



Dawn of Private Space Science
June 2018

Space Sustainability

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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

Outer Space Treaty - Article I

The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and **shall be the province of all mankind.**

Outer space, including the Moon and other celestial bodies, **shall be free for exploration and use by all States without discrimination of any kind**, on a basis of equality and in accordance with international law, and **there shall be free access to all areas of celestial bodies.**

There shall be freedom of scientific investigation in outer space, including the Moon and other celestial bodies, and States shall facilitate and encourage international cooperation in such investigation

Trends in Space

Space is becoming more **globalized**

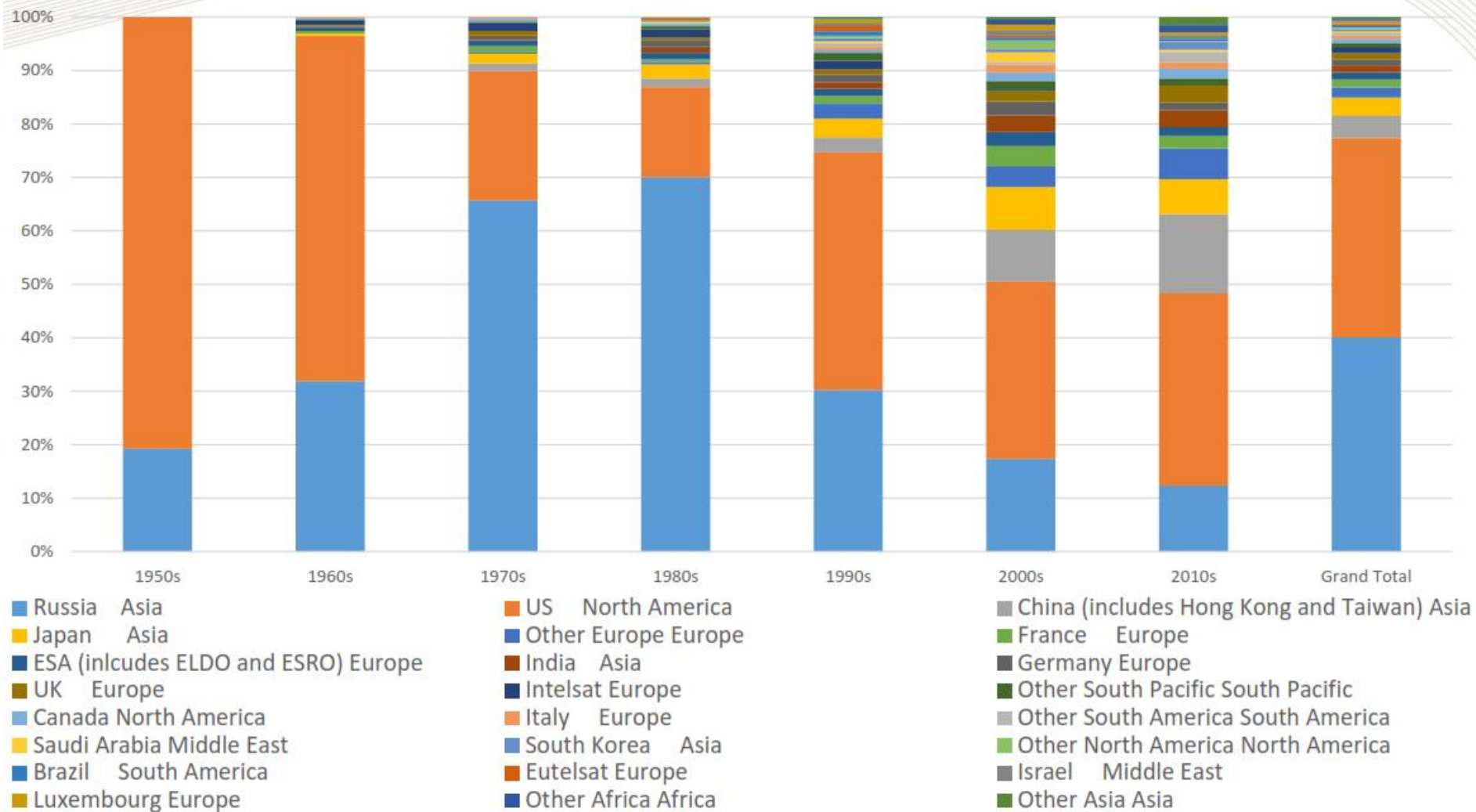
- Growing access to space technology
- Growing interest by many countries in utilizing space for national benefits (socioeconomic development, prestige, national security)

Space is becoming more **commercialized**

- Space began as part of competition between governments (US and USSR)
- Influx of technology, talent, and capital from other sectors (IT)

Space is becoming more international

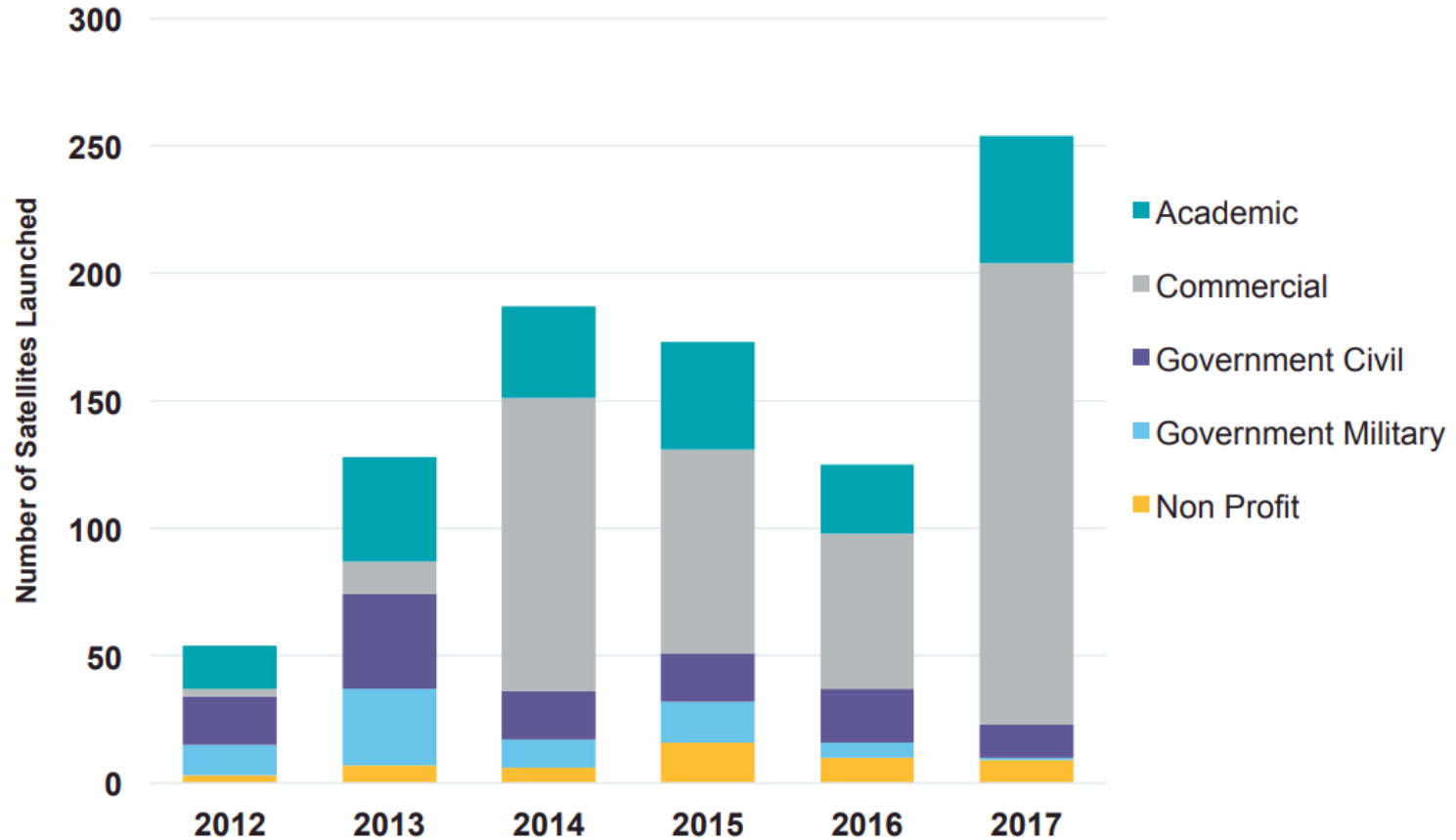
Satellites by Owner Country -1950s-today



Adapted from IDA Global Trends in Civil and Commercial Space Study

Surge in small satellites

Smallsat Operator Type, 2012 – 2017



Source: Bryce Smallsats by the Numbers, 2018



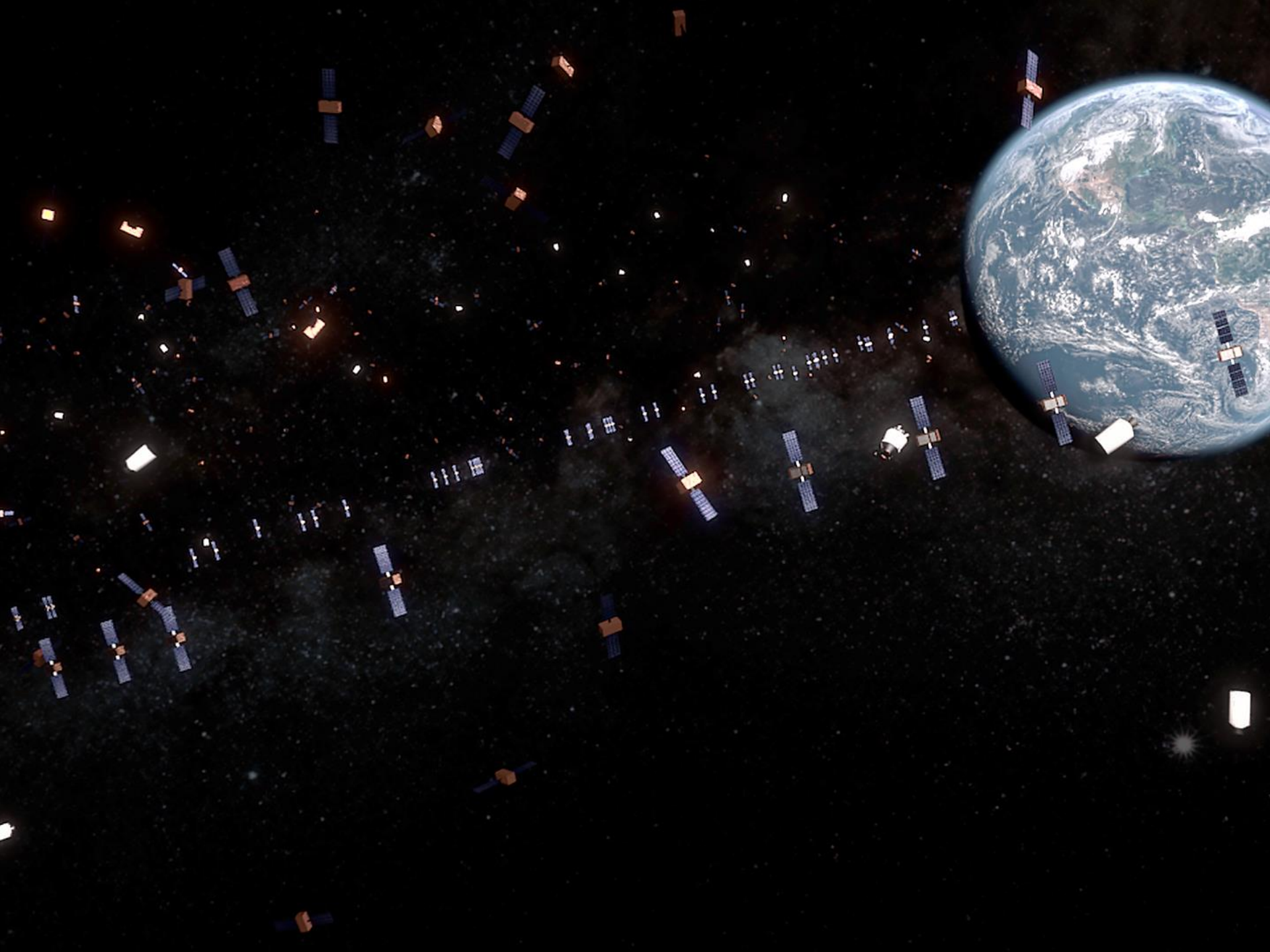
Human-generated space objects

Active Satellites

Total number of operating satellites: 1,738			
United States: 803	Russia: 142	China: 204	Other: 589
LEO: 1,071	MEO: 97	Elliptical: 39	GEO: 531

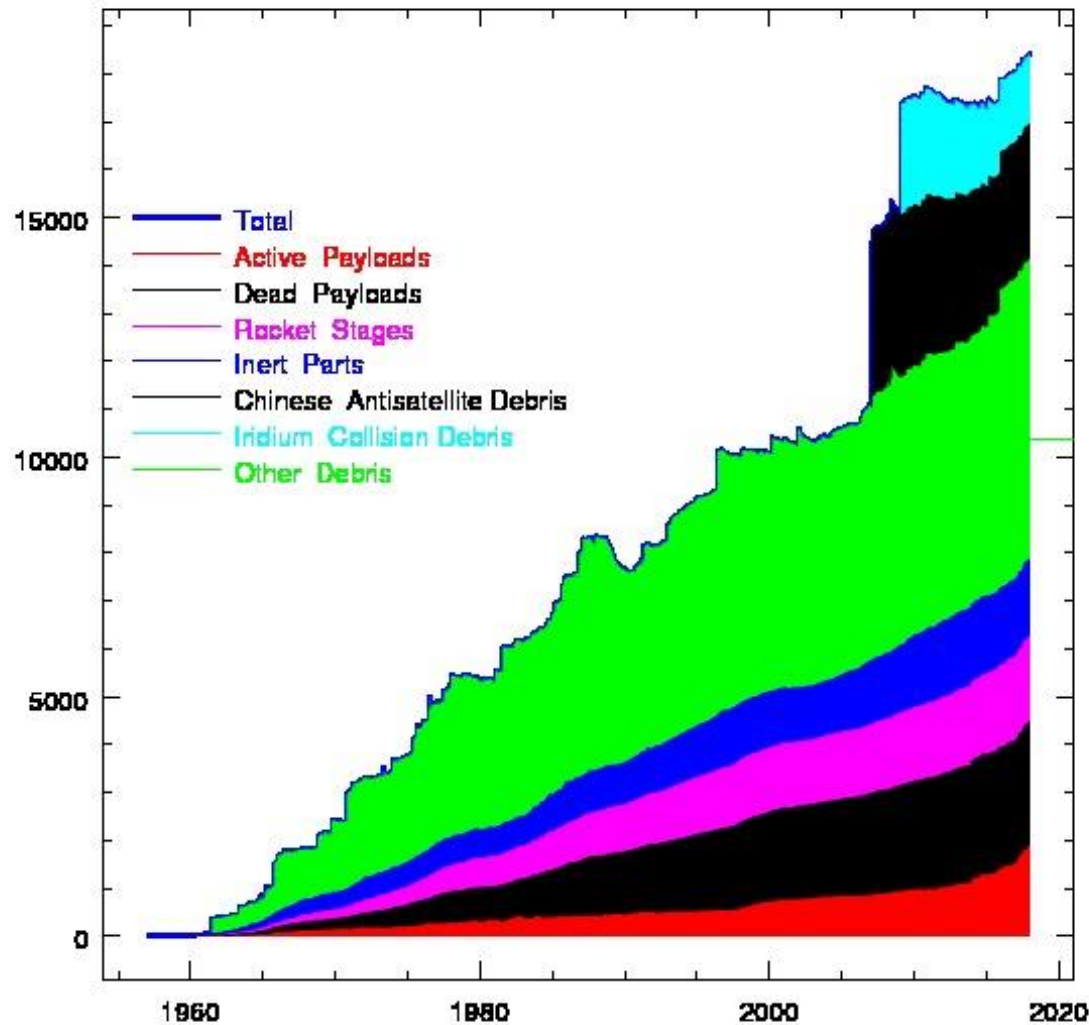
Data from the Union of Concerned Scientists
Current through 8/31/2017





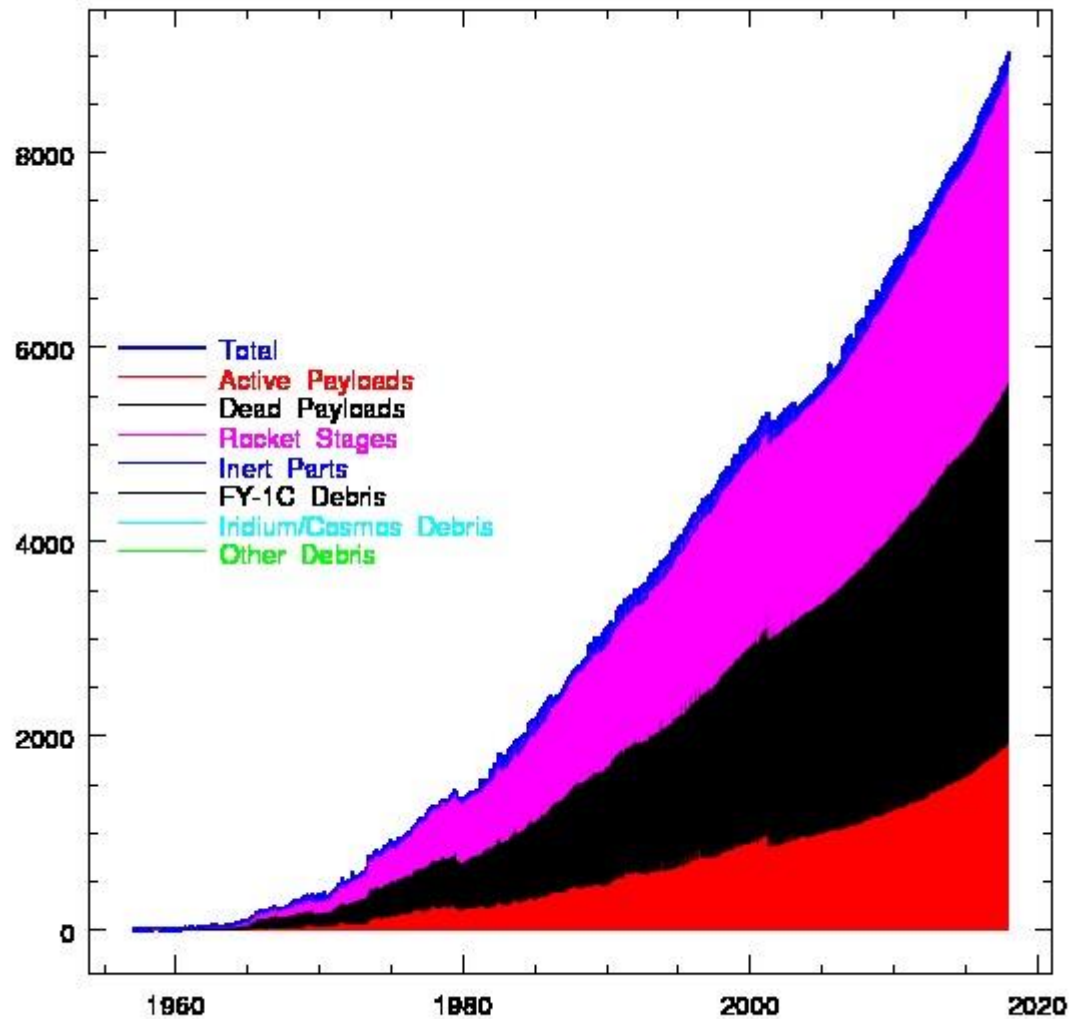
Long-term growth in space objects

Number
of
objects



Long-term growth in space objects

Mass
of
objects



Human-generated space objects

Space Debris

Larger than 10 cm	~21,000	Sources of new debris
Between 1 and 10 cm	~500,000	Can cause major damage
Smaller than 1 cm	Many millions	Can cause minor damage

Data compiled from U.S. Strategic Command, NASA, and ESA.

How do we manage the **influx of new actors** and **growth in space activities** to ensure the long-term sustainability of space?







9 Mar 2018 | 19:08 GMT

FCC Accuses Stealthy Startup of Launching Rogue Satellites

The U.S. communications agency says tiny Internet of Things satellites from Swarm Technologies could endanger other spacecraft

Rectangular Snip

By **Mark Harris** (/author/mark-harris)



On 12 January, a Polar Satellite Launch Vehicle (PSLV) rocket blasted off from India's eastern coast. While its primary cargo was a large Indian mapping satellite, dozens of secondary CubeSats from other countries traveled along with it. Seattle-based Planetary

CKS

LATEST

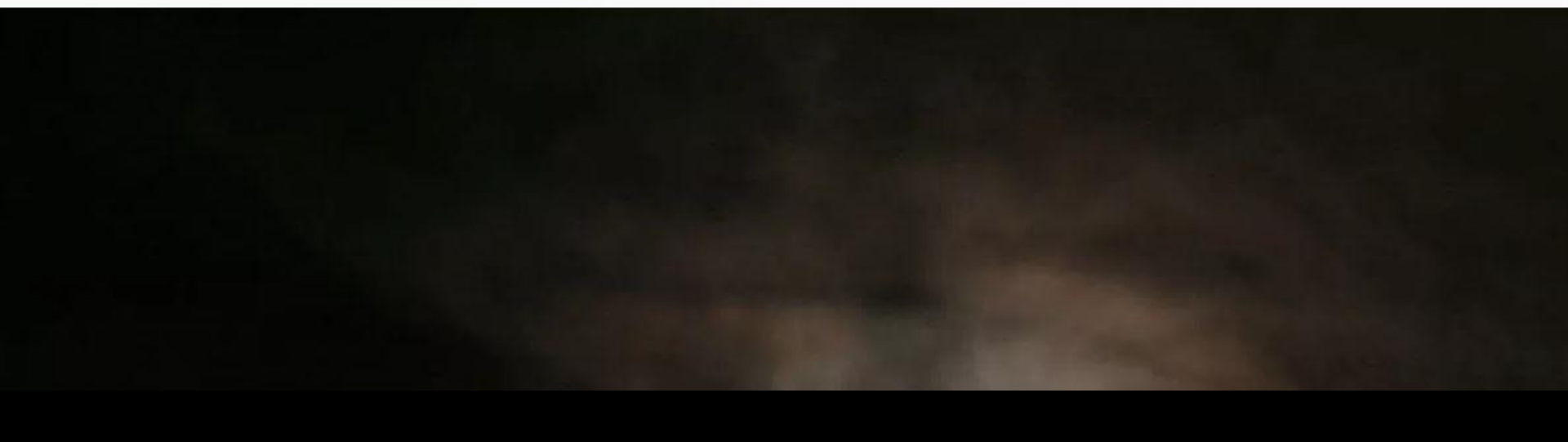
POPULAR

QUARTZ

OR

WHODUNIT?

The US government said no. Swarm Technologies launched its satellites anyway



Challenges

- Will all these new actors experience the same “learning curve” as the legacy actors?
 - Will they make the same mistakes, or just new ones?
- How do new spacefaring countries develop national space policy and law?
- How do we help maximize the benefits from new actors entering the space domain while minimizing potential sustainability challenges?

Article VI

States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.

The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.

Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

Brundtland Commission, Report of the World Commission on Environment and Development: Our Common Future, 1987.

Space Sustainability: the ability to maintain the conduct of space activities indefinitely into the future in a manner that realizes the objectives of equitable access to the benefits of the exploration and use of outer space for peaceful purposes, in order to meet the needs of the present generations while preserving the outer space environment for future generations.*

**Sustainability on Earth relies
on sustainability in space**



UN COPUOS

Long-term Sustainability

Guidelines

Compilation of best-practices

Non-binding 'soft law' norms

To be implemented on the
national level

Should be finalized in a few
weeks in Vienna at 61st COPUOS

Committee on the Peaceful Uses
of Outer Space
Sixty-first session
Vienna, 20–29 June 2018

Guidelines for the long-term sustainability of outer space activities

Note by the Secretariat

At its fifty-ninth session, in 2016, the Committee on the Peaceful Uses of Outer Space agreed that consensus had been reached on the text of twelve guidelines for the long-term sustainability of outer space activities (A/71/20, annex). At the fifty-fifth session of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space, in 2018, the Working Group on the Long-term Sustainability of Outer Space Activities agreed that consensus had been reached on a preambular text and nine additional guidelines for the long-term sustainability of outer space activities (A/AC.105/1167, annex III). The present document contains in part A the agreed texts of the preamble and 21 guidelines and, in part B, the texts of seven guidelines still under discussion, as per the conclusion at the fifty-fifth session of the Scientific and Technical Subcommittee.

The numbering of the guidelines mirrors that used in the annex of document A/71/20 and in subsequent versions of the guidelines, as most recently reflected in A/AC.105/L.362/Rev.1. The ordering of the guidelines in part A is as follows: each section contains guidelines ordered as in the annex of document A/71/20, followed by the additional guidelines agreed on during the fifty-fifth session of the Scientific and Technical Subcommittee. Therefore, guideline numbers may be missing or appear out of numerical order.

Part A Agreed texts

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

A. 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



SWF Handbook for New Actors in Space

Chapter 1. International Framework for Space

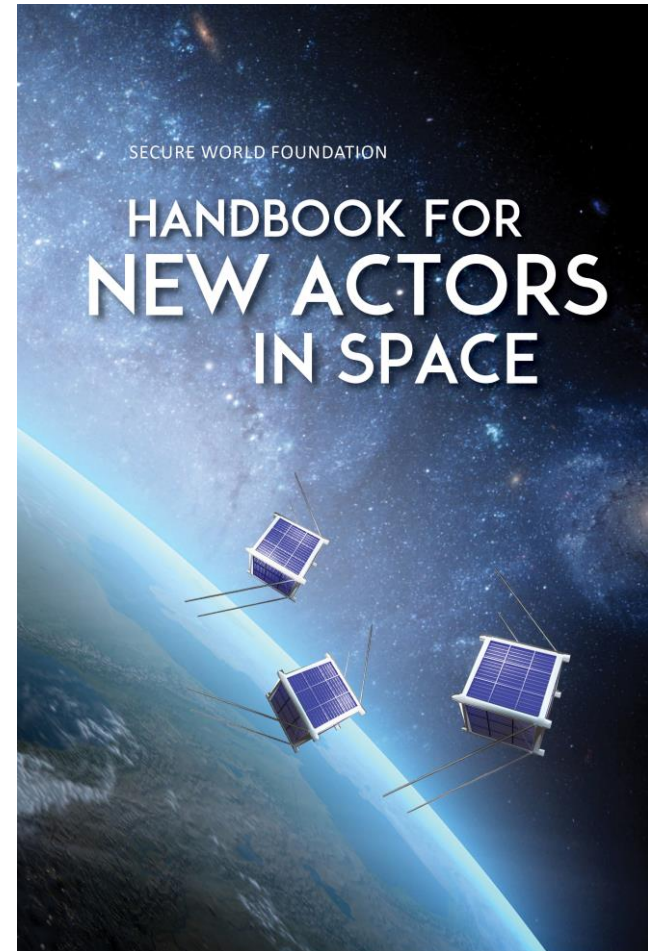
- International treaties, agreements and principles
- Multilateral fora and initiatives

Chapter 2. National Policy and Administration

- Public policy rationale, objectives, principles
- Administrative structures and coordination
- Licensing and regulations

Chapter 3. Responsible Space Operations

- Pre-launch licensing and testing
- Launch safety, deployment, on-orbit operations
- Post-mission disposal



SWF Handbook for New Actors in Space

Electronic copies are available through the SWF website, free of charge: www.swfound.org/handbook

Printed copies are also available

Looking for interested partners to help with sponsorship or contributions

- ✓ Companies
- ✓ Governments
- ✓ NGOs
- ✓ Universities



Questions?

Thank you

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Image Sources

The Telegraph

The Guardian

Rocketlab, www.humanitystar.com

Global Fishing Watch

United Nations

www.spaceflight.nasa.gov/gallery/

Qz.com; iee spectrum

SpaceX youtube channel – live views of starman

Space debris images: ESA/ID&Sense/ONiRiXEL (CC BY-SA 3.0 IGO)