

# Long-term sustainability: Rendezvous and Close Proximity Operations

**OOS & ADR**

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# Past, promise or new paradigm?

- Rendezvous and close proximity operations: from Gemini to Apollo to Salyut to MIR to ISS ... **nothing new** in principle.
- On-orbit **servicing** and active debris **removal**: **often described, rarely attempted** -> towards reduced or increased complexity in space ops?
- Overcoming the “build – use – throw away” approach ... the quintessence of ‘sustainability’?

# On-orbit satellite servicing (OOSS)

## Drivers

- to more fully exploit the flight systems already launched (lifetime / upgrade)
- to develop new systems that reliably and cost-effectively support space activities
- **to reduce, reuse and recycle**

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- Re-fueling
- Repairing
- Re-positioning
- Removing
- (Assembling)

# Legal and regulatory layers (overview)

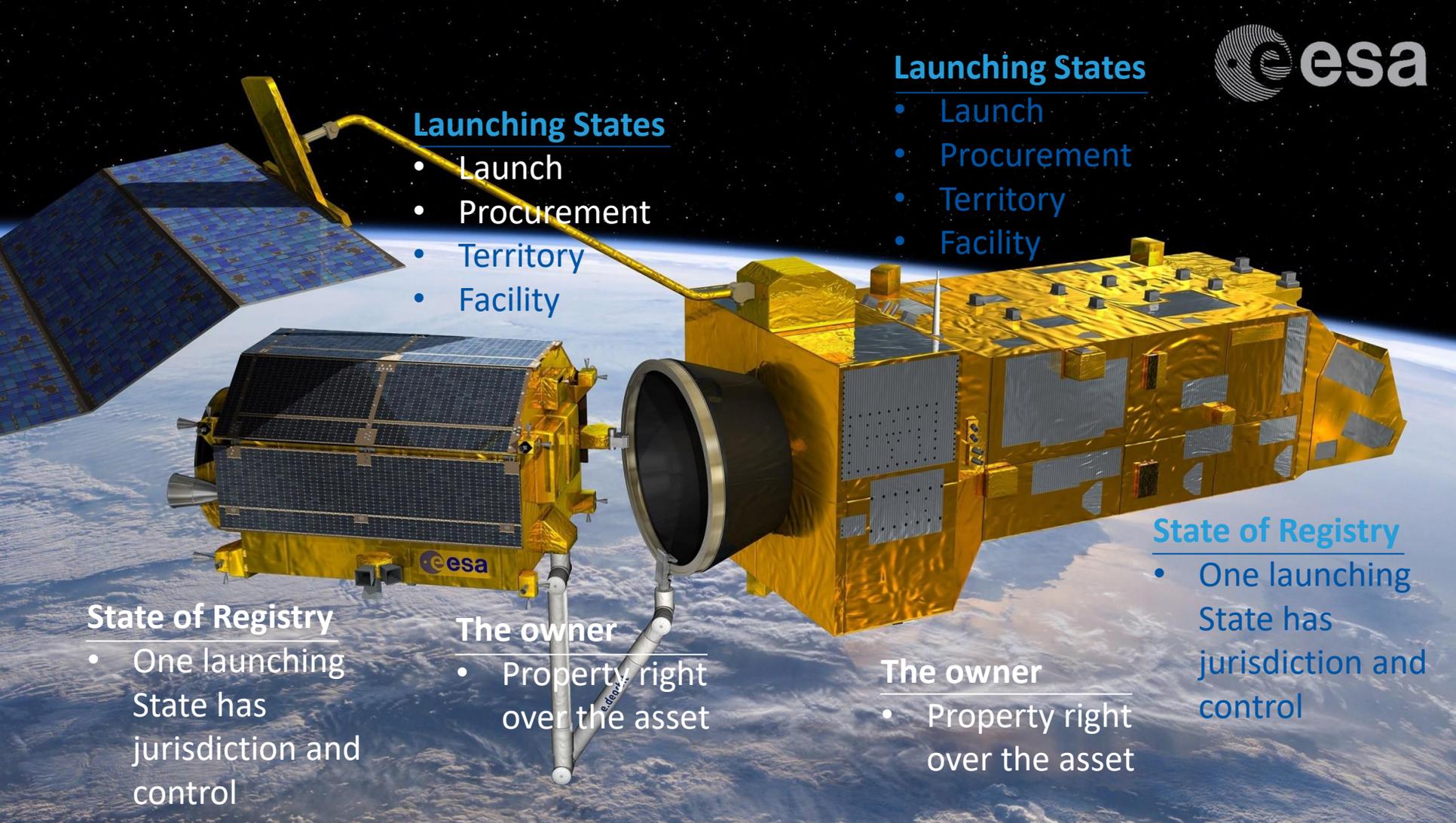
- an **international law** perspective
  - **States** and international space law
- a **national** regulatory perspective
  - **authorities** and national space law
- a **contractual** perspective
  - **service providers & customers** and their contractual relations
- a **‘soft law’** perspective
  - standards, **guidelines**, practices

# Some basic rights and obligations

- States\* are **free** in principle **to conduct** OOSS and ADR activities
- States are internationally **liable for damage caused by OOSS and ADR activities**, including those of non-governmental entities
- States shall **authorise and supervise** non-governmental OOSS / ADR activities
- States shall **register space objects** and **avoid harmful interference with others** when performing OOSS / ADR



\* and IGOs  
like ESA



### Launching States

- Launch
- Procurement
- Territory
- Facility

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### State of Registry

- One launching State has jurisdiction and control

### The owner

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# Preparing for the future of OOSS / ADR

- **novel technological approaches** to reduce cost and risk of such missions
- **novel legal approaches** to efficiently manage the convolution of legal relations
- **benchmarking for what constitutes ‘fault’** in relation to OOSS / ADR in orbit
- Role for governments, space actors and industry in creating **OOSS / ADR guidelines or standards**