



Commercial Space Debris Removal Service for the Long-term Sustainability of Space

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About us



Company	Astroscale Holdings Inc.
Foundation	May 4, 2013
Capital	USD 132 million
Team	75 members (75% of them are engineers)
Mission	Secure long-term spaceflight safety and orbital sustainability for the benefit of future generations
Vision	Develop innovative technologies, advance the business case and inform the international policies that will lead to reliable and safe orbital debris capture and removal



The Need for a Paradigm Change



1. With increased congestion comes higher risk of collision; it is no longer sustainable to operate satellites with rules designed for the past.
 - Very low PMD (post mission disposal) reliability in the past has led to crowded orbits.
 - Proliferation of numerous constellations benefits society but brings inherent risks.
 - Greater activities in orbits above 650 km means that failed objects will not naturally decay within today's guideline of 25 years.
 - More frequent maneuvering for collision avoidance leads to higher price and greater risk.

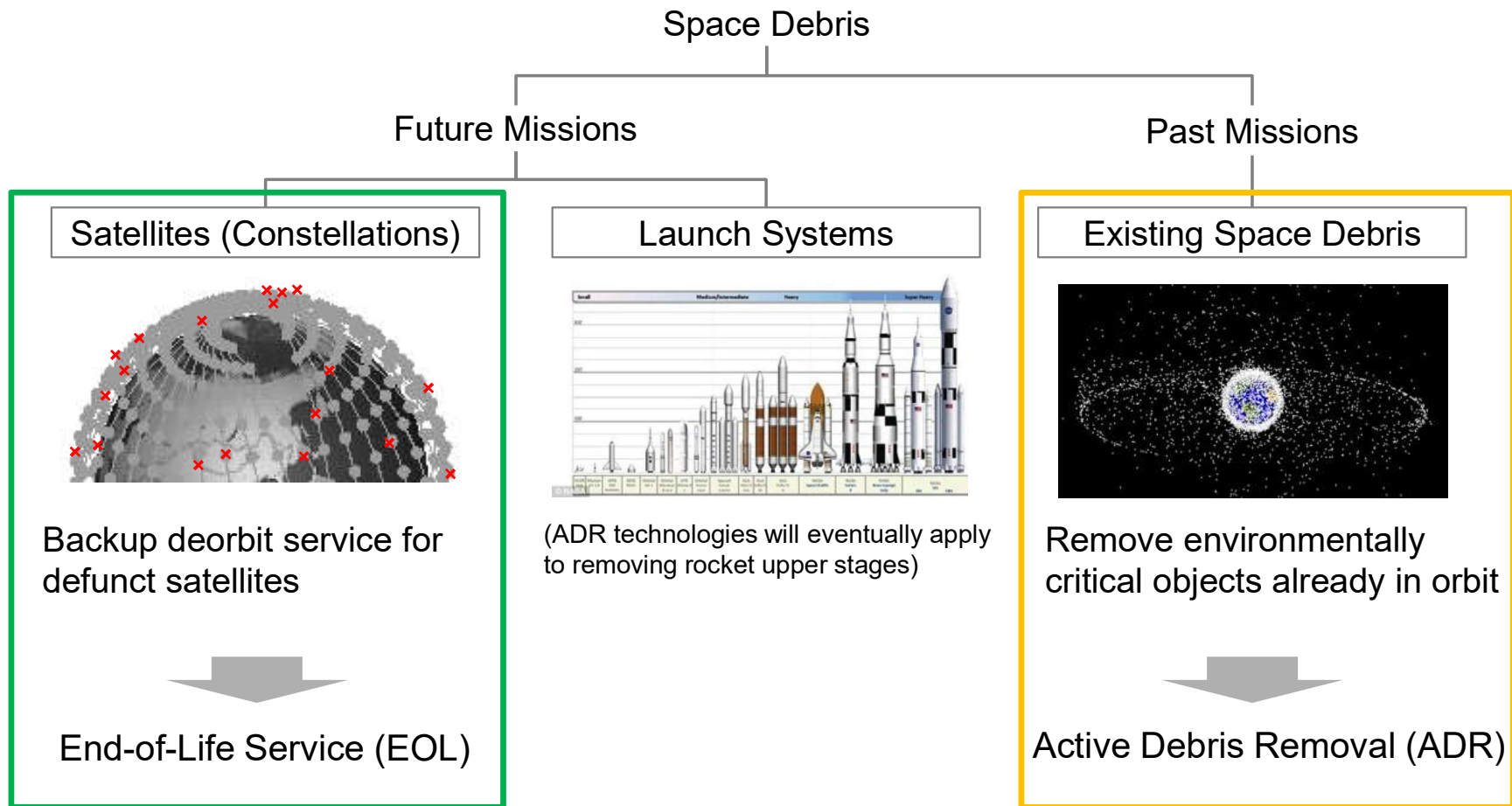
2. Mitigating the risk that comes from more debris brings societal and economic benefits.
 - Earth's orbit is a non-renewable natural resource that needs to be protected – for current benefits to society and for future generations.
 - Reducing the risk to a company or government satellite asset provides greater assurance for business continuity, leading to satisfied citizens and customers.

New Standards Should be Set



1. We strongly support SDM and LTS guidelines, which encourage operators to achieve the minimum in spaceflight safety, including adherence to the “25-year rule.”
2. To secure orbital sustainability, all operators should make plans to mitigate the debris problem at all stages - from launch to operations to end-of-life.
3. We urge regulatory organizations to set new standards and rules including:
 - Adhere to 25-year deorbit rule, with a future goal to lower to 5 years or less;
 - Have a PMD reliability of 99% for all constellations; and
 - Install an independent backup deorbit mechanism on all satellite buses.
4. 99% PMD reliability can be achievable by combining a reliable satellite design and a reliable backup PMD system.

Debris Removal Service Offering



EOL and ADR

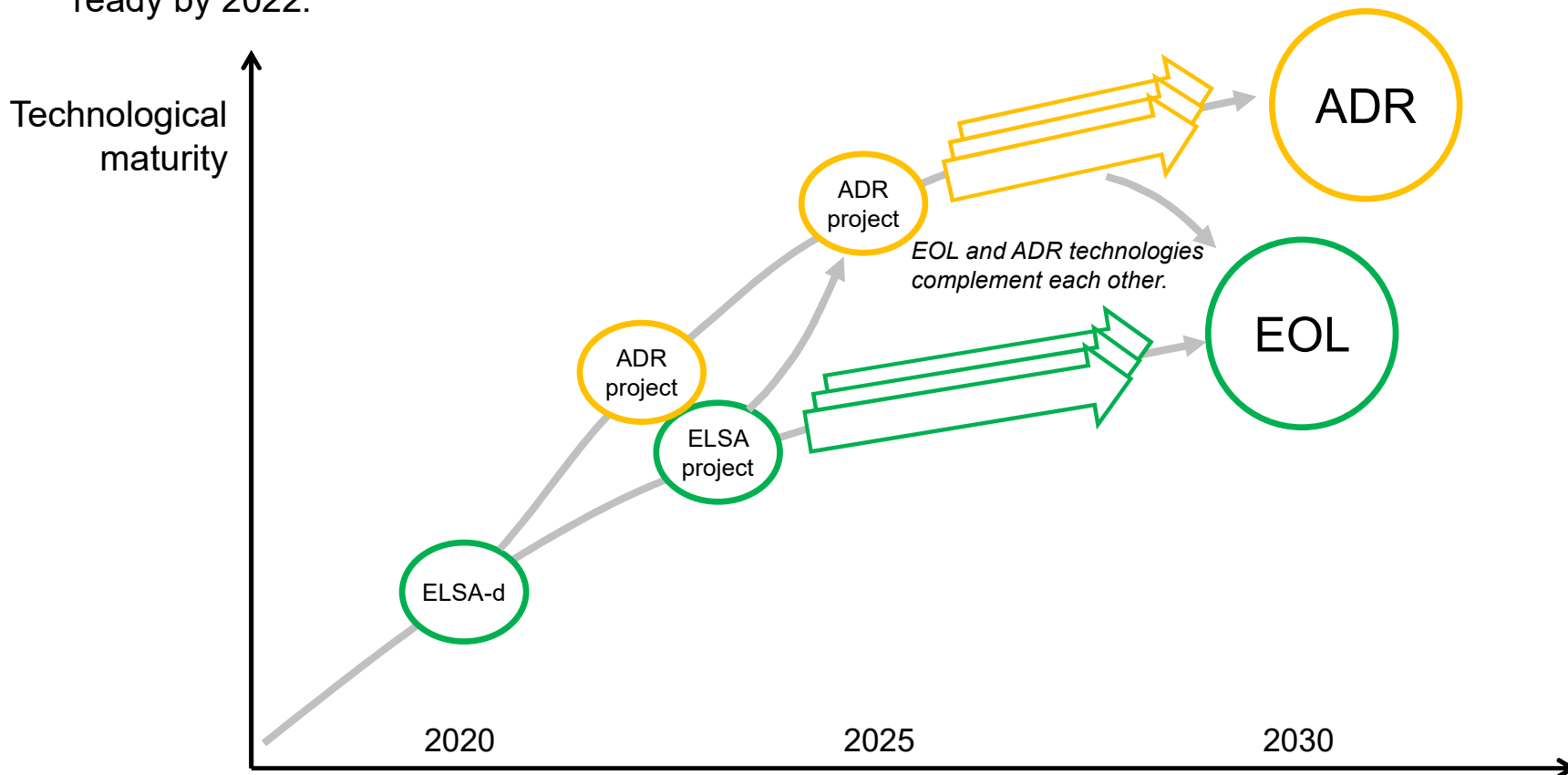


Services	End of Life (EOL) “Don’t add any more debris”	Active Debris Removal (ADR) “Remove debris that is already there”
Potential customers	Constellations, Private Satellite Operators	Governments, International framework
Client Objects	- Satellites that have failed in orbit or reached end of operational lifetime - 150~1,000kg	- Environmentally Critical Objects - Existing debris - 1,000kg~
Rationale	- Business continuity and maximize revenue - Adhere to best practices and public demands - Global responsibility	- Demonstrate commitment to orbital sustainability - Assure spaceflight safety for all operators - Global responsibility
Key Technologies	Semi-cooperative approach and capture	Non-cooperative approach and capture

Technological Roadmap



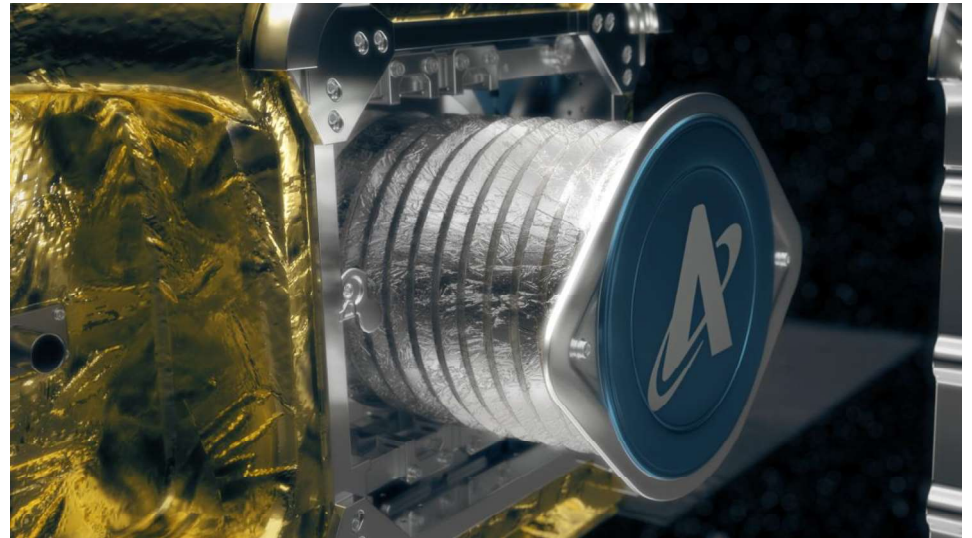
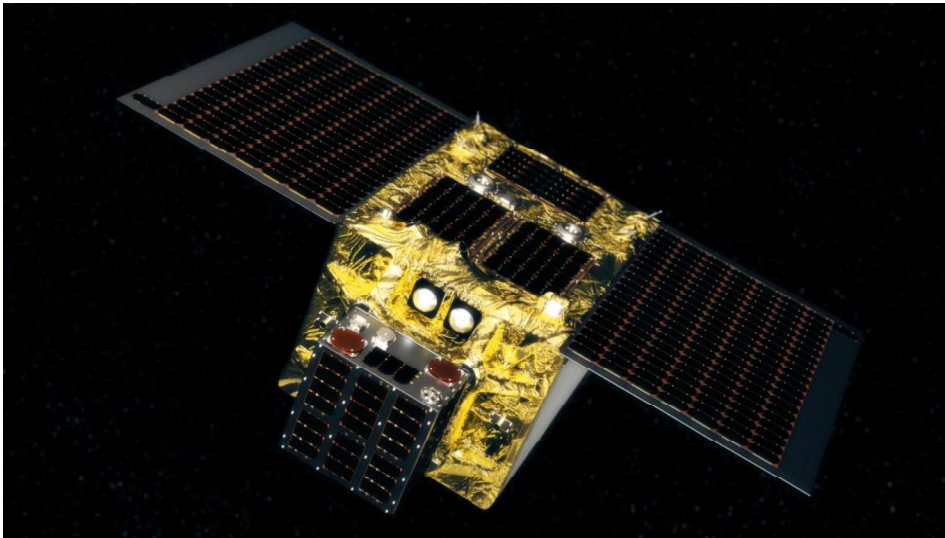
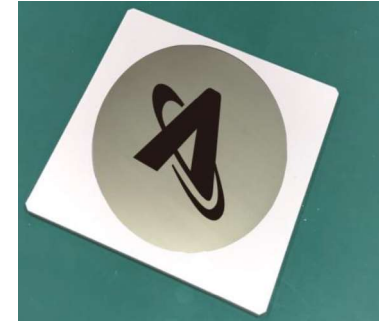
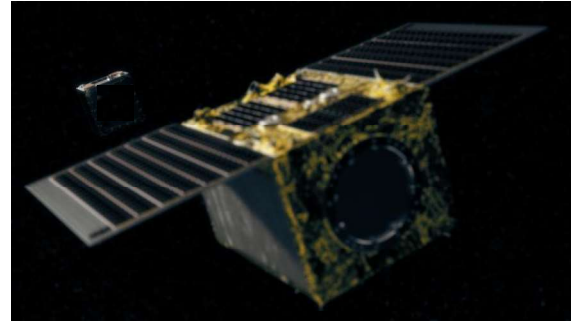
We plan to have multiple projects by 2025 to be ready for EOL and ADR. EOL service will be ready by 2022.



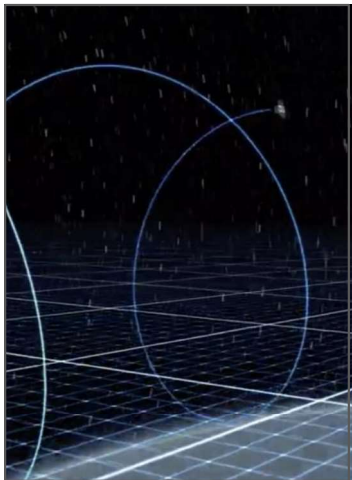
End of Life Services by Astroscale-Demonstration (ELSA-d)



- Scheduled launch: 2020
- World's first EOL demonstration proving end-to-end debris removal technologies.
- Servicer – optical sensing and capture mechanism
- Client– equipped with a rescue package
- Semi-co-operative magnetic capture



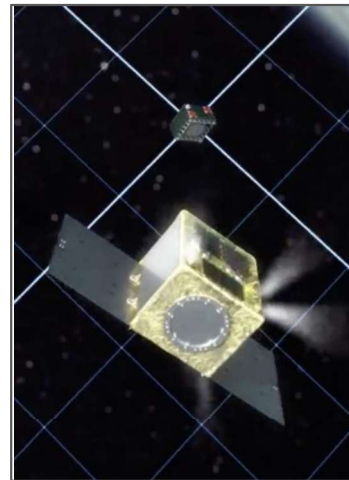
Technologies to be proven



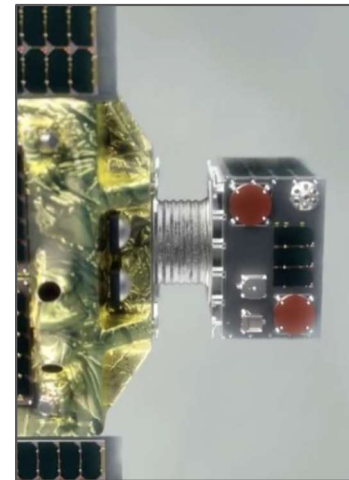
Approach



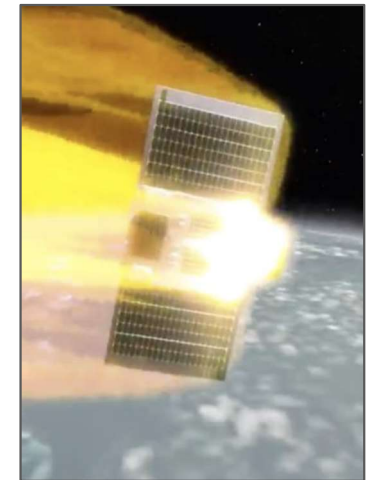
Fly around/
Diagnosis



Synchronize
tumbling/
Autonomous
operations

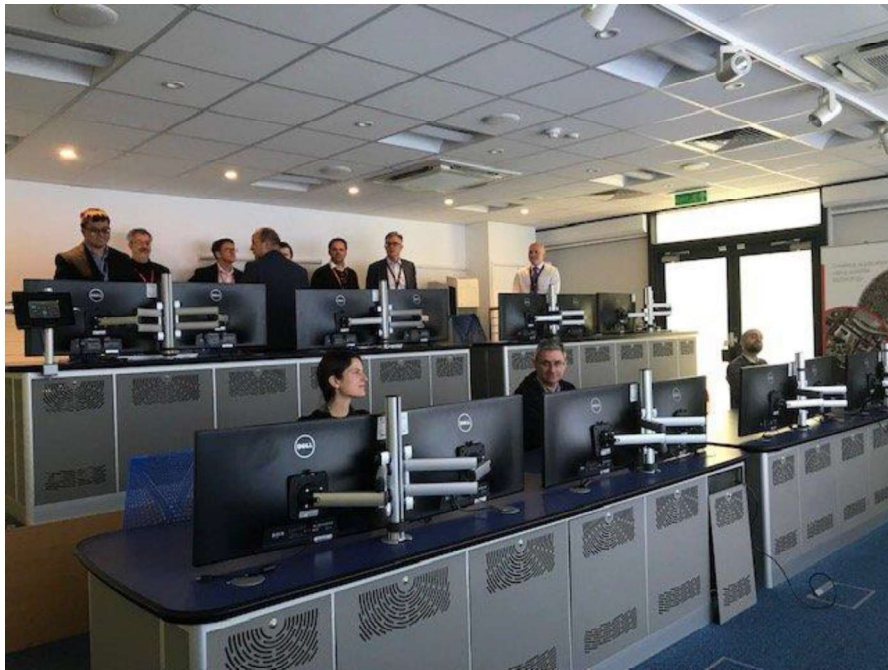


Capture/
Stabilize



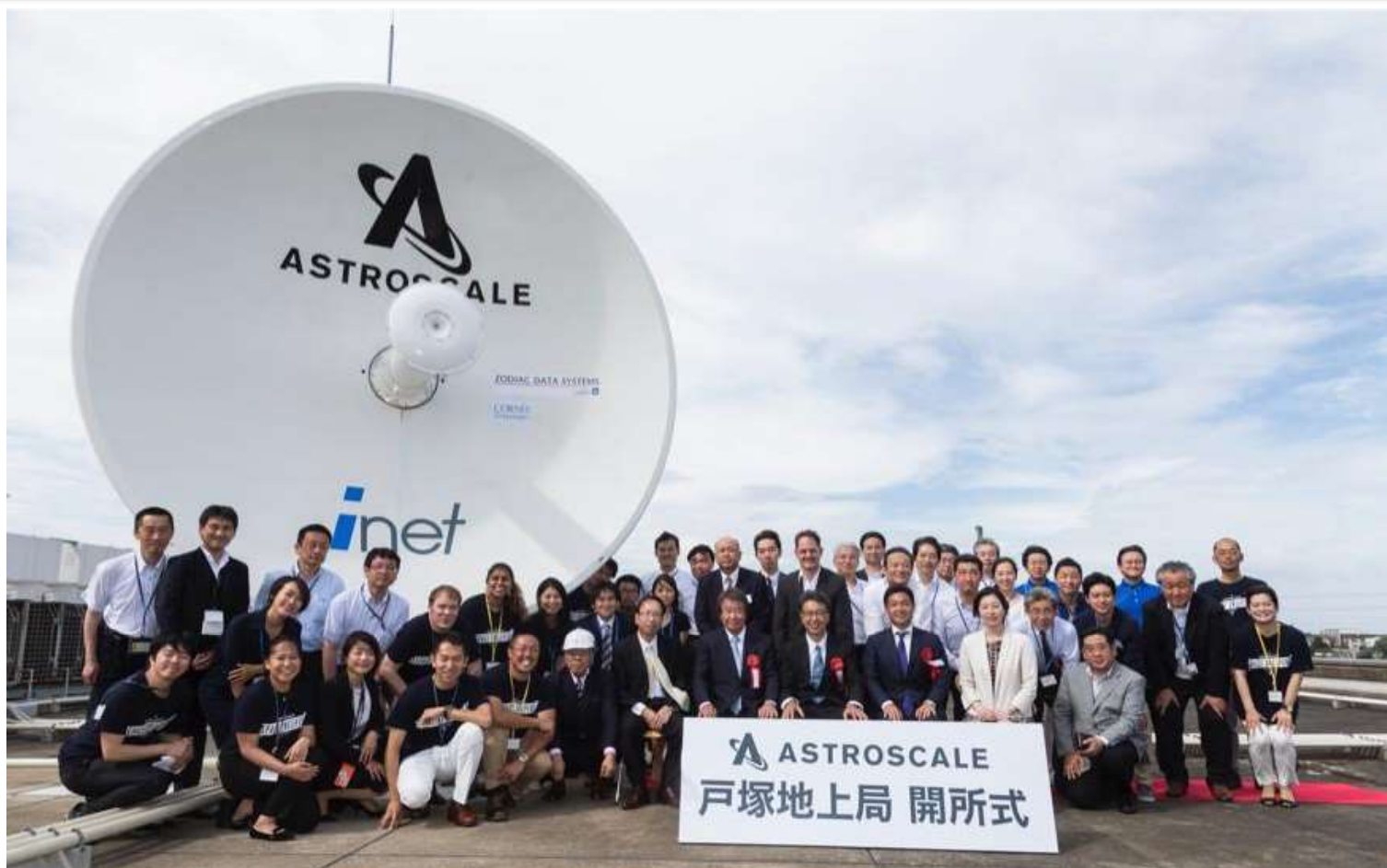
De-orbit

Mission Control Center in UK



National Facility – In-orbit Service Control Center in Harwell Campus

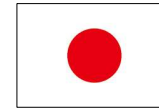
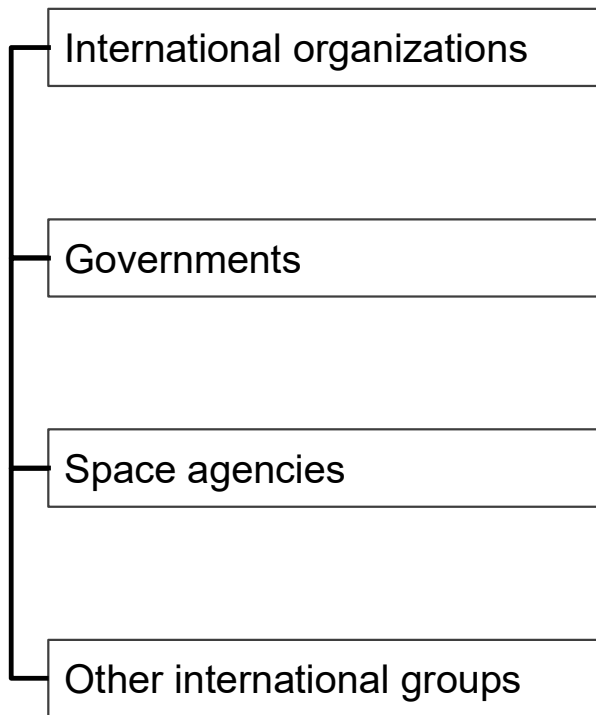
Ground Station in Japan





Regulatory Discussions

We see proliferations of efforts to develop industry best practices and rules. We actively participate almost all the discussions with aim to supporting implementation of enforceable regulations to secure space sustainability.





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For the Responsible Use of Space