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Small Satellites: Regulatory Requirements and Challenges

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Small Satellites – Opportunities
A (New) World of Space Activity

- Access to new applications – flexibility
- Unknown possibilities – a wealth of new ideas
- Allows entry by new space 'actors'
  - lower barriers to entry
  - addresses technology gaps between developed / developing countries
- Facilitates capacity building
    - precursor to a national space program
      - larger future missions
    - commercial applications
    - shorter timelines
  - Education and training
  - Facilitates broader collaboration
  - universities, NGOs, non-profit organisations but now also …
  - Government organisations / space agencies

Small Satellites – Opportunities
A (New) World of Space Activity

- Driver of scientific and technical development but also …
- Expanding scope of existing capability – at lower cost
- Does not always require a dedicated 'launch'
- A 'model' for developing future best practices?
  - Eg de-orbiting techniques
- No universal definition - differentiated by mass
  - mini: 100-500kg
  - micro: 10-100kg
  - nano: 1-10kg
  - pico: 0.1-1kg
  - femto: <100gm

Existing Legal Framework / Regulatory Requirements include …

- Article VI Outer Space Treaty
  - authorization – including extraterritorial activities
  - continuing supervision
- Liability Convention
  - 'space object'
  - 'launching State'
    - national law – indemnities?
      - insurance requirement / direct financial responsibility
      - exemption?
- Registration Convention
  - national register
  - information to United Nations Register

Existing Legal Framework / Regulatory Requirements include …

- ITU Requirements
  - liaison with national administrator
  - use of radio frequency – will expand as applications / complexities develop
  - coordination
    - ITU mandatory procedures not always followed
- IADC / UNCOPUOS Debris Mitigation Guidelines
  - non-binding but influential for practice
- Specific national law requirements (space / telecommunications / technology etc)
  - national security
  - export controls

Small Satellites – Challenges Incorporating into the Existing World of Space Activity

- No existing dedicated rules / specific international law but …
  - compliance with existing regulatory requirements?
    - hard law
    - 'soft' law
    - not designed with small satellites in mind
- No national legal framework / procedures
  - are States doing enough?
  - understanding / expertise regarding peculiarities of small satellites
  - new to space activities?
  - small satellite program pre-dating national law
    - authorization?
    - continuing supervision?

Small Satellites – Challenges (continued)

- Liability issues
  - Launching State
    - procuring?
  - how to protect State and also encourage small satellite developers?
    - national indemnity requirements may make program unaffordable
    - policy decision – added risks v. stifling of development
- Insurance?
  - part of the conditionality for authorization?
  - availability?
  - perceived need?
    - consequences of uninsured space object?
    - need to negotiate with launch service provider
- Registration
  - establishing national register – time lag
  - who should register? – need for coordination

Small Satellites – Challenges (continued)

- Lower cost => lower (perception of) risk
  - financial / technical – utilising 'off the shelf' components
  - new technology
    - => higher tolerance with respect to failure?
- Impact on the space environment and long term sustainability
  - exponential growth – constellations
  - need to launch multiple satellites – hazardous
  - potentially long period (>25 years) before orbital decay (in higher orbits)
  - lack of manoeuvring capabilities
  - inability to track (femto satellites)
  - in orbit risks
    - => conflict with principles underpinning debris mitigation guidelines?
- Impact on safety

Small Satellites – Challenges (continued)

- Use of radio frequencies
  - (lengthy) time lag
  - harmful interference
  - coordination
- (lack of) Track record
  - previous program involvement?
- Expertise – control
- Other challenges?

Managing Future Progress

- Predicted exponential growth in small satellite programs
  - new applications
  - scientific development
  - greater commercial application
  - 'bringing space to more people'
- Many small satellite programs driven by scientific motives but …
  - various regulatory / legal / financial requirements
  - => small satellite developers must understand existing national / international legal framework
  - must be addressed coincident with development phase
- Development of best practices – a Code of Conduct
  - 'soft' law / guidelines => compliance?

A Policy Decision for (Inter)National Regulators

- Clear need for (additional) national law to specifically address small satellites
- Must balance between
  - => stricter regulation
    - financial / technical etc
    - minimising risks
- and …
  - => facilitating rules / liability limitations /exemptions / subsidies etc
    - promote research / development
    - encourage greater access to space