From SmallSats to Large Constellations: Why Law is Relevant for You

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Introduction

"In the long march of mankind from the cave to the computer a central role has always been played by **the idea of law** – the idea that order is necessary and chaos inimical to a just and stable existence."

M. Shaw

Space law in a nutshell

- **1959-1979:** the foundation of space law –> five international treaties

Outer Space Treaty	Rescue & Return A.	
Liability C.	Registration C.	Moon A.

- **1980s-present:** space “soft law” and national space laws;
- **the future:** a comprehensive space traffic management regime, similar to ATM?

Core principles

- "Treaty on **Principles** Governing the Activities of States in the Peaceful Exploration and Use of Outer Space"
  - "space freedoms"
  - no national appropriation
  - State responsibility and liability
  - authorisation and supervision
  - registration of space objects
  - no contamination of space or Earth

From principles to laws …

Example 1: Some States…

– split ***'space activity'*** into launch, operation, control, guidance, command, orbital, sub-orbital, etc.;

– split ***'space object'*** into launch systems / vehicles, satellites, payloads, sounding rockets, re-entry vehicles, etc.

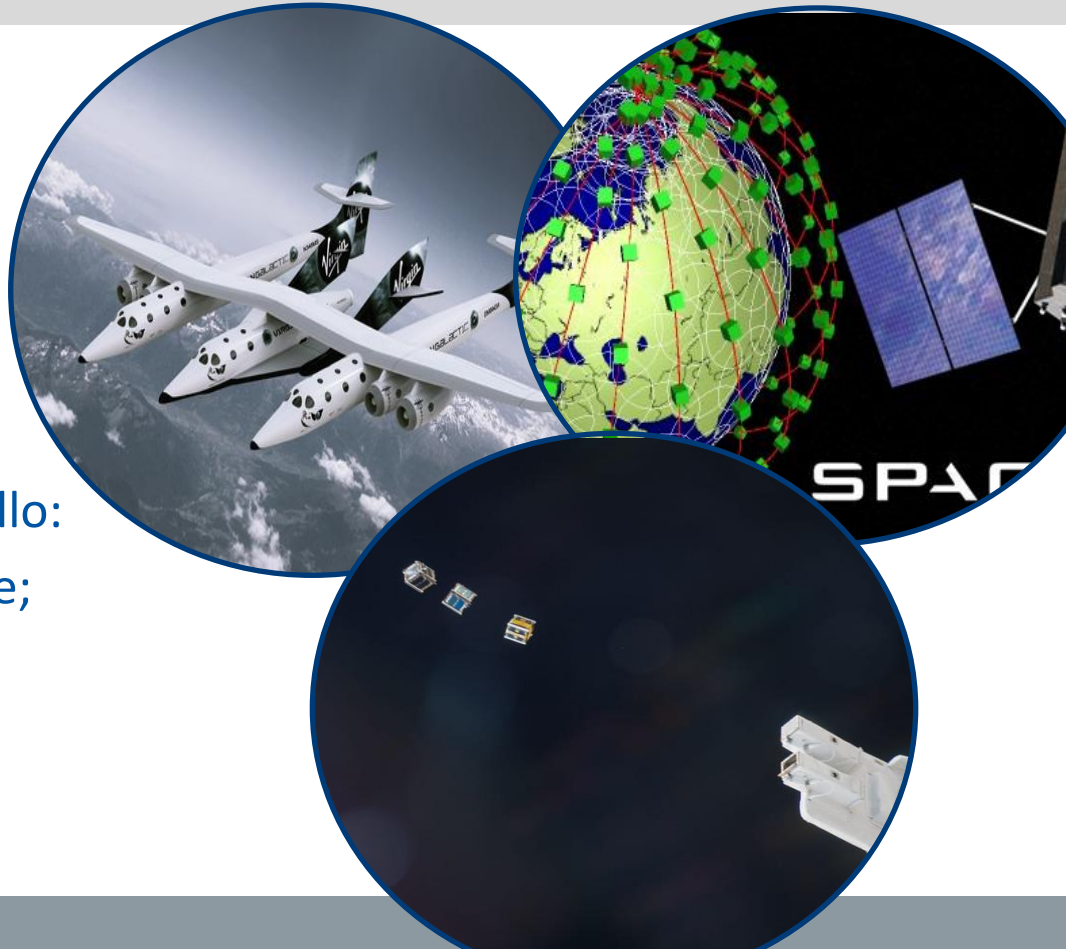
Example 2: Some States…

– require financial and professional guarantees;

– undertake environmental impact assessments;

– request taking out insurance.

The world continued turning…



Spaceflight since the days of Apollo:

- new ways of using outer space;
- new types of space activities;
- new technical challenges;
- new actors;

From “old space” to “new space”

How we do spaceflight today

- **Smaller** satellites
- **Flexible** launch systems
- **Innovative** applications
- **Smart** industries

The way space impacts life

- “GPS, drones and satellites: *digitalized farming*”

International liability for space activities

- unusual in int. law;
- how to establish fault,
- how to proof fault?

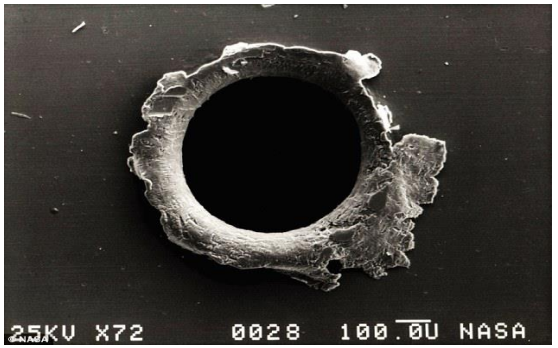
- triggered automatically;
- even force majeure;
- financially unlimited.

the concept of the launching State

"once launching State, always launching State"

Space debris: an overview

– "all **non-functional, man-made (= artificial) objects**, including fragments, in Earth orbit or re-entering the Earth's atmosphere"
(ISO 24113)



  - 750.000 objects of > 1cm;
  - +100 million objects of < 1cm (ref.: ESA Space Debris Office).

– **Types:** S/C; launch vehicle upper stages; "mission-related objects";
– **Sources:** new launches; emissions / erosion; explosions; collisions.

Space Debris Mitigation

- Technical and regulatory reactions to safeguard the orbital environment:

  => space debris mitigation (SDM) and remediation (SDR)

Outer Space Treaty 1967

Nairobi Int. Convention on the Removal of Wrecks

Various SDM Guidelines / Stds.

National space legislation

- not legally binding under int. law (recommendations, technical standards)
- may be legally binding for space mission owners and operators

SDM guidelines and standards: the catalogue

2002

- **IADC "SDM Guidelines"** (2002+): 13 agencies; technical requirements applicable to S/C & O/S mission planning, design and operation.
- **"European C.o.C. for SDM"** (2004): ASI, BNSC, CNES, DLR and ESA; re-enforced SDM commitment.
- **UN "SDM Guidelines of the COPUOS"** (UNGA Res. 62/217, 22Dec2007): widest political SDM commitment to date; consensus-based.
- **ISO standard 24113** "Space Systems – SDM Requirements" (2011): a technical standard establishing design and operations requirements.
- **ECSS standard ECSS-U-AS-10C** "Space Systems – SDM Requirements" (2012), adopted ISO 24113; basis for ESA's SDM policy.

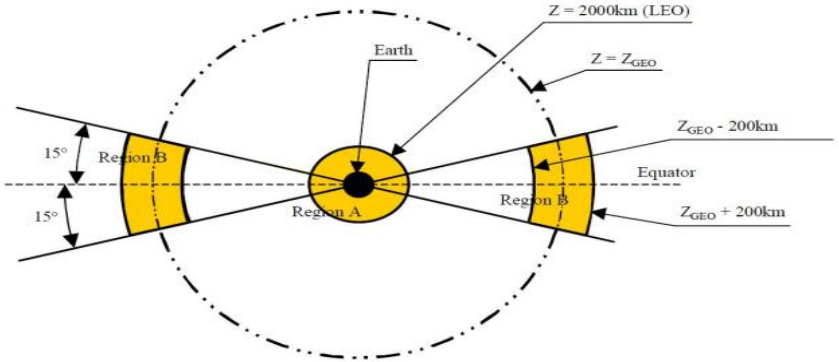
2012

… and on-going …!

SDM guidelines and standards: the content

Key recommendations:

- limit debris release during operations;
- minimize break-up potential during and post-mission;
- limit probability of collisions in orbit;
- avoid intentional harmful activities;
- limit S/C and O/S long-term presence in LEO and long-term interference



Key issues:

- implementation
- compliance & verification
- reliability assessment
- ADR

Towards space traffic management…

The basic idea:

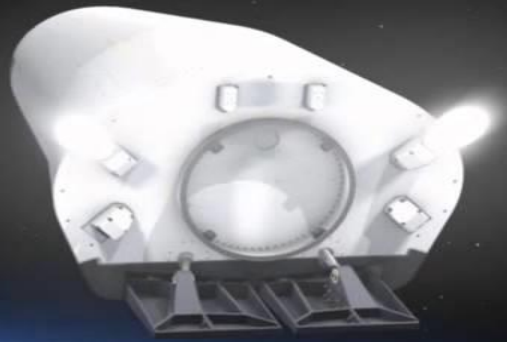
- view spaceflight as **comprehensive traffic** regime



- "STM is the set of regulatory rules to ensure safe access to outer space, safe operations in outer space and safe return from outer space."

space-related rules	object-related rules	traffic rules

Thank you.



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