OXFORD SPACE SYSTEMS

Innovative materials for EO missions & beyond

CEOI Emerging Technologies Challenge Workshop

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Oxford Space Systems | UK Space Cluster | Harwell OX11 0QR | United Kingdom

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OXFORD SPACE SYSTEMS

Who we are

- Founded in 2013
- An award-winning VC-backed space technology business pioneering the development of a new generation of deployable space structures
- Using origami & proprietary materials, we design and manufacture deployable structures are lighter, less complex, and lower cost than those in current commercial demand.

beea 2015 WINNER
british engineering excellence awards

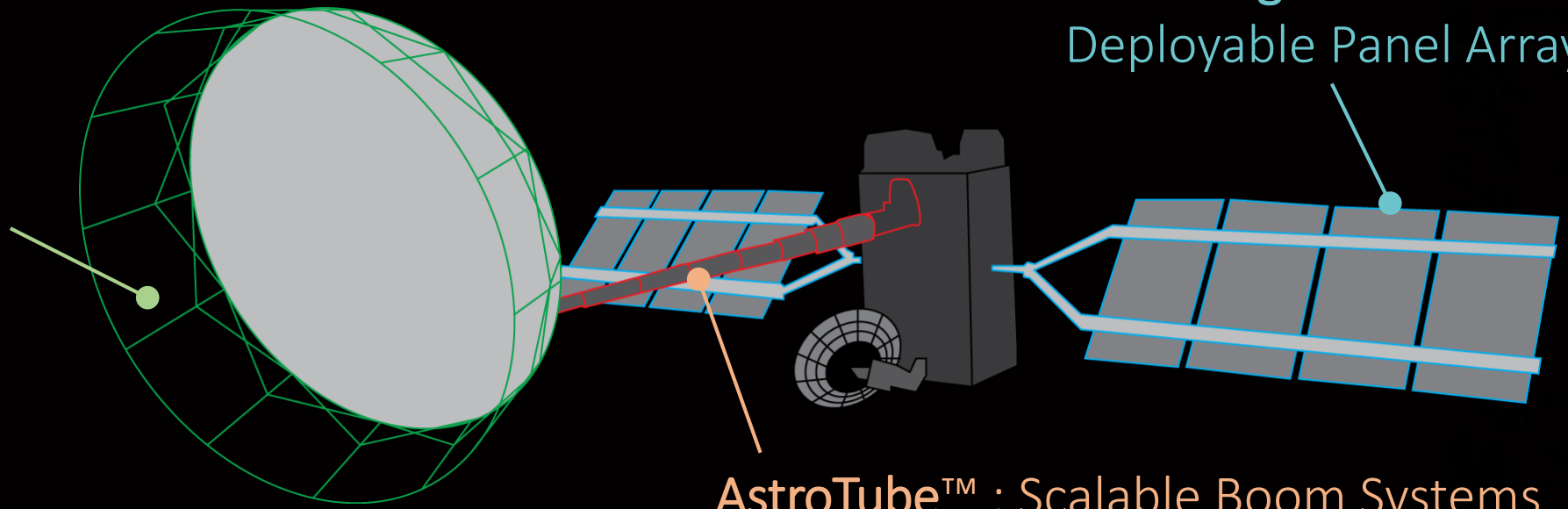
Best UK Start Up 2015

Grand Prix Winner 2015

UK Business Angels Association

Best Investment In A High Growth Manufacturing Business 2015

Products overview



By using flight-qualified proprietary materials OSS products are:

- ✓ **Lighter**
- ✓ **Less complex**
- ✓ **Lower cost**
- ✓ **More stowage efficient**

…than those in current commercial demand.

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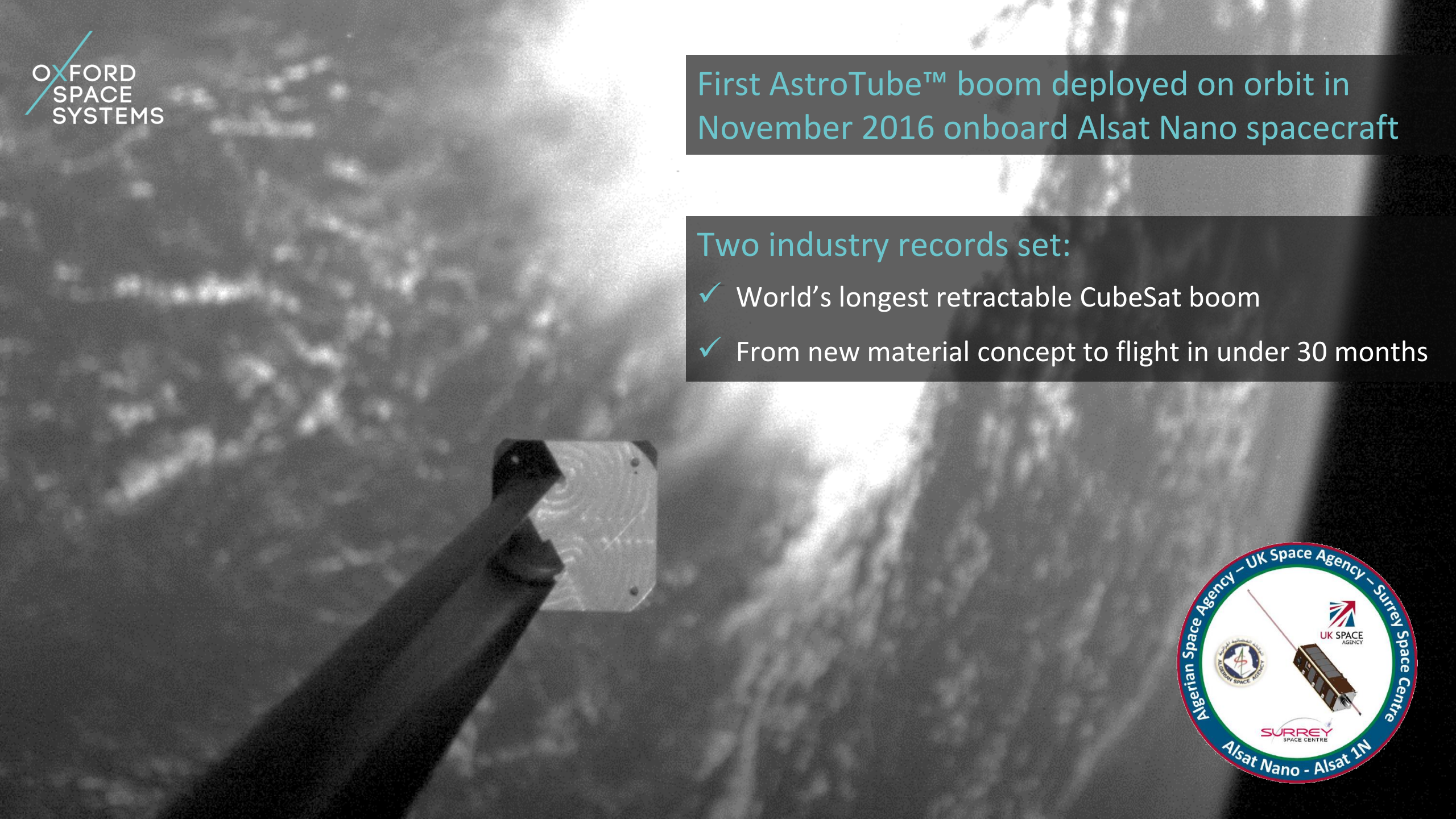
First AstroTube™ boom deployed on orbit in November 2016 onboard Alsat Nano spacecraft

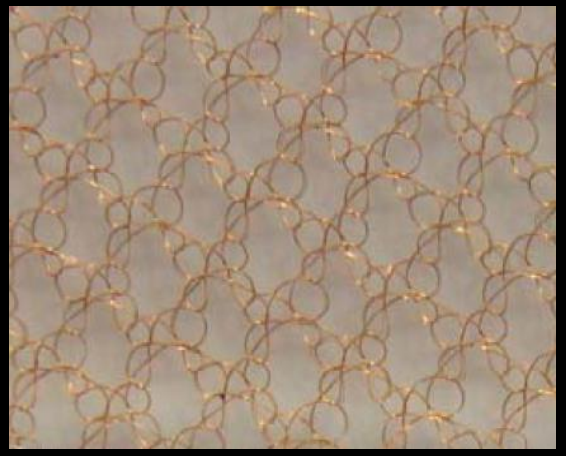
Two industry records set:

- ✓ World's longest retractable CubeSat boom
- ✓ From new material concept to flight in under 30 months

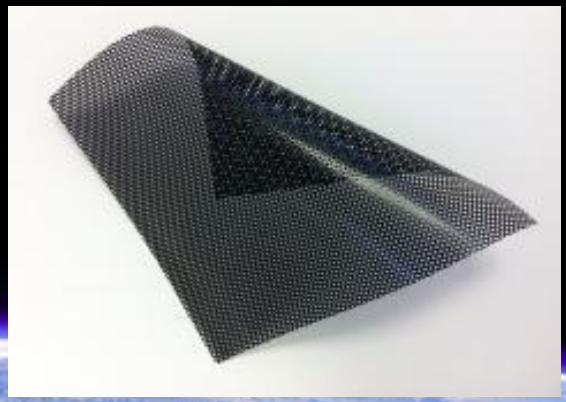


Large Deployable Reflector Parabolic Antennas (LDA)

- ESA identified strategic requirement for LDAs for data communications & earth observation
- Antenna market largely dominated by US providers
- “Europe is critically dependent upon US for LDAs” (ESA)
- Traditionally LDAs have metal mesh reflectors with complicated support structure and bracing
- Use of novel preformed fibre-based flexible surface would allow for significant reduction in complexity and cost



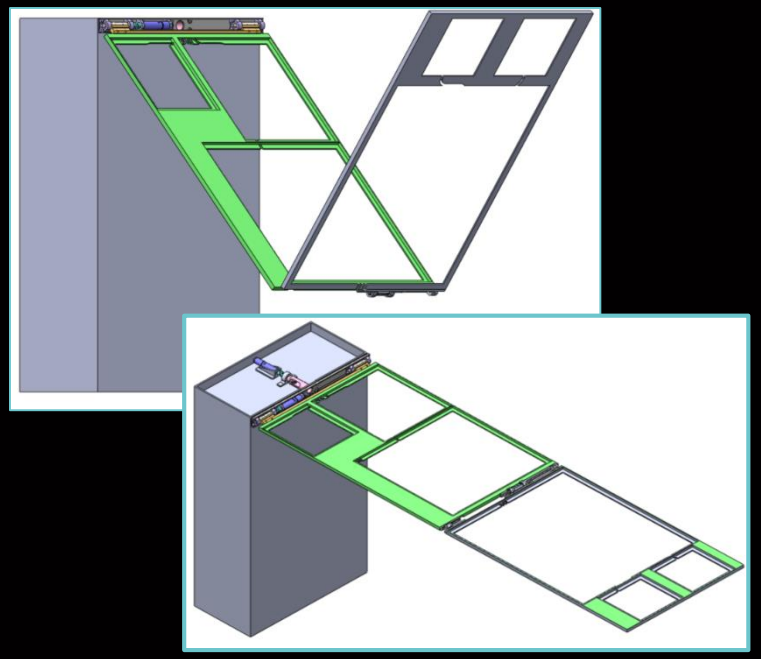
Conventional reflector surface material (metal mesh)



Novel fibre-based flexible surface

Antenna products under development

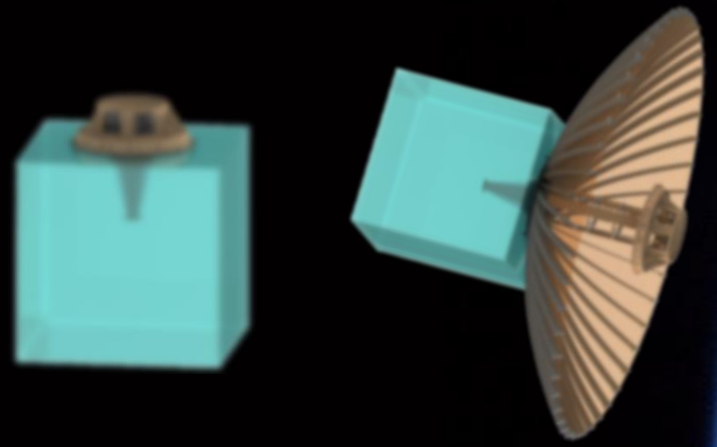
Microsat RF Patch Arrays

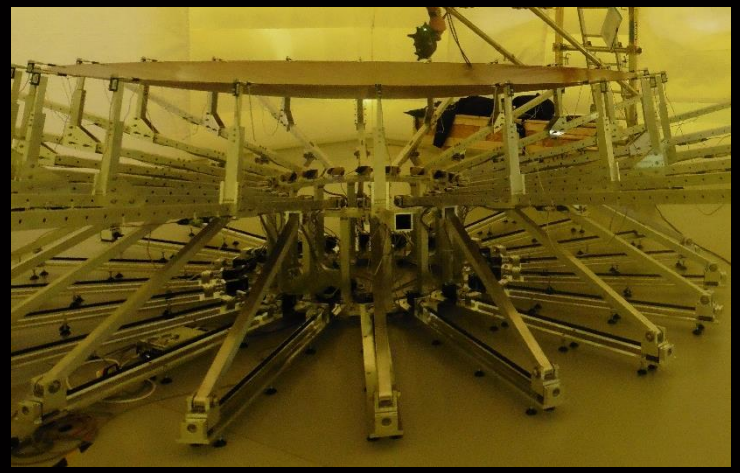


- Steerable (2 DOF)
- Scalable & modular
- 6U and up
- S, Ka and Ku patches

Wrapped-rib Antennas

- Scalable
- 6U and up
- Up to Ka-band
- Cassegrain option





Large Unfurlable Antennas (TRL3)

- Scalable 4m – 12m
- Up to Ka-band
- Novel low complexity outer ring
- Unique membrane surface

Antennas under development

Log periodic antenna

- Backbone structure manufactured using 4 deployable tape springs
- 6 m total length breadboard to correlate mechanical performance
- 6 m kinematic evaluation breadboard completed under contract for Asian customer

CEOI funding

- OSS has secured a CEOI grant to develop a large flexible carbon fibre-based Cassegrain deployable antenna
- CEOI funding enabled a quicker pace of execution than ESA funding streams
- This development directly addresses the global need for highly cost-competitive antennas for microsat constellation opportunities
- Project aims to develop a TRL3 demonstrator and to validate materials, coatings & surface treatments to endure the LEO space environment

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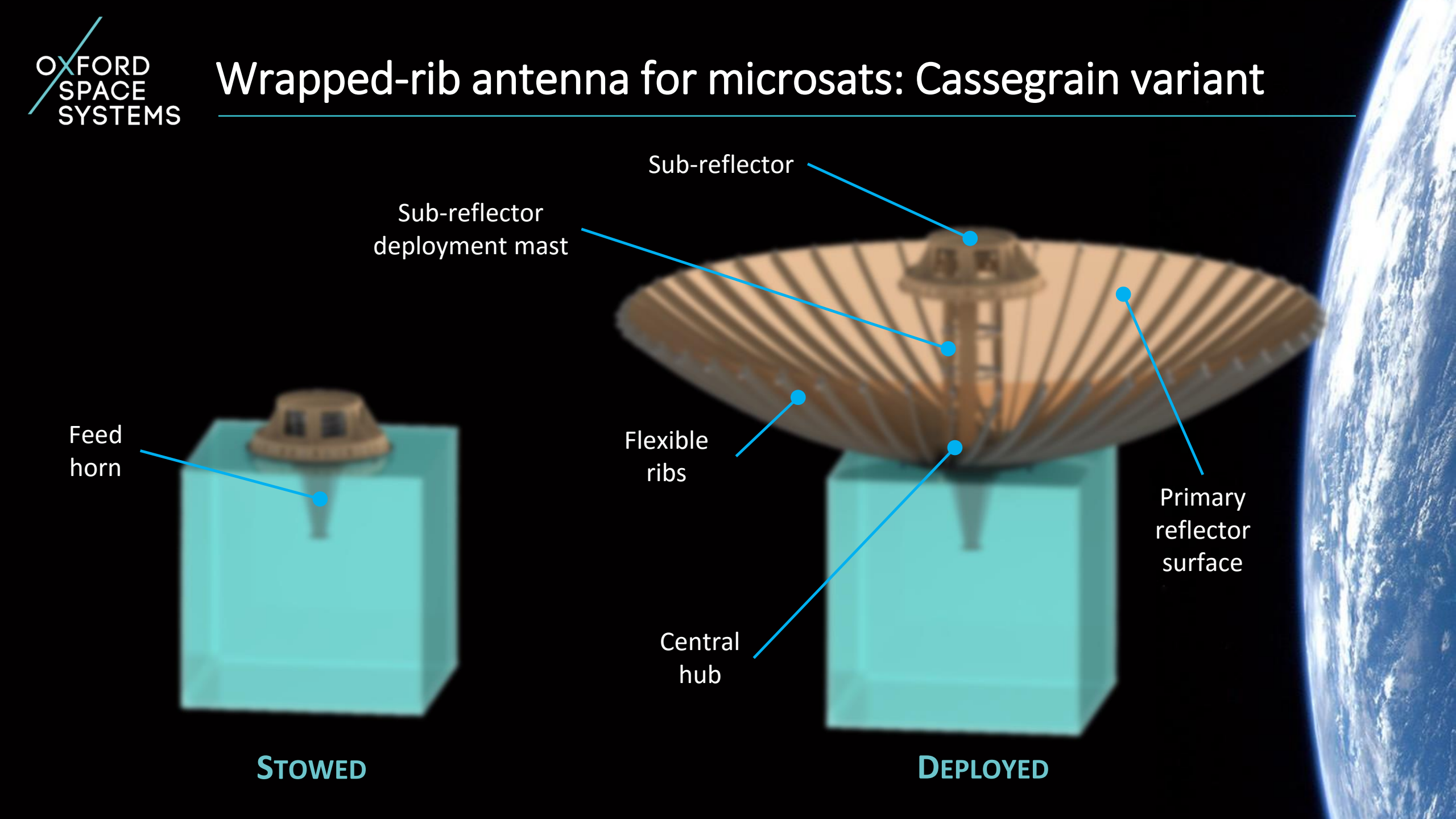
Wrapped-rib antenna for microsats: Cassegrain variant



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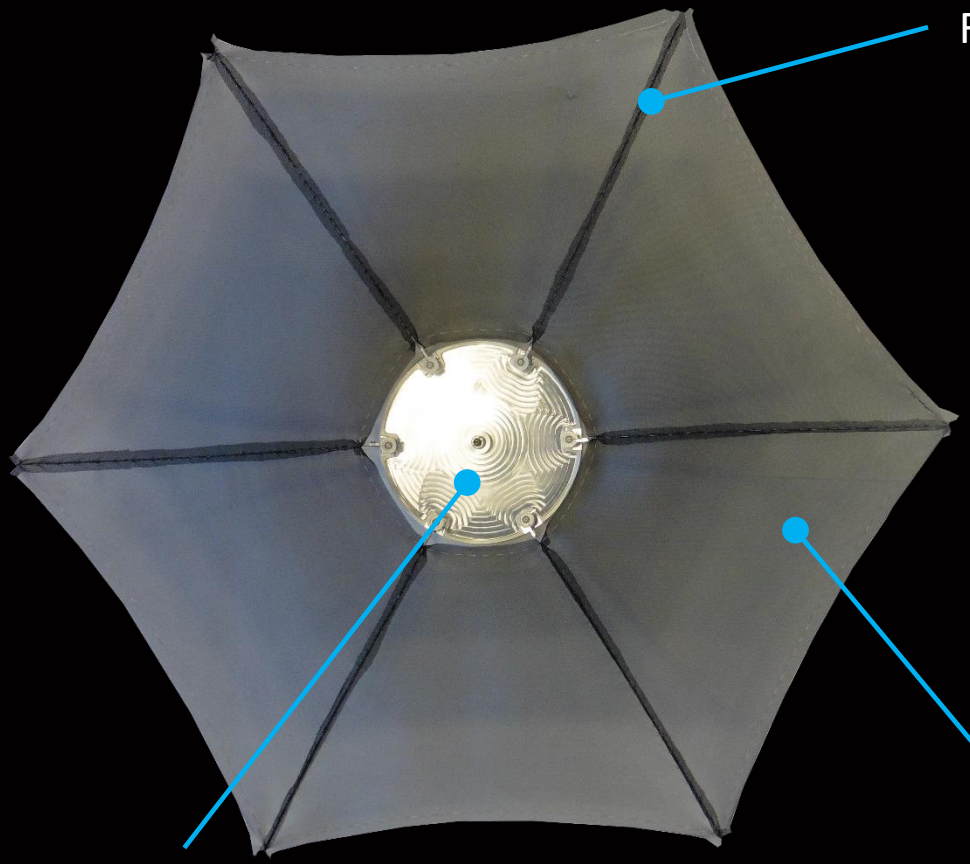
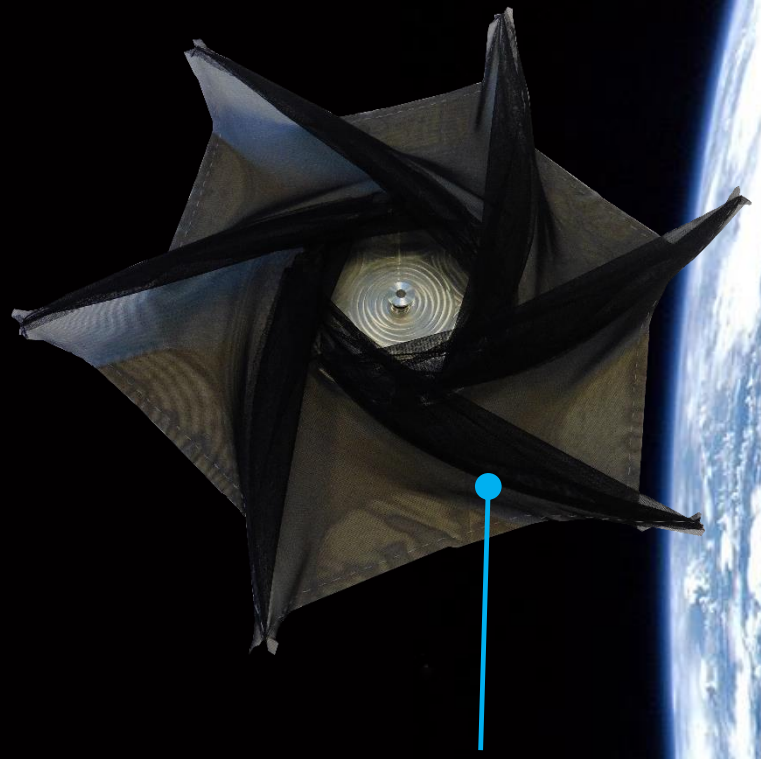
1 m diameter Cassegrain breadboard



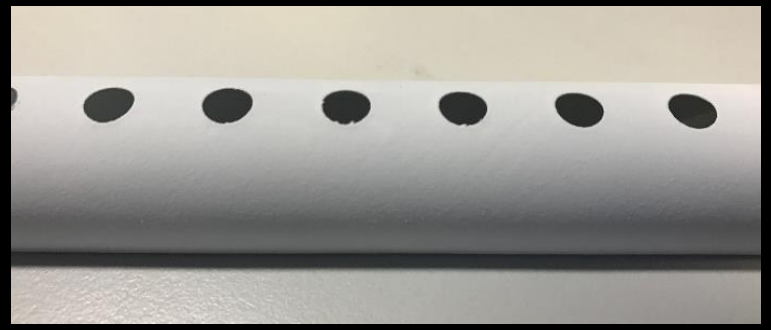


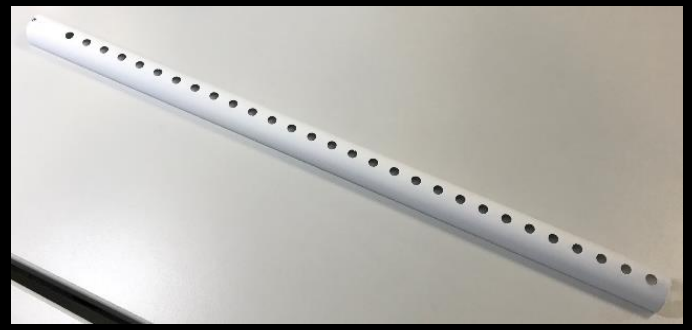
Materials and coatings investigation

- Characterisation of several material candidates
- Exploration of surface treatments and coatings to improve resistance to space environment
- Space environment aspects considered:
  - › High energy particle (proton and electron) radiation (most significant in GEO applications)
  - › Vacuum ultra-violet (VUV) radiation (significant for LEO applications)
  - › Atomic oxygen (ATOX) erosion (significant for LEO applications)
  - › Temperature extremes

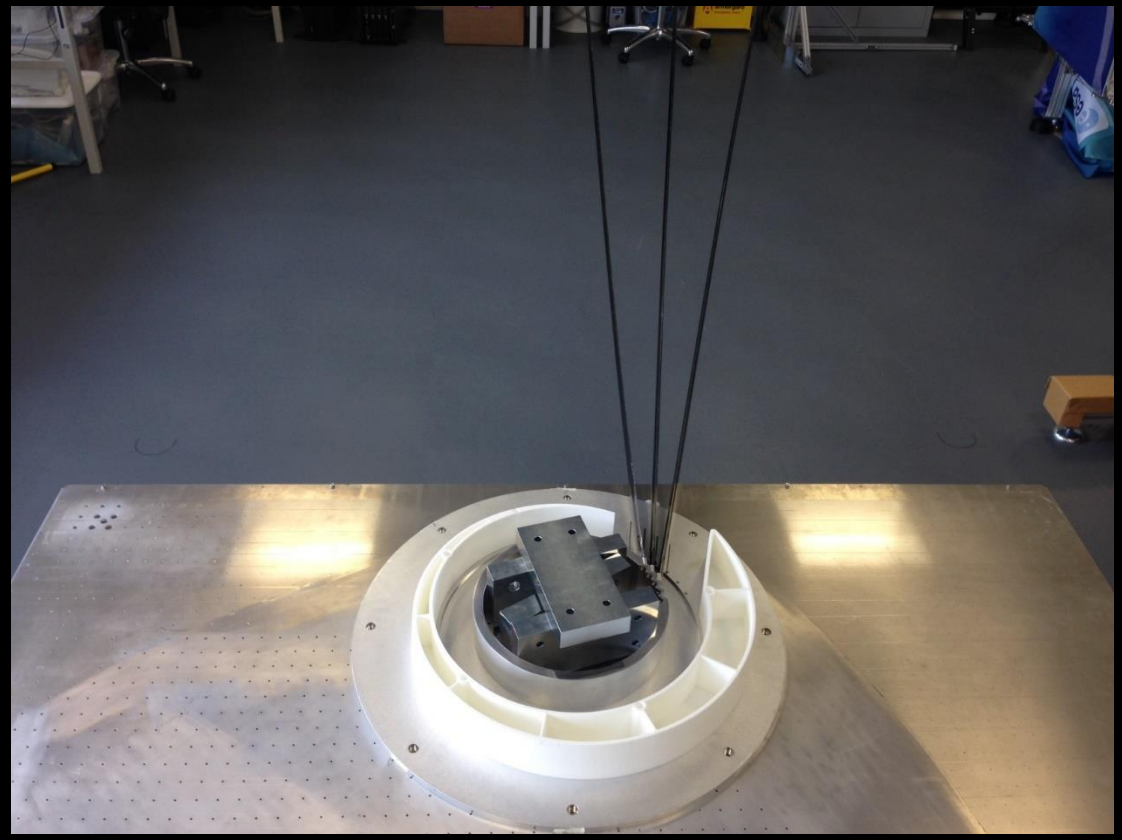
Materials and coatings investigation

- Under CEOI project OSS is investigating new coatings able to improve
  - Thermal protection
  - High thermo-optical properties
  - Is able to sustain large deformations





Reduced CEOI breadboard assembly



Conclusions

- CEOI grant crucial to OSS strategic technology development of deployable antenna technology
- Project aims to build a novel Cassegrain deployable antenna, to address global market need for higher frequency (up to Ka-band) antennas for microsat constellation opportunities
- OSS sees deployable structures as an enabler of EO technology with the aim to drive down cost and increase accessibility to space

Come and find us!

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