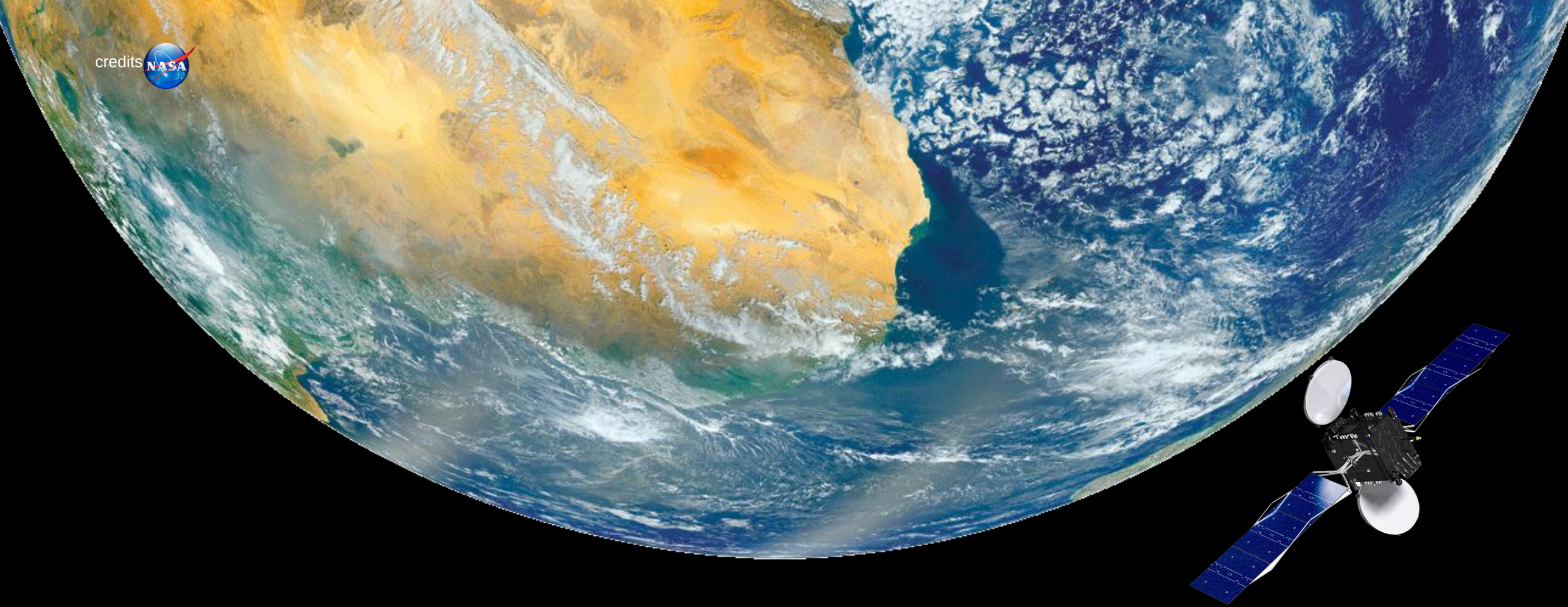


Use of the Geostationary Orbit

Topics of Special Interest to the Contribution
of Space Law to Economic and Social Development

Ms. Montserrat Sans

United Nations- Workshop on Space Law
5 to 8 November 2012 Buenos Aires, Argentina

Nature of the Geostationary Orbit

Unique, limited, non-renewable, not appropriable but accessible to all States

- **UNOST Treaties:** no technical definition, but OST principles apply:
  - Freedom of access : all countries have equal rights
  - Freedom of exploration & of use
  - No national appropriation
  - All activities carried in accordance to international law and in interest of peace.

United Nations

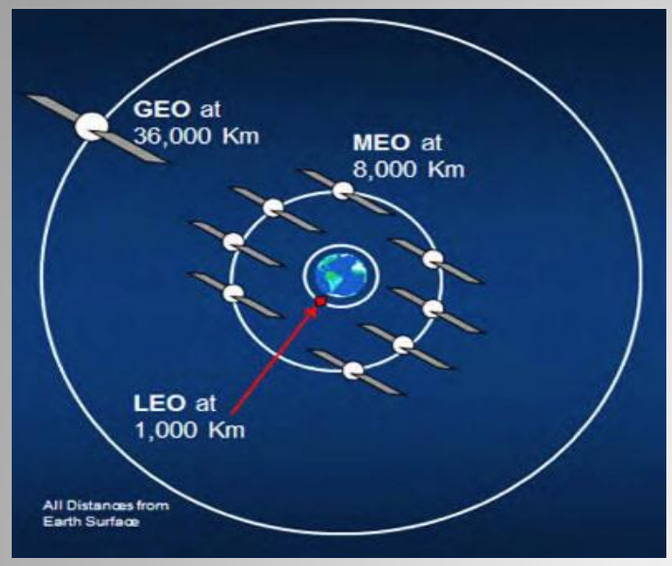
- **ITU Treaty**: defines the Geostationary-satellite orbit as a **limited natural resource** whose circular orbit lies in the plane of the Earth's equator at an altitude of 35,786 km
  - by extension, a GSO satellite is a **geosynchronous** satellite which remains approximately fixed relative to the Earth (RR-Art.1 § 1.189)

ITU

- **National Legislation on Space Activities**

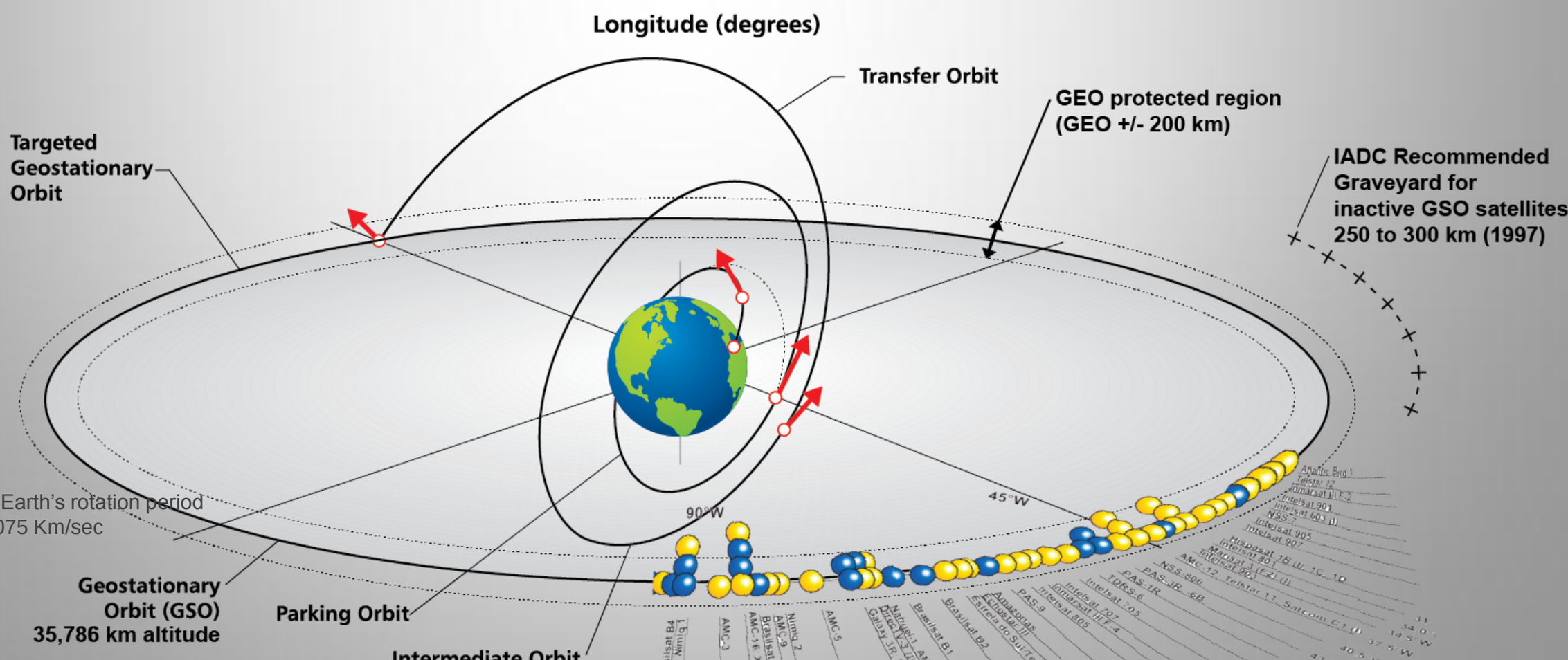
How to get there?

GSO ring and graveyard



FLIGHT DESIGN

Source: INTELSAT



Orbital period=Earth's rotation period
=3.075 Km/sec

Who can get access to a GSO slot?

Applicable UNOST & ITU-Convention & RR

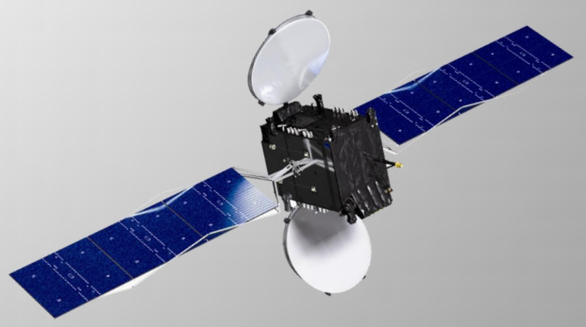
Eligible Subjects: only Member States of the ITU (193 as of 2012)

1. **Before the ITU:** Government sends a request to the ITU-BR

   - Informing Longitude, coverage, frequency assignment and type of radiocommunications service
   - Multilateral coordination and cooperation with other Governments that could be "affected" by the new system identified by the ITU-BR after "Favorable Finding";
   - Bring into use (BIU) the system/frequencies before the end of **7 years** from the date of receipt of the Advanced Publication Information (API);

- As of 2011, the ITU Space Network Systems (SNS)DB contained data of +11,000 GSO filings (many of them "paper satellites")

2. Before the UNOOSA: Member States obligation to provide information about their launch and to register



From international cooperation to liberalization

Intergovernmental Organizations go Private

- 1961: UNGA Resolution launches the era of cooperation via International Organizations Space Activities

  - Communications by means of satellite should be available to the Nations of the world(...) on a non discriminatory basis to enable leaders of nations to talk face to face **in the interest of world peace** and brotherhood

  -1964:International Telecommunications Satellite Organization (INTELSAT) from 19 to 144 Member States

  -international transoceanic government communications use a few large earth stations (not suitable for private industry or end users)

  -1971 INTERSPUTNIK; 1976 ARABSAT;1977 EUTELSAT, 1979: INMARSAT; etc.

  -Could provide space capacity only through each Signatory (State-monopoly),a not directly to end-users;

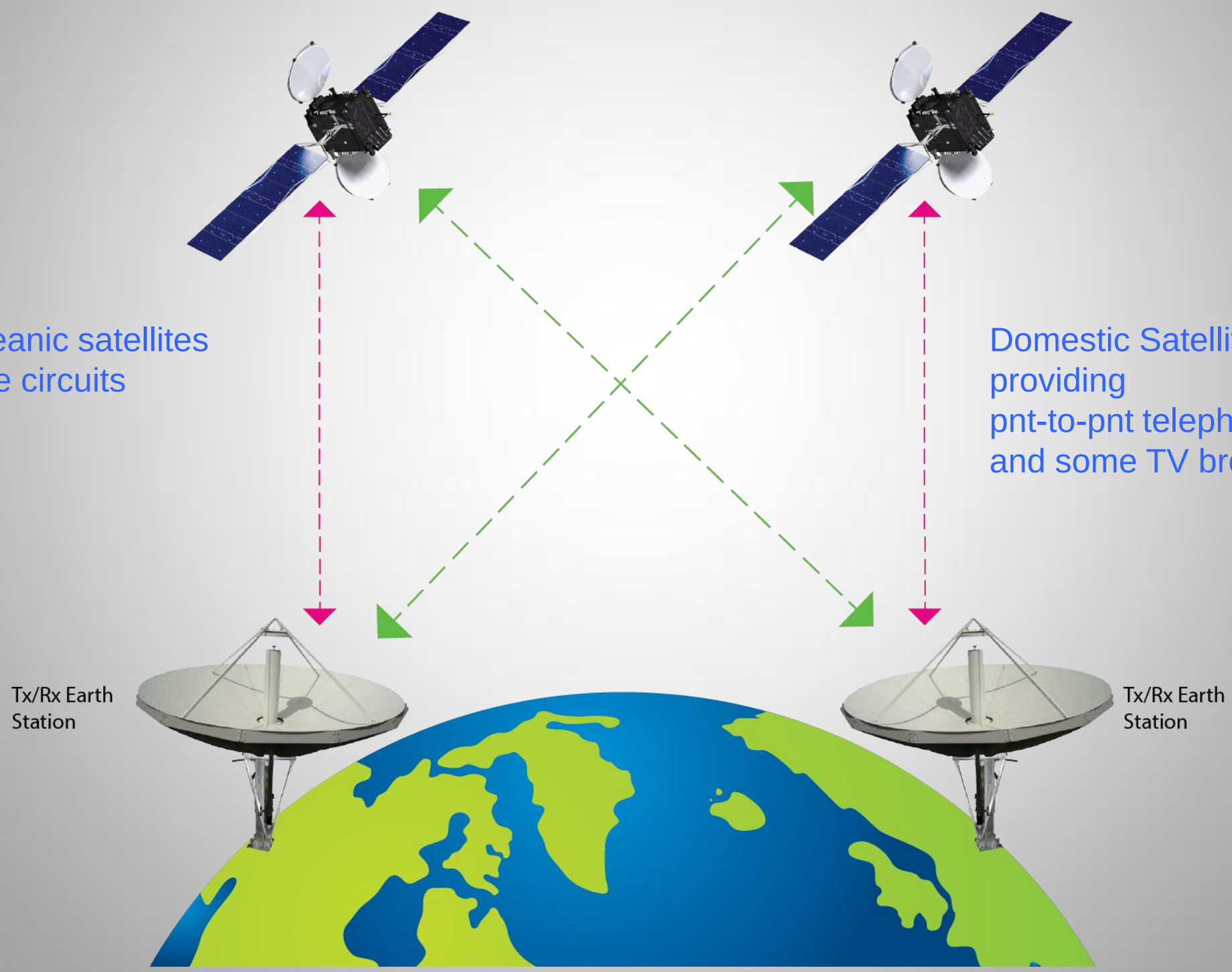
- 1990 : Start of the Liberalization era- end of International Organizations

  - Governments start privatization & divesting State-owned Telco monopolies of exclusive rights

  - Significant decrease in size & price of earth station antennas opens a market of millions of VSAT, DTH and portable terminals

- From 2000: “Open skies doctrine” and direct access to end-users

How it worked…before going massive



Commercial Use of the GSO by Communications Satellites

- Key role in globalization, integrating regions and continents.
  - Internet, VOIP, Government, GPS/Navigation Systems, humanitarian missions, etc.

- A US$ 130 billion industry that supports:
  - Media & TV industry, Telephony (fixed & mobile), multinational corporations, banks, Government institutional and social projects, military, etc.

- Ubiquitous coverage: each GSO footprint covers 1/3 of the Earth surface, so 3 GSO satellites cover the Earth when placed 120° apart
  - Satellites do not stop at international borders & do not discriminate between urban, rural or socially impoverished areas

- Cost and time efficient solutions:
  quick implementation compared to fiber or cable.
  - Particularly suitable for emerging countries lacking terrestrial infrastructures or with difficult geographical terrains (mountains, archipelagos,…) and for disaster recovery (Earthquakes, tsunami, etc.)

In the HDFSS decade

(2010-2020)

High Density Fixed Satellite Systems (HDFSS) incorporate small, ubiquitous, low-cost earth stations that can be deployed rapidly and flexibly

Direct Contribution of Space Law to the role of emerging countries in the GSO

United Nations

ITU

- **OST Treaty:** "*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 mankind.*" (Article I)

- **ITU Constitution:** "*In using frequency bands for radio services, Members shall bear in mind that radio frequencies and the* ***geostationary-satellite orbit*** *are limited natural resources and that they* ***must be used rationally, efficiently and economically****, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have* ***equitable access*** *to both, taking into account the* ***special needs of the developing countries*** *and the geographical situation of particular countries*". (Article 44.2)

Use of GSO orbit… *"in the interest of all countries, irrespective of their degree of economic development"*…Emerging countries are also space-faring Nations*

- Indonesia:± 10 GSO launches, 7 active GSO. Last launch PALAPA-D1@113EL on 2009;
- India : 24 GSO launches, 9 active GSO. Plans 14 GSO additional satellites to be launched by 2017;
- China: ±20 GSO launches, 6 GSO launches
- Thailand: 6 GSO launches, 3 active GSO LR
- Mexico: 4 GSO launches, 3 active GSO. To launch Satmex-8@116.9 WL by Dec.2012 & 3 Mexsat by 2015
- Brazil: 5 active GSO
- Egypt: 3 active GSO-To launch Nilesat-202 @7WL by 2015 R
- Nigeria: Launched its 2nd satellite NigComSat-1R @42.5 EL on 2011
- Venezuela: Launched its 1st satellite Venesat-1 @78WL on 2008 R
- Saudi Arabia: 11 GSO launches, 6 active GSO- R
- UAE: Launched its 3rd satellite Thuraya-3@98.5 EL on 2008
- Pakistan, Vietnam LR, Argentina, among others…

- **New space-faring States after 2013:**
  - Sri Lanka to launch @87.5 EL (Ku-band) next November 22, 2012 from Xichang Satellite Launch center R
  - Azerbaijan to launch Azerspace@46EL on January 2013 ✖
  - Nicaragua to launch NicaSat1 its 1st GSO by 2016 (with China Great Wall Industry Corp.) (s)
  - Armenia to launch @71.4EL its 1st GSO by 2016 (with Russia Roscosmos) ✖
  - Bolivia to launch its 1st GSO, Tupac Katari-1 @87.2WL, Dec.2013(with China Great Wall Industry Corp.) LR
  - Colombia filed with ITU @67WL (under Andean Community) R
  - Afghanistan to launch @50EL (tender issued Oct.2012) LR
  - …

*not a comprehensive list-subject to changes
L: not a party to Liability Conv; R: not a party to Registration Conv.; ✖ not a party to OST treaties

GSO congestion

2012-2021 GSO launches forecasts:

A trend toward higher mass class satellites

2010-2019:
+210 commercial sat. GSO launches*

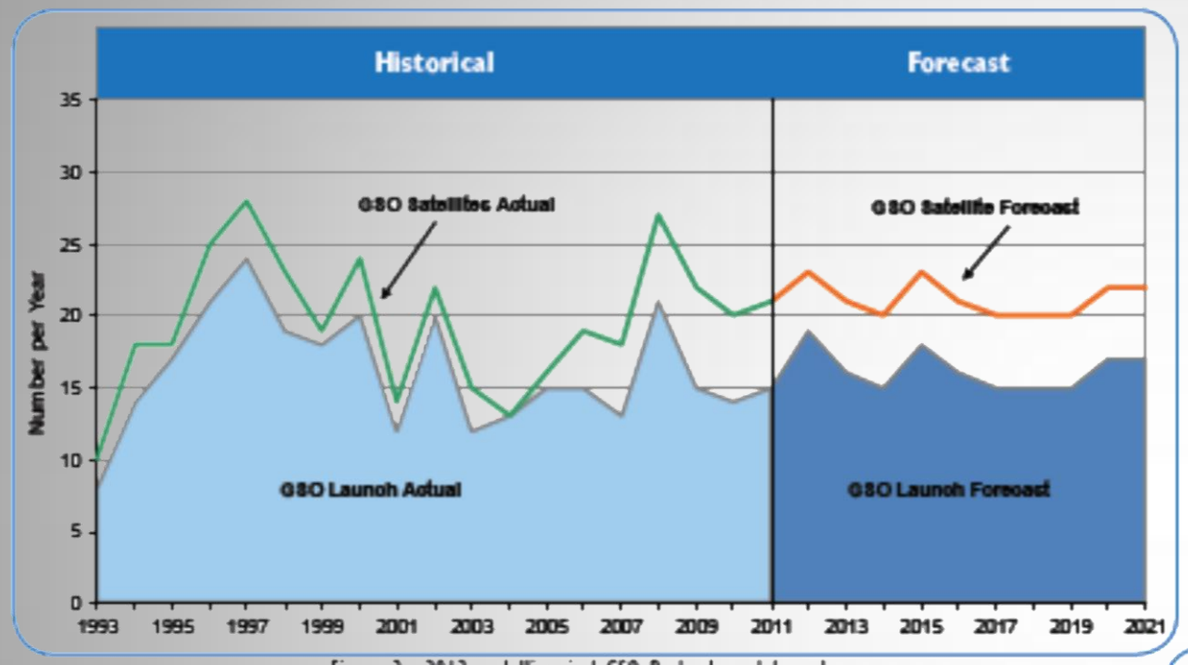


Figure 2. 2012 and Historical GSO Payloads and Launches

* Euroconsult : "Satellites to be built & launched by 2019-World Market Survey"

TRENDS:

•High demand for new GSO slots from emerging countries;

•New launch vehicles capabilities: Ariane5, Proton, Long March, Falcon 9;

•GSO Satellite Mass: 100 times heavier

•GSO projected demand of 21.2 satellites per year;

•43% of GSO satellites projected to be launched from 2012 to 2021 weight +5,400 kg;

•Global demand for satellite services remains strong, led by substantial growth in the Americas, Asia and Middle East

○Source: US-FAA/Commercial Space Transportation Forecasts 2012

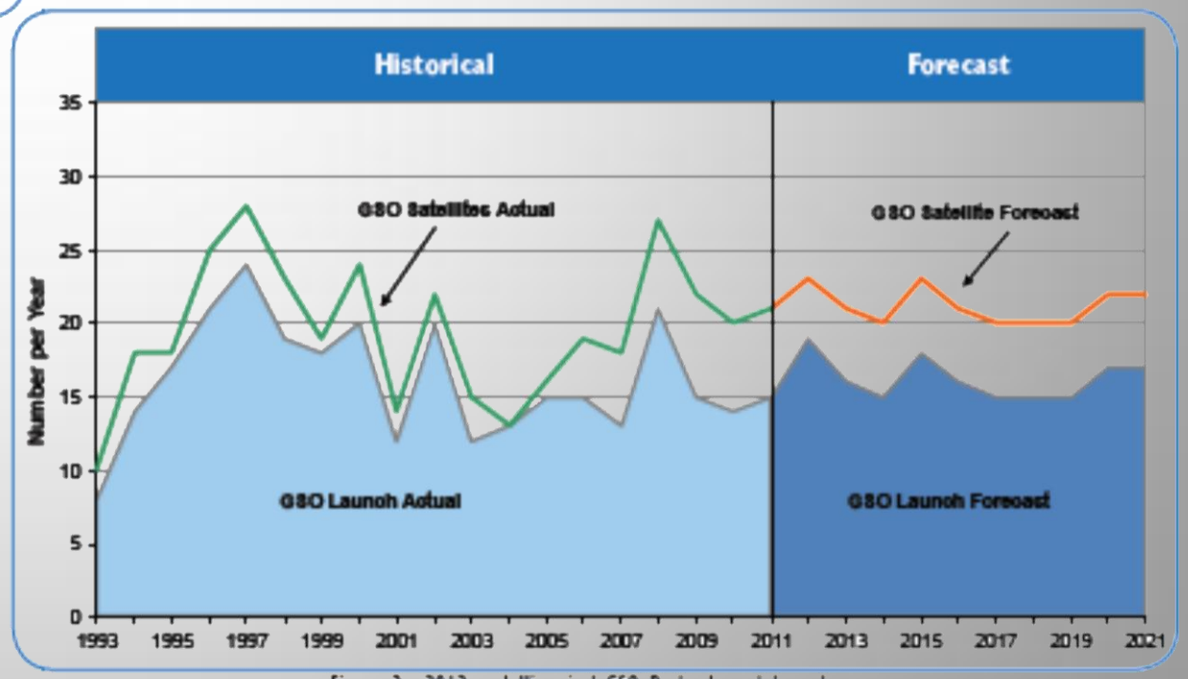
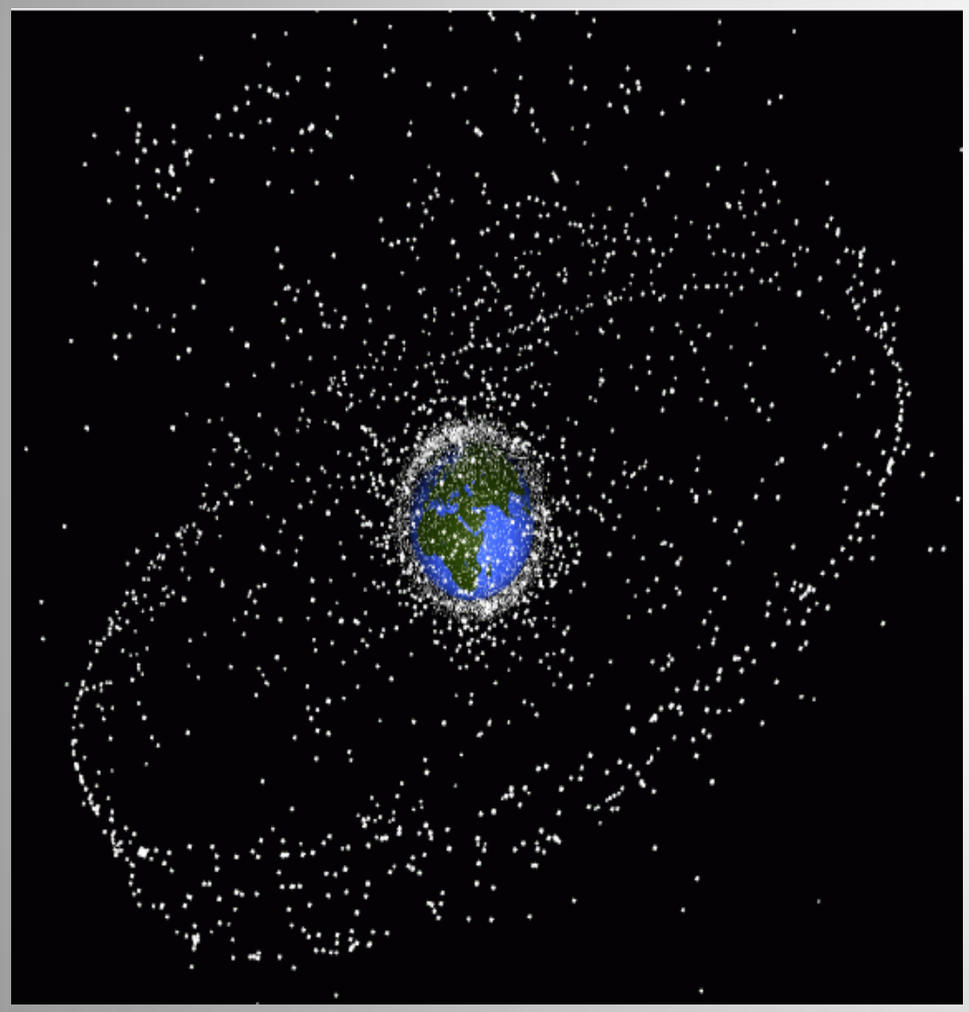


Figure 2. 2012 and Historical GSO Payloads and Launches

* US-FAA-2012-Commercial Space Transportation forecasts

The other side of the satellites growth:

Outer Space Environmental Impact



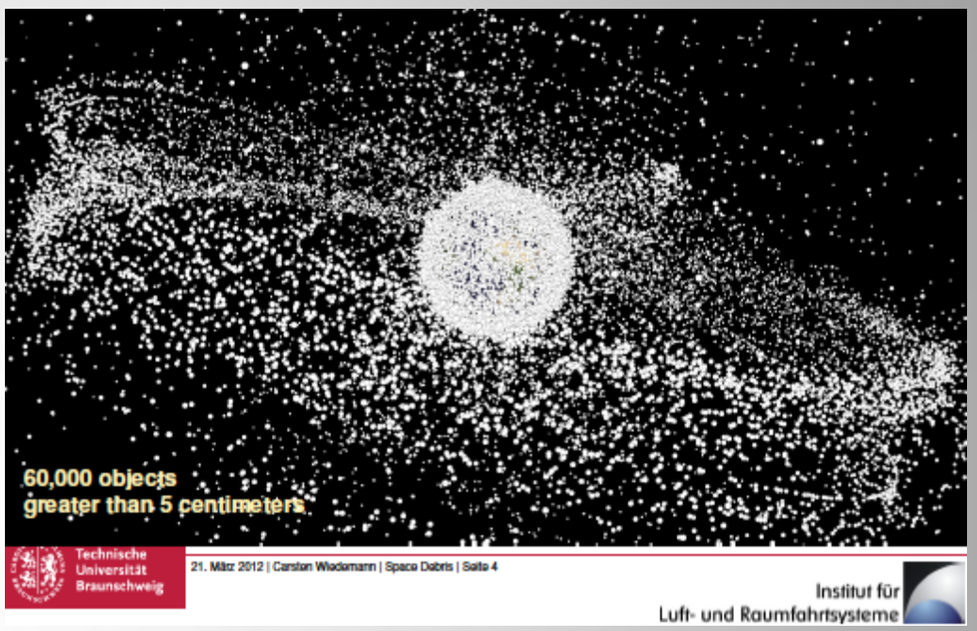
- GSO ring congestion: +900 GSO satellites in 50 years
  - From the +650 GSO satellites, half are not operational;
  - +230 launch vehicle stages, apogee kick motors and mission-related debris;
  - +700 cataloged objects are in elliptical orbits crossing through the GEO orbit +/- 200 km altitude
  - +2,200 not yet cataloged objects in the 10cm-1m range, observed (SSN-ISON)
- Risk of collision between GSO satellites increased by number of objects, their weight, eccentricity, inclination and by natural perturbations:
  - multiplication of avoidance maneuvers, reduced life, higher insurance cost
- No atmospheric drag: it is (today) impractical to retrieve objects from GEO altitudes or to return them to Earth at the end of their operational life…the graveyard ring is for the eternity

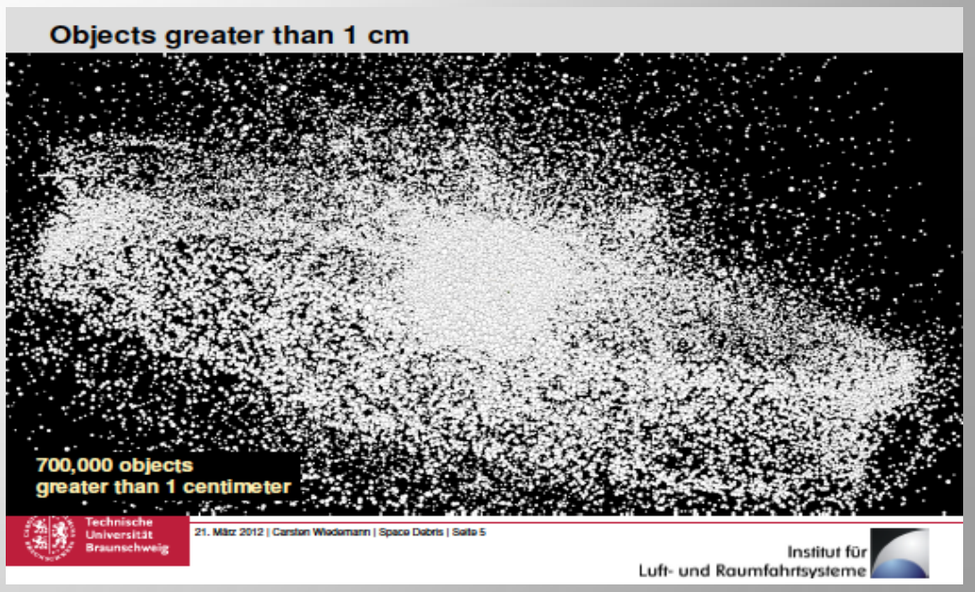
An “irreversible situation” (1)

Are guidelines, good will and best practices sufficient ?

- 2002 IADC Guidelines on Space Debris Mitigation (revised 2007)
- 2007 COPUOS Scientific & Technical Subcommittee Guidelines on Space Debris Mitigation endorsed by the UNGA Res 62/217
- 2008 COPUOS Legal Subcommittee introduced the “discussion” on space debris
- 2012 no consensus yet from space faring Member States to transform Guidelines into a set of Principles on space debris

- (Some) National space legislation or rules addressing Space Debris
  - 2008 Japan Basic Space Act
  - 2010 USA National Space Policy
  - 2010 France Space Operations Act/2011 CNES/ESA arrangement on safety
  - 2011 Austria Outer Space Act
  - 2012 NASA revised standards (STD8719.14 Rev.A)





(1) **Nicholas L. Johnson,** Chief Scientist for Orbital Debris, NASA, Houston, Texas, USA- 62nd International Astronautical Congress- Cap Town 2011

Space Law victim of its own success?

Who takes the lead in addressing the new legal challenges?

- Emerging countries have directly benefited from Space Law:
  - Fostering mutual trust to strengthen disarmament and non-proliferation of weapons of mass destruction in OS
  - Accessing outer space as new space-faring powers on an equal basis with developed Countries
  - Democratization of access to satellite services has boosted freedom of expression and political changes
- Joining the club means new challenges and obligations in protecting the OS environment and co-sharing the GSO orbit
  - Several new space-faring Nations have not ratified the UN Conventions on International Liabilities for Damage Caused by Space Objects and the Registration of Objects Launched into Outer Space, adopted national space legislation, or regulations on space debris mitigation, end-of-life and re-orbiting of their satellites
- New comers, incumbents –and the space industry-need to engage seriously in the protection of GSO ring:
  - The1994 International Instrument on The Protection of the Environment from Damage caused by Space Debris (66th ILA Conference –Buenos Aires) remains a great basis, together with the Czech Republic proposal (2010 COPUOS 49th Legal Subcommittee) to establish binding principles.