Commercial Space Debris Removal Solutions

ASTROSCALE
Nobu Okada, Founder & CEO

UNISPACE+50 Space and Industry
June 18, 2018
Space Debris Threatens Space Sustainability
More Dependency on Space Technologies

Traffic Control

Weather

Broadcasting

Disaster management

Security

Earth observation

Navigation

Time Stamp

Communication

Big data
Challenges for Space Debris Issues

Technologies

Business Model

Regulations

Team

Fund

Global Strategy
Astroscale: An International Company Solving a Global Problem

Founded: May 4, 2013
Team: 46
Capital: $53M
Mission: Secure long term spaceflight safety for future generations

Astroscale US (2018)
Astroscale UK (2017)
Astroscale Japan (2015)
Astroscale Singapore (2013)
Management Team

Nobu Okada  
Founder & CEO

Chris Blackerby  
Group COO

John Auburn  
Director, ASUK and Global Business Management

Ai Makino  
Director, Finance and Administration

Akira Okamoto  
Director, Technology and Mission Management

Miki Ito  
President, ASJP and Director, Mission Support
Technological Approaches

Monitor

1mm
Sub-millimeter sized debris monitoring satellite IDEA OSG 1 (Launched on Nov 28, 2017)

1cm

10cm

Remove

1m
Debris removal demonstration satellite ELSA-d (2019)

10m
ADR solution for 500+kg objects

EOL solution for 50-500kg objects
Business Opportunities in Debris Removal

Space Debris

Future Missions

Satellites (Constellations)

Large constellations need to retrieve their defunct satellites and replenish with new satellites.

Launch Systems

(ADR technologies will eventually apply to removing rocket upper stages in future)

Past Missions

Existing Space Debris

The trend is moving toward governments taking responsibility for removing environmentally critical debris from space.

End-of-Life Service (EOL)

Active Debris Removal (ADR)
# EOL and ADR

<table>
<thead>
<tr>
<th>Services</th>
<th>End of Life (EOL)</th>
<th>Active Debris Removal (ADR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Don’t add any more debris”</td>
<td>“Remove debris that is already there”</td>
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<tr>
<td>Potential customers</td>
<td>Constellations, Private Satellite Operators</td>
<td>Governments, International framework</td>
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</tbody>
</table>
| Target Objects    | - Satellites that have failed in orbit or reached end of operational lifetime  
|                   | - 50~500kg               | - Environment Critical Objects  
|                   |                       | - 500kg+  
|                   |                       | - Existing debris |
| Rationale         | - Business continuity and maximize revenue  
|                   | - Adhere to best practices and public demands | - Demonstrate commitment to orbital sustainability |
|                   |                       | - Assure spaceflight safety for all operators |
| Technical concept | Semi-cooperative approach and capture | Non-cooperative approach and capture |

**Global Responsibility**
Awards (2017~2018)

- Technology Pioneers
  - World Economic Forum

- Top 10 Most Innovative Companies in the World
  - Fast Company

- Soapbox Presentation Award
  - UK Space Conference

- Japan-US Innovation Award
  - Stanford University

- Start up of the Year 2018
  - Forbes Japan

- Nikkei Woman of the Year
  - Nikkei