



SFN Investors' Briefing

3 July 2015



Bird & Bird

UKSPACE
THE SPACE TRADE ASSOCIATION

BARCLAYS

AIRBUS
DEFENCE & SPACE

CATAPULT
Satellite Applications

inmarsat
The mobile satellite company™

UK SPACE
AGENCY

SFN
Satellite Finance Network

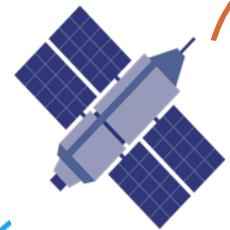


Introduction:

Richard Peckham

Business Development Director

Airbus



Bird & Bird

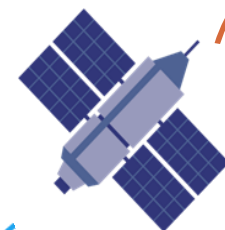


Welcome:

Stuart Martin

CEO

Satellite Applications Catapult



Bird & Bird



Introduction to the UK Space Industry and Opportunities

Antonia Jenkinson

CFO and COO

Satellite Applications Catapult



Bird & Bird



Satellites: Eight Great Technologies and UKEF

Sophie Boldon

Innovation Gateway, UKTI

and


Peter Maplestone

Senior Underwriter

UK Export Finance



Bird & Bird

A satellite in space with large solar panels and a view of Earth's blue and white atmosphere.

INNOVATION IS

GREAT

BRITAIN

Space in the UK,

The commercial benefits of innovating in the UK



UK Trade
& Investment



Innovation is GREAT

The UK is one of the world's top locations for commercial research and innovation

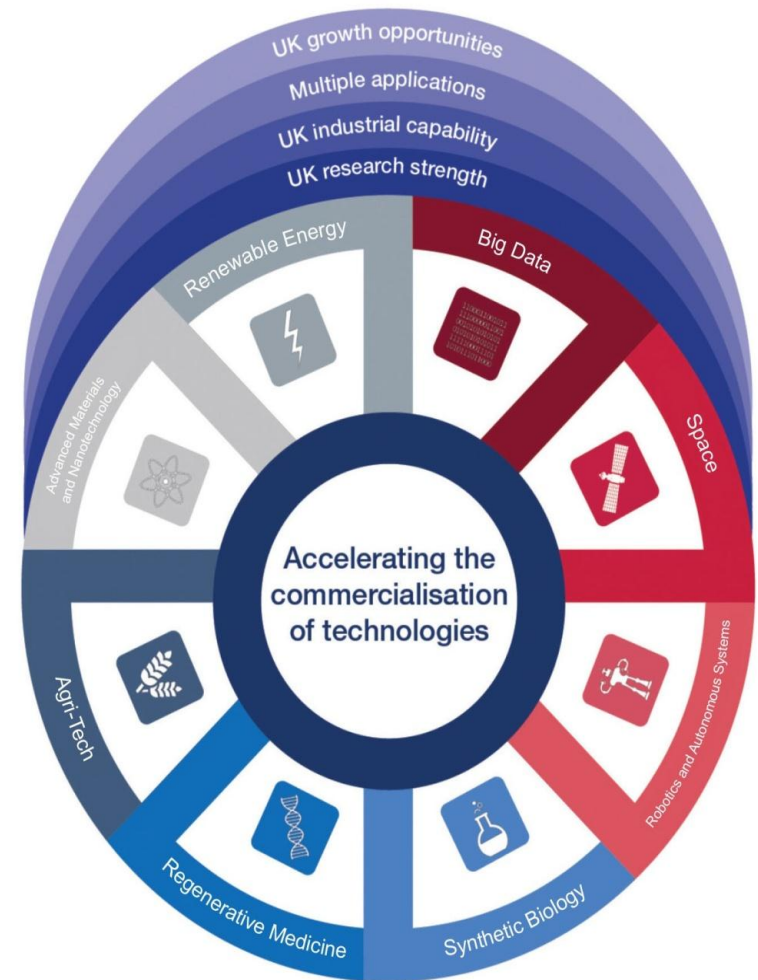
- 2nd out of 143 countries assessed in the World Innovation Index (2014)
- 4 of the World's Top 10 Universities
- 4th internationally for business-university collaboration (2014)
- Sustains the most 'impactful research base in the world' (Elsevier 2013)
- 15.9% of the world's most highly-cited research articles
- One in five people work in science-based roles - 5.8 million people
- Supportive tax system favours company R&D and innovation
- Easiest major economy in Europe to do business in (World Bank 2014)



The 8 GREAT Technologies

- **Space**
- Big Data
- Robotics and Autonomous Systems
- Synthetic Biology
- Regenerative Medicine
- Agri-Tech
- Advanced Materials and Nanotechnology
- Energy & its storage

[8 GREAT Technologies Infographic](#)



The UK “Space Sector”

Contributes £11.3 billion to
the economy

Direct employment
35,000

Estimated jobs supported
by space
101,000

Three quarters of staff are
graduates

85% commercial business

Upstream industry is three
times more R&D intensive
than the normal UK
average

UK space sector average
growth rate
7.5% pa

Estimated UK share of the
global market
7%

Targeting a £40B turnover
in 2030

Investing in Space technologies

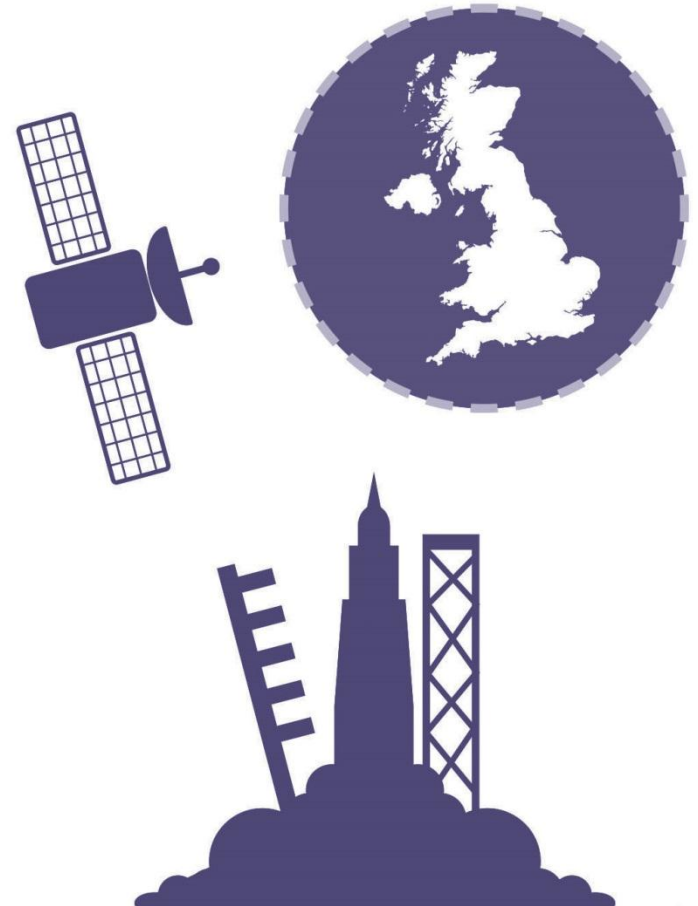
The UK government is very supportive of the Space Industry. Recent examples:

- £130m for development of telecommunications (ARTES)
- £48m to support ExoMars programme
- £2m Innovate UK/UKSA for spacecraft propulsion
- £32m UKSA International Space Partnership Programme

And launched this week:

[Space for Smarter Government SBRI](#)

(deadline 16 September 2015)





UK Trade & Investment

We work with:

- UK based businesses to ensure their success in international markets through exports.
- Overseas companies to look at the UK as the best place to invest, set up or expand their business.



UKTI at a glance

➔ **107**

Markets throughout the world in which UKTI operates

➔ **1,265**

Staff based overseas

➔ **515**

Staff based in our London and Glasgow headquarters

➔ **400**

International Trade Advisers and support staff based in the regions

➔ **40**

Offices located throughout England

UKTI and Space

We work closely with the UK Space Agency to build the UK's space offering to assist growth by:

- Showcasing the UK's offer on space to international audiences.
- Assist overseas companies with ambitions to expand into the UK or Europe, to match them with suitable areas, universities, companies, skillsets, investment.
- Link UK projects requiring investment to develop with overseas investors
- Assist companies in the UK wanting to export.

Exporting

- ***International Trade Advisers*** - International trade advisers work with businesses in the English Regions to offer advice and guidance to help them export.
www.ukti.gov.uk/tradeadvisers
- ***First Time Exporters Programme*** – training and advice for companies selling overseas for the first time.
www.gov.uk/government/collections/uk-trade-and-investment-services-for-exporters#first-time-exporters-ftes
- ***Business Opportunities*** - A service offering businesses new international sales leads identified by UKTI people.
www.businessopportunities.ukti.gov.uk

Contact details

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UKEF

Peter Maplestone
Senior Underwriter
UK Export Finance



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Success Stories

Chair – Barry Jennings – Bird & Bird

Mike Lawton – Oxford Space Systems

Nick Howland – Printech Circuit Laboratories

Charles Hannaford – O3b Networks

Maurizio Vanotti – SSTL

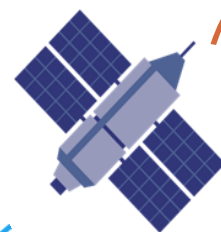
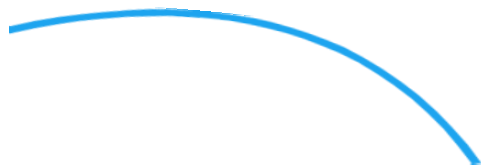


Bird & Bird

Success Stories

Mike Lawton

Oxford Space Systems





OXFORD
SPACE

SYSTEMS

Oxford Space Systems is an award-winning space technology business that is pioneering the development of deployable space structures that are lighter, less complex and lower cost than those in current commercial demand.

There are currently
2,300+ registered
satellites orbiting Earth.

This is forecast to
treble in the next 5
years.



IN THE NEWS: S

Airbus to build giant satellite network

By Jonathan Amos
BBC Science Correspondent, at the Paris Airshow

15 June 2015 | [Science & Environment](#)



Share



OneWeb aims to broaden internet access across the world

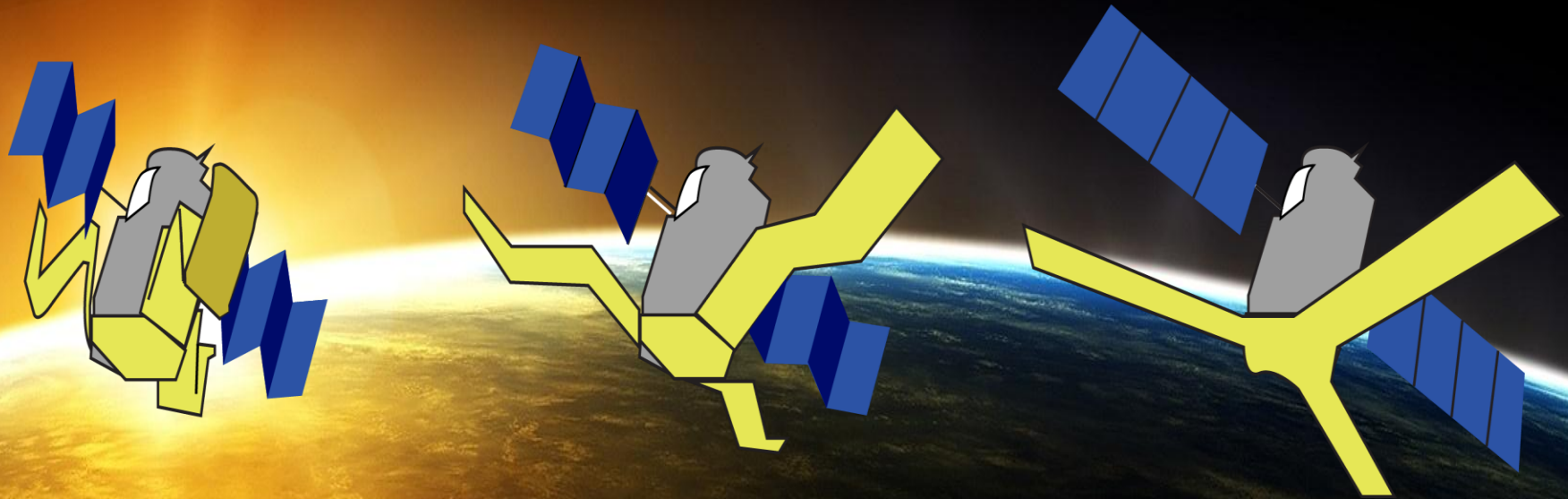


Launch is
expensive:
£30,000+ / kg

Two biggest factors:
size & weight



To maximize efficiency, **critical components** are designed to **deploy** in orbit.



Changing Times: Old Space & New Space



ASTROTUBE™

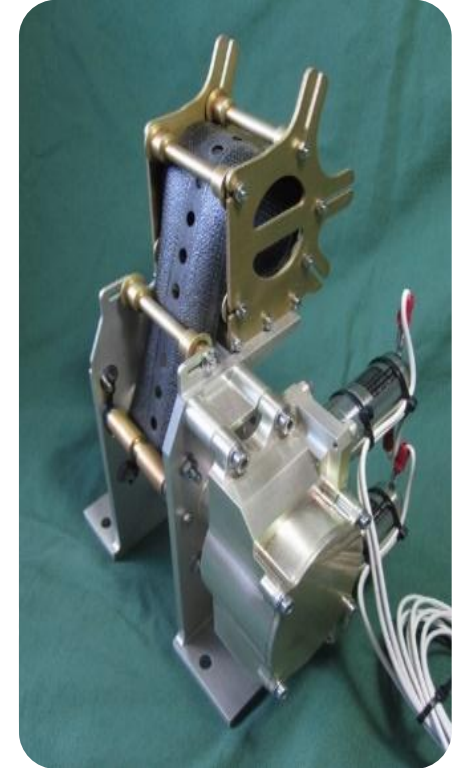


AstroTube™ video:
<https://youtu.be/ORc6DqYUytg>

ASTROTUBE™

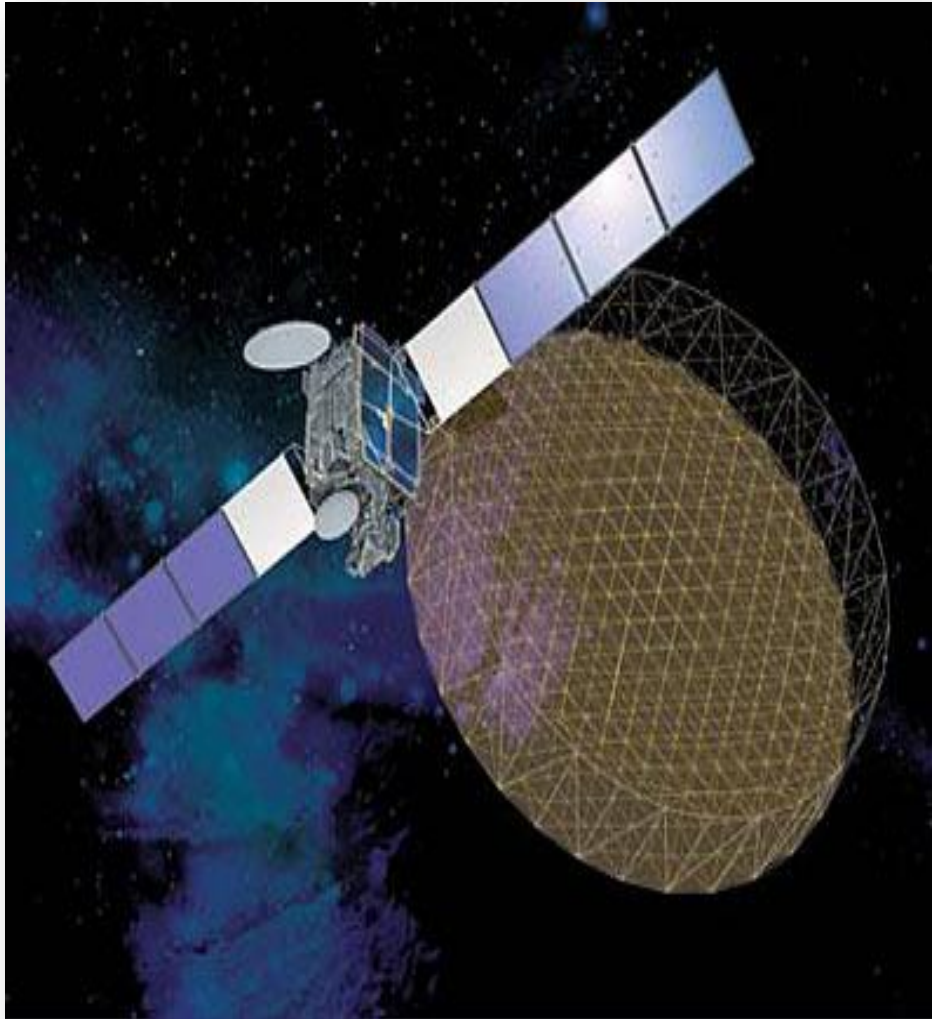


MAX



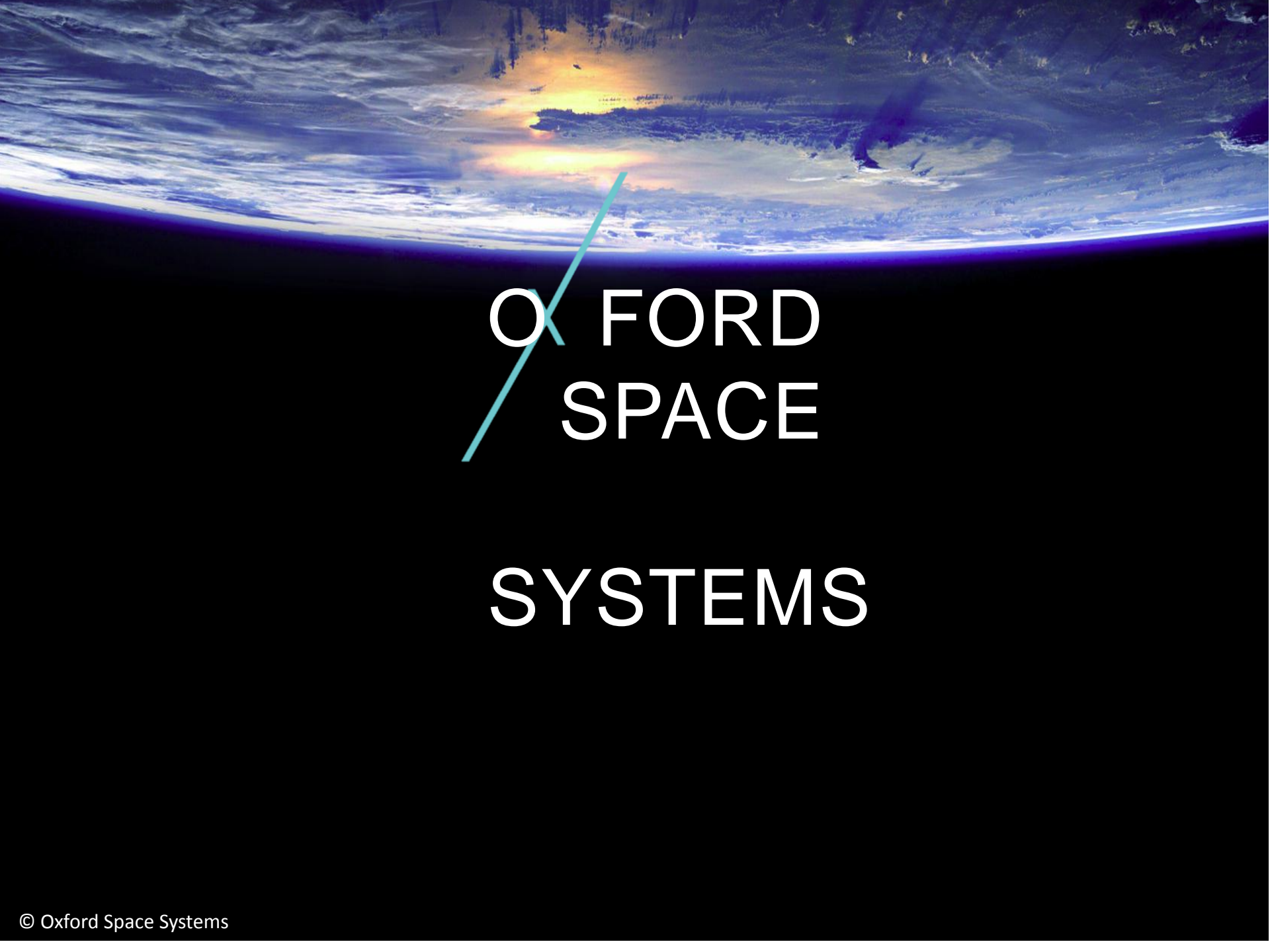
AstroTube™ Max video :
<http://youtu.be/sKG0n5Qoj0>

Deployable Parabolic Antennas





red prf.



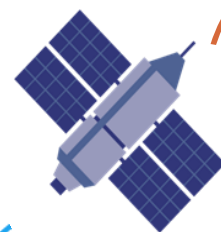
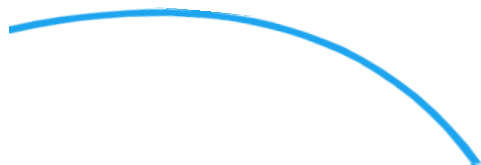
O FORD
SPACE
SYSTEMS



Success Stories

Nick Howland

Printech Circuit Laboratories



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Experienced at different

Printech Circuit Laboratories Ltd.

Space and the SME experience

‘Are you experienced?’





Experienced at different

Established in 1980

Privately owned business based in Essex

30 people, currently recruiting

Annual T/O around £2.8m

Originally established to make circuits for
defence/aerospace

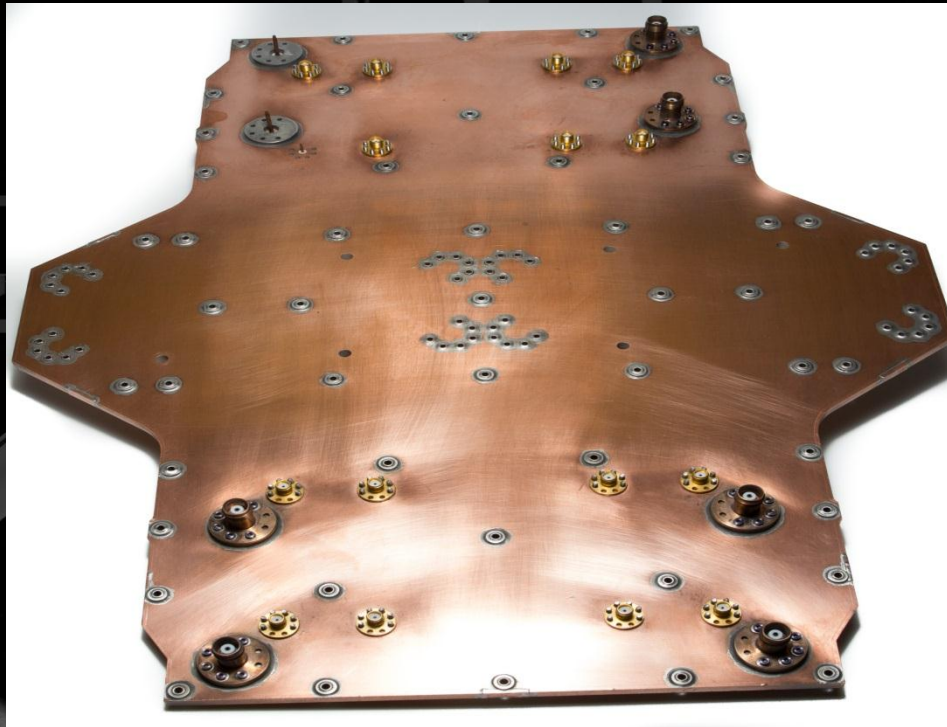
Business now 'specialist projects'

'Odd circuits built by odd people!'



Experienced at different

Space experience.
2000-2001 Inmarsat 4





Experienced at different

Space experience.

2000-2001 Inmarsat 4

Lessons learned

How many meetings need to be held?

Who actually owns the IP?

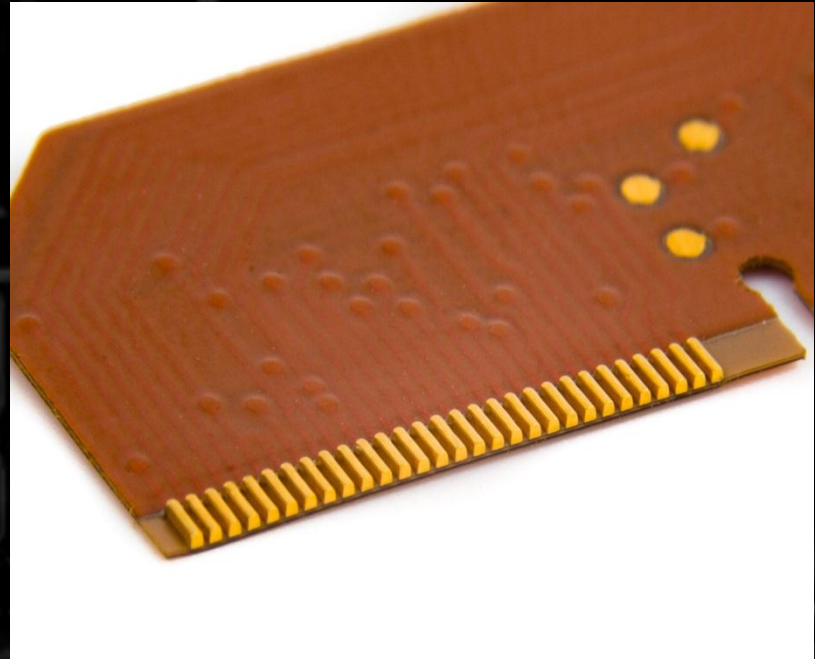
The space experience needs to be exploited

The designs change on each satellite



Experienced at different

Space experience 2.
E2V Flexible Circuitry





Experienced at different

Space experience 2.

E2V Flexible Circuitry PCL Investment





Experienced at different

Space experience 2.

E2V Flexible Circuitry

More lessons learned

10 years in development/build and test

Investment in infrastructure attracted more business and demonstrated commitment

Know your costs and more importantly your value!

Use our knowledge as leverage

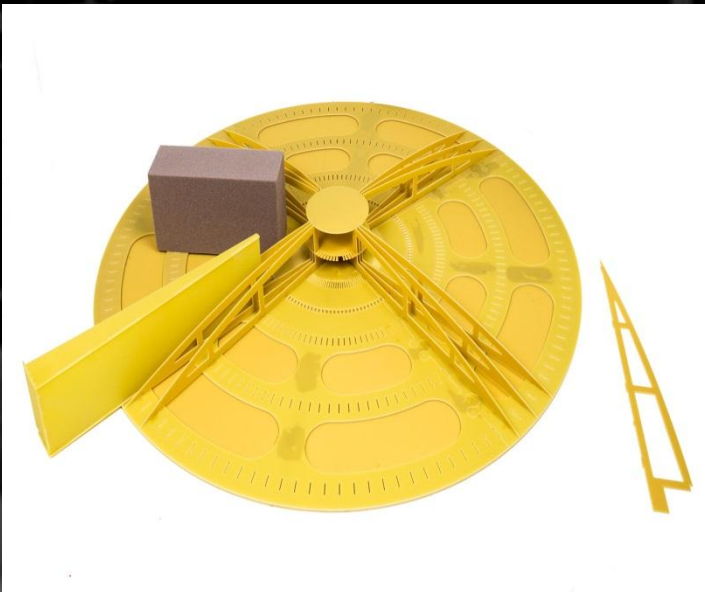
Ongoing business contributing to profits



Experienced at different

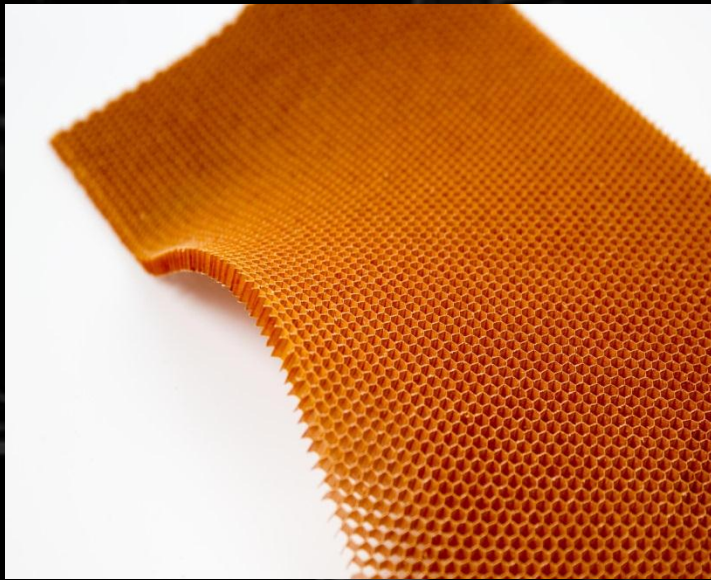
New and current space projects

5 layer Nomex/Kevlar/Polyimide paraboloid shaped polariser for Estec/ESA





Experienced at different





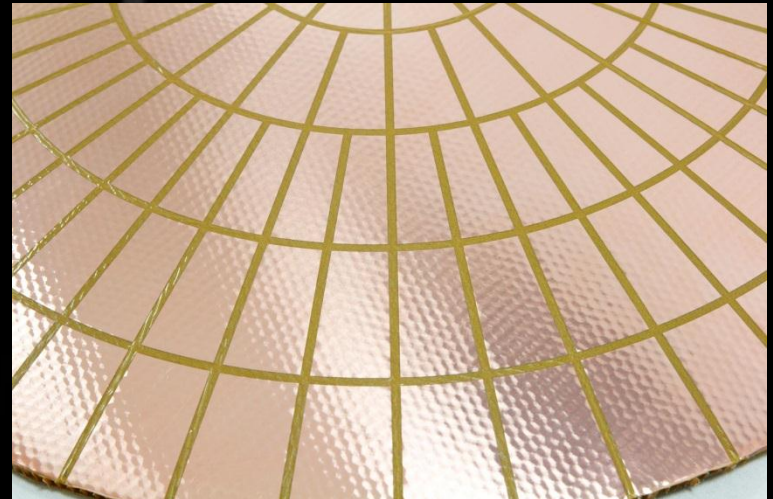
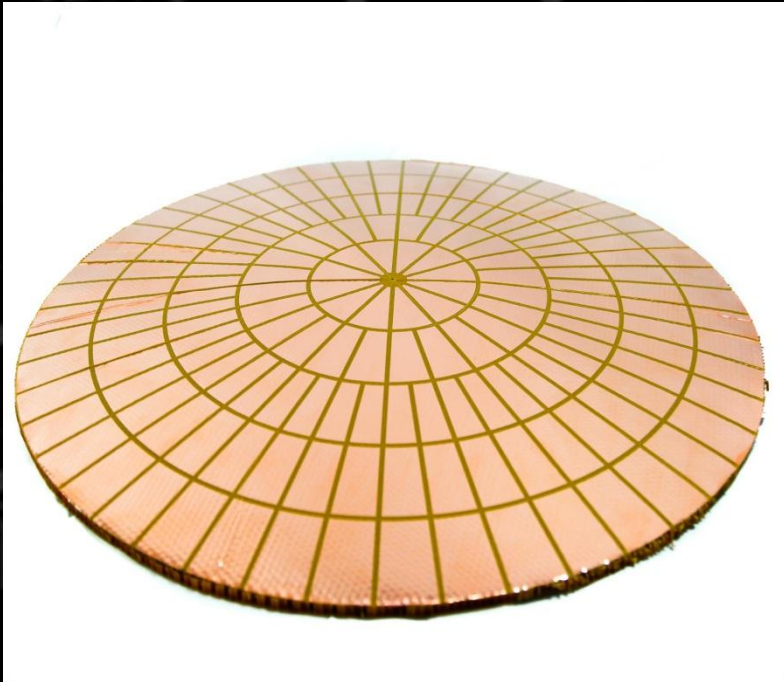
Experienced at different

New and current space projects





Experienced at different





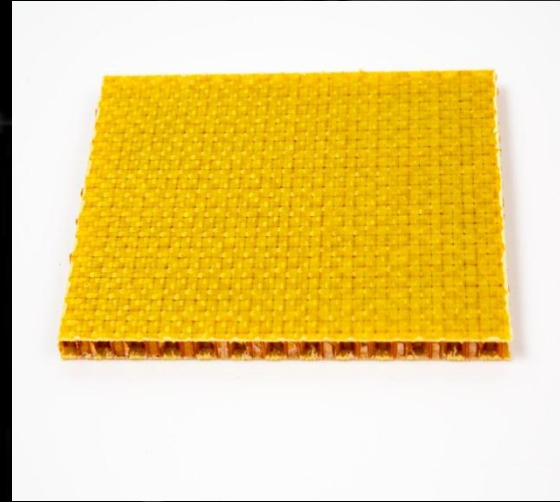
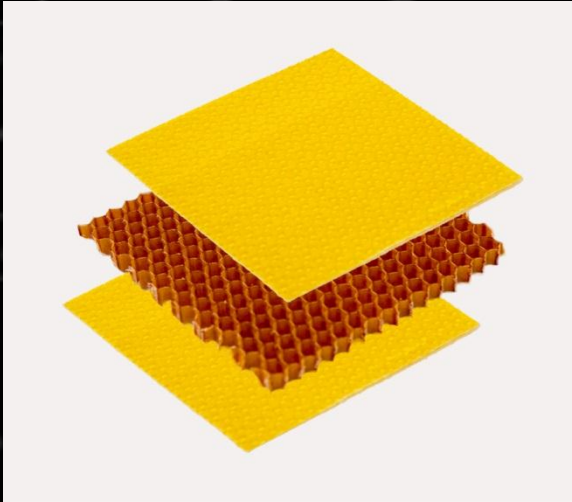
Experienced at different

New and current space projects

Large flight antenna 2.2 x 2 m built from 60 mm Kevlar core with 2 multilayer feed circuits 1.2 x 0.45 m with customer feed pins and end launchers.



Experienced at different





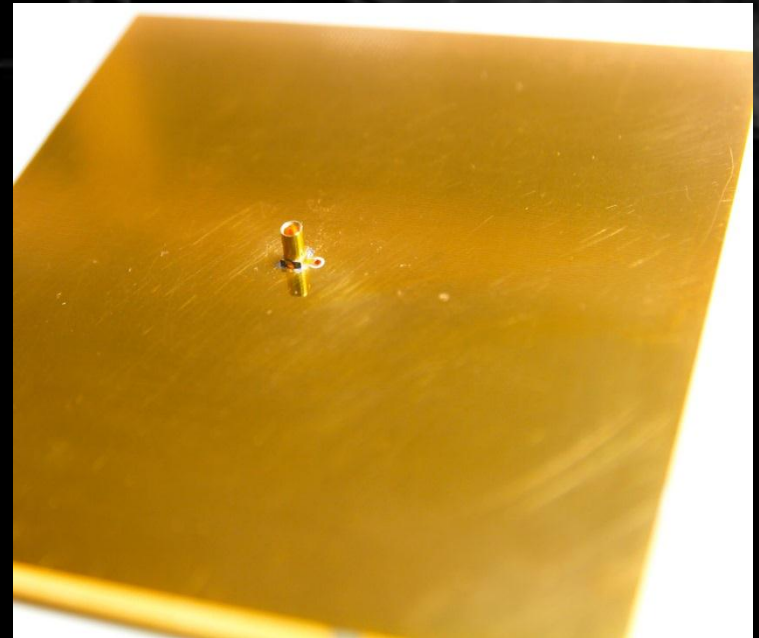
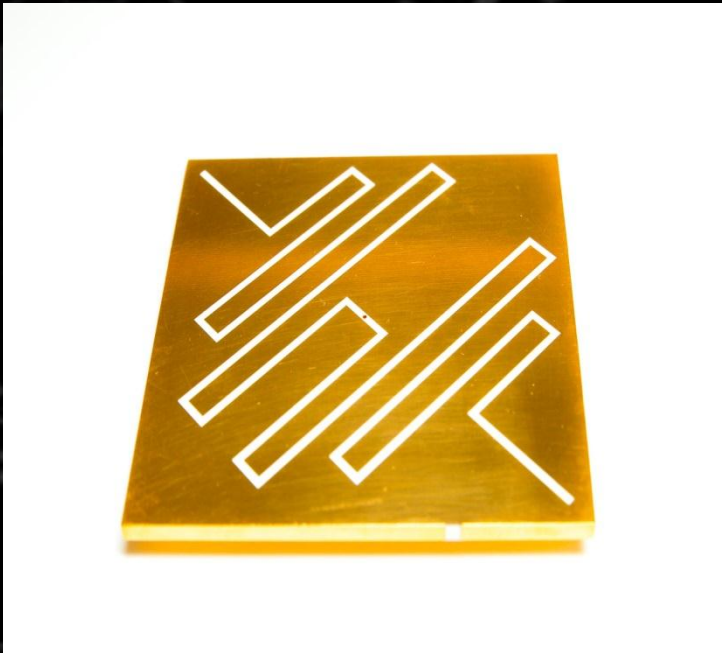
Experienced at different

New and current space projects

Small directional patch antenna 90 x 90 mm for use in CubeSat. Full series of different frequencies from 401 MHz to 2.2 GHz.



Experienced at different

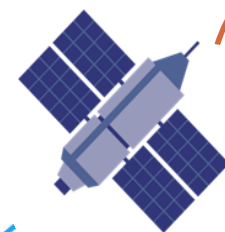




Success Stories

Charles Hannaford

O3b Networks



Bird & Bird

O3b – A Success Story

Charles Hannaford



2008

Download



Hard Drive



Classroom



Laptop



To..

2015

Stream



Cloud



Online, Massive Open
Online Course (MOOC)



Smart Phone



Applications - central today but non-existent when O3b started life



2005



2008



2008



2008



2008



2008



2008



2008



2009



2009



2010



2010

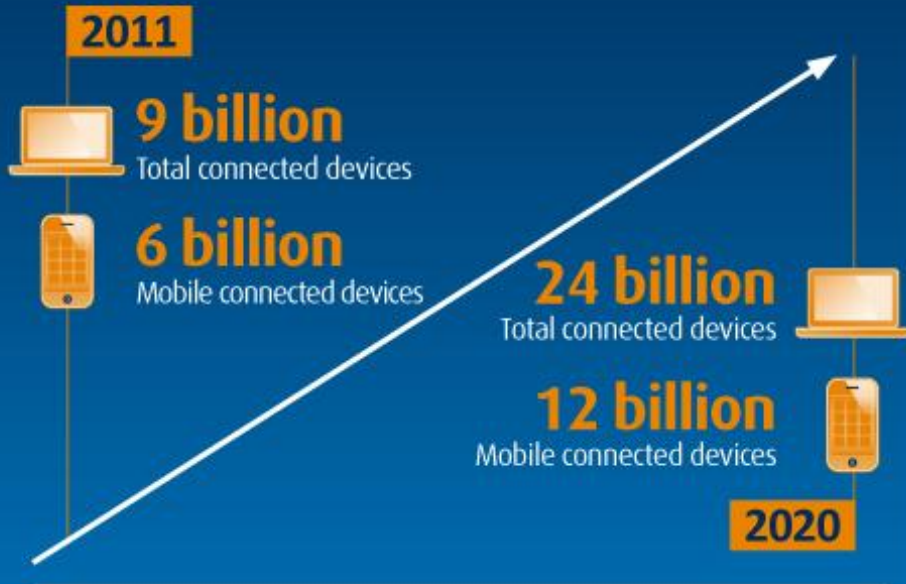


2013



2013

The Connected Life by 2020



Revenue opportunity for connected devices in vertical sectors



Revenue opportunity for mobile network operators in 2020

\$1.2 Trillion

7x

Increase on 2011 expected revenues



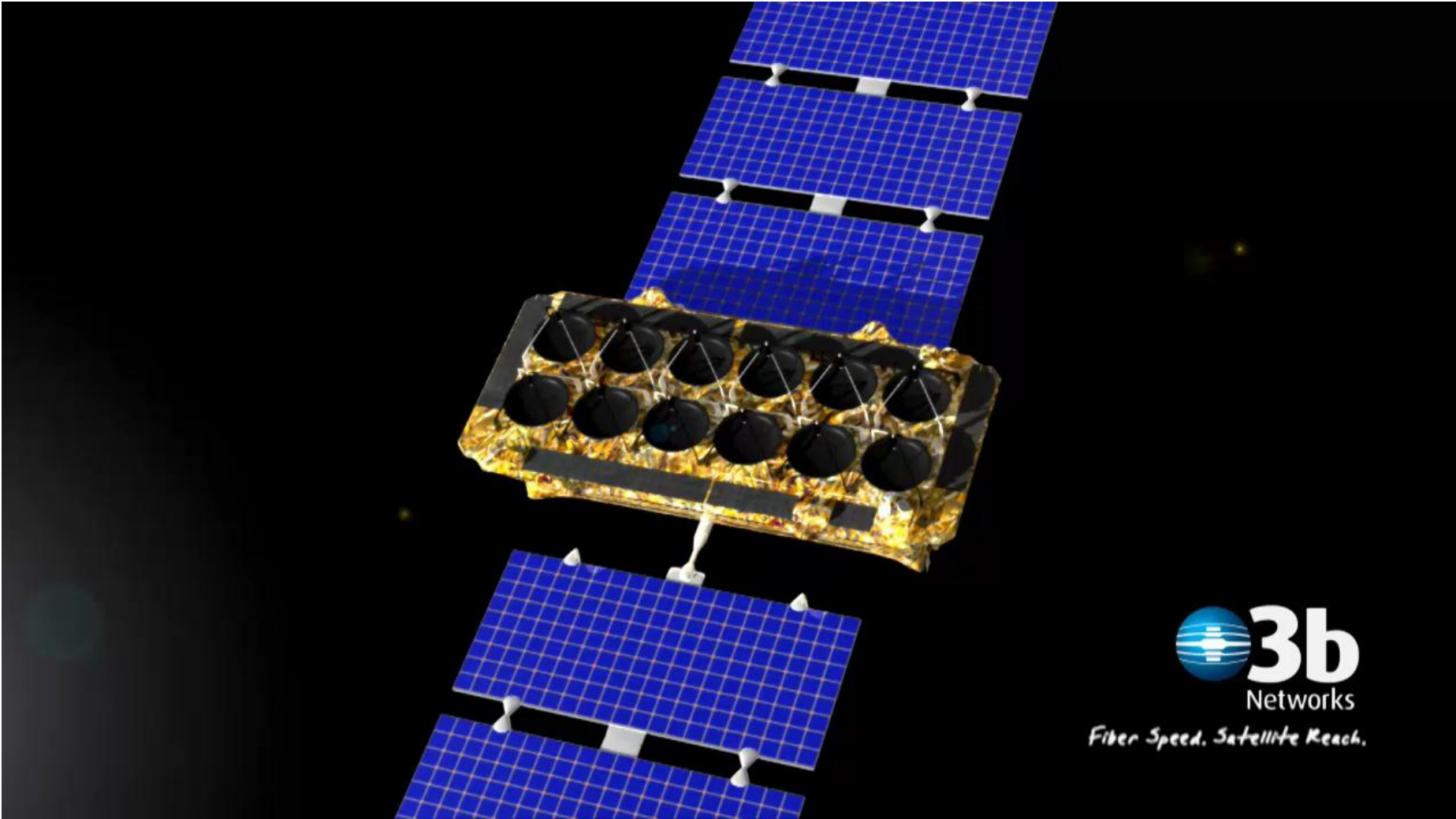
The O3b Vision

“The Internet has become the world’s information exchange and *everyone* should have the opportunity to participate.”

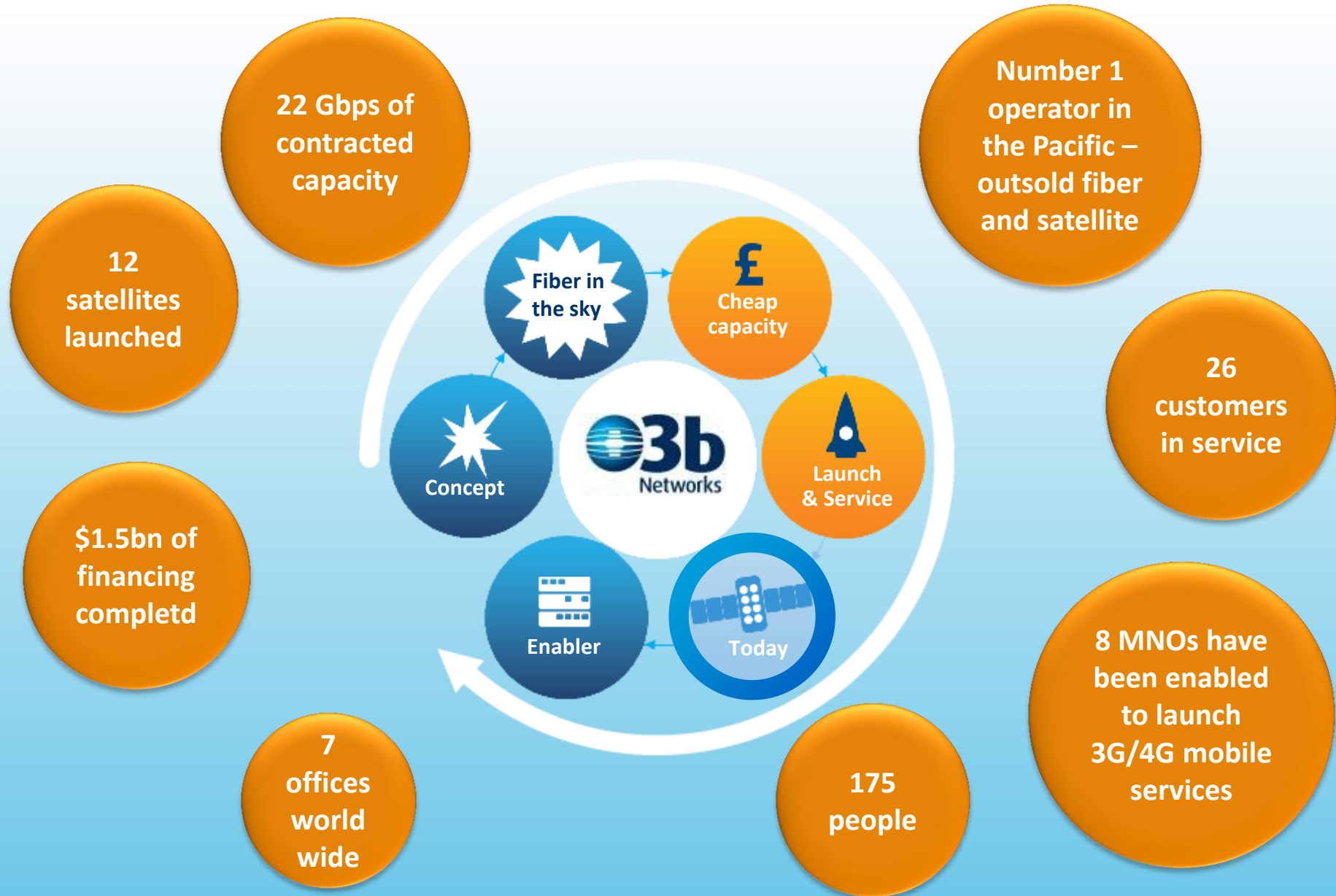
Greg Wyler, Founder



The O3b Constellation



O3b in Numbers



What our customers are saying about O3b

O3b delivering *Fiber speed, satellite reach*

“The reality after implementation matches the theory of what we hoped to achieve with O3b for our WiMAX network in Juba.”

RCS

“O3b, our satellite communications partner, calls it ‘fiber speed with satellite reach,’ and this is exactly the result we are seeing,”

Royal Caribbean

“The low latency O3b satellite constellation provides a similar service as we’d receive from an undersea cable, but at a fraction of the investment.”

Norfolk Telecom

“In our technology road map we do not include geostationary satellite beyond 2017 and expect to move fully to MEO or other technologies in that timeframe”

Shell

O3b as a strategic enabler

“Like everyone, our customers want fast response times and fast download speeds, and with our O3b link we have gone from a basic low speed infrastructure to a state-of-technology performance comparable to internet in Sydney or Singapore”

Digicel PNG

“We are very pleased to have gone live on the O3b network, which will allow us to launch 3G services”

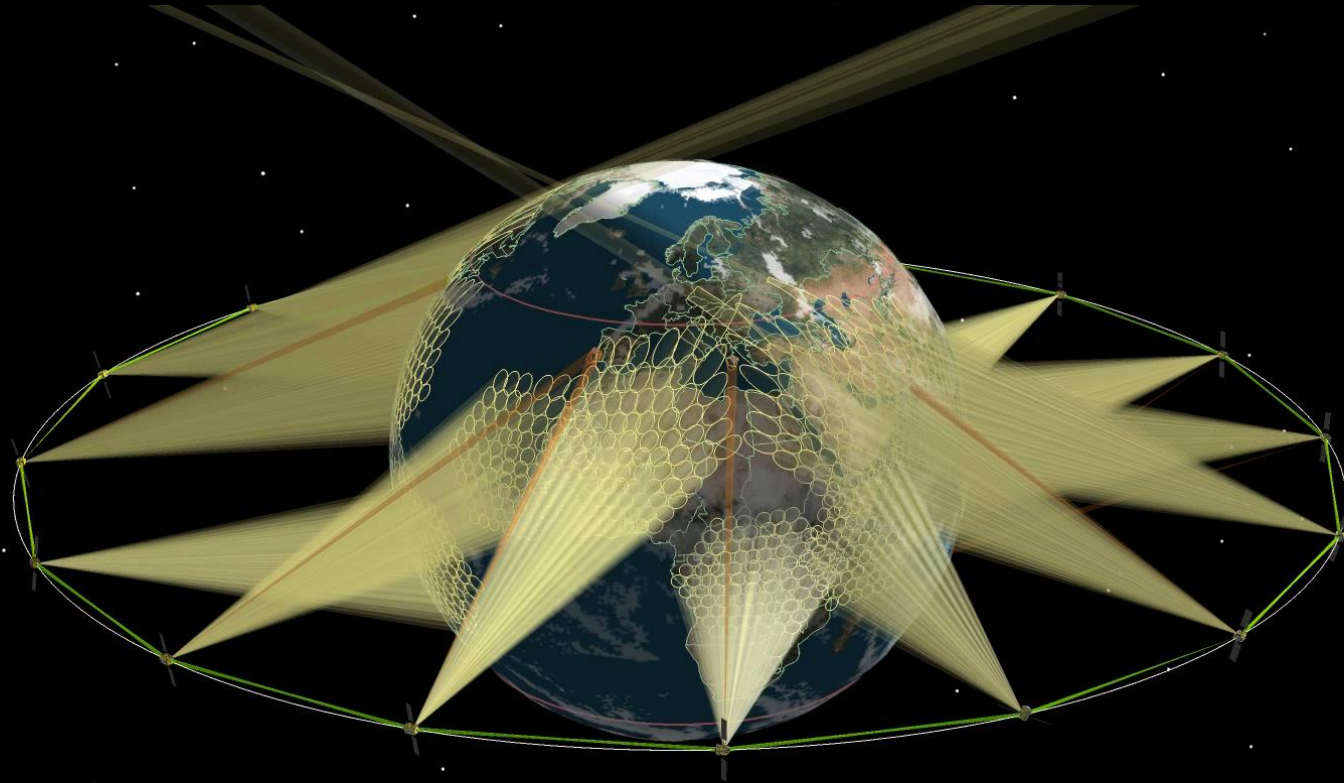
Palau National Communications Company

“Our corporate customers demand high levels of performance and resilience and our unique hybrid O3b and fibre network will differentiate our service.

Gulfsat

“Our 3G network now achieves up to 21 Mbps to a single customer, something that wasn’t possible before we had O3b”

Timor Telecom





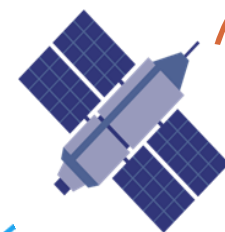
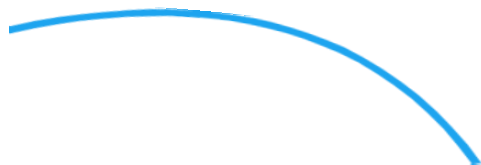
Networks

Fiber Speed. Satellite Reach.

Success Stories

Maurizio Vanotti

SSTL



A very British success








The early days







Disaster Monitoring Constellation

9 satellites launched providing emergency Earth imaging for disaster relief under the International Charter for Space and Major Disasters.

Operational satellites

| Country Operator | Designation | Type | Imager | Launch |
|--|---------------|-----------|-----------------------------|--------|
|  Nigeria NASRDA | Nigeriasat-NX | SSTL-100i | 22m MS | 2011 |
|  Nigeria NASRDA | Nigeriasat-2 | SSTL-300 | 2.5m Pan 5m MS 32m MS | 2011 |
|  UK DMCii | UK-DMC2 | SSTL-100i | 22m MS | 2008 |
|  Spain Deimos | Deimos-1 | SSTL-100i | 22m MS | 2008 |
|  China BLMIT | Beijing-1 | SSTL-150i | 32m MS 4m Pan | 2005 |

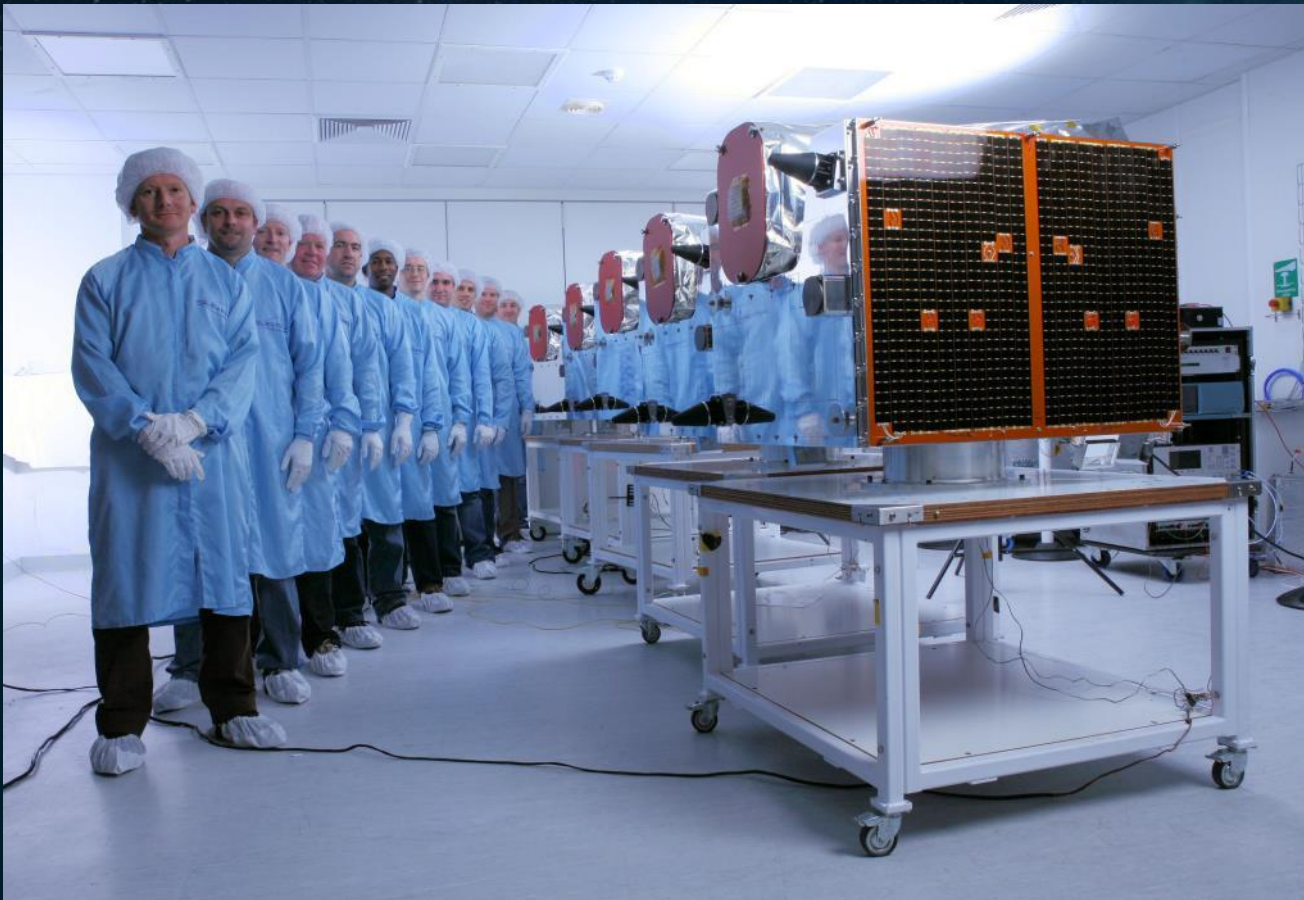
Retired satellites

| Country Operator | Designation | Type | Imager | Launch |
|--|--------------|-----------|-------------------|--------|
|  UK SSTL | UK-DMC | SSTL-100i | 32m MS | 2003 |
|  Nigeria NASRDA | Nigeriasat-1 | SSTL-100i | 32m MS | 2003 |
|  Turkey BILTEN | Bilsat-1 | SSTL-150i | 26m MS 12m Pan | 2003 |
|  Algeria ASAL | Alsatsat-1 | SSTL-100i | 32m MS | 2002 |

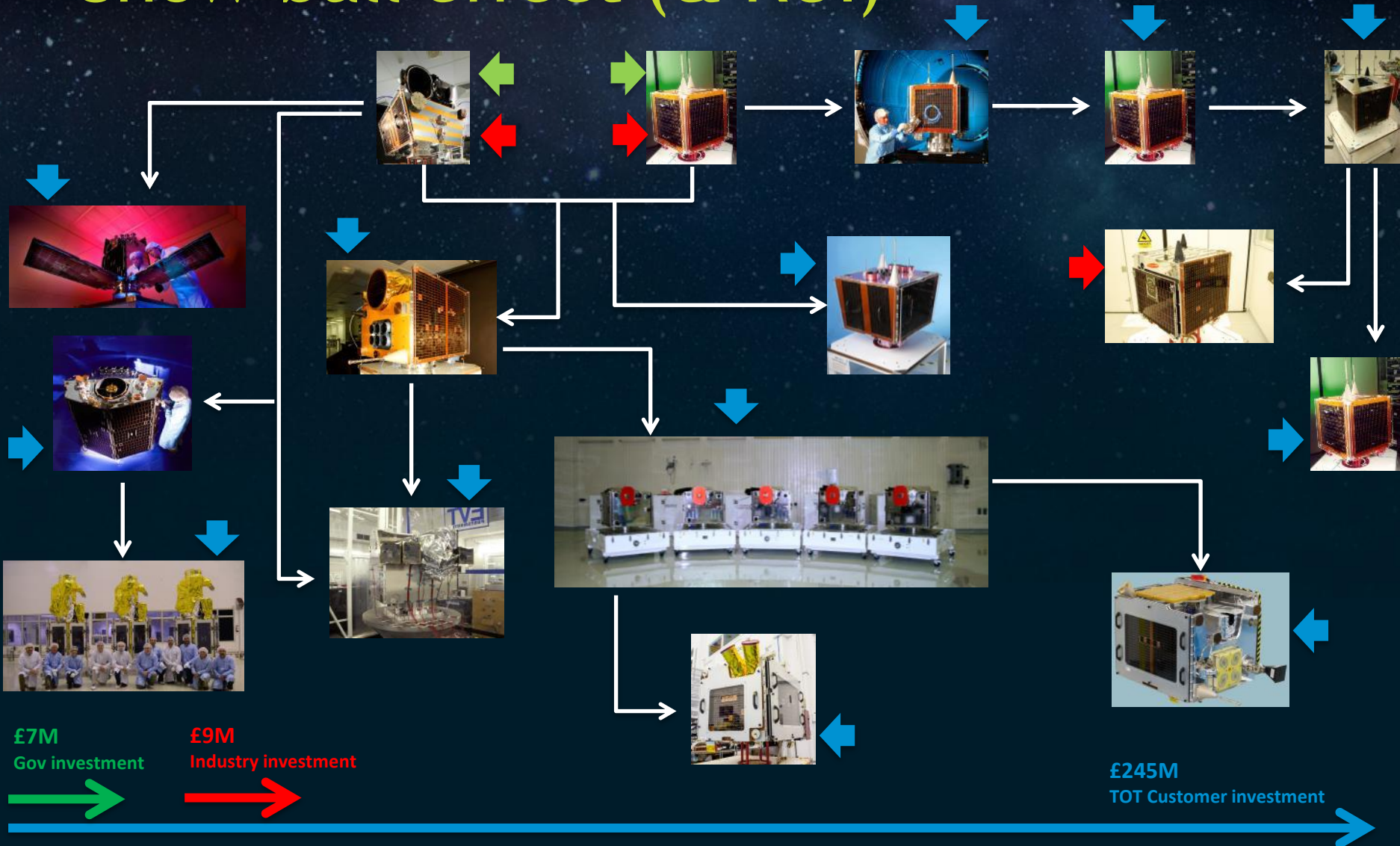
RapidEye constellation

5 satellites constellation.

First small satellite constellation for commercial Earth Observation.



Snow-ball effect (& ROI)



VNIIEM constellation

8 avionics suites of equipment for the Russian KANOPUS-type satellite platform



Avionics integration at SSTL



Kanopus satellites ready for launch

GIOVE-A

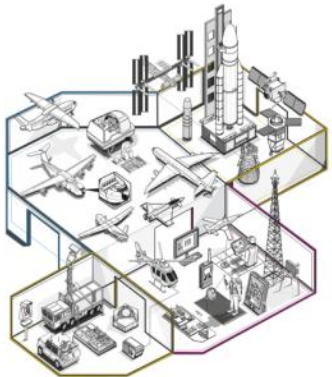
27 month programme launched on Dec 27th 2005

10 year anniversary in 2015

5 times the expected lifetime



Growing up



AIRBUS
GROUP

SSTL is an "Autonomous Entity"
within Airbus Defence & Space



DMC-3 constellation

3 satellites with daily revisit time.



Formosat-7 constellation

6+6 satellites for the joint civil programme between NSPO and the National Oceanic and Atmospheric Administration (NOAA) in the US.

The new constellation is intended to comprise 12 spacecraft.



Galileo Full Operational Constellation

22 Navigation payloads selected by ESA
for Europe's satellite
navigation system



GMP-T Quantum Mission



Know-how Transfer and Training (KHTT)

18 SSTL international programmes completed

6 Space Agencies formed

3 Spin-out companies

Hands on training

Academic training - Underpinned by the University of Surrey





YEARS
OF SPACE
INNOVATION



Changing the economics of space

www.sstl.co.uk

Q&A

Chair – Barry Jennings – Bird & Bird

Mike Lawton – Oxford Space Systems

Nick Howland – Printech Circuit Laboratories

Charles Hannaford – O3b Networks

Maurizio Vanotti – SSTL





Why Space? – Comments from Investors

Chair – Nick Flitterman, Portland Advisers

Mark Boggett, Seraphim

Richard Brook, E-Synergy

Simon Acland, Imprimatur Capital

Philip Grose, Castle Hill Asset Management

Stephen Ainsworth, Barclays



Bird & Bird

Why Space? – Comments from Investors

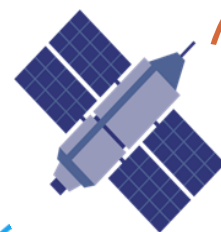
Mark Boggett
Seraphim



Why Space? – Comments from Investors

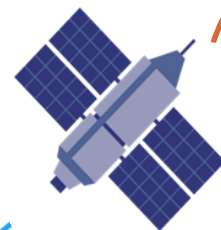
Richard Brook

E-Synergy



Why Space? – Comments from Investors

Simon Acland
Imprimatur Capital



Why Space? – Comments from Investors

Philip Grose

Castle Hill Asset Management



Why Space? – Comments from Investors

Stephen Ainsworth
Barclays



Q&A

Chair – Nick Flitterman, Portland Advisers
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Simon Acland, Imprimatur Capital
Philip Grose, Castle Hill Asset Management
Stephen Ainsworth, Barclays





Final Remarks

Joanne Wheeler

Partner

Bird & Bird

Co-Chair SFN



Bird & Bird

Final Remarks

SFN Update

- Aims to support the growth of the UK space industry at all levels
- Facilitate and attract investment
- Identify regulatory barriers and other impediments to growth
- Promote business opportunities between companies



SFN Update

Attracting investment

- In last 3 months – approached by 3 new companies (1 start up, 2 with existing revenue streams)

Identify regulatory barriers

- Reform of Outer Space Act to cap unlimited indemnity to put UK companies on a level playing field – received Royal Assent on 26 March 2015



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SFN – Success Through Collaboration



What's next?

- Elevator Pitch Event
- "Back on Board" project
- Regulatory Seminars (collaboration with ECSL/ESA)
 - o Licensing
 - o WRC-15 – what it means for the industry



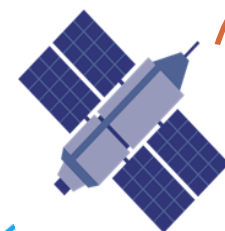
Bird & Bird



SFN

Satellite Finance Network
Finance and regulatory network
for the UK space industry

Thank You!



Bird & Bird