earth Orbit.

As noted in Viasat’s initial comments, considerations relating to the safe and sustainable use of space as well as equitable access to both spectrum and orbits are key determinants for the Turks and Caicos Islands’ meaningful participation in the new space economy and the assurance of a competitive marketplace for satellite capacity. As a result, Viasat reiterates and strongly recommends that The Commission add the

¹ See Turks and Caicos Weekly News, January 31, 2025, [SpaceX Debris Recovery Underway in the TCI, Public Urged to Report Debris](#); Turks and Caicos, The Sun, January 23, 2025, [Turks and Caicos, UK Officials Meet with SpaceX Team](#).

² See BBC Article, March 6, 2025, [SpaceX Rocket Explodes, Raining Debris from Sky for Second Time in a Row](#).

following policy principles relating to space sustainability and equitable access to orbital and spectrum resources to be considered in the adoption of its Satellite Framework.

- **Space Sustainability:** Actions must be taken today to “ensure that humanity can continue to use outer space for peaceful purposes and socioeconomic benefit now and in the long term.”³ The space surrounding the earth is a finite resource. The emergence of large non-geostationary (NGSO) constellations can trigger the following effects that may impact the long-term sustainability of space activities by the over-exploitation of Low-Earth Orbit (LEO):
 - Overconsumption of spectrum and “look angles,” reducing the protection of other NGSO as well as GSO satellites serving markets like The Turks and Caicos Islands;
 - Increased risk of collisions that can lead to unsustainable levels of space debris that can foreclose access to space for all mankind;
 - The potential for large quantities of deorbiting satellites, burning aluminum in the upper atmosphere thereby releasing aluminum oxide, can damage the Earth’s atmosphere and effect climate change through, among other things, the depletion of the ozone layer;
 - The same aluminum oxide increases the risk of neurological diseases like Alzheimer’s and Parkinson’s;
 - Impairing critical optical and radio astronomical research by disrupting the visible night sky as well as critical asteroid detection and defense capabilities; and
 - Creating light pollution, with the resulting negative impacts on the health and quality of life of humans, plants and animals.

Adding a Space Sustainability principle to the Satellite Framework will ensure long-term, safe, and reliable access to and use of space for the benefit of all.

Equitable Access to orbital and spectrum resources: As mentioned above, the LEO orbit is a finite resource that needs to be administered carefully to ensure that markets remain competitive and national systems in the future can be deployed and operated. Likewise, the spectrum environment needs safeguarding to ensure protection of all systems from interference from the largest NGSO constellations. Recently, large NGSO constellations are consuming the entire aggregate EPFD “budget” that must be apportioned among all NGSO systems using the same or overlapping frequencies, blocking other LEO systems and overpopulating orbital planes that constrains the orbital access for GSO and NGSO systems. If this goes unchecked, it will harm consumer choice and chill investment and innovation

Action is needed urgently. It will not be possible to mitigate these risks once the sky is populated with tens of thousands of satellites operating with no meaningful constraints in place to ensure that others can share.

³ *Definition of space sustainability from the Secure World Foundation.*

Analysis of the Guidelines for the Long-Term Sustainability of Space Activities and the Regulation on Spectrum and Orbits

The Committee on the Peaceful Uses of Outer Space (COPUOS) is the United Nations body responsible for promoting international cooperation in the peaceful uses of outer space and the development of the international legal regime that governs outer space. The United Nations Office for Outer Space Affairs (UNOOSA) is the Secretariat of COPUOS. To date, COPUOS has developed five main Treaties on activities in outer space, reflecting its essential role in enabling and sustaining space activities.

The Treaties constitute a fundamental international regulatory framework to establish rules and ensure the peaceful and cooperative use of space between nations. In addition to the aforementioned Treaties, COPUOS established principles and, in 2019, approved the Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space (LTS).⁴ These guidelines provide recommendations on the long-term sustainability of space activities, reinforcing the importance of complying with international rules provided for in the ITU Radiocommunication Regulations (RR).

Importantly, the very first guideline that is referenced states as follows:

A. Policy and regulatory framework for space activities

Guideline A.1

Adopt, revise and amend, as necessary, national regulatory frameworks for outer space activities

1. States should adopt, revise and amend, as necessary, national regulatory frameworks for outer space activities, taking into account their obligations under the United Nations treaties on outer space as States responsible for national activities in outer space and as launching States. When adopting, revising, amending or implementing national regulatory frameworks, States should consider the need to ensure and enhance the long-term sustainability of outer space activities.

By its own language, the United Nations expects administrations to take action and adopt national regulatory frameworks to promote space sustainability. As noted above, implementation of the LTS guidelines is voluntary, i.e. states may or may not choose to incorporate elements of the guidelines into their national framework.

In addition, the ITU has adopted resolutions relating to space sustainability, including those approved during the 2022 ITU Plenipotentiary Conference in Romania,⁵ and during the 2023 Radiocommunications Assembly, held in Dubai, United Arab Emirates.⁶

⁴ See [Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space](#)

⁵ See *Resolution 218 - ITU's role in the implementation of the "Space2030" Agenda: space as the driver of sustainable development, and its follow-up and review process; Resolution 219 -Sustainability of the radio-frequency spectrum and associated satellite-orbit resources used by space services; [Final Acts of the Plenipotentiary Conference - Decisions and resolutions \(Bucharest, 2022\)](#).*

⁶ See *Resolution ITU-R 74 - Activities related to the sustainable use of radio-frequency spectrum and associated satellite-orbit resources used by space services.*

The aforementioned international instruments are used as a grant for the determination of national rules for the exploitation of satellite services. One example that deserves highlighting is the procedure for removing from orbit (*deorbit*) geostationary satellites at the end of their useful life, provided for in [the Recommendation of the ITU-R S.1003 ITU](#). It should be noted that there is no technical recommendation issued by a United Nations organization that is analogous and applicable to non-geostationary satellites. As such, it is important for The Commission to adopt its own enforceable policies and rules at the national level.

Viasat remains extremely concerned about recent trends in the use of space that threaten to make its use unsustainable and unsafe—to the detriment of the Turks and Caicos Islands and all peaceful nations of the world. To that end, Viasat has been a global leader in developing research exploring the issues around overconsumption of spectrum and orbits, collision risk mitigation, impacts of space debris creation, and modelling the different design trades for large NGSO constellations.⁷ Our research has demonstrated that the COPUOS LTS Guidelines **are not sufficient for the protection of the outer space environment given the way space is currently being populated.**

An even more troubling development is the overconsumption of scarce and shared orbital and spectrum resources by a few large NGSO constellations. Recently disclosed plans by one company highlight the imminent threat to shared and equitable use of spectrum and orbits by all space actors around the world—whether civil, scientific or governmental.

Just a single NGSO constellation seeks to (i) dominate about 51 GHz of spectrum, (ii) utilize as many as 34,000 satellites, (iii) spread those satellites across 444 km of space in the best orbits in low Earth orbit (LEO), and (iv) operate without regard for ITU allocations and spectrum sharing provisions.⁸

This includes over 68% of all the spectrum allocated for fixed, broadcast and mobile satellite services under 200 GHz, and virtually all spectrum contemplated for nascent direct to device (D2D) service by satellite. Reliable access to both spectrum and associated orbits drives the ability to meet evolving commercial, civic and military needs, and the ability of every nation to participate in the global space economy.

If one NGSO constellation is allowed to serve the Turks and Caicos Islands under these terms, no one else would be able to reliably share the same orbital resources. With over 34,000 satellites, potentially with 100s of beams on each satellite pointable in any direction, employing elevation angles as low as 5 degrees, and serving antennas as small as 15 cm, no one else could predict if their satellite system could operate alongside, regardless of the orbits they use. Absent the adoption of suitable regulatory limitations **at the market access stage**, the Turks and Caicos Islands could not ensure the opportunity for a national satellite system (or competitive systems) to share the same scarce orbital or spectrum resources.

⁷ See, for further Viasat research and resources from national administrations, news outlets, and other entities: <https://www.viasat.com/about/sustainability-impact/space-policy/>.

⁸ See Space Exploration Holdings, LLC, Call Sign S3069, ICFS File Nos. SAT-MOD-20241011-00224 ([link](#)) and SAT-AMD-20241017-00228 ([link](#)); see also *Space Exploration Holdings, LLC Application for Authority for Modification of the SpaceX NGSO Satellite System to Add a Direct to Cellular System*, Order and Authorization, DA 24-1193 (rel. Nov. 26, 2024) ([link](#)).

Much like natural resources here on Earth, there are only so many orbits around Earth, all of which must be shared by the world and among different satellite technologies. There is also only so much collision risk that we can tolerate – risk that could lead to a runaway cascade of collisions that denies use of space to everyone for generations.⁹

That is, the new approach adopted by some operators creates significant negative externalities because the costs of one operator’s unsustainable, excessive, or unduly risky operations are not borne entirely—or even mostly—by that operator.¹⁰ Rather, those costs are borne by all who use, or benefit from the use of, space. Consequently, certain individual operators are incentivized to prioritize their own short-term interests above the long-term interests in the use of space by all¹¹—a true Tragedy of the Commons.

While we historically have regulated use of space on a satellite-by-satellite and system-by-system basis, nature and physics do not make those artificial distinctions. The consequences of over-crowding space can be addressed only by taking into account the aggregate of all human activities in space. If we do not manage the total impact of all objects and activities in space, we cannot manage the resulting risks and harms.

The space industry is at an inflection point. The cost of launch has dropped precipitously, and economies of scale that enable small, inexpensive payloads are driving investment in inexpensive and disposable spacecraft. These same factors shatter established norms in accessing space that have driven the way safe flight was managed for decades. When the cost of accessing space is high, self-interest motivates high standards of care because the cost of failure is high. The term “space-qualified” once meant the industry’s highest standards for quality and reliability even in the harsh conditions of space. Those high costs and risks once fostered a safe ecosystem, because the number of objects in space was limited, and the tools to manage them were adequate.

These developments demand new regulatory approaches. This is why Viasat has encouraged national administrations to adopt enforceable rules that discourage operators from emphasizing disposability and replaceability (redundancy in large numbers of satellites) rather than reliability and safety (deploying fewer, more efficient satellites that can be expected to be able to avoid collisions for the many years they

⁹ Concerns exist that increasing density of objects in LEO (active satellites, derelict satellites, and debris alike) can trigger a chain reaction of collisions, generating more debris and posing a growing threat to the future usability of LEO. This effect is sometimes referred to as a “Kessler Syndrome.”

¹⁰ See, e.g., *Mitigation of Orbital Debris in the New Space Age*, Notice of Proposed Rulemaking and Order on Reconsideration, 33 FCC Rcd 11352 (2018), at ¶ 89, <https://www.fcc.gov/document/fcc-launches-review-rules-mitigate-orbital-space-debris-0> (“Debris generation by on-orbit activities is a negative externality, and is one which could lead to the degradation of the commons of the Earth orbital environment.”).

¹¹ *Id.* (“While the debris problem is a significant consideration for the long-term use of orbital resources, such considerations may not play a significant role in economic decision making in the short-term. Individual satellite operators may have an interest in preserving the earth orbital environment for their continued operations, but a desire to avoid the short-term costs associated with deorbiting satellites to mitigate debris risk could override those long-term interests. Given these incentives, in the long term, the debris population is likely to continue to grow and could result in an exponential increase in the debris population such that use of certain valuable orbital configurations may no longer be economically feasible.”).

remain in orbit). Absent such rules, some satellite service providers: (i) will continue to make self-interested economic trades that endanger the sustainable and safe use of space; (ii) will not internalize the negative externalities created by their operations; and (iii) will not mitigate the burdens and adverse impacts that otherwise would be imposed on other operators and the public more generally.

Given the powerful economic incentives at work, we simply cannot rely on “best practices” or guidelines (whether created at the national or international level) to produce the correct—i.e., sustainable, safe, and responsible—results. **For this reason, it is critical that the LTS Guidelines not be read to convey a false sense of security or leave national administrations or private actors with the impression that they can ignore space sustainability and safety issues. It should be crystal clear that national administrations and private actors must act now to preserve space sustainability and safety—including by implementing comprehensive and enforceable policies and rules at the national level.**

Shortcomings of the LTS Guidelines

In particular, Viasat has identified the following gaps in the existing LTS guidelines:

- 1. The LTS guidelines do not anticipate recent trends in the satellite industry that adversely impact space sustainability and safety.**

The guidelines reflect outdated assumptions about how individual satellites and satellite systems are designed and operated and thus fail to appreciate the full scope or extent of risks to space sustainability posed by modern satellite operations. Unfortunately, these trends are heading in the wrong direction and making space less sustainable and less safe.

Among other things, LEO spacecraft are becoming larger and more massive, with significant implications for the space sustainability and safety risks posed by individual satellites, even when viewed in isolation (e.g., per-satellite collision risks), due to increased collision risk associated with greater cross-sectional area, and the larger resulting debris fields when these satellites collide with other space objects.¹²

Furthermore, LEO operators are iterating their satellite designs over time with virtually no constraints on this “evolution.” Among other things, regulators have not clearly established that they will carefully examine new or increased risks that may be associated with iterative design changes where relevant NGSO systems have already been authorized based on earlier designs.

At the same time, LEO constellations have grown much larger; regulators are now evaluating proposed LEO constellations that would include tens of thousands of satellites instead of a few dozen or even hundreds. These trends increase risks to space sustainability and safety—including risks related to the potential for in-orbit collisions.

¹² See M. A. Sturza and G. Saura Carretero, “Design Trades for Environmentally Friendly Broadband LEO Satellite Systems,” (2021), Advanced Maui Optical and Space Surveillance Technologies Conference (AMOS), <https://amostech.com/TechnicalPapers/2021/Poster/Sturza.pdf>; M. A. Sturza and G. Saura Carretero, Consequences of LEO Satellite Collisions – The Fragments (2021), 11th IAASS Conference – Managing Risk in Space, available at <https://www.viasat.com/spaceinnovation/space-policy/space-debris/>.

Among other things, the increase in constellation size is driving an exponential increase in the number of conjunctions that a given constellation can be expected to experience over time—dramatically increasing the likelihood of an in-orbit collision that would have devastating impacts on space sustainability and safety. As Dr. Hugh Lewis has observed, “The law of very large numbers will tell you that very low probability events can happen if given enough opportunities.”¹³

2. The LTS guidelines do not address aggregate risks to space sustainability and safety posed by each large NGSO system as a whole.

More generally, the LTS Guidelines ignore that many risks to space sustainability and safety are aggregate risks that scale with the size of a given constellation. For example, each additional satellite in a given constellation poses an incremental risk of collision—*i.e.*, all things being equal, the larger the constellation, the more likely it is that some satellite in that constellation will experience a collision during its lifetime. But the LTS Guidelines ignore this critical dynamic and consequently may leave individual nations with the impression that the collision risks associated with each individual satellite can or should be evaluated in isolation.

Notably, authorizing any NGSO system based on its apparent compliance with a per satellite collision risk metric alone would effectively sanction multiple collisions to occur over that system’s lifetime. This is illustrated in the following table, which examines the application of a 0.001 collision probability limit (for objects 10 cm and larger) over a 15-year term:

# of satellites in orbit	Allowed Mean Time Between Collisions in Years (Days)
1,000	10
5,000	2
10,000	1
50,000	0.2 (72 days)
100,000	0.1 (36 days)

Table 1: Aggregate Risk Applying a Single Satellite Risk Standard¹⁴

As the table shows, a constellation that meets such a collision risk metric on a per-satellite basis could still experience multiple collisions over the course of a 15-year term—a result that is inconsistent with efforts to preserve space sustainability and safety. To avoid unacceptable risks to space sustainability and safety, individual nations can, should, and

¹³ See: <https://twitter.com/ProfHughLewis/status/1509903335251456045> (Apr. 1, 2022).

¹⁴ Calculations are based on 10-year satellite design life, and application of the one-in-1,000 (0.001) collision risk standard for objects 10 cm and larger that is commonly used for single satellite risk scenarios.

must evaluate and limit the aggregate collision risk posed by each NGSO system as a whole. This evaluation should consider all potential sources of significant risk, including:

- Risks associated with derelict satellites that fail and no longer can maneuver (and therefore create significant risks for as long as they remain in orbit);
- The risks during the entire period each satellite in the system remains in orbit and at all orbits it may populate (injection, operational, and post-mission disposal);
- The increased risk of collisions due to changes in the orbital environment (such as satellites breaking up or exploding, debris colliding with other debris and breaking up further, and the deployment of additional LEO systems—not just the environment as it existed in the past);
- Characteristics of the satellites in the system—cross-sectional area, mass, subsystem reliability, redundancy, shielding, and operational techniques to reduce the risk of system failures—and any subsequent proposed changes to those parameters;
- The risk of collisions with all sizes of space objects, whether trackable or not, including lethal non-trackable (“LNT”) objects (discussed in further detail below);
- The continued reliability of critical command and propulsion capabilities needed to try to maneuver to avoid collisions—and the probability that those critical systems may be damaged by non-trackable debris that is too small to fragment the satellite;
- The risk of intra-system collisions within a given NGSO system (due to all causes, including failed satellites, within that system);
- Known risks with large numbers of expected conjunctions between a given NGSO system and other space objects (*e.g.*, large numbers of maneuvers to avoid some collisions create other collision risks; low-probability conjunctions not resulting in avoidance maneuvers add up to significant collision risks with very large numbers of conjunctions);
- The interactions of all satellites in a system with all other objects in their environment (including overlapping and intersecting orbits) during orbit raising maneuvers for rising satellites, considering active and passive decay trajectories for satellites in the orbital disposal phase, as well as taking into account those satellites in active service;
- The impact of solar disturbances;¹⁵ and
- The accuracy and tolerances of all orbital trajectories in order to accurately assess and model conjunction probabilities.

These risks should be measured, assessed, modeled, and tracked, and operations adjusted, during the lifetime of each mission—not just at the initial authorization stage (including for communications and Earth observation missions). And, needless to say, the

¹⁵ See *Geomagnetic storms cause “mass migrations” of satellites*, in [SpaceNews](#), by Jeff Foust, 11 December 2024] (“The first problem was the low accuracy of forecasts of the timing, magnitude and duration of the storm. “As a result of this low skill in our forecasts, SpaceX saw 20 kilometers of position error in their one-day computations” of the orbits of Starlink satellites, he said. “If we’re uncertain in where our spacecraft are by 20 kilometers, then you can throw collision avoidance out the window.” The problem was compounded by a lack of knowledge of just how inaccurate the forecasts were at the time. “We were pretty confident in those bad solutions,” he said. “Being confident in the wrong answer fundamentally changes the decisions that we’re making whether or not to maneuver the spacecraft.”)

following types of “simplifying” assumptions should be avoided in performing an aggregate collision risk assessment: (i) the myth of purported “self-cleaning orbits;”¹⁶ (ii) blind belief in the efficacy of “autonomous” controls in avoiding collisions;¹⁷ and (iii) the fallacy that maneuverable satellites have “zero risk” of collision.¹⁸

Further, research by Viasat demonstrates that constellations with large numbers of NGSO satellites are not necessarily more resilient than smaller networks, impose additional costs to other operators due to higher likelihood of collision and fragmentation events, and increased costs of Space Traffic Management (STM), Space Situational Awareness (SSA), and Space Surveillance and Tracking (SST) activities¹⁹.

3. The LTS guidelines do not adequately address risks to space sustainability and safety collectively posed by emerging satellite systems.

As discussed above, national regulators are currently examining proposals to deploy tens of thousands of additional satellites into NGSO orbits—and there are additional proposals to submit hundreds of thousands of additional satellites that are likely to be considered in the near term. The deployment of even a fraction of these satellites would represent an exponential increase in the total number of satellites in LEO in particular—and create new challenges for the sustainability of satellite operations in all orbits.²⁰

There is growing recognition that there are limits on the exploitation of LEO.²¹ With respect to collision risk, the extent to which LEO can be populated in a safe and sustainable

¹⁶ See *Self-Cleaning Orbit Myth*, available at <https://www.viasat.com/space-innovation/spacepolicy/space-debris/>.

¹⁷ See Comments of NASA, IBFS File No. SAT-AMD-20210818-00105, at 2 (filed Feb. 8, 2022) (“[T]he concern remains that other vendors proposing large constellations would also use auto-maneuvering capability within altitude ranges occupied by Starlink, thereby requiring multiple autonomous constellations to maneuver out of each other’s way without clearly defined rules of the road for such interactions.”).

¹⁸ See *id.* at 3 (“[C]onsidering multiple independent constellations of tens of thousands of spacecrafts and the expected increase in the number of close encounters over time, the assumption of zero risk from a system-level standpoint lacks statistical substantiation.”) (emphasis supplied).

¹⁹ See M. Sturza, M. Dankberg, and W. Blount, “Resilience of LEO Constellations to Accidental and Intentional Fragmentation Events”, Advanced Maui Optical and Space Surveillance Technologies Conference – AMOS, 2024. Available at: <https://amostech.com/TechnicalPapers/2024/Space-Debris/Sturza.pdf>.

²⁰ See, e.g., European Space Policy Institute, *Space Environment Capacity: Policy, regulatory, and diplomatic perspectives on threshold-based models for space safety and sustainability*, at 39 (Apr. 11, 2022), <https://www.espi.or.at/reports/space-environment-capacity/> (“As the Earth orbital environment is getting increasingly congested, concerns about its long-term sustainability, potential overexploitation, and risk of interference are becoming increasingly clear and shared among policymakers, industry leaders, and academia”) (“ESPI Paper”).

²¹ See, e.g., L. Miraux, *Environmental Limits to the Space Sector's Growth*, SCIENCE OF THE TOTAL ENVIRONMENT (Feb. 2022),

manner depends on the nature (e.g., mass, cross-sectional area, materials used) and number of relevant satellites, and the characteristics of their orbits. The way in which LEO is populated can, among other things:

- (i) Accelerate the approach of a series of self-sustaining collisions in LEO among space objects (debris and satellites, whether active or derelict) that impairs or even precludes access to space in LEO—as well as MEO, GSO, and other orbits;
- (ii) Threaten the continued safe and reliable operation of many space missions on which consumers, commercial enterprises, scientific research, and defense alike rely—including those that provide vital communications, Positioning, Navigation, Timing (PNT), and Earth Observation data and services;
- (iii) Damage the Earth’s atmosphere and effect climate change;²² and

<https://www.sciencedirect.com/science/article/abs/pii/S0048969721059404?via%3Dihub> (“A common assumption is that limitations to the human enterprise in space are of a purely technical and economic nature. This paper challenges this assumption, by highlighting the existence of environmental limits to the currently planned development of space activities. Risks arising from these limits are explored, and the importance of ecodesign in the space sector is emphasized.”).

European Space Policy Institute, *Space Environment Capacity: Policy, regulatory, and diplomatic perspectives on threshold-based models for space safety and sustainability* (Apr. 11, 2022), at 39, <https://www.espi.or.at/reports/space-environment-capacity/> (“The Space Environment Capacity Concept has been developed with an ambition to create a metric-based, flexible, and transparent foundation within a wider policy discussion of regulating the Earth’s orbital environment, a global common where tensions are increasingly rising and better regulation is necessary.”);

A. Lawrence, M. L. Rawls, M. Jah, A. Boley, F. Di Vruno, S. Garrington, M. Kramer, S. Lawler, J. Lowenthal, J. McDowell, and M. McCaughrean, [The case for space environmentalism](#), NATURE ASTRONOMY (Apr. 22, 2022);

M. Lifson, D. Jang and R. Linares, *Space Environmental Governance and Decision Support Using Source-Sink Evolutionary Environmental Models* (2023), at 8, 2023 Advanced Maui Optical and Space Surveillance Technologies Conference (AMOS) (“Multiple factors potentially constrain human ability to make use of the space environment over time. In the realm of kinetic space safety there are concerns related to the long-term sustainability of the space environment, operational threats to spaceflight safety and associated mitigation burden, and orbit coordination and cross-constellation orbital compatibility. Other potential limitations include access to communications spectrum to send and receive information between satellites and the ground, the risk to air and ground users from space debris that survives re-entering the Earth’s atmosphere, changes to climate from increasingly large amounts of aluminum and other materials being vaporized in the Earth’s upper atmosphere during post-mission disposal, and the carbon cost of spaceflight and associated terrestrial activities.”).

Toni Feder, Q&A: Moriba Jah on the sustainability of near-Earth space, PHYSICS TODAY (Mar. 31, 2022), <https://physicstoday.scitation.org/doi/10.1063/PT.6.4.20220331a/full/>.

M. A. Sturza and G. Saura Carretero, *Design Trades for Environmentally Friendly Broadband LEO Satellite Systems* (2021), 2021 Advanced Maui Optical and Space Surveillance Technologies Conference (AMOS), <https://amostech.com/TechnicalPapers/2021/Poster/Sturza.pdf> (“AMOS Paper”).

²² See, e.g. Andy Lawrence, Meredith L. Rawls, Moriba Jah, Aaron Boley, Federico Di Vruno, Simon Garrington, Michael Kramer, Samantha Lawler, James Lowenthal, Jonathan McDowell & Mark McCaughrean, *The case for space environmentalism*, NATURE ASTRONOMY (Apr. 22, 2022), <https://www.nature.com/articles/s41550-022-01655-6>;

- (iv) Disrupt the night sky and impair critical astronomical research.²³

There also is growing recognition that these risks are increased by each LEO system that is authorized to operate in this increasingly congested part of space, and that the deployment and operation of each such system drives increased collision risks due to changes in the orbital environment created by the deployment of those systems, their interaction with each other, and their interaction with the growing amount of orbital debris.²⁴ **Accordingly, it is critical that national administrations evaluate the potential impact of each NGSO market access applicant both alone and in conjunction with other proposed deployments of NGSO systems.**

4. The LTS guidelines do not identify other critical sources of potential risk to space sustainability and safety.

The existing LTS Guidelines do not specifically identify or address significant sources of risk to space sustainability and safety. Perhaps most conspicuously, and as briefly noted above, the LTS Guidelines fail to appreciate the risks associated with lethal, non-trackable (“LNT”) debris, i.e., objects in the 1-10 cm range that cannot be tracked (and hence cannot be avoided) yet are capable of fragmenting satellites with which they collide. Notably: (i) LNT “dominates the risk profile of operational spacecraft,”²⁵ and (ii) LNT is likely to be the fastest growing category of debris.

Indeed, an estimated 1,000,000 pieces of LNT exist²⁶ that: (i) increase the risk of collisions and human casualties in space; (ii) cannot be seen and thus cannot be avoided by in orbit satellite—regardless of whether they are nominally maneuverable; (iii) create

Martin N. Ross and Karen L. Jones, Implications of a growing spaceflight industry: Climate change, JOURNAL OF SPACE SAFETY ENGINEERING (June 6, 2022), <https://www.sciencedirect.com/science/article/abs/pii/S2468896722000386>.

²³ See Id.; Chris Young, The worst case Starlink scenario? We could be ‘right on the edge’ of Kessler syndrome, INTERESTING ENGINEERING (Aug. 11, 2022), <https://interestingengineering.com/innovation/worst-case-starlink-scenario-kessler-syndrome>.

²⁴ See generally ESPI Paper.

²⁵ See generally R. Buchs, Collision risk from space debris: Current status, challenges and response strategies (Lausanne: EPFL International Risk Governance Center, 2021), at 13, available at <https://go.epfl.ch/irgcspace debris report> (“LNT objects dominate the risk profile of operational spacecraft. As they are far more numerous than trackable objects and cannot be avoided, LNT objects make up more than 95% of the mission terminating collisional risk for a typical LEO satellite[.]”).

²⁶ As of 2024, ESA estimates the existence of 36,500 objects greater than 10 cm, 1,000,000 objects from 1 cm to 10 cm, and 130 million objects from 1 mm to 1 cm. See ESA Space Environmental Statistics, https://www.sdo.esoc.esa.int/environment_report/Space_Environment_Report_latest.pdf

risks that cannot otherwise be mitigated today; and (iv) have the potential to destroy and fragment a satellite, with the collision creating many thousands of new pieces of lethal debris.²⁷ **Nevertheless, the risks to space sustainability and safety posed by LNT are largely unaddressed by the existing LTS Guidelines, which may leave individual nations with the misimpression that these risks need not be addressed by comprehensive and enforceable national policies and rules.**

5. The LTS guidelines pay insufficient attention to the need to ensure that authorized systems are safe in order to keep space sustainable.

There are clear links between space safety and sustainability. For example, collisions resulting from the operation of satellites or satellite systems designed or operated in a manner that causes undue risk can adversely affect the ability to safely access and use, and the cost of accessing and using, orbits near Earth for everyone else. Unfortunately, the existing LTS Guidelines pay insufficient attention to the links between space safety and space sustainability.

Although the LTS Guidelines discuss the “safety of space operations,”²⁸ they largely focus on recommendations that might make it easier to track space objects over time and predict if and when a conjunction could occur. Unfortunately, the LTS Guidelines do not recognize the significant risks to space safety—and thus space sustainability—that can result from satellites and satellite systems that are designed in the first instance without due regard for risk. Nor do the LTS Guidelines provide meaningful direction to national regulators as to how they might reduce these risks.

6. The LTS guidelines do not provide a clear roadmap for scientific and technical research and development.

The LTS Guidelines recommend efforts to “promote and support research into and the development of ways to support sustainable exploration and use of outer space” and “investigate and consider new measures to manage the space debris population in the near term.”²⁹ Viasat believes that further research into space sustainability and safety issues is critical. Unfortunately, the LTS Guidelines do not provide a clear roadmap with respect to the

²⁷ See R. Thompson, A Space Debris Primer, CROSSLINK (Aerospace Corp. Fall 2015), at 6 (“Every [fragment smaller than 10 centimeters, down to 1 centimeter] has the potential to cause catastrophic damage to an active satellite. Space debris larger than 1 centimeter has the potential to completely fragment any object it hits. If that object is a large mass such as a satellite or rocket body, the resulting collision will add tens of thousands of new space debris fragments to the population.”).

²⁸ See LTS Guidelines at 19-29.

²⁹ See: LTS Guidelines at 37-38.

types of substantive R&D that would be most beneficial for national administrations to undertake, individually and collectively.

In conclusion, we strongly urge The Commission to take the above considerations into account as it considers issues of space sustainability further. At the very least, the Commission should require, as a pre-condition to licensing, that satellite service providers submit, in detail, what steps they will take to ensure space sustainability, including how the satellite service provider plans to deorbit its satellite after its useful life.