New Space and Responsibility for Sustainable and Safe Space Operations

Presentation to G20 Space Economy Leaders Meeting Precursor Meeting

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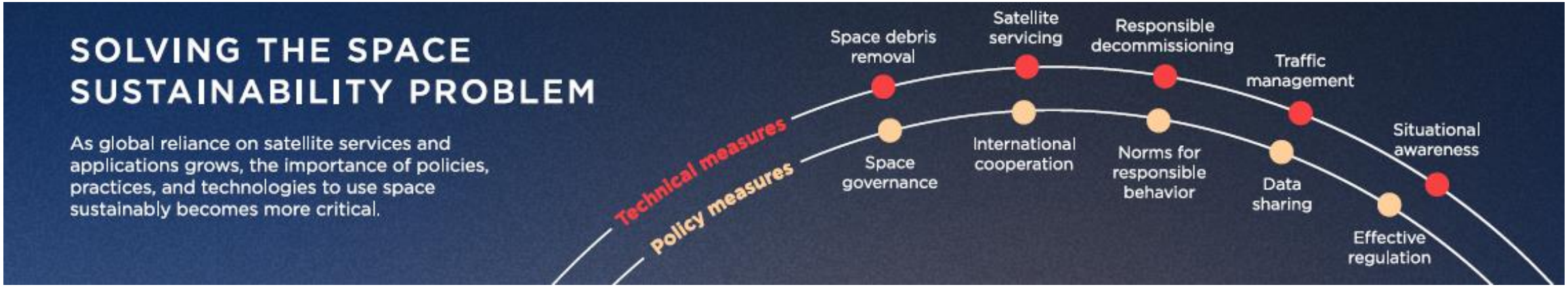
SECURE WORLD FOUNDATION

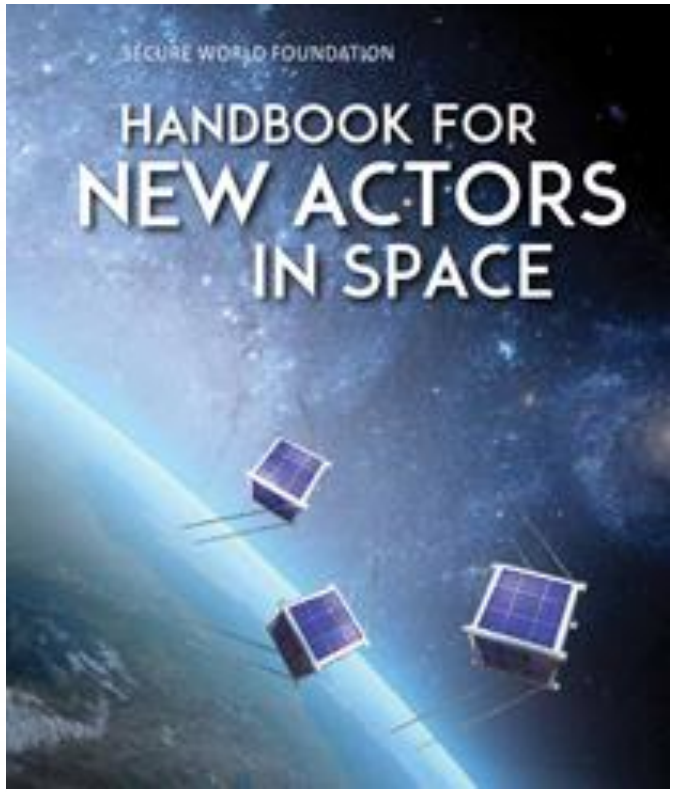
About Secure World Foundation

- Secure World Foundation (SWF) is a ***private operating foundation*** that promotes cooperative solutions for space sustainability
- **Our vision:** The secure, sustainable, and peaceful uses of outer space that contribute to global stability on Earth
- **Our mission:** Secure World Foundation works with governments, industry, international organizations, and civil society to develop and promote ideas and actions to achieve the secure, sustainable, and peaceful uses of outer space benefiting Earth and all its peoples



https://swfound.org

Example of Our Work: Handbook for New Actors in Space



SWF developed the Handbook for New Actors in Space, which is intended to provide nations, established satellite operators, start-up companies, universities, and other space actors with a broad overview of the fundamental principles, laws, norms, and best practices for peaceful, safe, and responsible activities in space.

Available as free pdf download from SWF Website

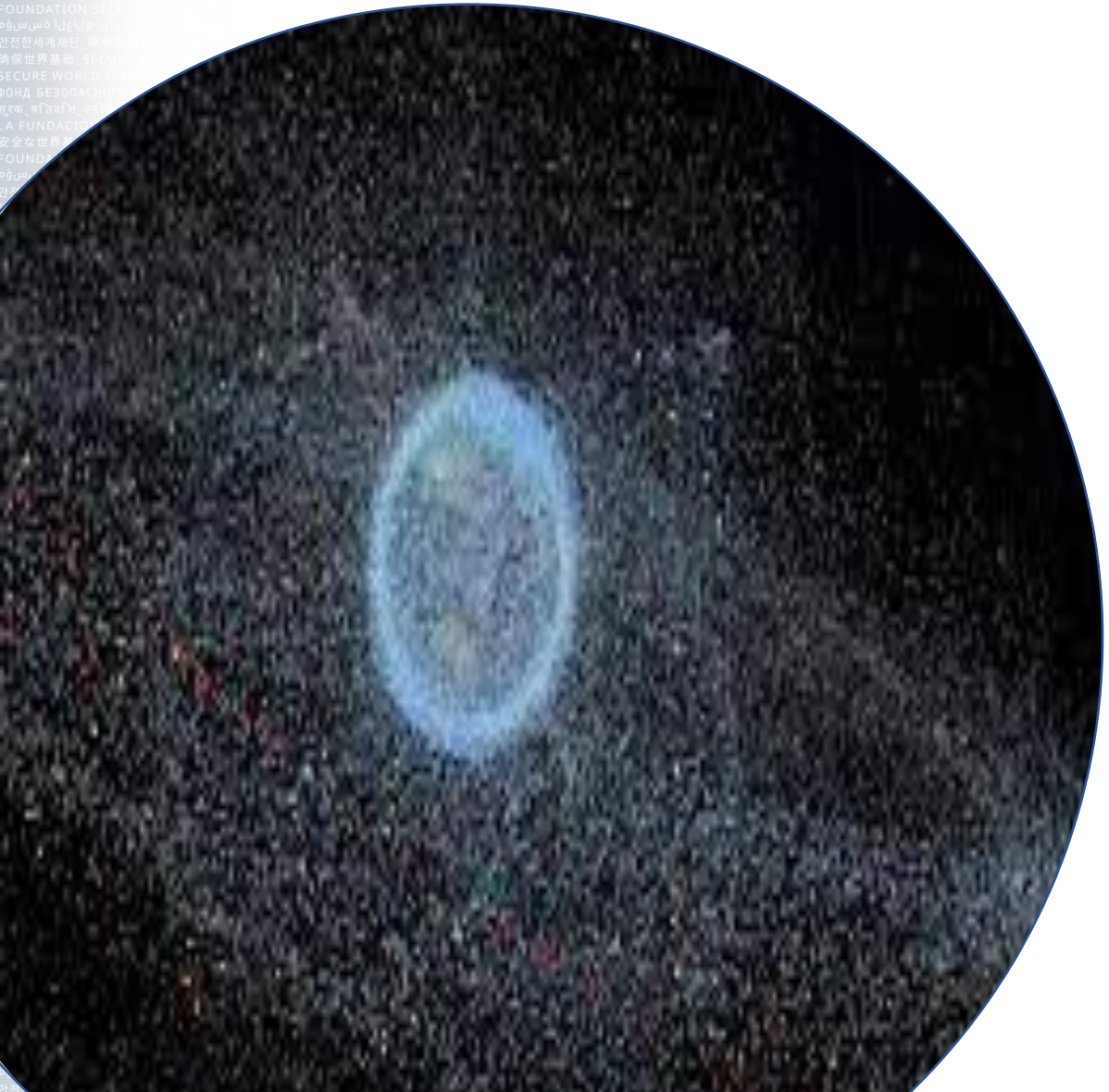
- In English
- In Spanish
- In Chinese
- In French

Chapter 1 covers the international framework for space activities

Chapter 2 covers national space policy and administration

Chapter 3 covers best practices for responsible space operations

The Space Environment: Debris & Space Safety



Most regulation, policy, and guidelines affecting space debris was developed in the context of a less complex operational domain – **regulatory best practice to require space debris mitigation plan as part of licensing requirements**

- Avoid intentional creation of debris
- 25-year "rule" for post mission disposal: [in]adequacy and [lack of] compliance
- Population of legacy government debris objects (e.g. spent rocket bodies)
- Role of commercial data in national space tracking and awareness systems
- Propulsion, maneuverability, and identification?
- Mitigation vs. remediation

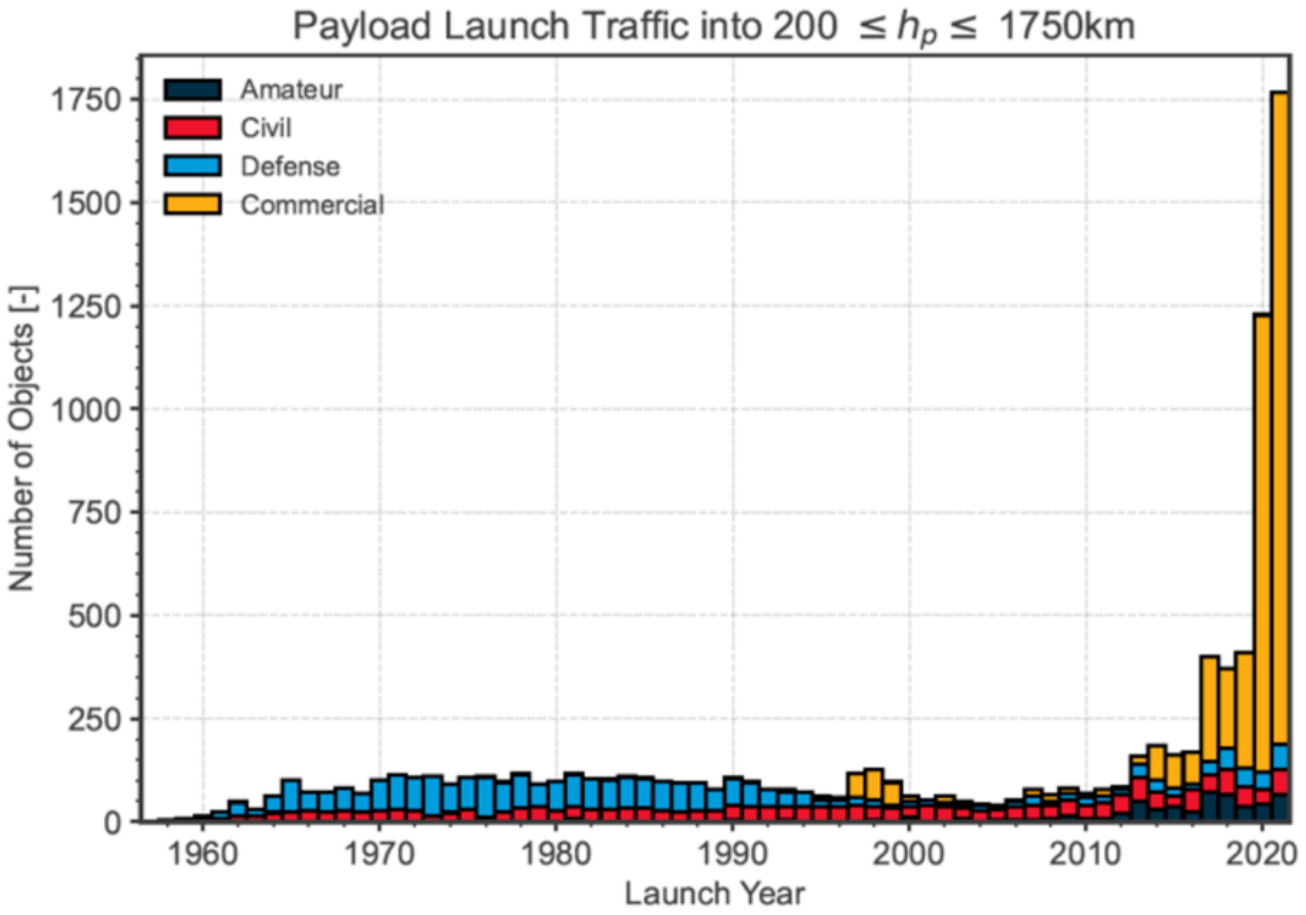
Rise of Commercial Space: A Multi-user Domain

Starlink Constellation
3800+ satellites in orbit

OneWeb Constellation
500+ satellites in orbit

Planet Constellation
~250 satellites in orbit

Kuiper Constellation
~3200 satellites planned



Source: ESA (2022)

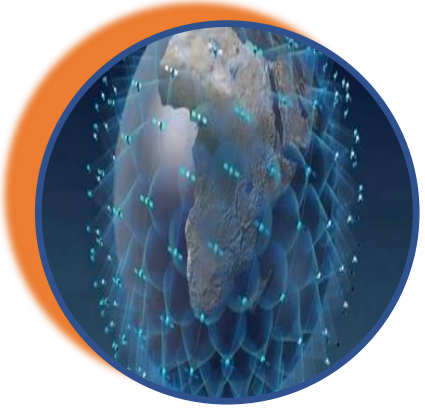
Novel Applications and Services

Satellite Servicing
("ISAM", "OSAM")

Private Space
Stations & Human
Spaceflight

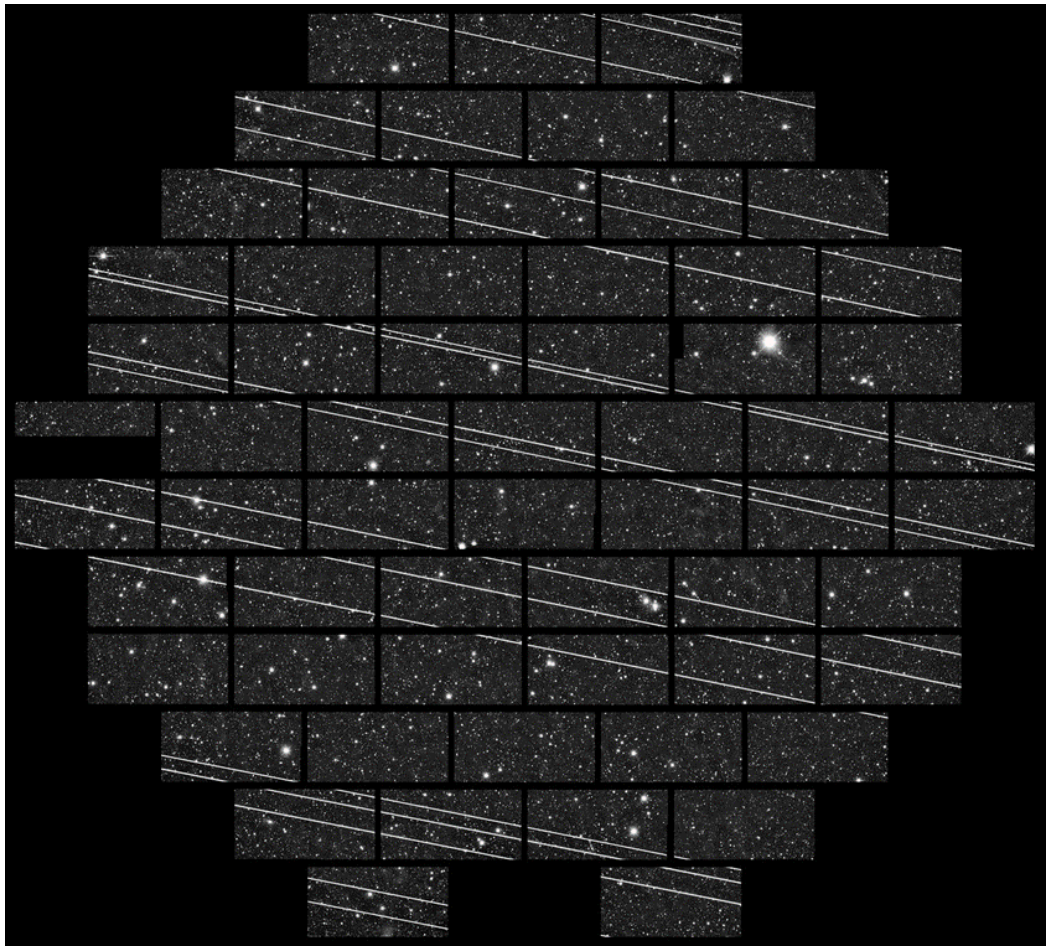
Reusable Launch

Commercial
Lunar Activities



Large
Constellations

Significant (and growing) Public Concern Over Space Congestion



MIT Technology Review

Who is Starlink really for?

The boom in LEO satellites will probably change the lives of customers who've struggled for high-speed internet—but only if they can afford...

Sep 6, 2021

Nature

The world must cooperate to avoid a catastrophic space collision

Governments and companies urgently need to share data on the mounting volume of satellites and debris orbiting Earth.

Aug 11, 2021

Engadget

We're entombing the Earth in an impenetrable shell of dead satellites

A recent study suggests that there is now nowhere on Earth free from the light pollution produced by overhead debris and satellites.

Apr 8, 2021

Sustainable Management of Very Large Constellations

- Constellations (both commercial and governmental) of 1000s to 10,000s of individual satellites are increasingly being deployed. These systems require specialized consideration in regulation.

Operational Challenges

- Paper filings for spectrum access
- Putting in to use requirements (ITU requirements)
- Satellite reliability commitments & satellite check-out practices
- Orbital crowding & space traffic coordination
- Inter-operator coordination practices and data-sharing
- Satellite tracking, orbital position sharing, and maneuver notification/coordination
- Best practices for satellite end of life operations & passivization, beyond de-orbit guidelines

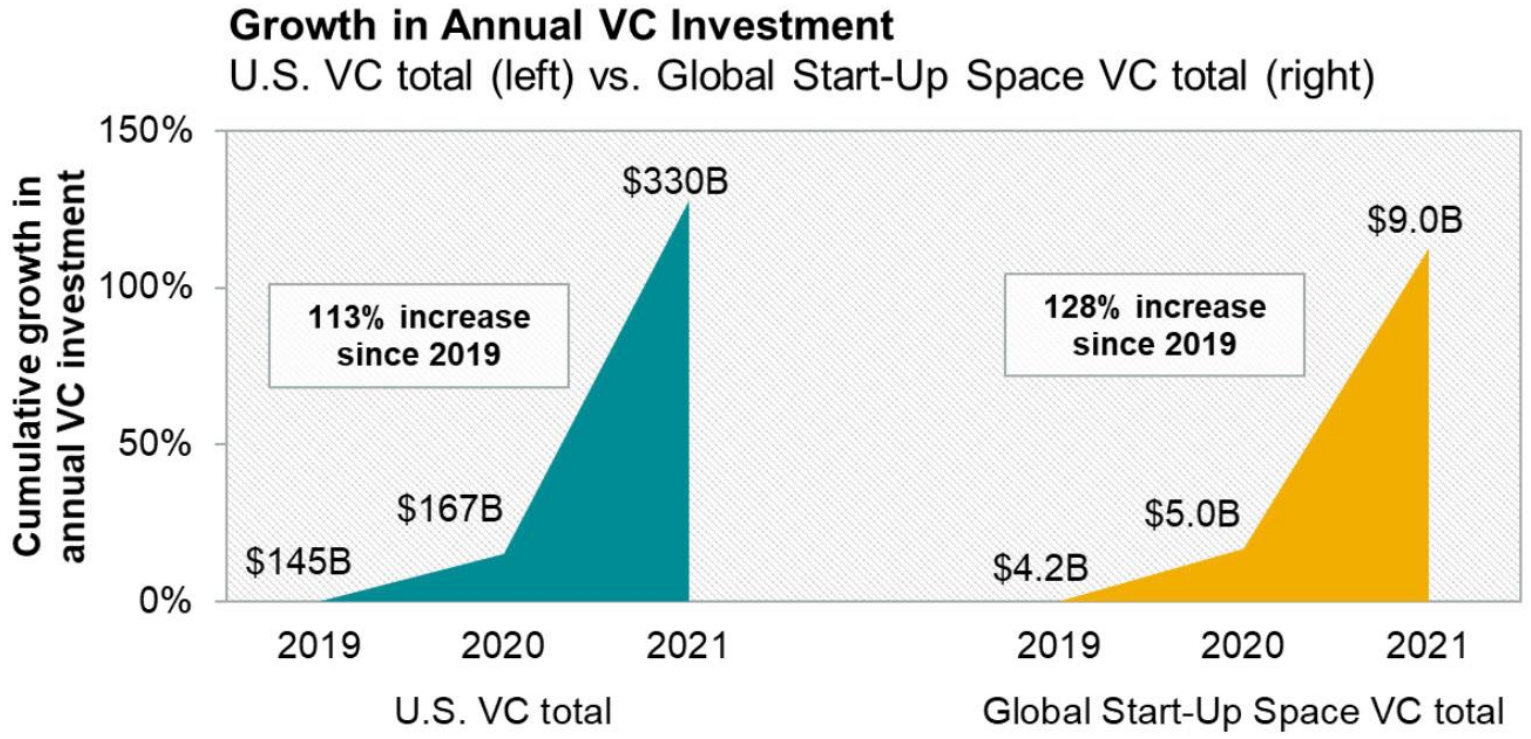
Regulatory & Policy Considerations

- Space debris mitigation requirements as part of licensing
- Consider requirements for telemetry markers, beacons, or other technical means to enhance satellite trackability
- Encourage satellite operators to publish satellite positional data, health and maneuver plans (satellite ephemeris)
- Encourage/require operators to register their satellite(s)/payload(s) with the US 18th Space Defense Squadron (www.space-track.org) to contribute to space flight safety and receive conjunction assessment services [as well as other national spaceflight safety systems]
- At national level: consider space situational awareness data sharing agreement with USSPACECOM

Key Themes From Prior Regulator to Regulator Dialogues on Large Constellations

- Political leadership will likely be required to implement large scale changes or updates to regulation
- Regulation of large constellations will be most likely and most effectively implemented at the national level, but at the same time there is need to ensure consistency across national administrations
  - Value of regulator to regulator exchanges and discussion of best practices
  - Relationship between spectrum/radio administrations and space authorities [shared challenge]
  - Tools such as multilateral market access policies and the development of a model law for regulation of the physical management of large constellations
- Discussion of the key role that equity considerations – of access to orbit for both emerging space countries and for future generations – should play in management of orbital capacity
- How many “sovereign” large constellations are necessary? What role for international cooperation?

Private Space Investment



Source: Bryce Tech, "Start-up Space 2022,"

- Significant private sector-capital is flowing into the space sector
- Growing the space economy is dependent upon a stable operating environment
- Companies have self-interest in safety/sustainability; as risks to the environment are risks to the business plan

Voluntary Industry Commitments

SSC SPACE SAFETY COALITION

https://spacesafety.org/

CONFERS

FOSTERING THE SATELLITE SERVICING INDUSTRY

https://satelliteconfers.org/

https://assets.oneweb.net/s3fs-public/2022-09/Satellite%20Orbital%20Safety%20Best%20Practices.pdf

Some Key Common Elements

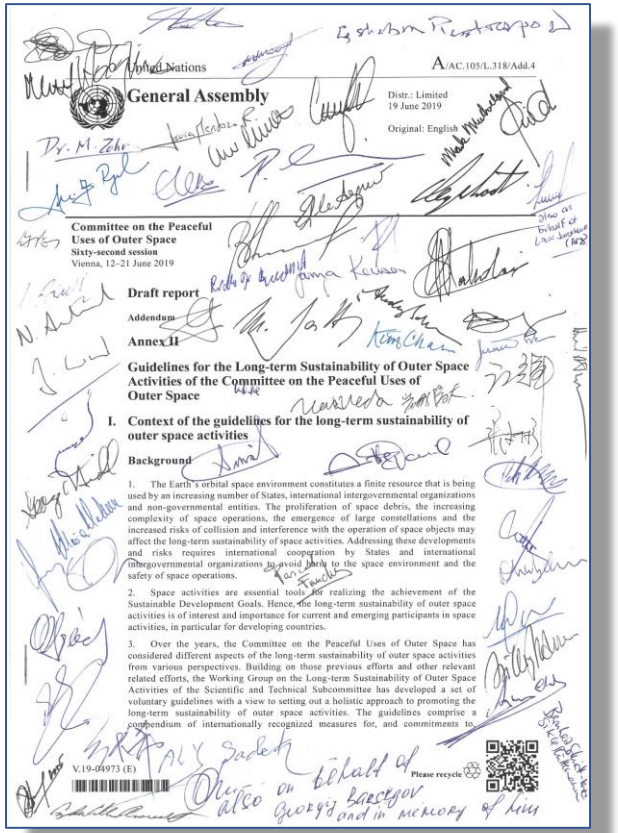
- Transparency & communication of intentions in operations
- Intra-operator exchange information of relevant to safety-of-flight and collision avoidance
- Commitment to post mission disposal w/in 5 years of end of mission
- Encouragement of design practices for responsible de-orbiting and passivation, including facilitation of servicing/removal
- Initial proposals for "rules of the road" for maneuver coordination and collision avoidance

Government should coordinate with and support, not compete with industry best practices. Regulation and policy support also required to ensure implementation and follow-through

Recognized Practices: UN COPUOS Space Sustainability ("LTS") Guidelines

- Working Group on Long-Term Sustainability of Outer Space Activities worked from 2010 – 2018.
- Adopted 21 Guidelines and a politically significant preamble
- Adopted by consensus of 92 States
- Address all kinds of space activities & all mission phases
- Voluntary & non-binding

- The guidelines address:
  - Policy and regulatory framework for space activities
  - Safety of space operations
  - International cooperation, capacity-building, & awareness
  - Scientific and technical research and development



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General Assembly

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Sixty-second session
Vienna, 12–21 June 2019

Draft report

Addendum

Annex II

Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space

I. Context of the guidelines for the long-term sustainability of outer space activities

Background

1. The Earth's orbital space environment constitutes a finite resource that is being used by an increasing number of States, international intergovernmental organizations and non-governmental entities. The proliferation of space debris, the increasing complexity of space operations, the emergence of large constellations and the increased risks of collision and interference with the operation of space objects may affect the long-term sustainability of space activities. Addressing these developments and risks requires international cooperation by States and international intergovernmental organizations to avoid harm to the space environment and the safety of space operations.

2. Space activities are essential tools for realizing the achievement of the Sustainable Development Goals. Hence, the long-term sustainability of outer space activities is of interest and importance for current and emerging participants in space activities, in particular for developing countries.

3. Over the years, the Committee on the Peaceful Uses of Outer Space has considered different aspects of the long-term sustainability of outer space activities from various perspectives. Building on those previous efforts and other relevant related efforts, the Working Group on the Long-term Sustainability of Outer Space Activities of the Scientific and Technical Subcommittee has developed a set of voluntary guidelines with a view to setting out a holistic approach to promoting the long-term sustainability of outer space activities. The guidelines comprise a compendium of internationally recognized measures for, and commitments to,

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Full texts of agreed guidelines available in UN document **A/74/20, Annex II**

Concluding Observations: Space Governance and Space Sustainability

- Space environment – driven by new actors, new applications, and competition – is rapidly becoming more complex.
- Commercial and private sector space capabilities offer potential for tremendous benefit.
- Regulation and governance is challenged – especially at international level – to keep pace with rate of change.
  - Extremely difficult to achieve consensus on internationally binding measures.
- International Forums (e.g. COPUOS) remain useful for developing common principles.
  - e.g: LTS 2.0; Space Resources Working Group, OEWG (at CD)
- But pace of change means most effective action is at the national level – and the private sector must play a role.
- How to maintain coordination?
  - Leadership commitments
  - Regulator to Regulator dialogues
  - Standards & industry best practice
  - Support operator to operator coordination

Thank You

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