Space Sustainability:
Global Market Developments and Space Programme Contributions

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Who We Are

- Secure World Foundation ***is a private operating foundation*** that promotes cooperative solutions for space sustainability

- Why **space sustainability**? Increasing reliance on space assets coupled with potentially destabilizing trends

- **Our mission**: SWF works with governments, industry, international organizations and civil society to develop and promote ideas and actions for international collaboration that achieve the secure, sustainable, and peaceful uses of outer space for the socioeconomic and environmental benefits to Earth

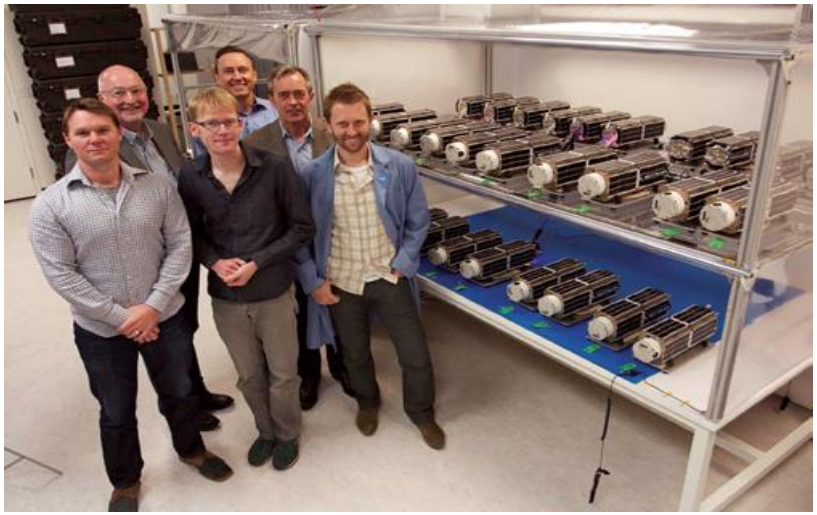
What We Do

- The Foundation acts as a **research body, convener and facilitator** to examine key space policy topics
  - To promote **international cooperative governance** for increased space sustainability
  - To increase **human and environmental security** by promoting improved governance of the delivery of information gathered from space systems in ways that promote its utility
  - To assist in the **development of effective national and international space policies and laws** both in established and emerging space nations

THE CHANGING NATURE OF SPACE ACTORS

A growing, diversifying, and rapidly innovating community.

Disruption



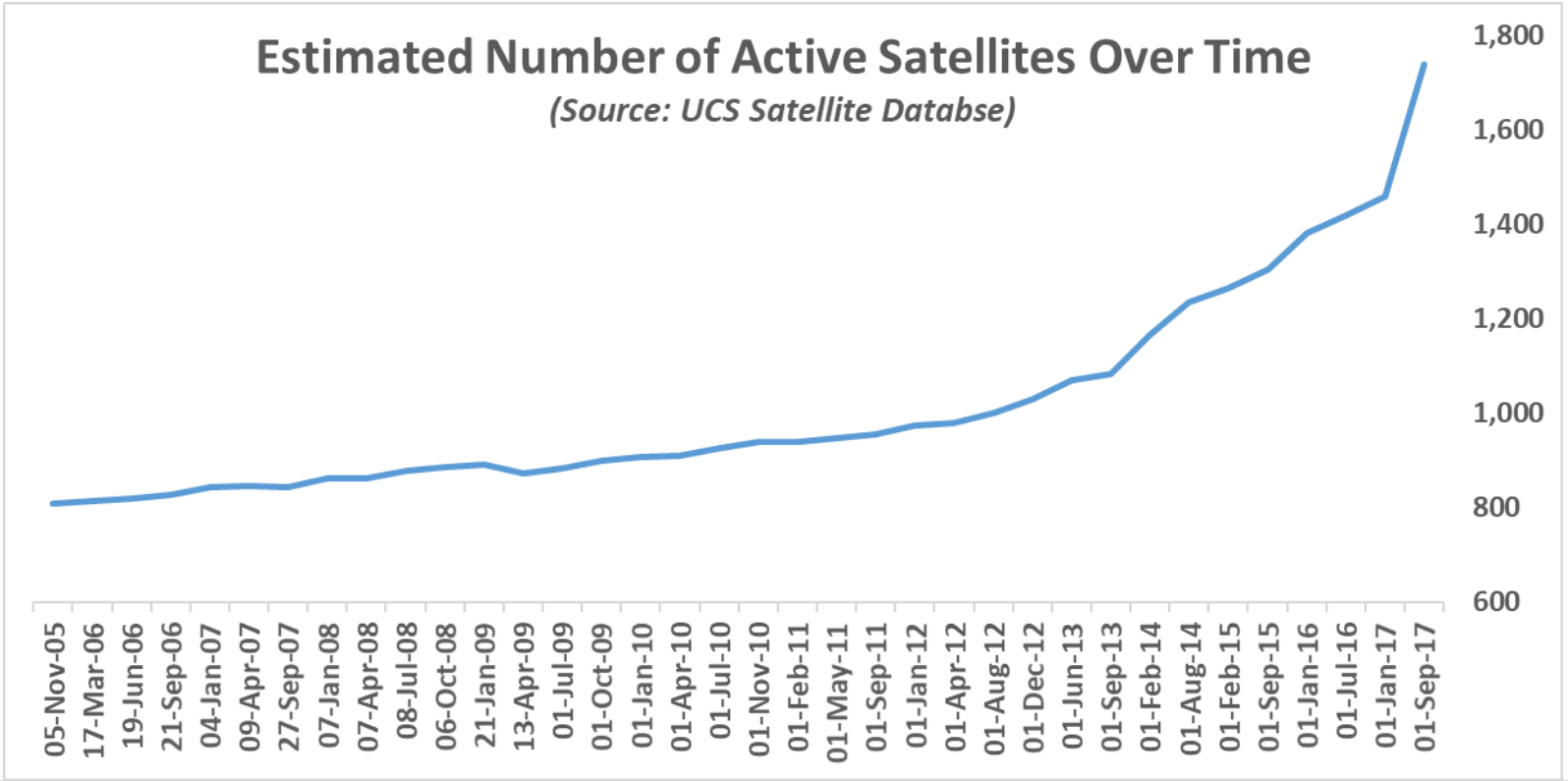
Planet founders pose with a flock of Doves. Image credit: SatMagazine

Disruptive Innovation: "a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors"

(Clayton Christensen)

http://www.claytonchristensen.com/key-concepts/

A Fundamental Change?

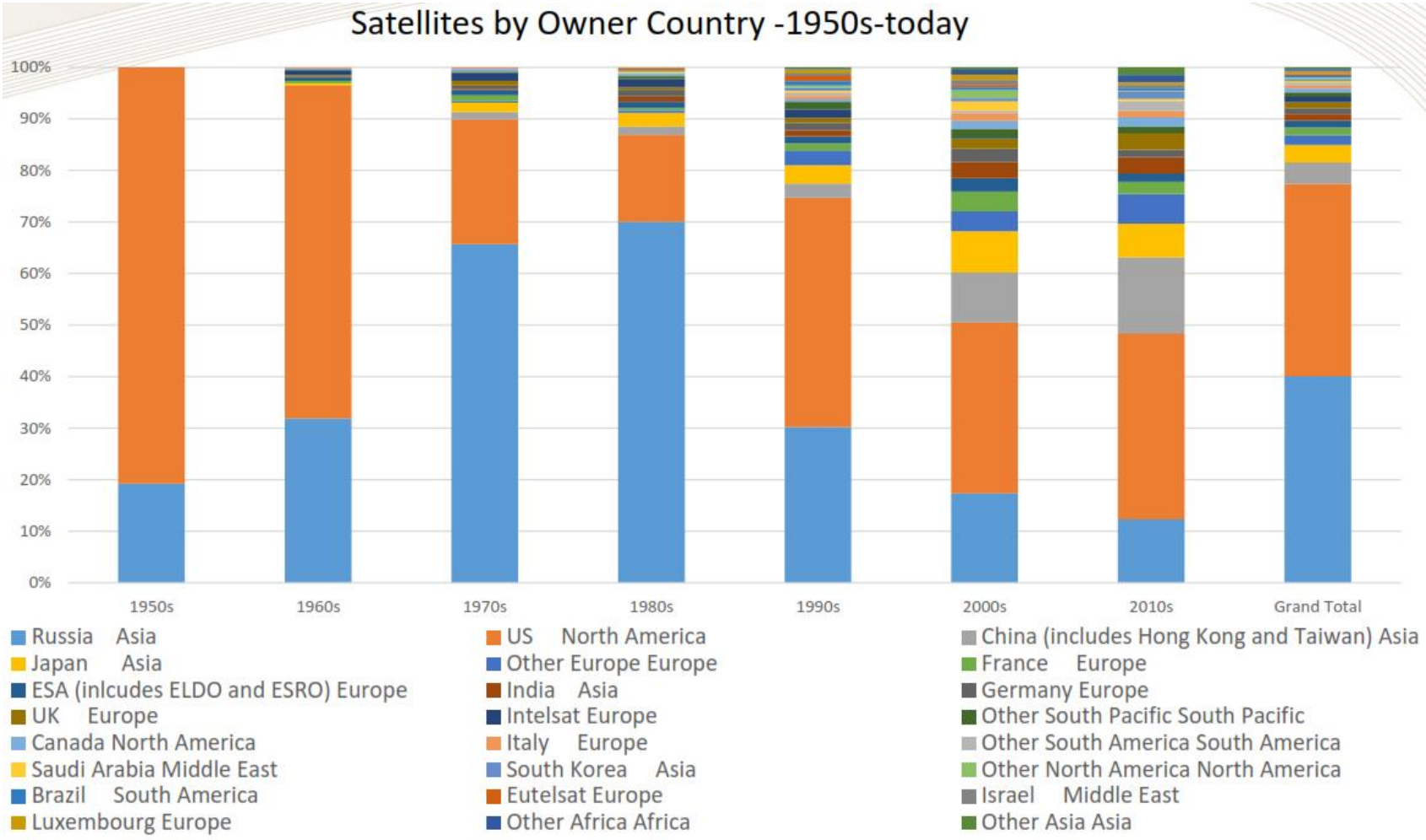


As of September 1, 2017: Estimated total number of operating satellites: 1,738

1-50 kg Forecast: Up to 2400 micro/nanosatellites to launch by 2023 (Spaceworks)

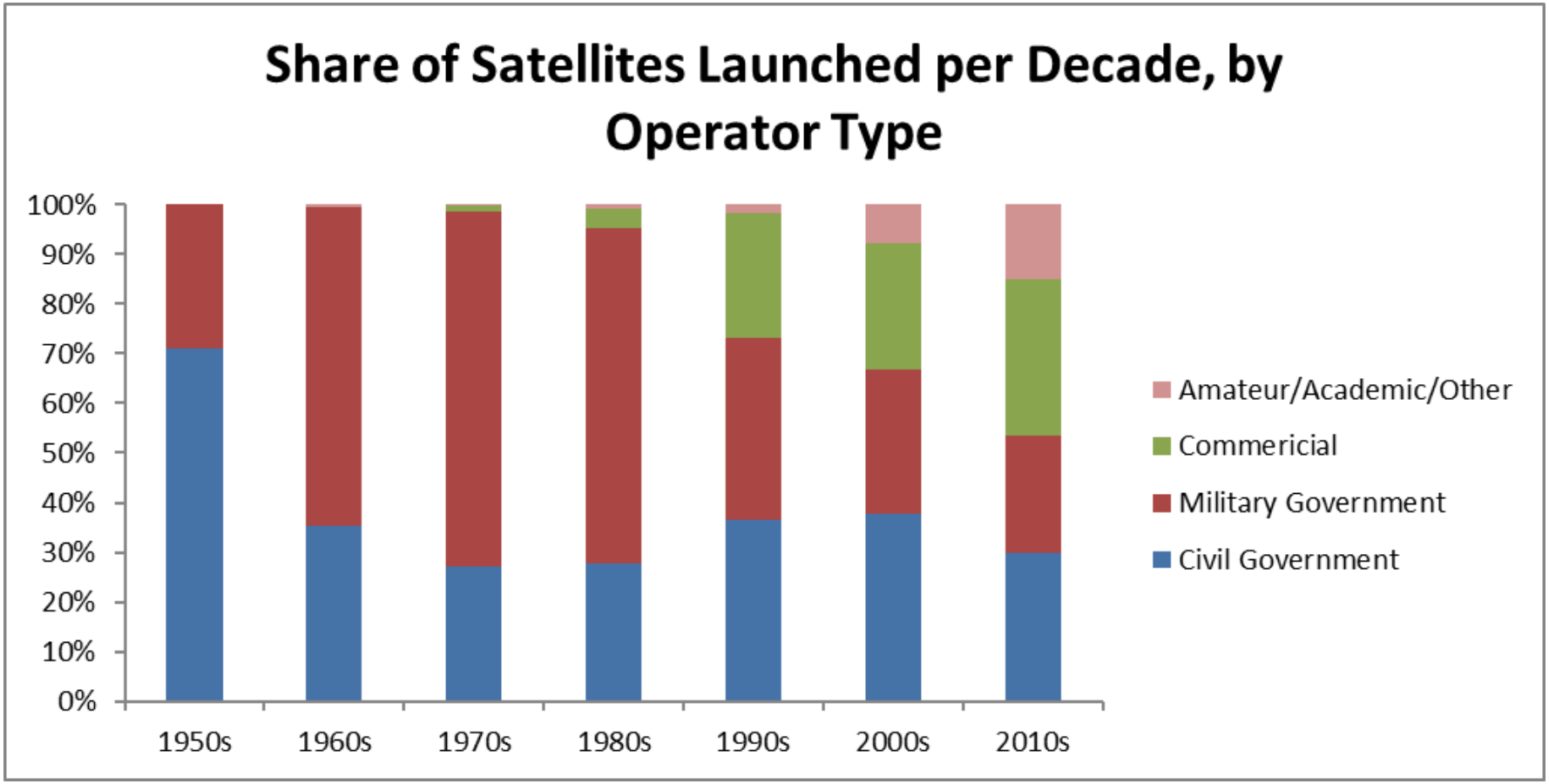
NGSO Constellations: 16,000+ planned satellites – based on US filings alone

Space is Becoming More International



Adapted from IDA Global Trends in Civil and Commercial Space Study

Space is Becoming More Commercial



Source: McDowell, Jonathan C, 2017—Satellite Statistics
http://www.planet4589.org/space/log/stats2/own_categ.txt

Implications

Opportunities

- Lower costs of access to space technology
- Lower technical and scientific barriers
- Broaden and diversify actors and users
- Enable new (and innovative?) applications and services
- Provide increased societal benefit

Challenges

- Regulatory fit, efficiency, and scale
- Diverse, heterogeneous set of actors
- Few standards for operations
- Spectrum, SSA, and potential space debris implications

BEST PRACTICES & NORMS OF BEHAVIOR

How can governments and the private sector work together to ensure sustainability of the space domain?

What are "Norms"?

- **Sociology**: informal understandings that govern the behavior of members of a society
- **International relations:** Standard of appropriate behavior for actors with a given identity

Osaka

Historically – stand on right, walk on left

Tokyo

Historically – stand on left, walk on right

Norms in Space Governance

- Much of the existing space governance framework is based on norms
  - **Example:** Freedom of overflight for satellite reconnaissance
    - Launch of Sputnik in 1957 helped set the norm that satellite overflight did not breach territorial sovereignty
    - By mid-1960s, freedom of overflight was a generally accepted norm
    - Was not codified into "hard law" until Outer Space Treaty of 1967

- Norms are likely going to be the main mechanism to address future challenges
  - "Congested, contested, competitive"
  - Far more space actors than ever before, with diverse interests and goals
  - Increasingly challenging to get global consensus on new "hard law"

Impetus for Norms in the Private Sector

- Over the next decade, the private sector will become the dominant player in space (16,000+ satellites planned for launch)

- Incentives for satellite operators to set norms/behaviors w/out waiting for governments to act
  - Increase the sustainability of their own business models
  - Allay concerns that "darkening the skies" will create havoc for existing users
  - Preempt the need for government regulation (or at least inform it)

- Ties into broader Corporate Social Responsibility movement
  - Businesses value in social good beyond just bottom line
  - Socially responsible practices that reinforce business models

Areas of Opportunity to Develop Norms of Behavior

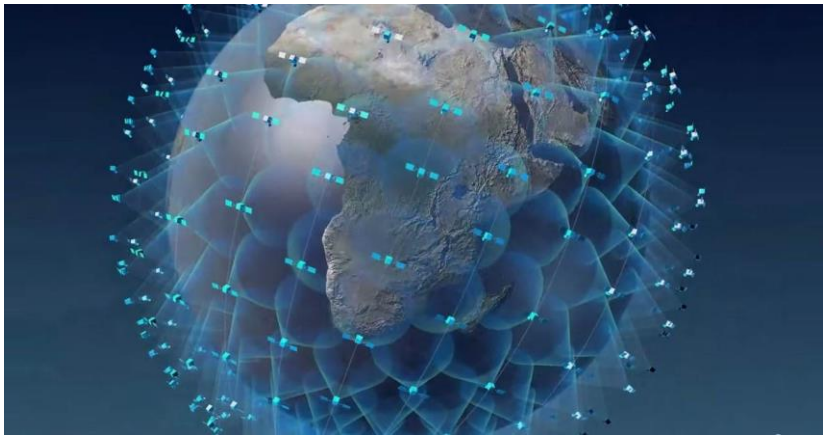
During 2016 and 2017 the Secure World Foundation (SWF) has held a series of workshops discussing best practices in several areas:

- Satellite operator best practices for minimizing collisions
- Space situational awareness (SSA) and smallsats
- Cubesat launch and deployment best practices
- Cubesat post-mission disposal best practices;
- Principles for safe and responsible active debris removal
- Operations principles for large commercial satellite constellations

Principles for Responsible Space Actors

In an increasingly competitive orbital environment, how can operators cooperate on responsible operations principles?

How can operators work with government(s) to ensure safety of operations for all users of the space environment?



* Satellites not to scale

- Satellite tracking capabilities
- Constellation separation
- Satellite reliability and end-of-life passivation commitments
- Adequacy of space debris guidelines
- Spectrum management & coordination
- Information sharing and transparency

SPACE FOR BENEFIT

Opportunities for policy development and collaboration to ensure positive outcomes

Novel Commercial Space Approaches

Rapid expansion in the number & types of commercial space applications is challenging existing policy context for space activities

Image Source: VIA Satellite

Image Source: Planetary Resources

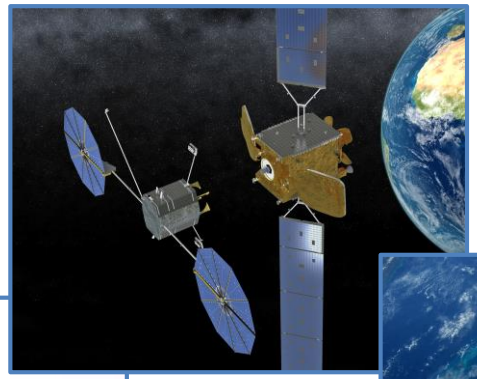


Image Source: Orbital ATK

Image Source: UNOOSA / Sierra Nevada Corp

Governmental policy and regulation must be developed to support these activities, in manner that is consistent with international obligations, and that provides for benefit.

Benefit as a Concept in Space Governance

- Benefit has long been a key concept in space governance
- No benefit without development
- There is a need for an adaptive approach to the development of governance approaches to ensure benefit from non-traditional and novel commercial space applications
- Most benefit sharing expectations and arrangement are defined, implemented, and executed through national and local policy and regulation - rooted in internationally agreed to principles
- Sustainable Development Goals as one metric to monitor and track benefit

The Sustainable Development Goals

- The "globally accepted and practical definition of sustainable development, " set goals and targets for achievement by 2030
- Adopted by all 193 United Nations Member States in September 2015
- Commercial space can – and is – contributing
  - No SDG contains goals that weren't already being worked on by professionals around the world
  - Need to define and think broadly from citizens to organizations to governments
  - Potential end users may be unaware of the possibilities

Conclusion: A Stable, Predictable, and Sustainable Operating Environment in Space

How can governments and the private sector work together to ensure sustainability of the domain?

Issues/Topics

- Policy context for identifying and obtaining benefit
- Regulatory authority, structure & process
- Space traffic management
- Norms of behavior
- New actors & best practices
- Government role as both customer & operator

Example Efforts

UNISPACE +50 and High Level Fora

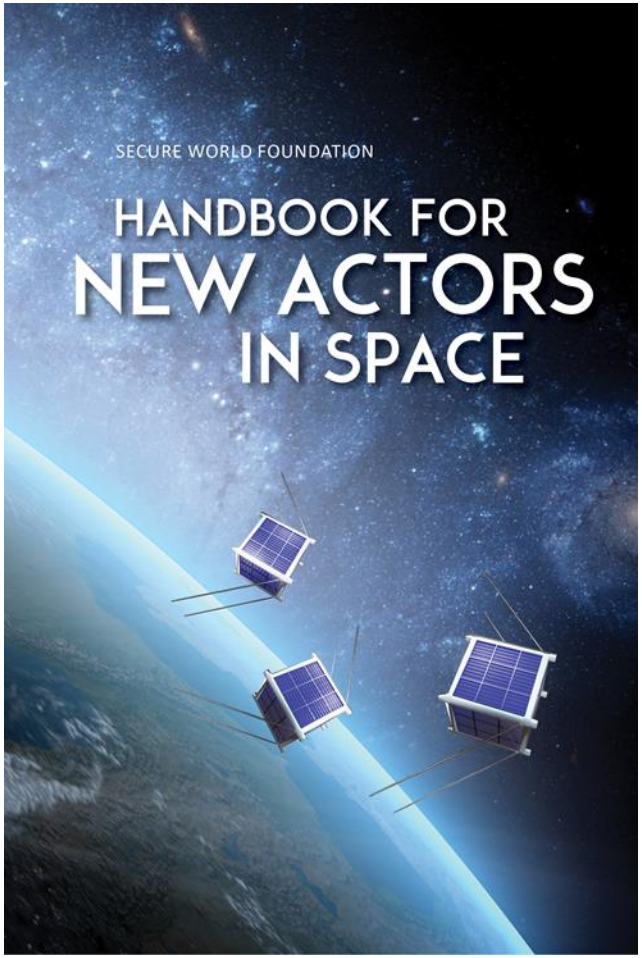
- Agenda-setting for future multilateral discussions

The Hague Space Resources Governance Working Group

- Multilateral, multi-sectoral effort to define policy and legal "building blocks"

SWF Handbook for New Actors in Space

- Overview of fundamental principles, norms, and best practices for safe, predictable, and responsible activities in space



Thank You

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