



PANEL DISCUSSION: Emerging Technologies to Meet the Ambition of Future Defence Space Capability

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OXFORD SPACE SYSTEMS

OVERVIEW

DSEI 2019

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THE STORY SO FAR.....

- Founded in Sept 2013 - seed funding secured Jan 2014
- Developing a new generation of novel deployable space **antennas, booms** and **panel arrays**
- Origami & proprietary materials combined to produce products are **lighter, less complex & more stowage efficient**
- **Significant IP** developed: 8 patents applied for together with significant materials science IP
- A **growing & diverse team** of experienced industry experts & highly talented graduates (**FTs: 49** - currently recruiting)
- Commercial traction: contracts with MoD (DSTL + DASA), SSTL, Airbus Defence & Space, Thales Alenia Space, LuxSpace, DSO Labs (Singapore) + US
- **Showcase New Space company** for the UK



SELECTED HIGHLIGHTS

- Private Equity Investment: \$16m (USD)
- UK Government & ESA: \$10m (USD)

Dec 2018: Top 100 Fastest Growing UK Company (ranking: #52)



June 2018: Excellence in Innovation Award



Dec 2017: Start-Up Entrepreneur of the Year 2017 (Mike Lawton)



Nov 2017: Top 5 Global Start-up to Watch
Institute of Physics : Business Innovation (AlSat Mission)



Sept 2018: \$8.1m Round 4

Nov 2016: AstroTube™ boom successfully deployed

Dec 2015: Best Investment in Disruptive Technology 2015



Jun 2017: \$1.5m (USD) Round 3 ("Interim Round" including Space Angels USA)



Sept 2015: Best UK Tech Start-Up 2015
Grand Prix 'Winner of Winners' Award 2015



Feb 2015: AstroTube™ boom selected for UKSA AlSat Mission

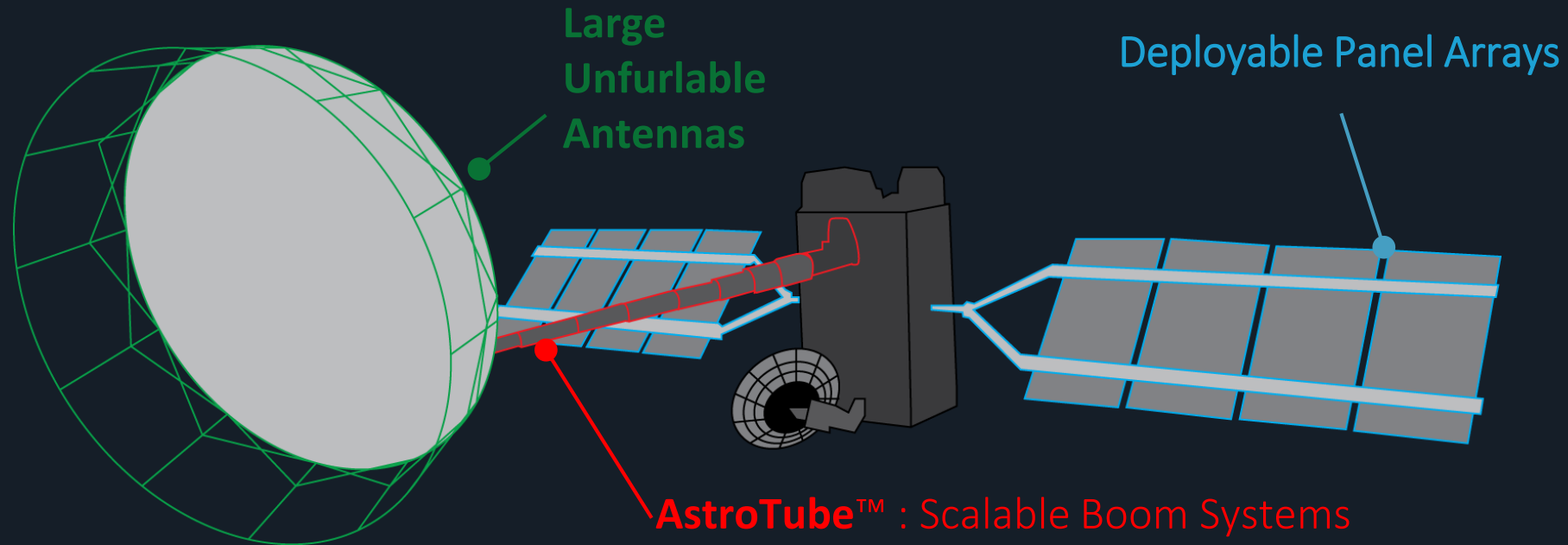
July 2015: \$1.7m (USD) Round 2

Jan 2014: \$670k (USD) seed investment from Longwall Ventures

Sept 2013: \$135k (USD) Innovate UK 'Pre-Start-Up' Harwell Launchpad Grant

April 2019: NASA iTech Ignite the Night: Colorado Springs Winner

THREE KEY PRODUCT AREAS.....



By using flight qualified proprietary materials OSS products are:

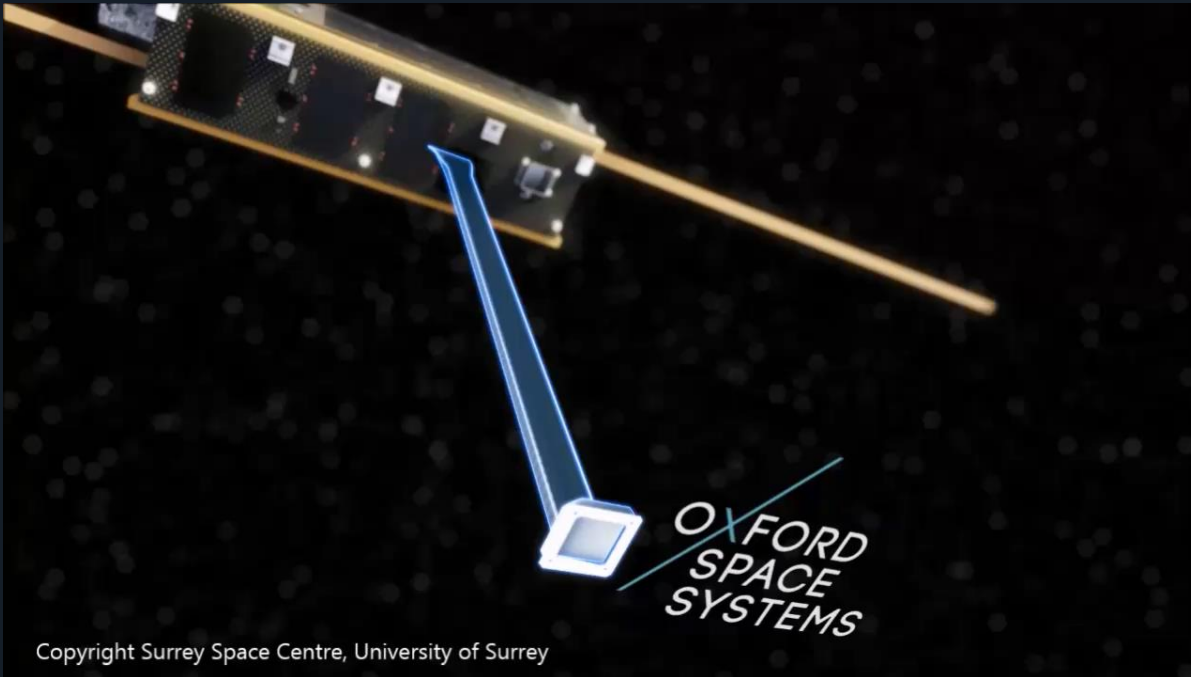
- ✓ Lighter
- ✓ Lower cost
- ✓ Less complex
- ✓ More stowage efficient

...than those in current commercial demand

DEPLOYABLE BOOM TECHNOLOGY

TWO WORLD RECORDS SET.....

- World's **longest** retractable nanosat boom system
- **Fastest** time from concept to orbit for a new material



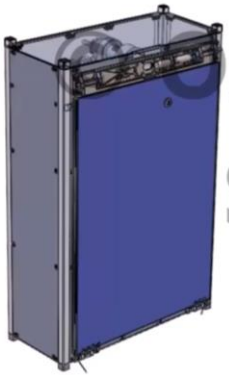
SHOOTING SPACE JUNK...!

- *RemoveDEBRIS* satellite launched April 2018
- Satellite released from the International Space Station **21 June 2018**
- AstroTube Boom **successfully** deployed after 9 months on orbit storage on 13 February 2019
- Harpoon experiment seen as a **“complete success”** by Airbus Defence & Space



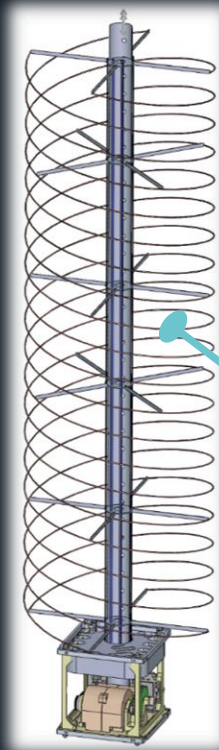
ANTENNA PRODUCTS UNDER DEVELOPMENT

Microsat Patch Panel Arrays



Oxford Space
Systems

- Steerable (2 DOF)
- Scalable & modular
- 6U and over
- S, Ka and Ku patches + solar array options



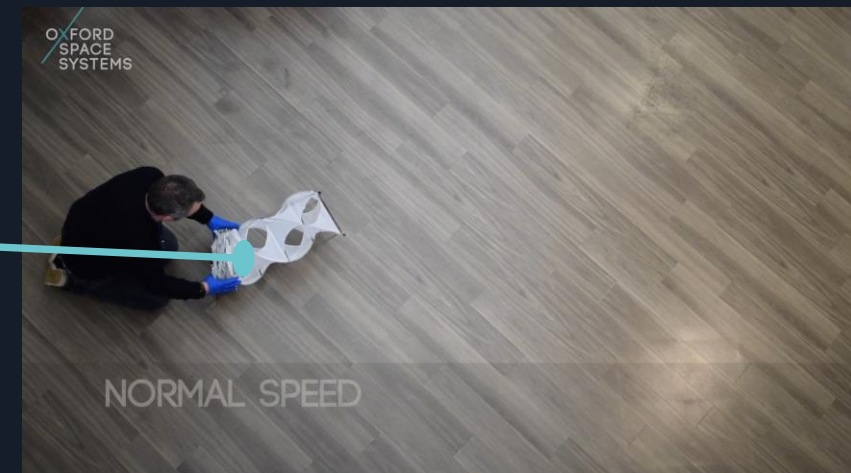
Tri-Filar Cubesat
Antennas for IoT

Helical deployed
diameter greater
than stowed
diameter possible

- Up to 10m in length
- Low complexity
- Cost optimised



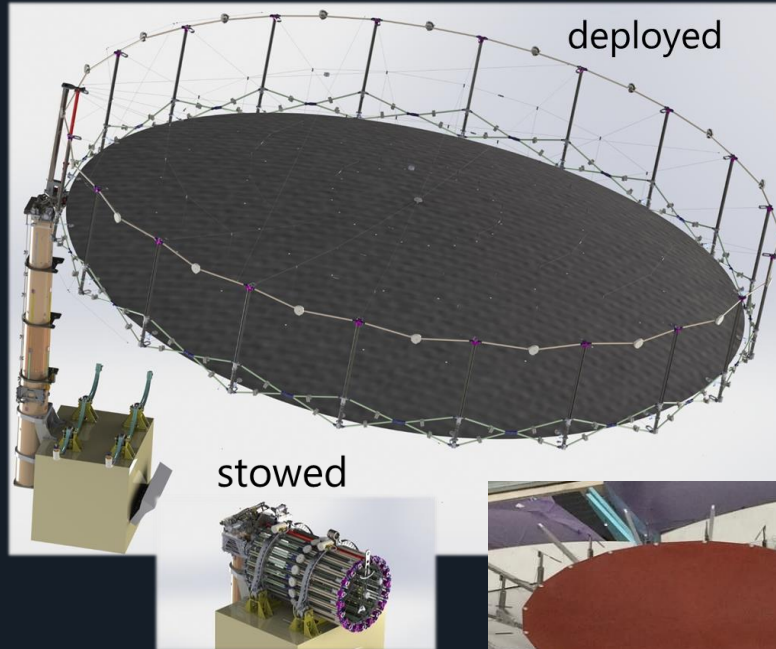
Deployable Helical Antennas



ANTENNA PRODUCTS UNDER DEVELOPMENT

Large Unfurlable Antennas

- Scalable 4m – 12m
- Up to Ka-band
- Patented design
- Unique pre-shaped membrane surface



Microsat Rib Antennas

- Scalable
- 6U and up
- Up to Ka-band
- Both membrane and proprietary metal mesh reflector



(above left dish image: surface on test rig – **not** actual antenna!)

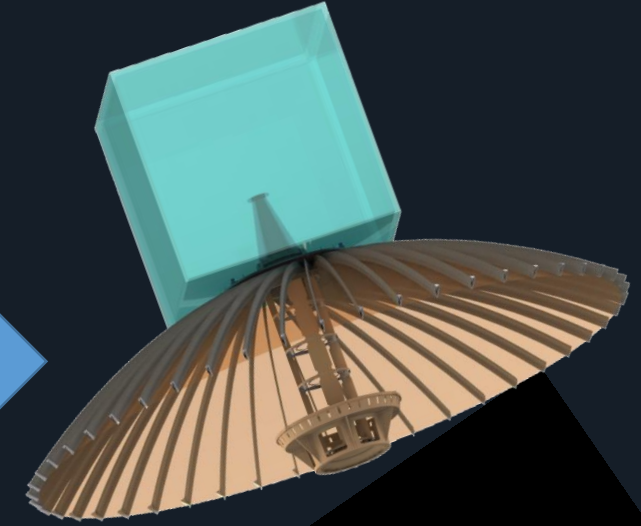


COMMERCIAL REMOTE SENSING AND COMMUNICATIONS CLUSTERS IN LEO – ENABLED BY MINIATURISATION



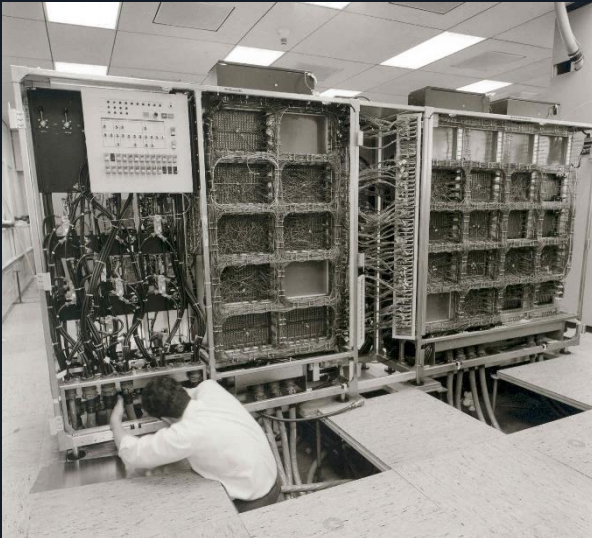
Microsats are increasingly able to replicate the performance of much larger satellites.

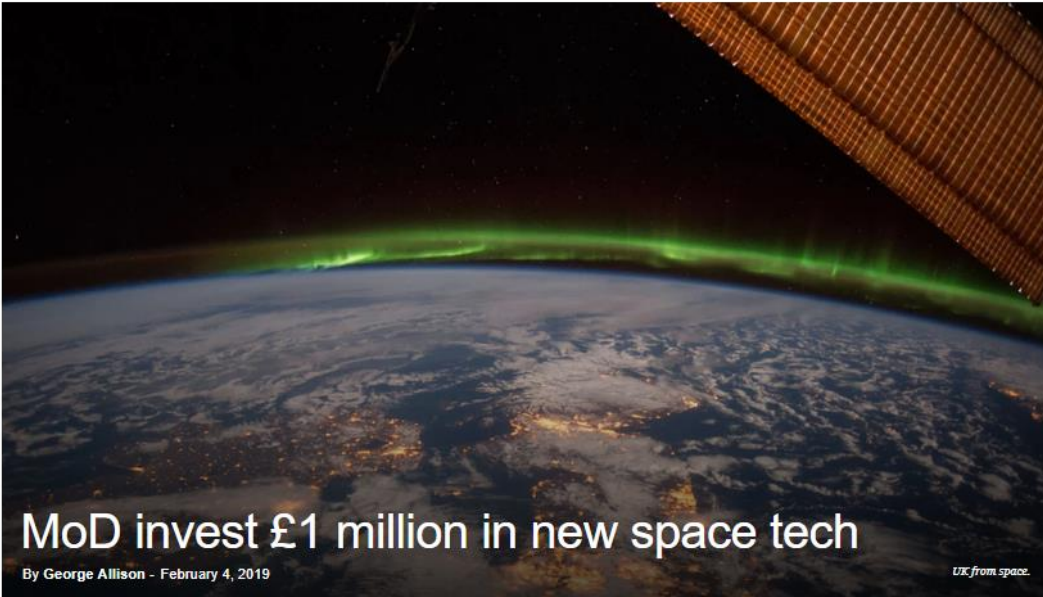
In the same way most mainframe computers can now be replaced with high-end desktops, so the trend is to smaller spacecraft



BUT....the laws of physics prevail:

- Sensitivity required to maintain link budget – better with large antenna
- Smaller low cost satellites need to accommodate large antennas
- Solution – Deployable antennas:
 - stowage efficient
 - lighter and lower in cost
 - maintaining good performance





MoD invest £1 million in new space tech

By George Allison - February 4, 2019

UK from space.



The development of a new generation of pioneering British deployable satellite antennas has been boosted following a £1m MoD investment, according to the department.

According to a news release, the 'wrapped rib' antenna is lighter, less complex and more cost-competitive than those currently available commercially.

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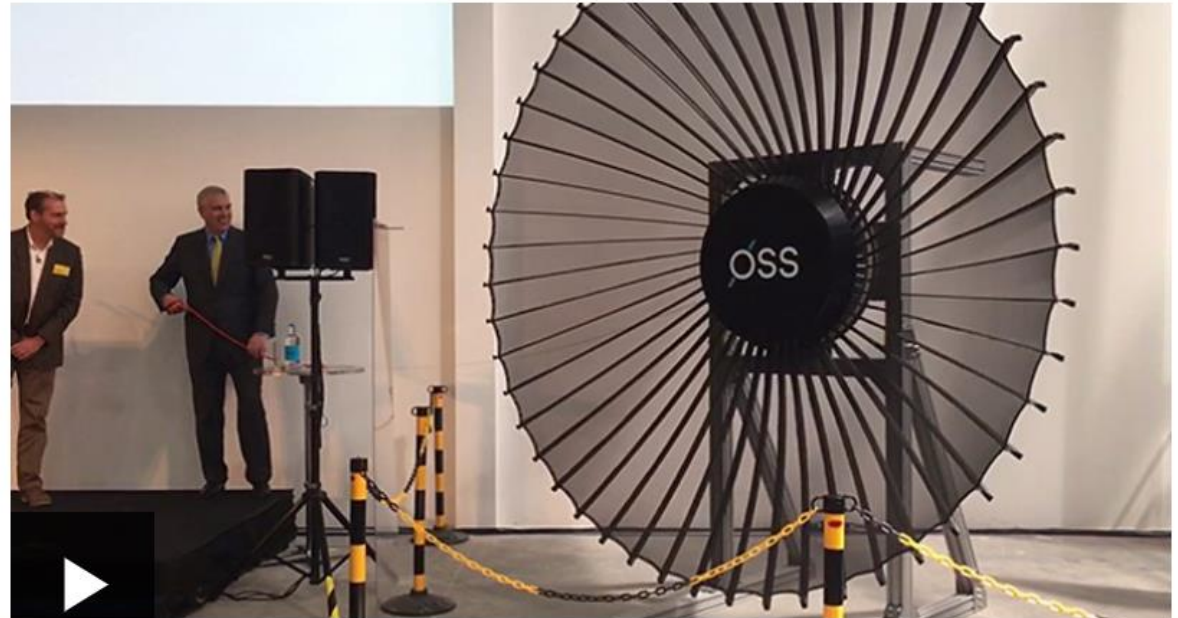
MoD backs satellite 'origami radar antennas'

By Jonathan Amos
BBC Science Correspondent

28 January 2019



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OSS MICROSAT WRAPPED-RIB

- Scalable: 0.5m to 5m
- Up to Ka-Band operation
- Provides high gain lightweight antenna capability in small storage area
- Proprietary metal mesh surface
- Microsat compatible



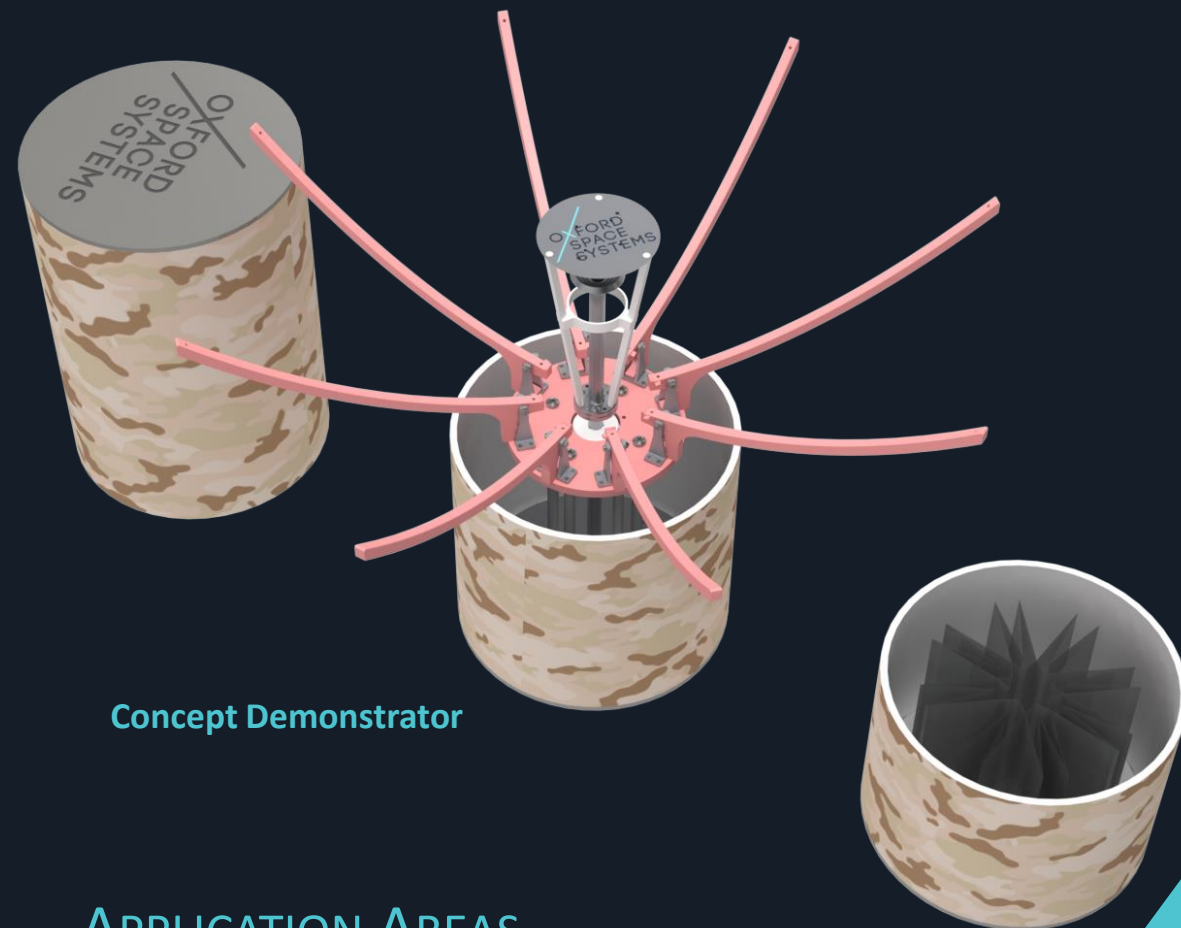
Currently at TRL3 (prototype demonstrated in lab environment)



FROM SPACE TO GROUND – DEPLOYABLE PARABOLIC ANTENNA

KEY FEATURES

- › Compact & Lightweight
- › Simple Deployment
- › ITAR Free
- › Cost competitive
- › Proprietary reflector surface
- › Class leading RF performance, 20GHz and above



Concept Demonstrator

APPLICATION AREAS

Man Portable Antennas,
FOB Comms etc.

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