The Co-Dependent Nature of Policy and Regulations, Mission Design, and Commercialisation

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Multiple Capabilities, Multiple Orbits

Astroscale is the only company dedicated to providing in-orbit services across all orbital regimes

Life Extension + Fleet Management

LEX (GEO)

Keep GEO satellites in operation after fuel depletion

In-Space Situational Awareness/Inspection

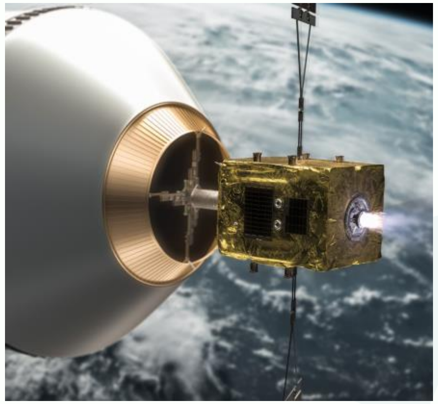
COSMIC, ADRAS-J

Diagnose and characterize objects

End of Life & Orbital Transfer

ELSA-d, ELSA-M

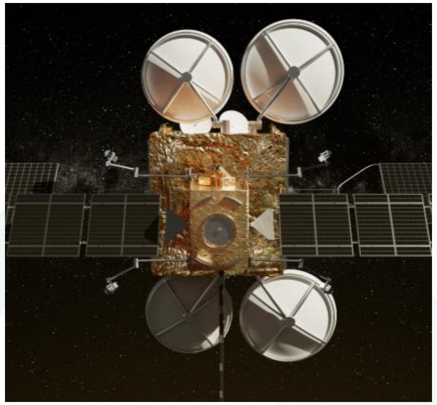
In-orbit maneuver, last mile delivery, and deorbit services



Active Debris Removal

COSMIC, ADRAS-J2

Remove large, non-prepared debris currently in orbit



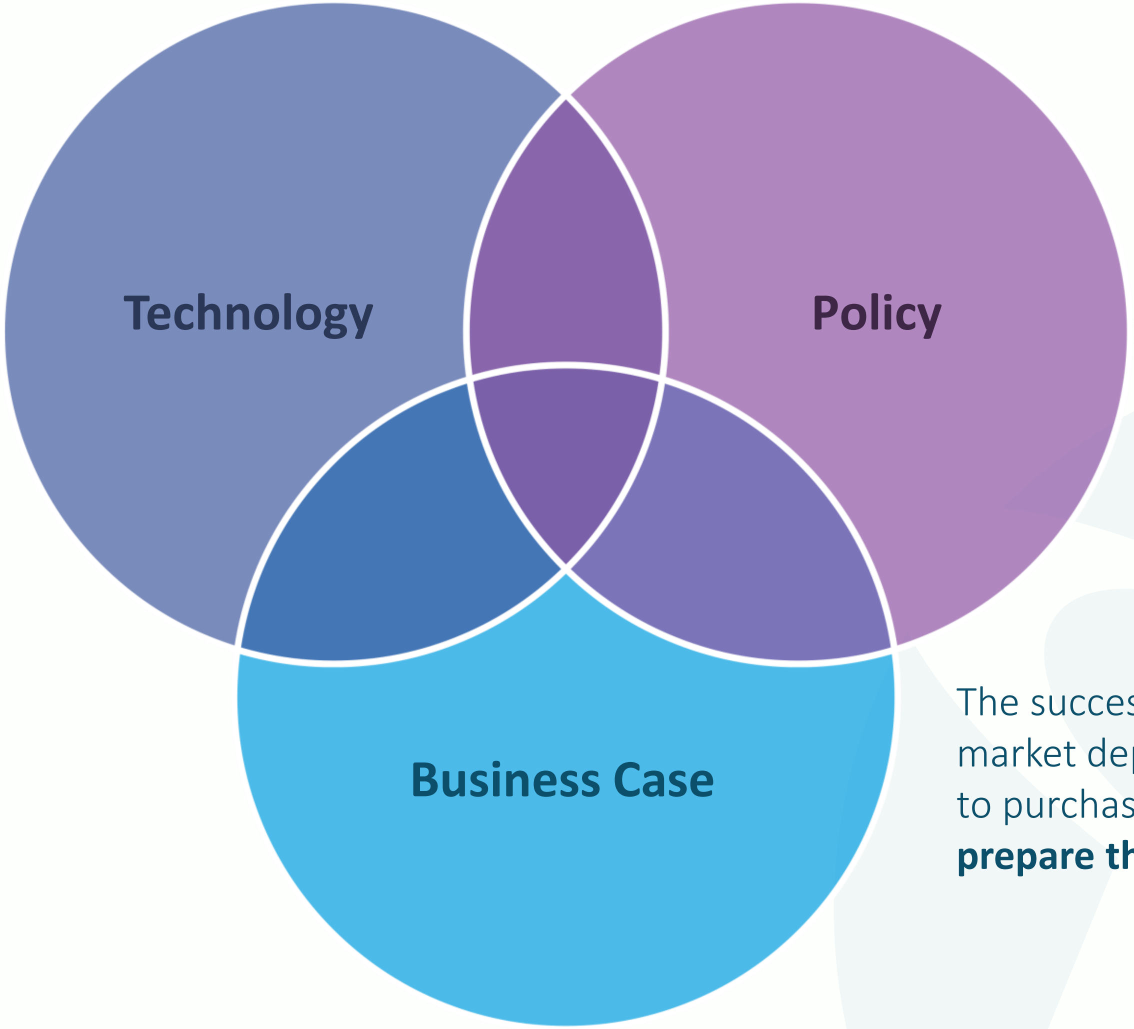
Refueling + Maintenance

LEX, APS-R

Upgrade, refuel, repair, or assemble in-orbit

Astroscale's Interdependent Core Pillars

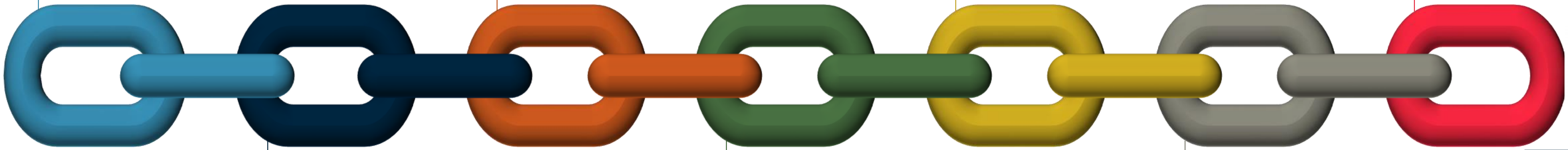
ELSA-d (2021) and ADRAS-J (2024) demonstrated the core technologies necessary for **in-orbit servicing (IOS):** namely rendezvous and proximity operations **(RPO) and docking**



Astroscale works with policy makers and decision makers in governments across the globe to get **licensing and regulation** in place that will foster a **sustainable space environment and market**

The success of the in-orbit servicing market depends **operator buy-in**, not only to purchase the services, but also to **prepare their spacecraft for servicing**

The Policy Chain – Normalising In-orbit Services



Thought Leadership

Technical Standards

National Regulation

Multi-lateral & International Agreement

G7 Hiroshima Leaders' Communiqué

Industry & Multilateral Best Practices

National Policy & Strategy

National Legislation

S. 4814

AN ACT

LOIS

LOI n° 2008-518 du 3 juin 2008 relative aux opérations spatiales (1)

Space Industry Act 2018

Four Pillars of Space Policy

Operator's Legal and Regulatory Framework

Service providers: policies, regulations, and laws required by IOS providers

Client Authorisation Framework

IOS clients: policies, regulations, and laws required by IOS providers' clients

Space Sustainability and Debris Mitigation

All space operators: policies, regulations, and laws related to space sustainability and space debris mitigation

Development of a Commercial IOS Ecosystem

Service providers: policies, regulations, and laws related supporting the development of commercial IOS

Legal and Regulatory Framework

International and National Legal Frameworks

- Outer Space Treaty, in particular:
  - **Article VI:** international responsibility for national activities
  - **Article VII:** launching State liability
  - **Article VIII: R**egistration, jurisdiction and control, and ownership
- Implementation of Int'l Obligations: National Space Legislation

Example: SIA 2018, s.(4) (b) – "space activity" means (…) **operating a space object;**

  - no specific regime or requirements for RPO mission types

However:

- Each country might choose to regulate space activities differently; these laws may not be harmonised.
- *Rationae Personae/Materiae/Loci*
- Different (technical/safety/security/sustainability) requirements
- Very few laws cover commercial IOS services

States need to **understand the risks** associated with complex RPO missions and have a **national legal framework** in place to authorise and continuously supervise:

- Adoption at national level of guidance for RPO mission types – minimum standards on safety and sustainability will provide legal and regulatory certainty for operators.
- Challenges around (third-party) liability (example: New Zealand and UK consensual joint ADR and IOS missions framework) export control, and insurance requirements.
- Astroscale working closely with regulators (UK Regulatory Review, RPO Regulatory Sandbox).

Legal and Regulatory Framework

Countries with some legislation pertaining to space activities (information from UNOOSA)

Legal and Regulatory Framework

UNCOPUOS Guidelines for the LTS of Outer Space Activities

- Guideline A1: States' responsibility to adopt, revise and amend national regulatory frameworks for outer space activities (no specific mention of IOS)
- Better understanding of RPO missions required to avoid restricting innovative future missions (communication between States and harmonising laws and frameworks)

Mission Authorisation Frameworks and Access to Spectrum

- Spectrum challenge: no ITU Radio Regulations allocations for IOS
- Countries without a mission authorisation framework rely on access to the radio frequency spectrum as a main path for licensing space activities
- Astroscale missions to date: frequency allocations selected which most closely match our mission types (not a long-term solution)
- Astroscale's Missions (ELSA-d, ADRAS-J, ELSA-M, COSMIC…)

Client 'Authorisation' Framework

This pillar concerns the client's ability to get the IOS mission authorised. Currently, three scenarios exist:

1. The client's appropriate State **does not have a framework** to authorise handing over jurisdiction and/or control of the client's space object during an IOS mission.
2. The client's appropriate State has a licencing framework, but there's **nothing specific on IOS** missions.
3. The client's appropriate State has a licencing framework, which specifically highlights **specific requirements for transfer of control/authorisation**.

Which one is it?

- *Transfer of a licence? Is the IOS Operator subject to additional licences?*
- *Transfer of effective control?*
- *Transfer of operational control?*
- *Transfer of jurisdictional control (registration)?*
- *None of the above?*

Transfer of control could be difficult to obtain, done on a case-by-case basis, or result in there being no way to carry out the mission (worst case).

- Interpreting existing frameworks: nuances and debate around 'jurisdiction' and 'control' (Art. VIII OST).
- Prior consent from the State of Registry and owner (?) of the client space object might be difficult.
- Example of additional complexity: some States require a new licence, either from the servicer or client, to transfer control over the space object, whereas others go a step further to insist that you have a national presence (legal representation) to obtain control.

Client 'Authorisation' Framework

- Depending on the RPO mission type, other legal challenges might arise, including the relationship between regimes under national law (product liability, negligence, tort, strict liability) and international law (faut-based liability).
- Commercial contracts for RPO/IOS/ADR/EOL missions might be difficult and require international elements to be sorted out.
- **Key message:** it is possible to have everything in place from a servicer-provider perspective, but the client jurisdiction rejects consent to transfer control, not allowing the mission to be carried out.

Space Sustainability and Debris Mitigation

A range of non-binding guidelines exist on space sustainability and debris mitigation:

- Often parallel to one another and sometimes conflicting.
- Low levels of compliance with the existing instruments, example: ESA's Annual Space Environment Report 2024 highlights compliance with space debris mitigation measures in LEO (i.e. the 25-year), is improving, but still not sufficient.

These guidelines indirectly support IOS:

- Incentives for clients to avail of the services.
- Solution is not necessarily binding guidelines, but encouraging operators to adopt any of the solutions to ensure long-term sustainability – IOS, changes to design and/or operation of their missions, improving the reliability of missions, etc.

Space Sustainability and Debris Mitigation

Examples of promising initiatives (non-exhaustive list):

- Resolution ITU-R 74 calls for a Handbook on space sustainability.
- Zero Debris Charter and Technical Booklet list ambitious principals and targets towards a safe and sustainable future by 2030.
- EU Space Law intends to harmonise technical requirements (reliance, safety and sustainability) across the single market.
- Pact for the Future, adopted by all States at the UN General Assembly.
- FCC 5-years Rule and Notice of Proposed Rulemaking (NPRM) on ISAM (FCC).
- Japanese Guidelines on a Licence to Operate a Spacecraft Performing OOS.
- UKSA Consultation on Orbital Liabilities, Insurance, Charges and Sustainability; UK Regulatory Review and Regulatory Sandbox

While these initiatives support future IOS services, they need be based on scientific evidence

- **Example:** 'intentional' release of debris potential implications for ADR and EOL missions.

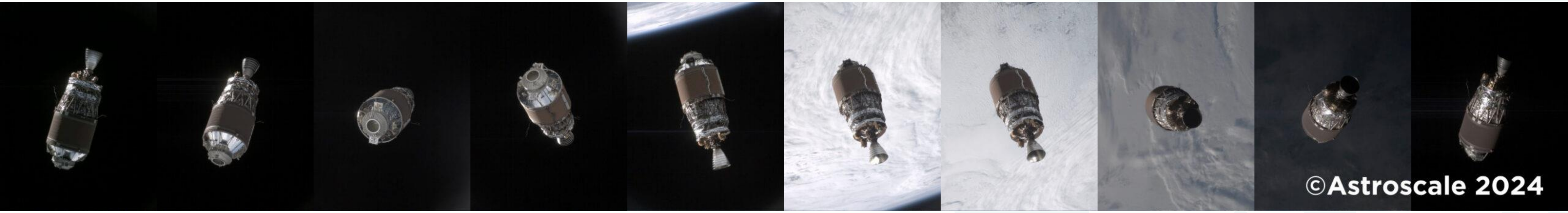
Development of a Commercial IOS Ecosystem

States need to continue investing in programmes which promote space sustainability:

- Maturing technologies for in-orbit demonstrations of ADR, EOL, IOS, etc.
- Prepare for removal, prepare for servicing, standardisation of interfaces, etc.
- Exploring additional support: encourage bilateral missions, dual use applications, etc.

Institutional programmes have begun to pivot to focusing on unlocking commercial potential:

- Space programmes must contend with other opportunities for government funding.
- Success case: ELSA-M public private partnership with ESA, Eutelsat OneWeb, and Astroscale.
- IOSM represents a predicted $18.2B market (NSR 2024), with many overlapping enabling technologies, but **initial institutional support for demonstration missions is key to de-risking the missions for future customers.**



Conclusions

~~We need more regulation~~

~~Our legal and regulatory frameworks can't support IOS missions~~

→

We need closer scrutiny of what these challenges really are and how to address them to enable commercial IOS

- Existing international legal framework(s) don't prevent IOS missions, but commercialisation is challenging
- Pillar #1 requires work at national and international levels to ensure IOS operators have enough legal certainty to obtain operation licences
- In Pillar #2 clients need to have legal and regulatory certainty in procuring IOS/ADR services from operators within or outside their own jurisdictions
- Further clarity is required on apportionment of liability, registration and jurisdiction and control over a space object to ensure the success of RPO mission types:
    - **Potential scenario:** IOS operator obtains mission authorisation (licence), but the mission cannot proceed because the Client's appropriate State(s) do not grant consent or authorise the mission to take place.

Thank you for listening!

Any questions?

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