LONDON INSTITUTE OF SPACE POLICY AND LAW

SPACE POLICY AND LAW COURSE

ON-LINE
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SPACE APPLICATIONS

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Applications

- Telecommunication
  - Spectrum management
  - Orbits
  - Content
- Remote Sensing – Earth Observation or EO
  - Sovereignty
  - Civilian and Military
  - Data
  - Privacy, Search and Warrants
  - NASA's Gravity Recovery and Climate Experiment (GRACE) [2002-2018]
    Density increase speeds satellite
  - Distinguish tracking and telescope satellites
    - » Canada Near Earth Object Surveillance Satellite (NEOSS)
      Launched 25 Feb 2013 Orbit 800 km

APPLICATIONS

…Continued

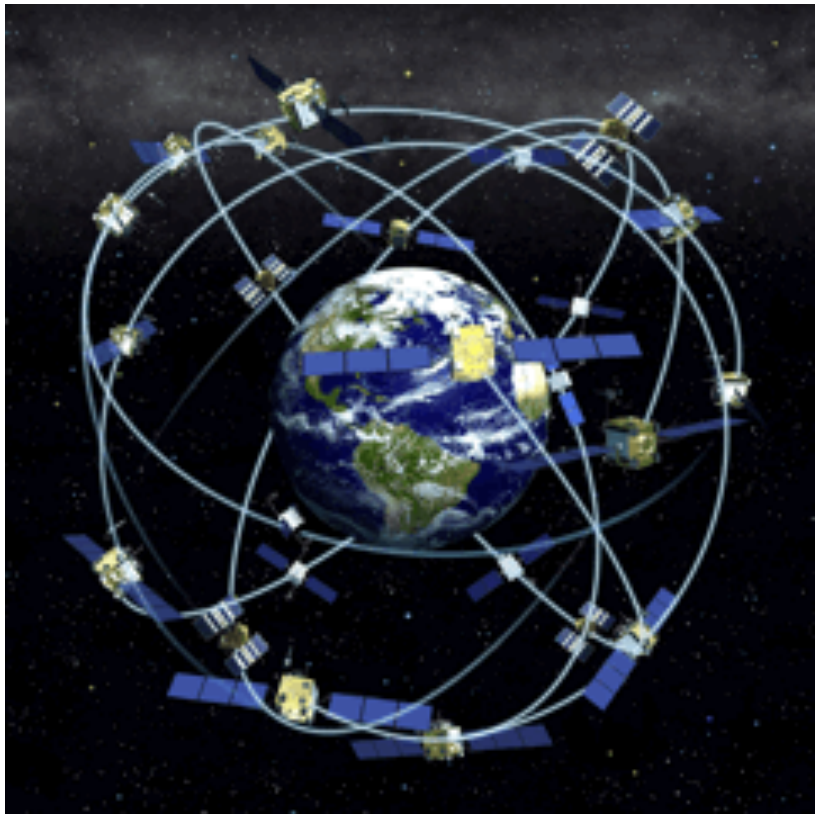
- Research
  - Non-commercial, mainly government and universities, and Commercial
  - Small Satellites

APPROXIMATE MAXIMUM WEIGHT

Type	Pounds	Kg	NASA Kg
Mini-satellite (minisat)	1,100	500	≥ 100
Micro-satellite (microsat)	220	100	10 – 100
Nano-satellite (nanosat)	22	10	1 – 10
Pico-satellite (picosat)	2.2	1	0.01 – 1
Femto-satellite (femtosat)	0.22	0.1	0.001 to 0.01

- Inexpensive and fast to construct and launch
- Universities and other educational and experimental
- Military use; Disaster relief
- PlanetLab
- Debris risk – life-span
- Spectrum - coordination

Applications



APPLICATIONS

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- Global Positioning System (GPS) and Global Navigation Satellite System (GNSS) also Positioning, Navigation and Timing (PNT)
  - United States GPS and the Russian GLONASS are GNSSs China expanded BeiDou into the global Compass GNSS and the EU's Galileo
  - Minimum 24 satellites for GNSS
  - Independence and interoperability – spectrum separation
- **Liability**
  - GPS free and operated by US military – State immunity
  - Galileo commercial element – Contractual and non-contractual
- **Privacy**
  - Location is *personal information*

APPLICATIONS

…Continued

- International Space Station ISS
  - Formed under IGA between Canada, ESA, Japan, Russia and USA 29 January 1998 – ESA representing 11 of its members, Belgium, Denmark, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom.
  - Many MoUs govern specific arrangements and details.
  - Orbit at 330 to 410 kilometres
  - Spans 420 X 160 ft (128 X 49 m), including its solar arrays, area of U.S. football field, weighs nearly a million pounds (454 tons), not including visiting vehicles.
  - More liveable room than a conventional five-bedroom house, two bathrooms, a gymnasium and a 360-degree bay window.
  - May 2020 had 240 visitors from 19 Countries

APPLICATIONS

…Continued

- Space Transportation
  - ELVs
  - Private operators – SpaceX
  - Cargo delivery to ISS – SpaceX, May 2012
  - Personnel delivery to ISS – Soyuz
  - Launch America 30 May 2020 SpaceX
- Manned Space Travel
  - As of the end of October 2020 about 567 (USAF 576) people from 41 countries; 3 sub-orbital; 24 beyond LEO; 12 walked on Moon
  - Sub-orbital "tourism" – *Jurisdiction and Control*, Reg Conv Art II
  - Regulatory approaches – Certification v Permit (Experimental)
  - Spaceports
  - Liability waiver
  - Committee on Space Research (COSPAR) Planetary Protection Policy; Guidelines for Mars missions

UN Resolutions

- Remote Sensing Principles
  [UNGA 41/6 3 December 1986]
  - Definitions
    - *Remote Sensing* Earth's surface from space using electromagnetic waves *emitted, reflected* or *refracted* by sensed object for *natural resource management*, *land use* and *environmental protection*.
    - *Remote Sensing Activities* Operation of system, data collection, processing, interpretation & disseminating processed data. Principle I
  - Benefit and interest of all countries; access to processed data. Principles II, XII
  - Remote Sensing Activities to respect *full and permanent sovereignty* of State and people over their *wealth* and *natural resources* and not to be detrimental to *legitimate rights and interests* of sensed State. Principle IV
  - Cooperation and participation - *equitable*. Principles V-VIII
  - Information about activities to UN and requesting affected States. Principle IX
  - Protection of environment and from natural disasters. Principles X-XI

International Disasters Charter

- Structure for cooperation between space agencies and space system operators – not an IGO
- Allows use of space facilities for the prediction and *management of disasters* arising from *natural* or *technological* causes
- Unified system for the acquisition and delivery of the data
- Provides mechanism for supply of data, information and other services, to States or communities influenced or threatened by disasters

UN Resolutions

…Continued

- States not to place in Earth orbit or on celestial bodies any nuclear weapons or other weapons of mass destruction (Resolution 1884 (XVIII) adopted 17 October 1963)
  - OST Article IV, without prohibition on encouragement or participation in such activities; Resolution 1884 (XVIII), Para. 2(b).

- Principles Governing Use by States of ... Satellites for International Direct Television broadcasting (adopted 10 December 1982 in Resolution 37/92)
  - Resolution 110 (II) 3 November 1947, condemned propaganda designed, likely to provoke or encourage threat to peace or act of aggression.

UN Resolutions

…Continued

- Principles Governing Use by States of ... Satellites for International Direct Television broadcasting (adopted 10 December 1982 in Resolution 37/92)
- International Direct TV Broadcasting
    - *Sovereign rights* of States and non-intervention.
    - Right to receive and impart information and ideas.
    - Promote free dissemination and exchange of information and knowledge.
    - Respect *political* and *cultural* integrity of States.
    - States bear responsibility.
    - State intending to establish service shall immediately notify and consult receiving State.
    - Observe ITU regulations.
    - Unavoidable overspill *exclusively* governed by ITU rules.

Commercial Activities

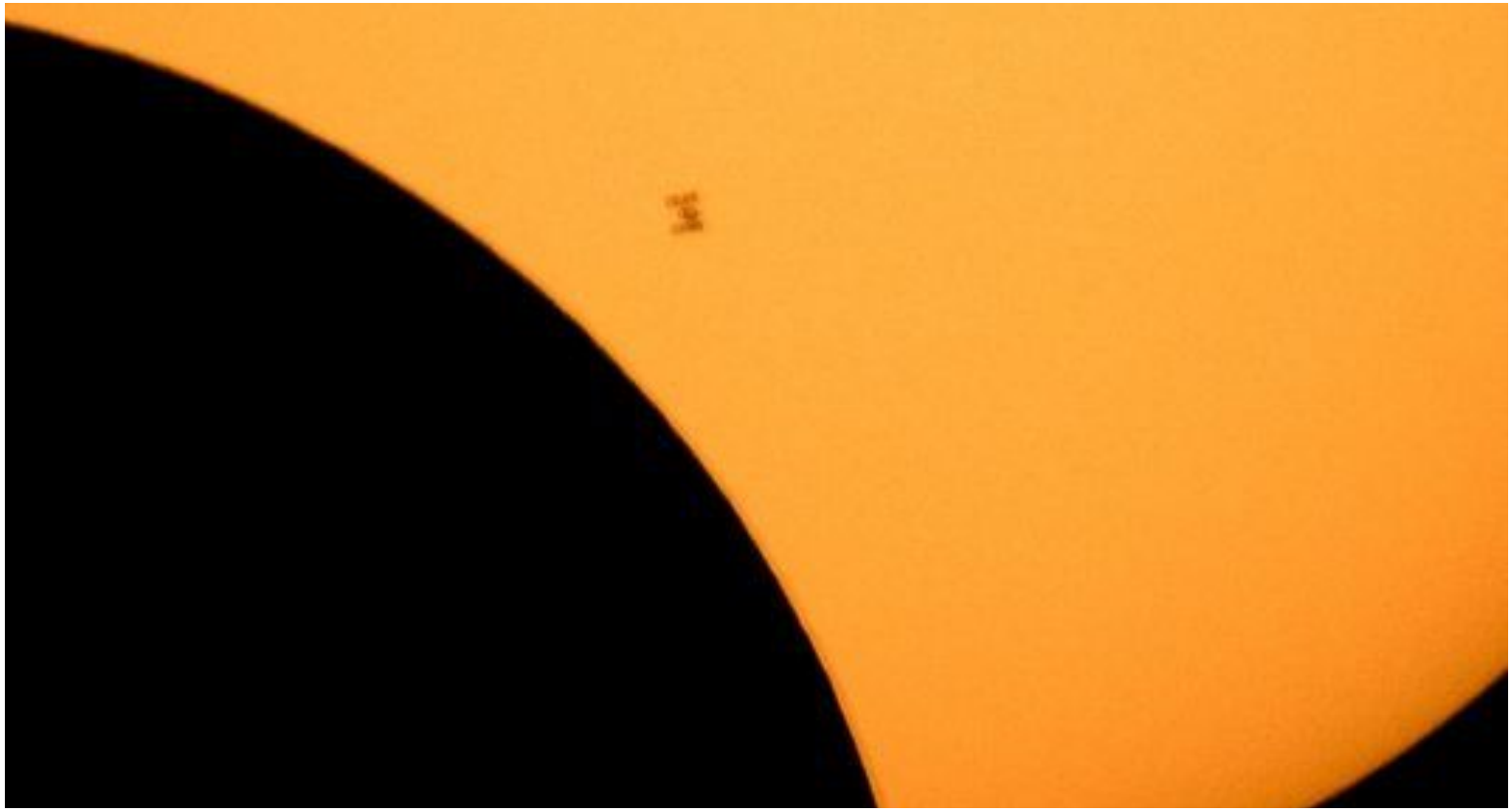
- Activities conducted by Government are not necessarily non-commercial
- OST recognised and provides for private space activities
- Range of Current Activities
  - Launch services, satellite communications, and remote sensing
  - Telecom earliest private space service; Privatisation of telecom, US breakup of AT&T in early 1980s; see Arthur C Clark in *Wireless World*, October 1945
  - *NewSpace* Those products and services not under contract to NASA
- Planned
  - Missions beyond Earth's orbit: Missions to the Moon, Mars & lunar habitat
  - On-orbit activities: Life extension, graveyard transfer, refuelling & service
  - Resource utilisation: Extraction of elements from asteroids and other bodies

Impact of National Laws

- State responsibility *and* liability
- Obligation to *Authorise* and *Supervise*
- *Jurisdiction* and *Control*
- Licence conditions
  - Permitted activities
  - Insurance
  - End of life

Human Flight

Solar Eclipse 21 Aug 2018



NASA Image

Human Flight

Asked what he thought of man's attempt to reach the Moon,
Dr Albert Schweizer replied:
"Poor Moon"

1959 at Grünsbach in the Alsace

Human Flight

- Space or Airspace
- Liability Waivers and Cross-waivers
  - *Informed* Consent
  - Municipal Law Requirements – NY, EU and UK
    - » EU Directive 93/13/EEC; Unfair Terms in Consumer Contracts Regulations 1999, Reg 4
- Certification or Permit
- Federal Aviation Administration - AST in US
- UK Space Industry Act 2018
- European Aviation Safety Agency - EASA
  - Was developing European approach and regulation

Property Rights

- Ownership of Property
  - *The Gods Must be Crazy*
  - Legal relationship between persons relating to property
  - Affected by law and other factors
  - At a minimum, owner's government will exclude others from the use or enjoyment of owner's possession without consent
- Ownership of Space Objects
  - Not affected by presence in space or return to Earth
  - Applies to objects constructed on a celestial body OST Art VIII

PROPERTY RIGHTS

…Continued

- Ownership of Space Resources
  - Jurisdiction OST Arts II & VIII
  - Right to remove samples for experiment Moon Agt Art 6(2)
- Non-corporeal Property
  - Nature
  - Jurisdiction and control
  - Priorities
- Salvage
  - Right against property saved – *in rem*
  - In Admiralty specific rights created by law
  - Action must be entirely voluntary

US Legislation

- Space Resource Exploration and Utilization
  [51 USC, Ch 513]

  - Asteroid resource.—The term "asteroid resource" means a space resource found on or within a single asteroid

  - Space resource.—
    - (A) In general.—The term "space resource" means an abiotic resource *in situ* in outer space.
    - (B) Inclusions.—The term "space resource" includes water and minerals

  - 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*

LUXEMBOURG LEGISLATION

- Luxembourg passed a space resources law 2017
  - Grants companies, including those operating out of the country, ownership of space resources they extract, similar to provisions in the Commercial Space Launch Competitiveness Act 2015.
  - Both the U.S. and Luxembourg laws grant ownership of resources only after they have been extracted, attempting to avoid potential conflicts with the Outer Space Treaty, which prohibits countries from appropriating any part of space or celestial bodies *by any means*.