

# Emerging Trends in Space Technologies and Legal issues

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November 01, 2020**

# Outline

- Brief note on International Space Law under UN Treaties
- Space Debris
- Small/ Nano Satellite Constellations
- Private Sector Participation
- Space Resources Utilization
- Conclusion

# Constituent Elements of body of Space Law

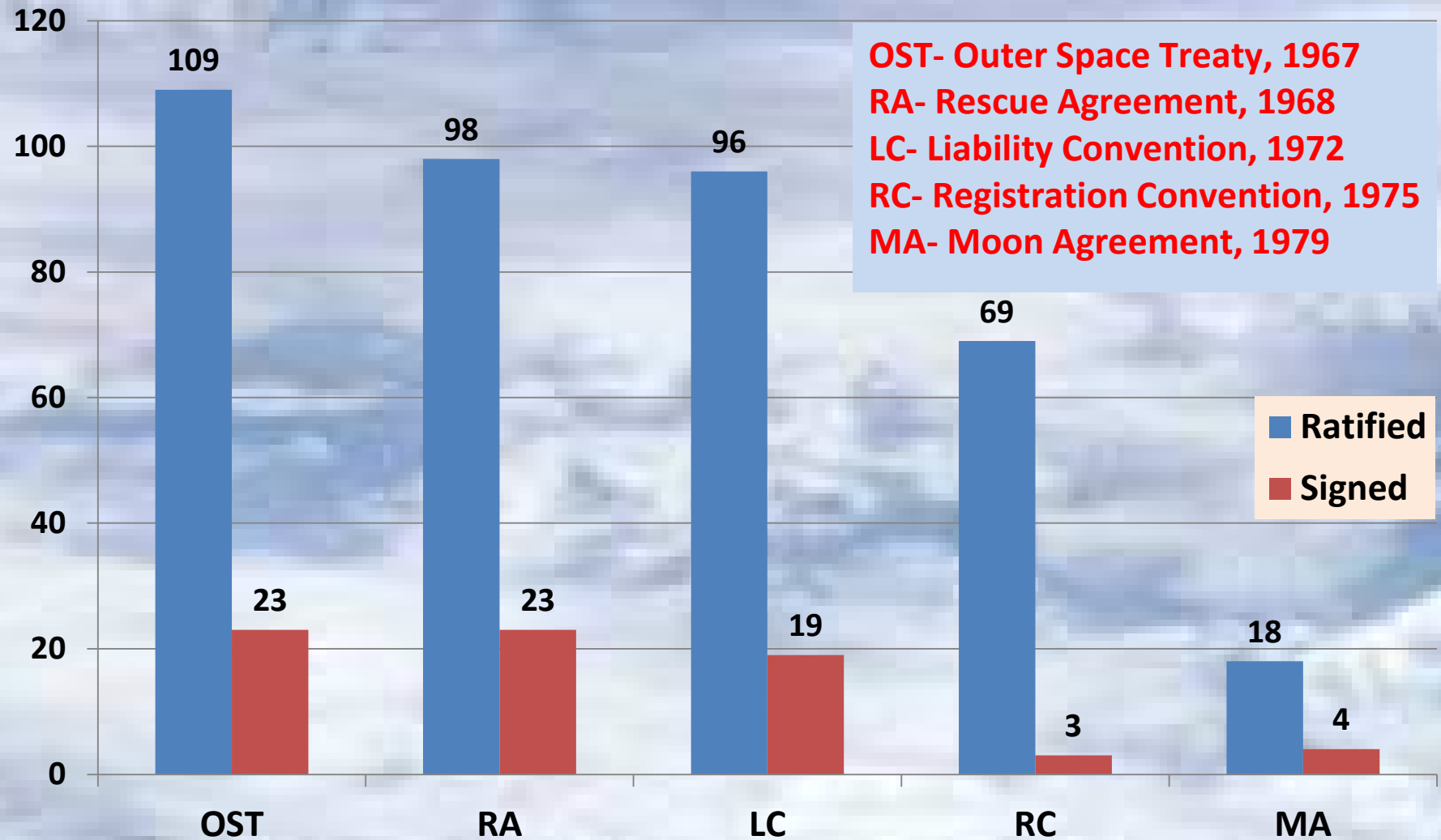
- **UN Principles**- *Declaration of Legal Principles, 1963; Broadcasting Principles, 1982; Remote Sensing Principles, 1986; Nuclear Power Sources" Principles, 1992; Benefits Declaration, 1996.*
- **UN Treaties – Five Treaties - (Details in next slide)**
- **UNGA Resolutions** – *International Cooperation 1961; Launching State, 2004; Registration Practices, 2007; National Legislation, 2013, ... ..*
- **Other Documents** – *Space Debris Mitigation Guidelines, 2007; Safety Frame Work for NPS, 2009, Transparency and Confidence Building Measures (TCBMs) 2013, Long Term Sustainability of Outer space activities (2010.. 2018?)*

# UN Treaties on Outer Space Activities

- **Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty) 1967**
- **Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement) 1968**
- **Convention on International Liability for Damage Caused by Space Objects (Liability Convention) 1972**
- **Convention on Registration of Objects Launched into Outer Space (Registration Convention) 1975**
- **Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement) 1979**

# Status of UN Treaties on Outer Space –

*As on January 2019*



# Emerging Scenario

- Growth of Space Debris in outer space - *Active Debris Removal Techniques*
- Nano Satellite/ Small Satellite Constellations
- Utilization of Space Resources -Space Mining
- Dominance of Non-Governmental Sector activities – New Space Era- Start-Up
- Space Tourism
- Lunar Gateway Project



# Space Debris

# Space Debris in motion



# Article IX of OST

- In the exploration and use of outer space, including the moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of co-operation and mutual assistance and **shall conduct all their activities in outer space, including the moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty.**
- States Parties to the Treaty shall pursue studies of outer space, including the moon and other celestial bodies, and **conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter** and, where necessary, shall adopt appropriate measures for this purpose. If a State Party to the Treaty has reason to believe that **an activity or experiment planned by it or its nationals in outer space, including the moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. ..**

...

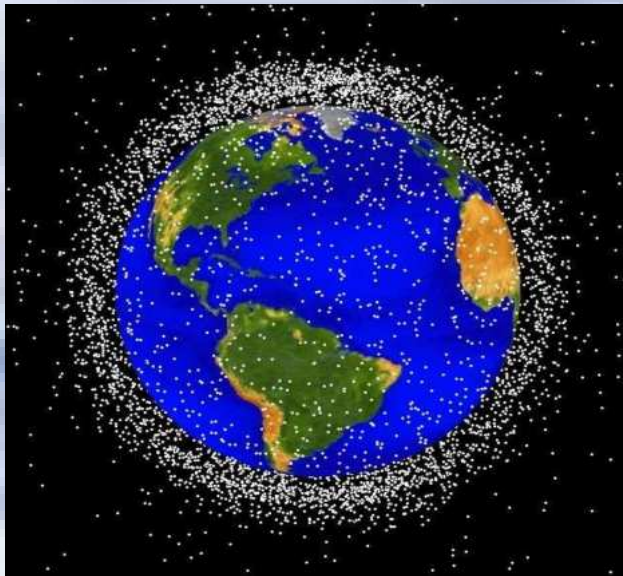
# Snapshot on Space Objects *(as of Jan 2019)*

- Number of Space Objects Launched since 1957: **About 5450** *(excluding failures)*
- Number of satellites placed into Earth orbit: **About 8950**
  - **Still in space: About 5000; Still functioning: About 1950**
- Number of debris objects tracked and catalogued: **About 22 300**
- Estimated number of break-ups, explosions, collisions, or anomalous events resulting in fragmentation: **More than 500**
- Total mass of all space objects in Earth orbit: **>8400 Tonnes**
- Number of debris objects estimated by statistical models to be in orbit:
  - **34 000 objects >10 cm**
  - **900 000 objects from 1 cm to 10 cm**
  - **128 million objects from 1 mm to 1 cm**

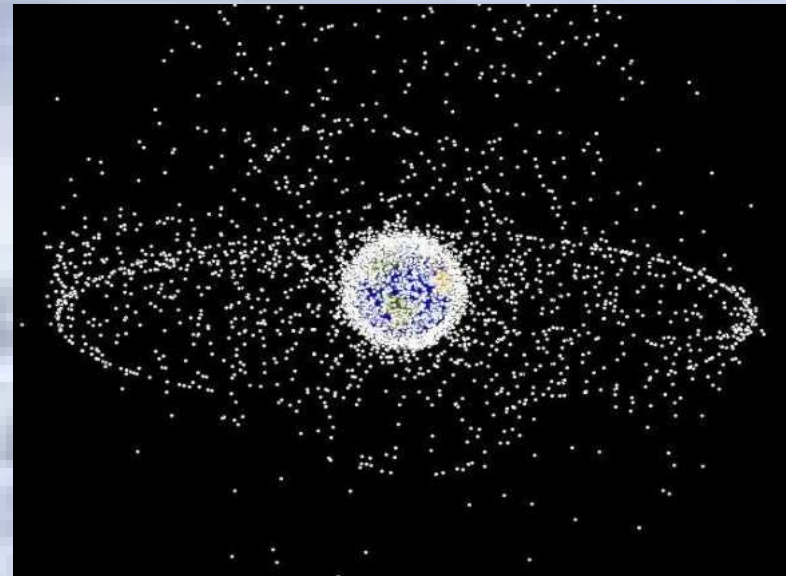
*(Source: ESA Space Debris Office, DoA: Feb 11, 2019)*

# Space Debris

- Space / Orbital Debris are all man-made objects in orbit about the Earth which no longer serve a useful purpose.
- Speed : In Low Earth Orbits- 7 to 8 km/s; Impact speed- 10km/s



Low Earth Orbit(LEO)



Geo Synchronous Region

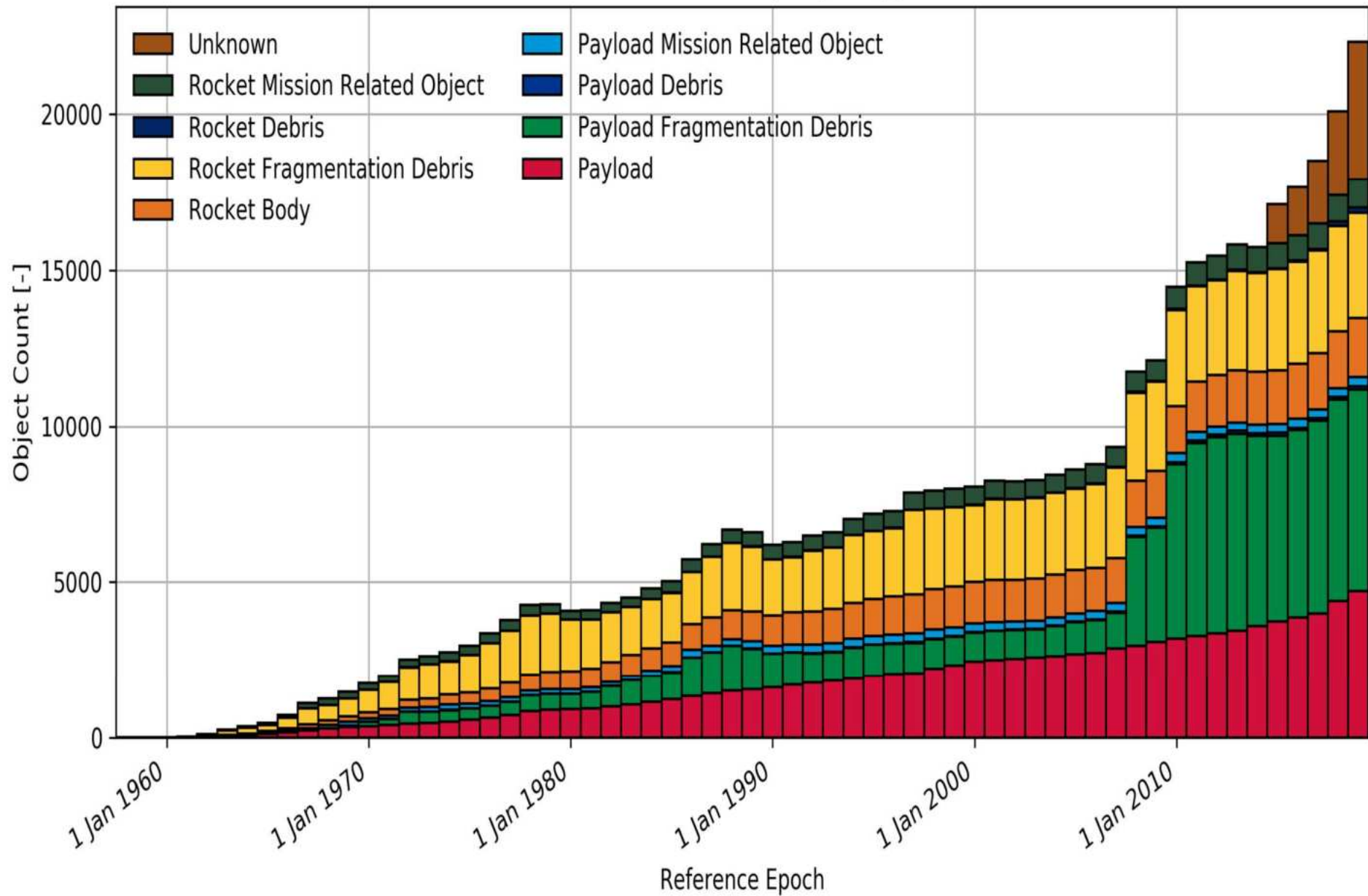
- Debris of size larger than 10 cm: > 22,000
- Particles between 1 and 10 cm in diameter: 500,000 (approx)
- Number of particles smaller than 1 cm : > 100 million.

Source: NASA Orbital Debris Program<sup>11</sup>Office

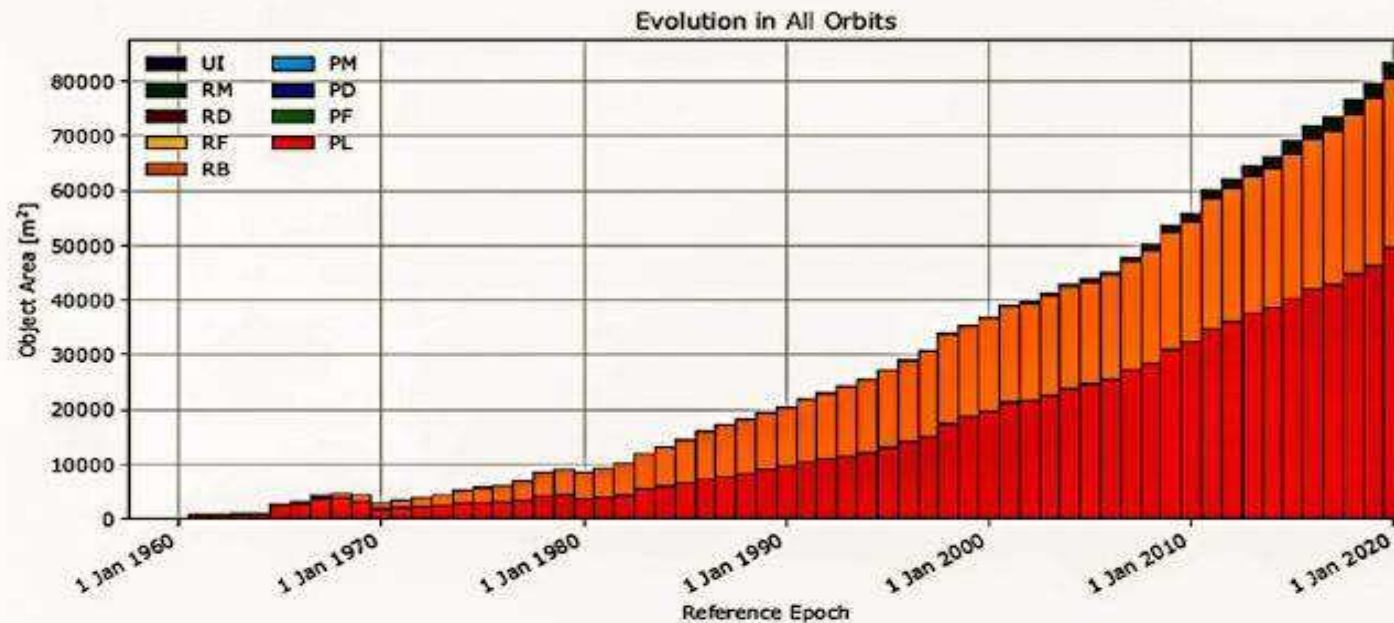
## **Sources of Space Debris**

- **Mission related - Satellites, Rocket bodies**
- **Accidental – Satellite break-ups, On-Orbit Collisions, Drop-outs from astronaut's extra-vehicular activities**
- **Intentional or Avoidable – ASAT tests, Intentional Destructions, Abandonment of space objects in LEO, launching of Space Objects non-compliant to UN debris mitigation measures, micro and small satellites ... ..**

Count evolution by object type



# Growth of Space Debris- Evolution of Area



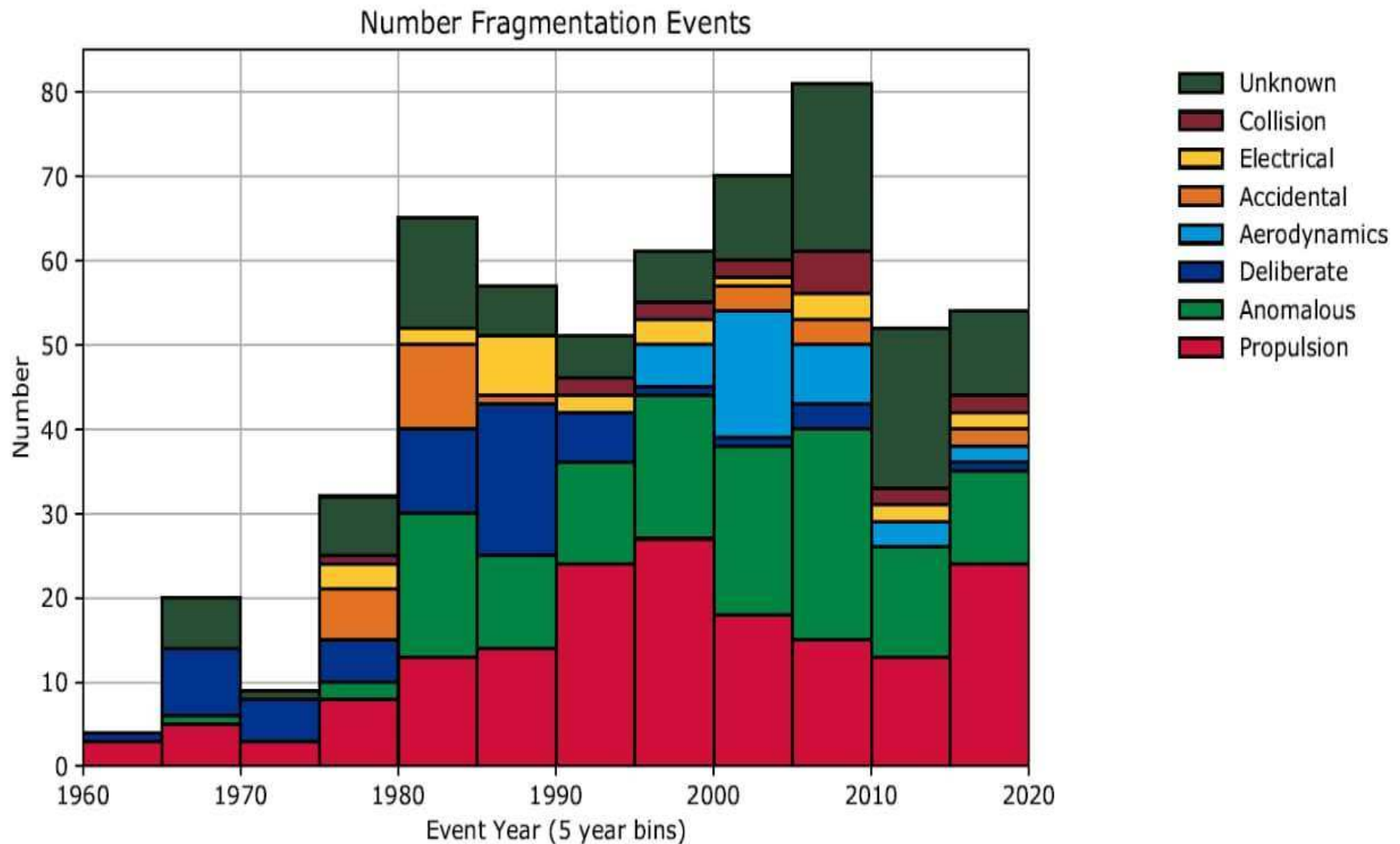
(c) Evolution of area.

Image:

The objects we sent to orbit take up space, as does the debris they create. The increasing area of objects in space dramatically increases the likelihood of collisions.

Red (PL) = Payload;  
Orange (RB) = Rocket body;  
Dark Green (RM) = Rocket mission related object;  
UI = Unidentified;  
RD = Rocket debris;  
RF = Rocket fragmentation debris;  
PM = Payload mission related object;  
PD = Payload debris;  
PF = Payload fragmentation debris

# Number of Fragmentation Events



Source: ESA- Space Debris Office

# Evolution of Space Debris Mitigation Measures

- Liberal dumping space debris - initial phase space players - Unaware of consequences -*Late realization*
- Bilateral discussions initiated in 1986; Call for international cooperation in 1988
- UN General Assembly Resolution (48/39) in 1993 on International Cooperation- *concern on space debris*
- UNCOPUOS STSC – Agenda on Space Debris in 1994
- Formation of IADC- 1993.
- International Law Commission – Resolution on space debris- 1994.
- IADC Guidelines on Space Debris Mitigation of 2002 – Introduced in STSC of UNCOPUOS- Adopted in 2007
- Adopted through a UN General Assembly Resolution (No.62/217) – December 2007 – *A Legal Sanctity !*

# Space Debris Mitigation Guidelines

- **United Nations Space Debris Mitigation Measures Guidelines – 7 Guidelines**
  - Limit Debris released during normal operations
  - Minimize the potential for break-ups
  - Limit probability of accidental collisions in orbit
  - Avoidance of intentional destructions
  - Minimize potential for post-mission break-ups
  - Limit long term presence of space objects after EOL
  - Limit long-term interference of space objects with GEO region at EOL
- **Effectiveness of Mitigation Guidelines**
  - Soft Law - For voluntary implementation -Legally Non -Binding
  - Offers neither incentives for compliance nor penalty for non-compliance
  - Not effective to control the existing debris population – *Kessler Effect*

## **Space Debris – *Remedial Measures***

- **Alternate Measures**
  - **Active Removal of Debris**
  - **On-Orbit Satellite Servicing**
- **Challenges**
  - **Technology – Development – Demonstration**
  - **High Cost – Sharing - International co-operation**
  - **Policy – Consensus – Willingness**
  - **Legal – Liability – Dispute Settlement**

## **Space Debris – *Legal Issues***

- **Definitional issues**
  - Space Object Vs. Space Debris : Functional Vs. Non-Functional
- **Liability**
  - Article VII of OST – Liability for damages
  - Article II & III of Liability Convention- Absolute and fault based liability
- **State Responsibility**
  - Article VI of OST – Internationally responsible for outer space activities- No Bar on Government or Non-Governmental activities
  - Article-VIII of OST- Jurisdiction and Control over space objects
  - Article-IX of OST – Due regards to interests of other states

## **Active Debris Removal (ADR) – Legal Issues.**

- **Declaration of a Space Object as Space Debris**
  - Technical attempts for retrieval
  - Economic aspects – Cost of investment Vs. Returns through extended services
  - Past Experiences – Successful retrieval of spacecraft - Palapa B2, Galaxy -15, GOES-13
- **Abandonment of Space Objects**
  - State Responsibility – Art. VI of OST
  - Due Regards to Others interests – Art. IX of OST
  - Dereliction of ownership responsibility - Jurisdiction & Control - Art. VIII of OST
  - State Responsibility for Wrongful Act

## **Analogy from Maritime Law**

- **United National Convention on Law of Sea (UNCLOS, 1982)**
  - **Responsibility for removal of abandoned wrecks**
    - **Abandoned or disused installations or structures to be removed**
    - **To ensure safety of navigation**
    - **To take into account accepted international standards**
    - **Due regard to fishing, protection of marine environment, rights & duties of other states**
  - **Article- 60, applicable to Exclusive Economic Zone**
  - **Article- 80, applicable to Continental Shelf**

# **Active Debris Removal (ADR) – Policy Issues**

- **Technology Controls**
  - Dual-Use Nature of Space Technology & applications
- **Access to or Recovery of Abandoned space objects of one state by other technically competent state**
  - Exposure of Systems, Technologies, Stored Data ...
  - Control Regimes- MTCR, Wassenaar Arrangement
  - Salvage value
  - Breach of Intellectual Property Rights
  - Motive for Removal – Operational Necessity or Self Defence or Intentional
- **Liability for Accidents during removal or recovery operations**

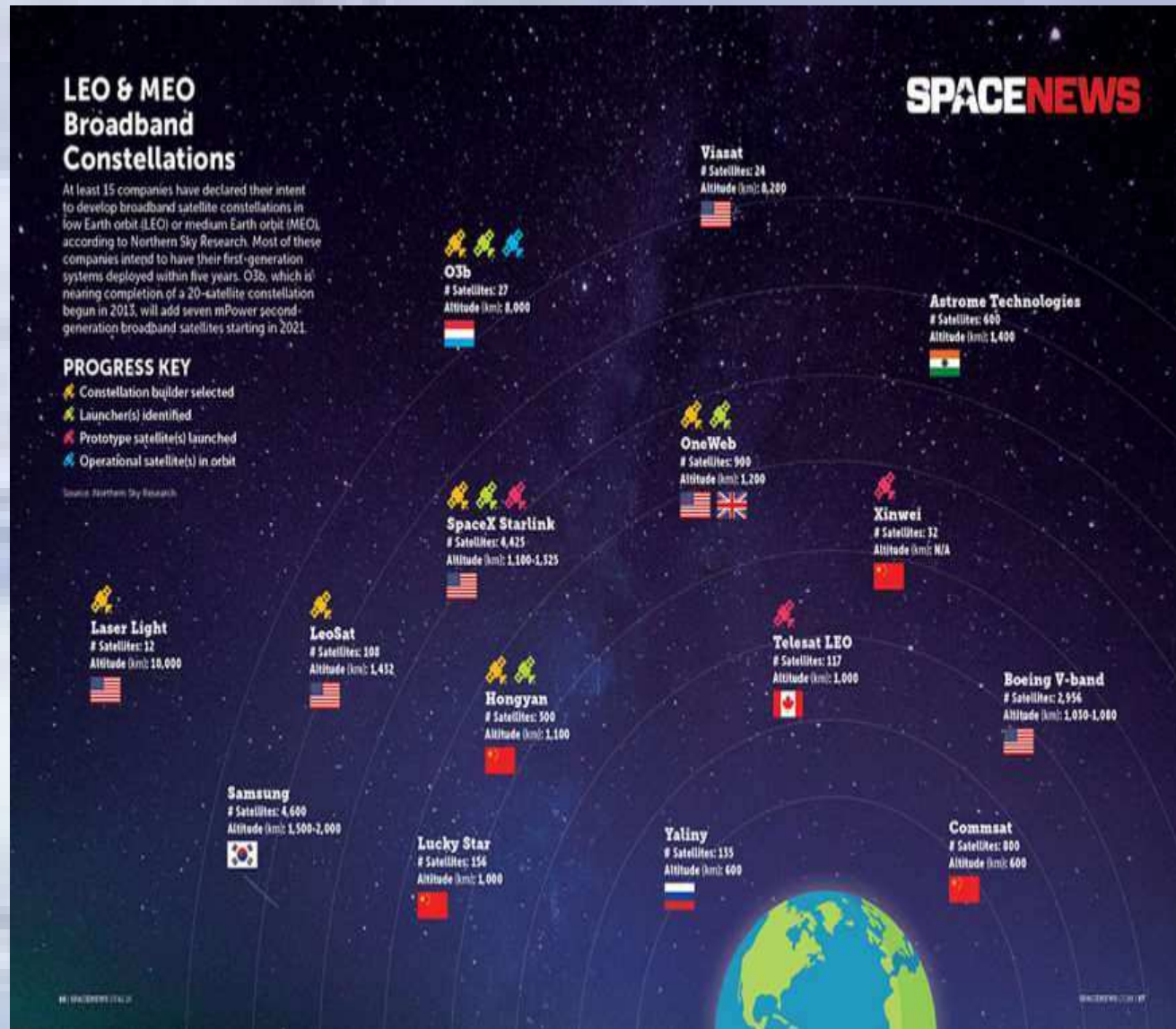
# Compliance Measures

- **Implementation of Space Debris Guidelines**
- **Ease of Trackability**
- **De-Orbit mechanisms**
- **Disposal / Mission closure measures**
- **Registration of Space Objects with –**
  - National Authorities
  - UN Registry
- **Frequency Coordination with ITU**
  - IARU + ITU Compliance -Advance Publication and Coordination
  - No harmful interference
- **Due Authorization & Licence from State Authority**
  - International Responsibility and Liability for damages
  - Compliance to Terms of License

An aerial photograph of a vast, flat, arid landscape, likely a desert or salt flat. The terrain is a mix of light brown and tan colors, with some darker patches and a few small, dark structures or trees visible in the distance. The sky is a clear, pale blue. The overall image has a slightly grainy, high-resolution quality.

# **Small / Nano Satellite Constellations**

# Large Constellations



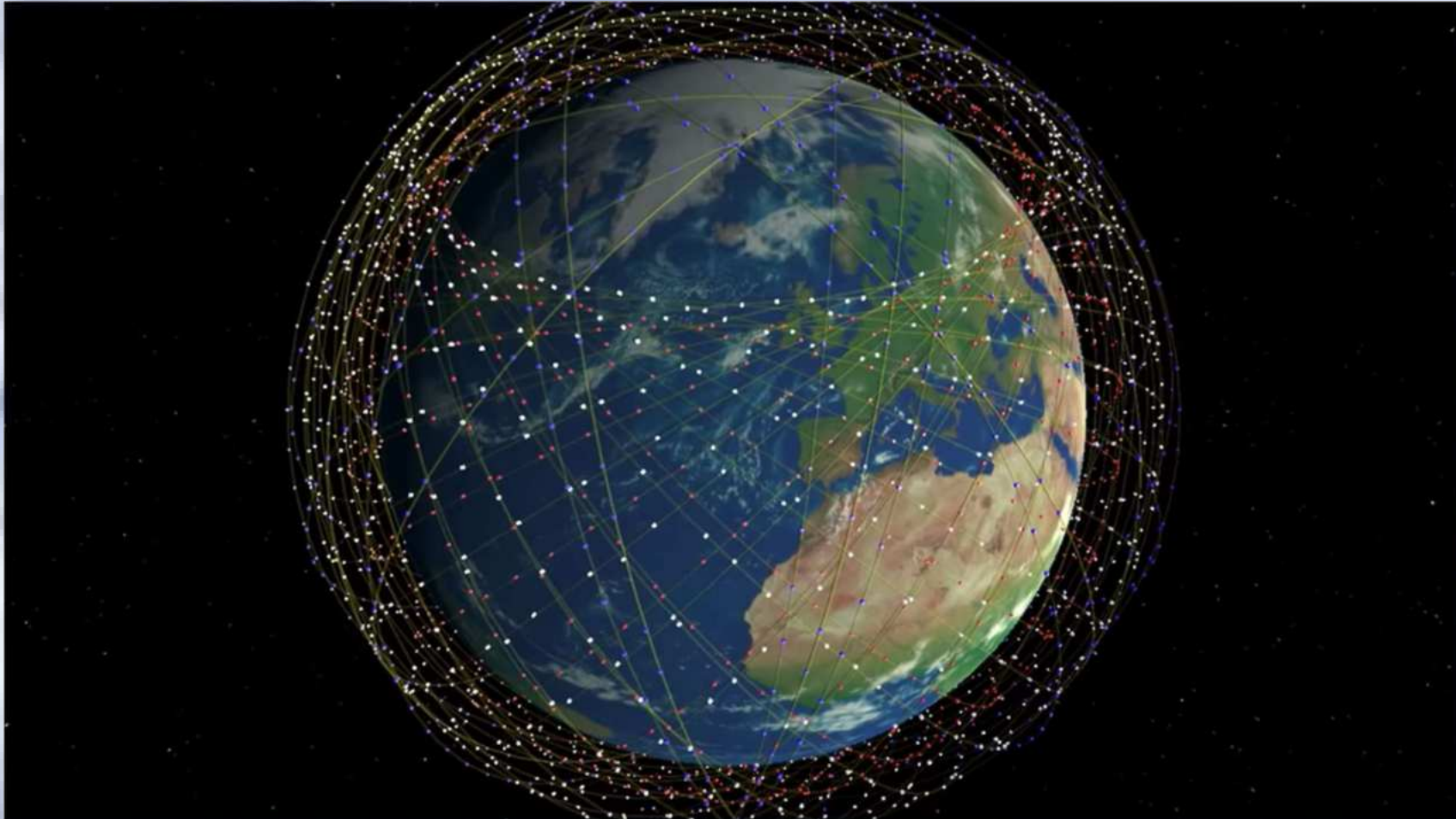
Low cost , small sats.  
Latency only 20ms  
against 280 of GEO

Mass production

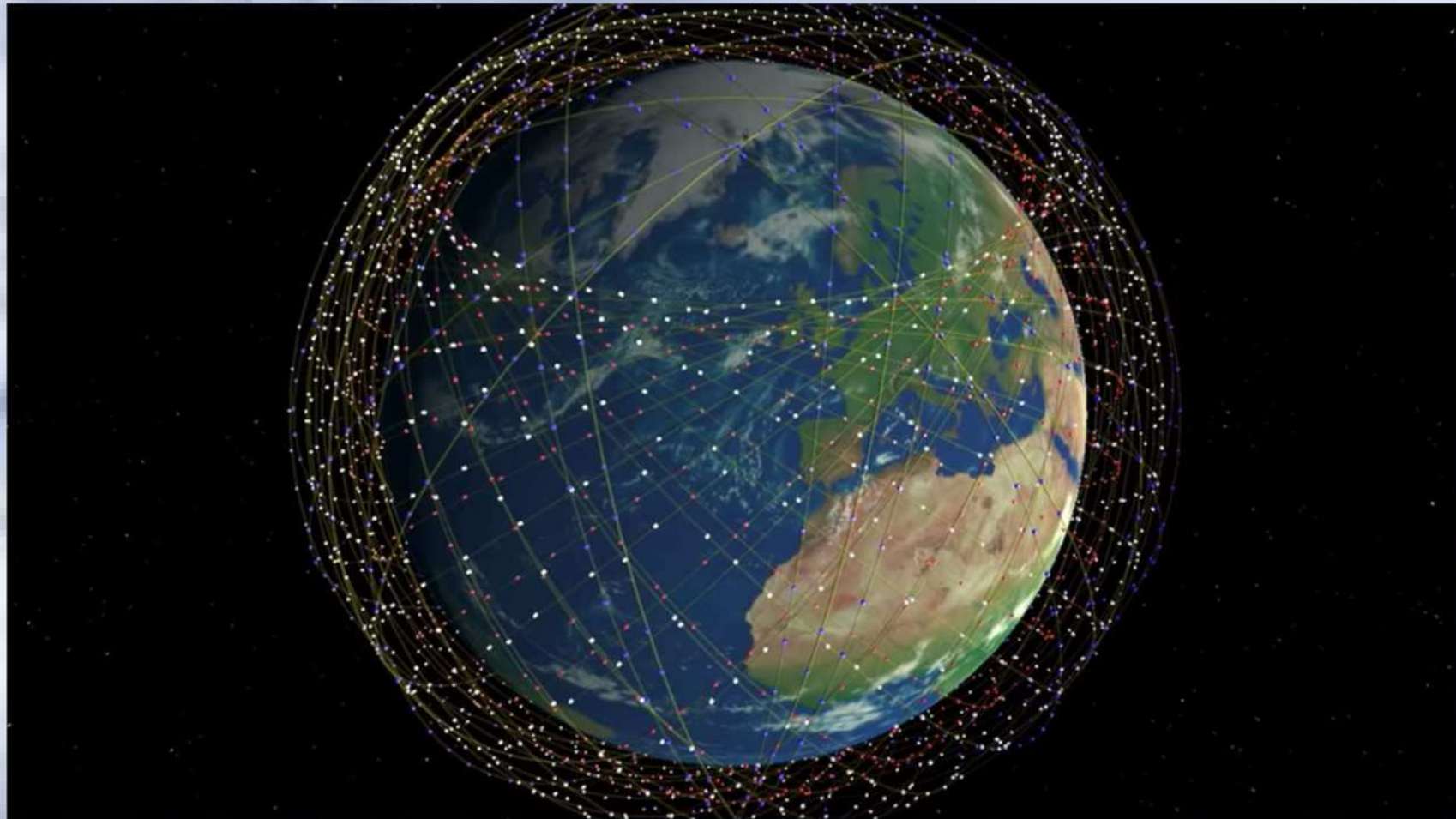
Market: High speed  
INTERNET, IOT  
M2M, Asset tracking  
etc.,,

Source: SPACENEWS

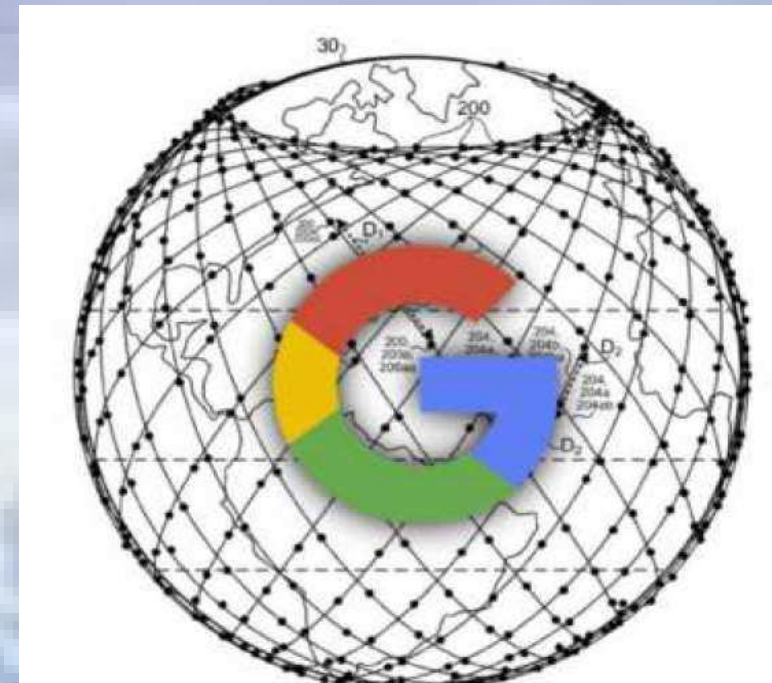
# Proposed Starlink Satellite Constellation



# Proposed Starlink Satellite Constellation



# One Web and Google Constellations



**OneWeb intends to cover the Earth with a nominal constellation of 648 LEO mini satellites built by Airbus Defence and Space (image credit: Airbus DS)**

Of the constellation, 648 of them will be placed in 18 orbital planes with an altitude of about 1200 km. ..(Source : eoPortal Directory- <https://directory.eoportal.org/web/eoportal/satellite-missions/content/-/article/oneweb>)

**Google plans to launch a constellation of 1000 satellites orbiting around Earth, covering 75 % of its surface ... to spread the reach of internet across the world (source: USPTO)**

# Starlink Satellites in orbit



A train of SpaceX Starlink satellites are visible in the night sky in this still from [a video captured by satellite tracker Marco Langbroek in Leiden](#), the Netherlands on May 24, 2019, just one day after SpaceX launched 60 of the Starlink internet communications satellites into orbit. (Source: Space.com; Image: © [Marco Langbroek via SatTrackBlog](#))

# Space Traffic Management

- European Satellite Dodges Potential Collision with SpaceX Starlink Craft



**ESA Operations** @esaoperations · 22h

For the first time ever, ESA has performed a 'collision avoidance manoeuvre' to protect one of its satellites from colliding with a 'mega constellation'

[#SpaceTraffic](#)

[#SpaceTraffic](#)



- The European Space Agency's (ESA) Aeolus Earth Observation satellite fired its thrusters as an evasive maneuver on Sept. 2, 2019 to make sure it didn't collide with one of SpaceX's recently launched internet craft.
- Prior warnings/ Negotiations Failed
- ESA Calls for Space Traffic rules

# ITU-Regulatory Procedures for Small Satellites

## Regulatory Procedures for Amateur-Satellite Service



- API must be submitted to ITU **before** coordinating frequency with **IARU**
- Note that frequency assignments in **notification must be covered** by frequency bands in **API**, therefore avoid submitting a very narrow frequency band at the API, in case there is a change needed during the comments/consultation process
- Administrations authorizing space stations in the **amateur-satellite service** shall ensure that **sufficient earth command stations** are established before launch to ensure that **any harmful interference** caused by emissions from a station in the amateur-satellite service **can be terminated immediately** (see No. **25.11**)
- Amateur-satellite service is **exempted from cost recovery fee** (please refer to **DEC 482**)

*Source of Extract: ITU Regulatory Procedures- Space Services Dept, radio Communications Bureau, ITUu*

# ITU- Prague Declaration on Small Satellite Regulation and Communication Systems – 3<sup>rd</sup> March 2015

## ***Recognizing***

- the increasingly growing interest by universities, educational and research institutes, governments, private industry, space agencies and radio amateurs, in utilizing the potential benefit offered by small satellites, in particular nano satellites and pico satellites;

.... ....

## ***Noting***

- the specific nature of small satellite space stations in the amateur-satellite service and the frequency coordination process within the International Amateur Radio Union (IARU) **to avoid harmful interference to amateur and amateur-satellite stations,**
- *confirm and strengthen* the importance of implementing national legal and regulatory frameworks in conformity with the above international instruments, **clearly defining rights and obligations of every stakeholder participating in small satellite initiatives,**

## ***urge***

- **the small satellite community to comply with the applicable international and national laws, regulations and procedures** , indispensable to guarantee the long-term sustainability of small satellite projects, the avoidance of harmful interference and proper management of space debris,

# New Regulatory Measures of FCC-2018...

- What the Notice Would Do: application disclosures regarding
  - Propose new and revised :
    - deployment and use of deployment devices
    - risk of collision with large objects
    - choice of operational orbital altitude
    - potential impact to operations of manned spacecraft
    - trackability and maneuvering capabilities of NGSO satellites
    - probability of human casualty resulting from uncontrolled atmospheric re-entry of a satellite
  - Make proposals and seek comment related to satellite disposal reliability and methodology, appropriate deployment altitudes in LEO, and on-orbit lifetime.
  - Propose new rules for geostationary orbit satellite (GSO) license term extension requests.
  - Propose that Commission satellite licensees indemnify the United States against any costs associated with a claim brought against the United States related to the authorized facilities and seek comment on whether to require that licensees have insurance coverage to provide for payment for any costs associated with such a claim.

*Extract from FCC Fact Sheet Dt. March 27, 2018*



# **Space Resources Utilization**

# Relevant Articles in OST

- Article – II of OST: Outer space, including the moon and other celestial bodies, is not subject to national **appropriation by claim of sovereignty, by means of use or occupation, or by any other means.**
- Article III of OST: States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, **in accordance with international law, including the Charter of the United Nations,** in the interest of maintaining international peace and security and promoting international co-operation and understanding.

# Relevant Articles in Moon Agreement

1. **The moon and its natural resources are the common heritage of mankind**, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this article.
2. **The moon is not subject to national appropriation by any claim of sovereignty**, by means of use or occupation, or by any other means.
3. **Neither the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person.** The placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the moon, including structures connected with its surface or subsurface, shall not create a right of ownership over the surface or the subsurface of the moon or any areas thereof. The foregoing provisions are without prejudice to the international regime referred to in paragraph 5 of this article.

# Relevant Articles in Moon Agreement..Contd

**5. States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible. This provision shall be implemented in accordance with article 18 of this Agreement.**

**7. The main purposes of the international regime to be established shall include:**

- (a) The orderly and safe development of the natural resources of the moon;**
- (b) The rational management of those resources;**
- (c) The expansion of opportunities in the use of those resources;**
- (d) An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon, shall be given special consideration.**

# Recent Developments

- **Space Resources Utilization:**
  - USA-Space Resource Exploitation and Utilization Act 2015 - Popularly known as Asteroid Mining Act (*As part of U.S. Commercial Space Launch Competitiveness Act, 2015-H.R 2262*)
  - Luxembourg's Law on the Exploration and Use of Space Resources (2016)
  - Hague Space Resources Working Group- **Building Blocks** towards reaching international Framework for celestial Resources Utilization
- Asteroid Sample Recovery Missions
  - JAXA's **Hayabusa 2** – Sample recovery mission to asteroid **Ryugu**
  - NASA's *Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer* (**OSIRIS-REx**) to asteroid **Bennu**

# US Act 2015

- **U.S. Commercial Space Launch Competitiveness Act (H.R. 2262), Dt. November 25, 2015, some salient features of it are given below:**
  - **It states that the US President shall -**
    - **facilitate commercial exploration for and commercial recovery of space resources by United States citizens;**
    - **discourage government barriers to the development in the United States of economically viable, safe, and stable industries for commercial exploration for and commercial recovery of space resources in manners consistent with the international obligations of the United States; and**
    - **promote the right of United States citizens to engage in commercial exploration for and commercial recovery of space resources free from harmful interference, in accordance with the international obligations of the United States and subject to authorization and continuing supervision by the Federal Government.**

# US ACT 2015 .. Contd..

- ***Asteroid resource and space resource rights: A United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States.”***
- **Disclaimer of Extraterritorial Sovereignty: “It is the sense of Congress that by the enactment of this Act, the [US] does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body.”**

# IISL Position Papers on property rights in outer space and space resources mining

- **2004 Statement** - Emphasized the provision under Article II of OST and reiterated that the object and purpose of this provision was to exclude all territorial claims to outer space, including the Moon and other celestial bodies. Nevertheless, a note under this statement, conveyed that other private activities on the Moon and other celestial bodies are permitted and put the responsibility of authorization and supervision of such activities on the State Party, as per Article VI of the OST.
- **2009 statement:** Emphasized the Article VI of OST, and further conveyed its opinion that a specific legal regime for the exploitation of such resources should be elaborated through the United Nations, on the basis of present international space law, for the purposes of clarity and legal certainty in the near future.

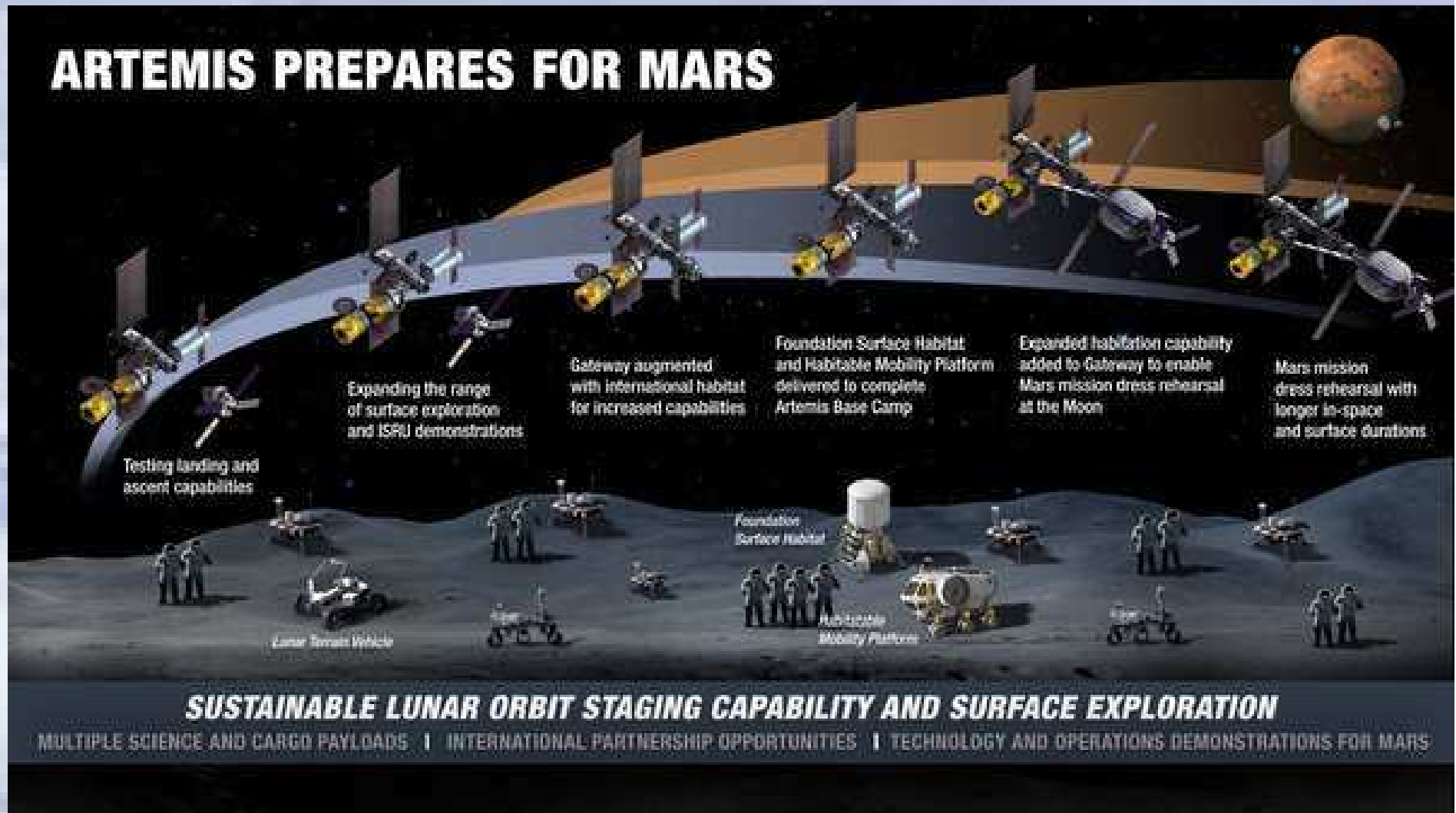
# IISL Position Papers ... contd..

- **2015 Statement:** In the context of the enactment of the U.S. Commercial Space Launch Competitiveness Act (H.R. 2262), IISL issued another position paper that conveyed the legal position that –
  - *in view of the absence of a clear prohibition of the taking of resources in the Outer Space Treaty one can conclude that the use of space resources is permitted.*
  - Nevertheless, this legal position was thrown as an open question as to how other states would follow the interpretation of Article II of OST by the US. It concluded that,
  - ***It can be a starting point for the development of international rules to be evaluated by means of an international dialogue in order to coordinate the free exploration and use of outer space, including resource extraction, for the benefit and in the interests of all countries.***

# Lunar Gateway Program

- **Lunar Gateway program, an advanced planned mini-space station to orbit the moon and intended to serve as a home base for missions to the moon's surface, including the Artemis 3 mission to land the first woman and next man on the moon by 2024.**
- **From facilitating short-term missions, the station will evolve and pioneer what will become the first sustainable human presence on the moon.**
- **Artemis Programme to facilitate NASA to land the first woman and next man on the Moon by 2024, using innovative technologies to explore more of the lunar surface than ever before. The learning through Artemis programme, to take the next giant leap of sending astronauts to Mars.**

# ARTEMIS PREPARES FOR MARS



# ARTEMIS ACCORDS

- **PRINCIPLES FOR COOPERATION IN THE CIVIL EXPLORATION AND USE OF THE MOON, MARS, COMETS, AND ASTEROIDS FOR PEACEFUL PURPOSES**
  - **SECTION 1 - PURPOSE AND SCOPE**
  - **SECTION 2 – IMPLEMENTATION**
  - **SECTION 3 – PEACEFUL PURPOSES**
  - **SECTION 4 – TRANSPARENCY**
  - **SECTION 5 – INTEROPERABILITY**
  - **SECTION 6 – EMERGENCY ASSISTANCE**
  - **SECTION 7 – REGISTRATION OF SPACE OBJECTS**
  - **SECTION 8 – RELEASE OF SCIENTIFIC DATA**
  - **SECTION 9 – PRESERVING OUTER SPACE HERITAGE**
  - **SECTION 10 – SPACE RESOURCES**
  - **SECTION 11 – DECONFLICTION OF SPACE ACTIVITIES**
  - **SECTION 12 – ORBITAL DEBRIS**
  - **SECTION 13 – FINAL PROVISIONS**

# SECTION 10 – SPACE RESOURCES

**1. The Signatories note that the utilization of space resources can benefit humankind by providing critical support for safe and sustainable operations.**

**2. The Signatories emphasize that the extraction and utilization of space resources, including any recovery from the surface or subsurface of the Moon, Mars, comets, or asteroids, should be executed in a manner that complies with the Outer Space Treaty and in support of safe and sustainable space activities. The Signatories affirm that the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty, and that contracts and other legal instruments relating to space resources should be consistent with that Treaty.**

## SECTION 10 – SPACE RESOURCES ...contd

**3. The Signatories commit to informing the Secretary-General of the United Nations as well as the public and the international scientific community of their space resource extraction activities in accordance with the Outer Space Treaty.**

**4. The Signatories intend to use their experience under the Accords to contribute to multilateral efforts to further develop international practices and rules applicable to the extraction and utilization of space resources, including through ongoing efforts at the COPUOS.**

# ARTEMIS ACCORDS Signed

- **Eight countries, namely, Australia, Canada, Italy, Japan, Luxembourg, the United Arab Emirates, the United Kingdom, the United States of America have signed and adopted the Artemis Accords on October 13, 2020.**
- **The signing of the accords represents a significant political attempt to codify key principles of space law and apply them to the programme.**
- **The Artemis accords are bilateral agreements and not binding instruments of international law. It is expected by the signatories that it would develop a customary law by establishing practice in the area, which could have a significant influence on any subsequent governance framework for human settlements on Mars and beyond.**

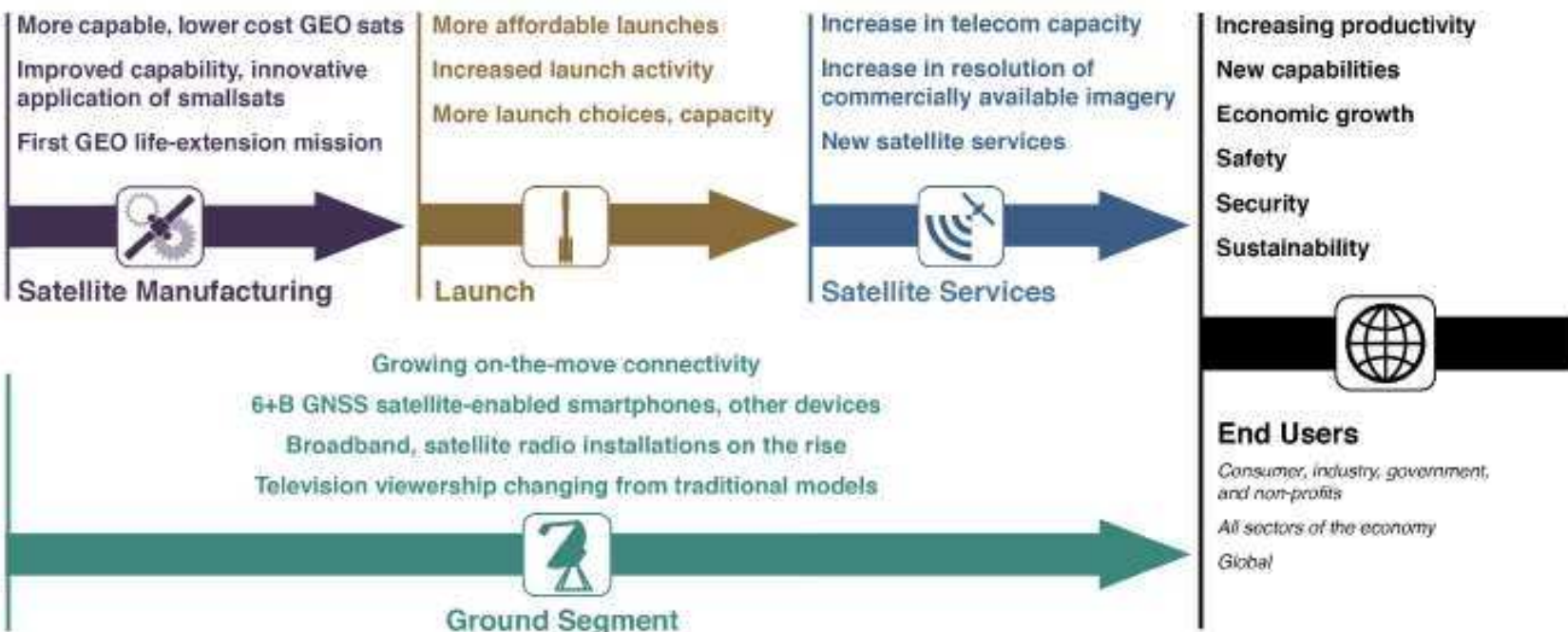
An aerial photograph of a vast, flat, arid landscape. The terrain is a mix of light brown and tan colors, suggesting dry earth or sparse vegetation. The horizon is visible in the distance under a clear, pale blue sky. The overall scene is desolate and expansive.

# **Private Sector Participation**

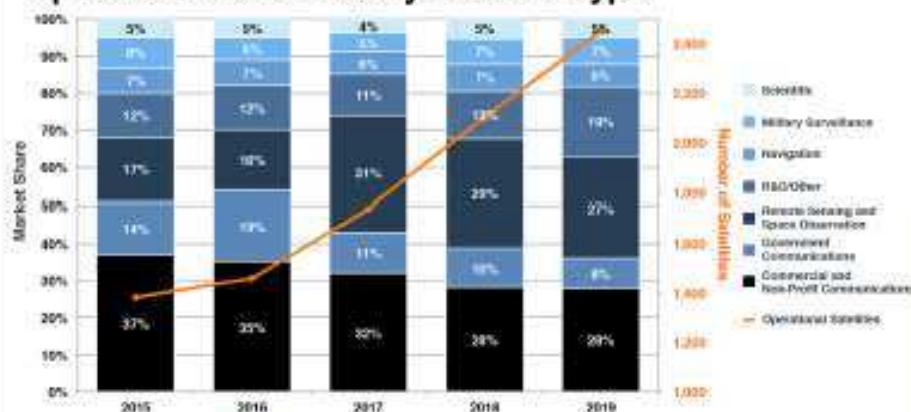
# 2019 Top-Level Global Satellite Industry Findings



Increasing Productivity, New Capabilities: Changing Industry Dynamics



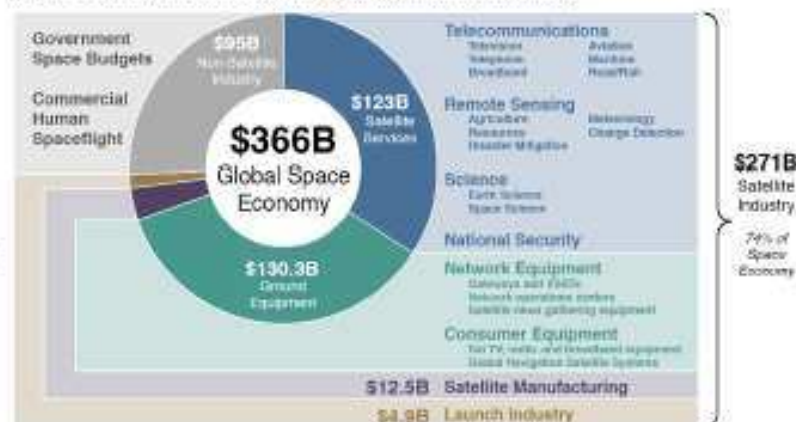
## Operational Satellites by Mission Type



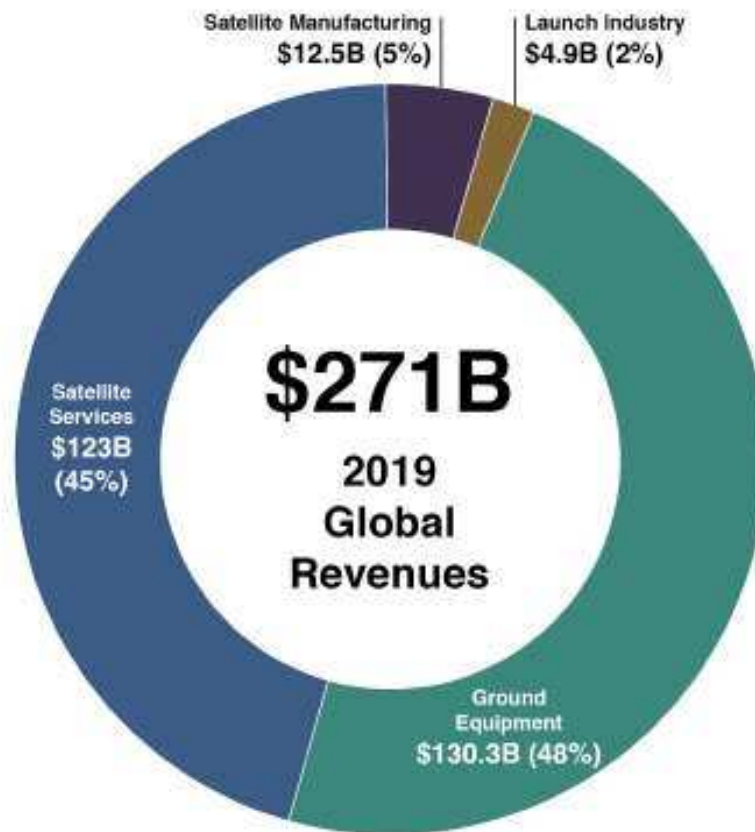
Prepared by: **BRYCE**  
space and technology

## The Satellite Industry in Context

(2019 revenues worldwide, in billions of U.S. dollars)



# 2019 Top-Level Global Satellite Industry Findings



For more information on the satellite industry, or for previous SSIR reports, contact SIA:

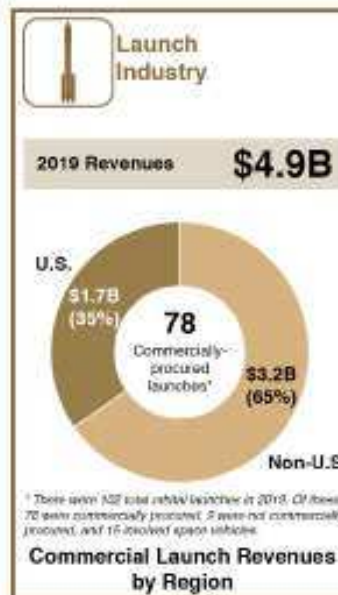
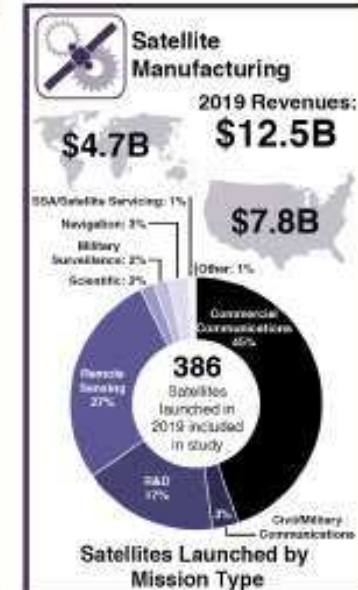


Satellite Industry Association

info@sia.org  
202-503-1560  
www.sia.org



Prepared by:  
Bryce Space and Technology  
brycotech.com



# Article VI of Outer Space Treaty

- 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. ....

# Articles VII of OST

- **Article VII**: Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air or in outer space, including the moon and other celestial bodies.
- **ARTICLE VIII**: A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return.

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# Need for National Space Legislation

- **To comply with UN Treaty Obligations**
  - To bear international responsibility for all space activities
  - To bear the liability and compensate the damage caused by space activities and space objects – while in space or upon re-entry - while operational or defunct.
  - To authorize and exercise continuing supervision of private sector space activities
  - To assure legal certainty for private sector participation
  - To encourage international space cooperation and collaboration – between Govts and private sectors

# **International Developments**

- **Space Security becoming important topic– Threats to space assets- Cyber Threats**
- **International Code of Conduct for Outer Space activities**
- **Transparency and Confidence Building Measures**
- **Long term sustainability of Outer Space activities – UNOPUOS**
- **Treaty on Prevention of Placement of weapons in Outer space**
- **Initiatives to formulate a Treaty on PAROS**

# Trend of Space Law Making

- Outer Space gaining strategic importance , with More spacefaring, space- active nations
- **More non-governmental players – State Responsibility – Liability Authorization and Continuing Supervision by State Party - National Space Legislation**
- UN Treaty making process – By consensus -No Treaty formulations after Moon Agreement in 1979-
  - *Code of Conduct, TCBMs, Guidelines on Long Term sustainability of outer Space activities...*
- *Will Soft Law practice tending towards establishing a Customary law ?*

# Interesting Developments

- **Lunar real estate for sale ?!**
- **Crime in Outer Space Onboard ISS**
- **Space based advertisements**
- **ISS for commercial purposes- Ads, Cine shootings**
- **Voting right exercised from outer space by an US astronaut onboard ISS**
- **Elon Musk's SpaceX will make its own laws on Mars!**

# Conclusion

- **Outer Space – Province of Man-kind**
- **Fair & Responsible use of Outer Space Activities by all stake holders**
- **Space Systems for wide variety of applications – Becomes critical national infrastructure**
- **Outer Space Resources – Common Heritage of mankind – Deriving benefits of all countries**
- ***Outer Space environment to be used for peaceful purposes and to be sustained for future generation.***
- ***Way Forward.. Cooperation all nation states towards reaching common security in outer space affairs***

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- *Thank you for your kind attention!*