Imperial Space Laboratory Launch

1st July 2013

Together pioneering excellence

ASTRIUM
AN EADS COMPANY

The Company

Astrium: part of EADS – a global leader in aerospace and defence

EADS

Airbus Airbus Military	Eurocopter	**Astrium**	Cassidian

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ASTRIUM : Facts & Figures 2012

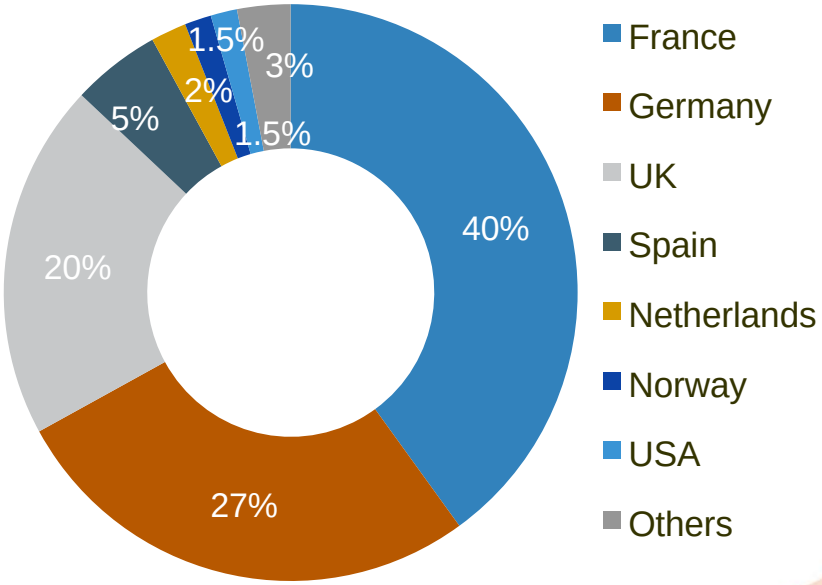
Employees:
18,000

Turnover:
€5.8 billion

Order backlog:
€12.7 billion

CEO:
François Auque

Employees by country:



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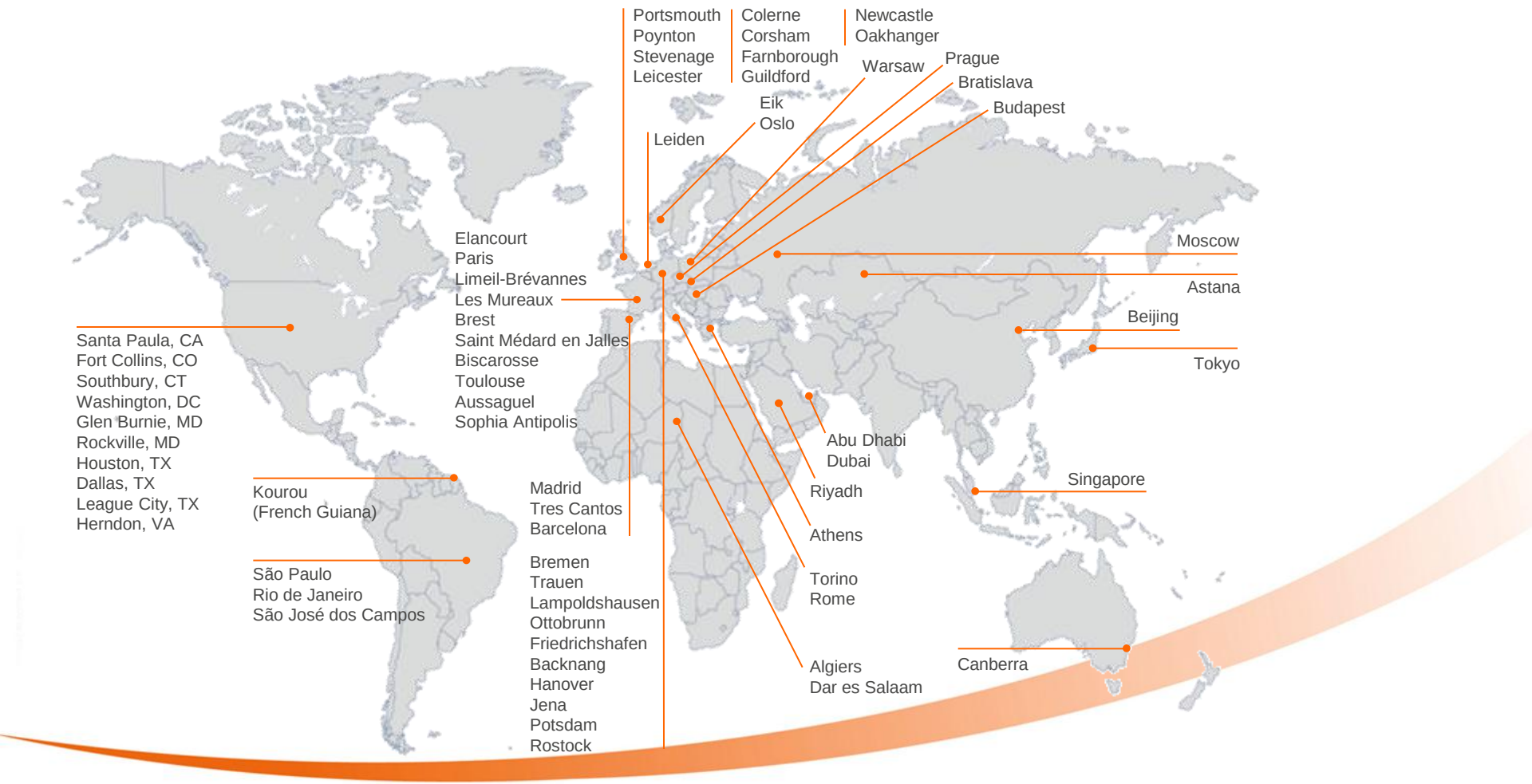
Astrium: a global company with European roots



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Astrium's activities are based in three key areas to serve governmental and commercial markets

Astrium Space Transportation

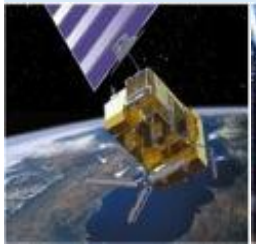
The European prime contractor for space transportation and orbital infrastructure

-Launchers
-Defence
-Orbital Systems & Space Infrastructure
-Propulsion & Equipment


Astrium Satellites

A world leader in the design and manufacture of satellite systems and ground segments

-Telecommunications Satellites
-Earth Observation, Navigation & Science
-Products




Astrium Services

A global provider of end-to-end solutions for satellite communications and geo-information services

-Government Communications
-Business Communications
-Geo-information Services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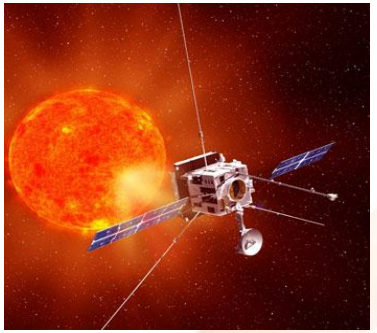
ASTRIUM IN THE UK

- Astrium UK has a balanced portfolio of services and manufacturing, with 45% of turnover deriving from services
- Astrium UK turnover c.£1bn per annum, of which c.50% is exports from the UK
- Astrium employs about 3,500 people in the UK and contributes around 20% of group revenues
- Of £1bn turnover nearly 60% flows down the supply chain:
- **Manufacturing business**:
  - Around 70% or £350M is sub-contracted annually, of which around £100M to UK based suppliers
- **Service business**:
  - Around 35% or £150M is sub-contracted annually, of which around £100M to UK based suppliers
  - 400 UK companies supply to Astrium, with around half being SMEs
- Strategic partnering with SMEs for some key technologies
- A large UK Prime is good for the health of the SME sector; a healthy SME sector vital for Astrium
- Major R&D and other investments into the university sector



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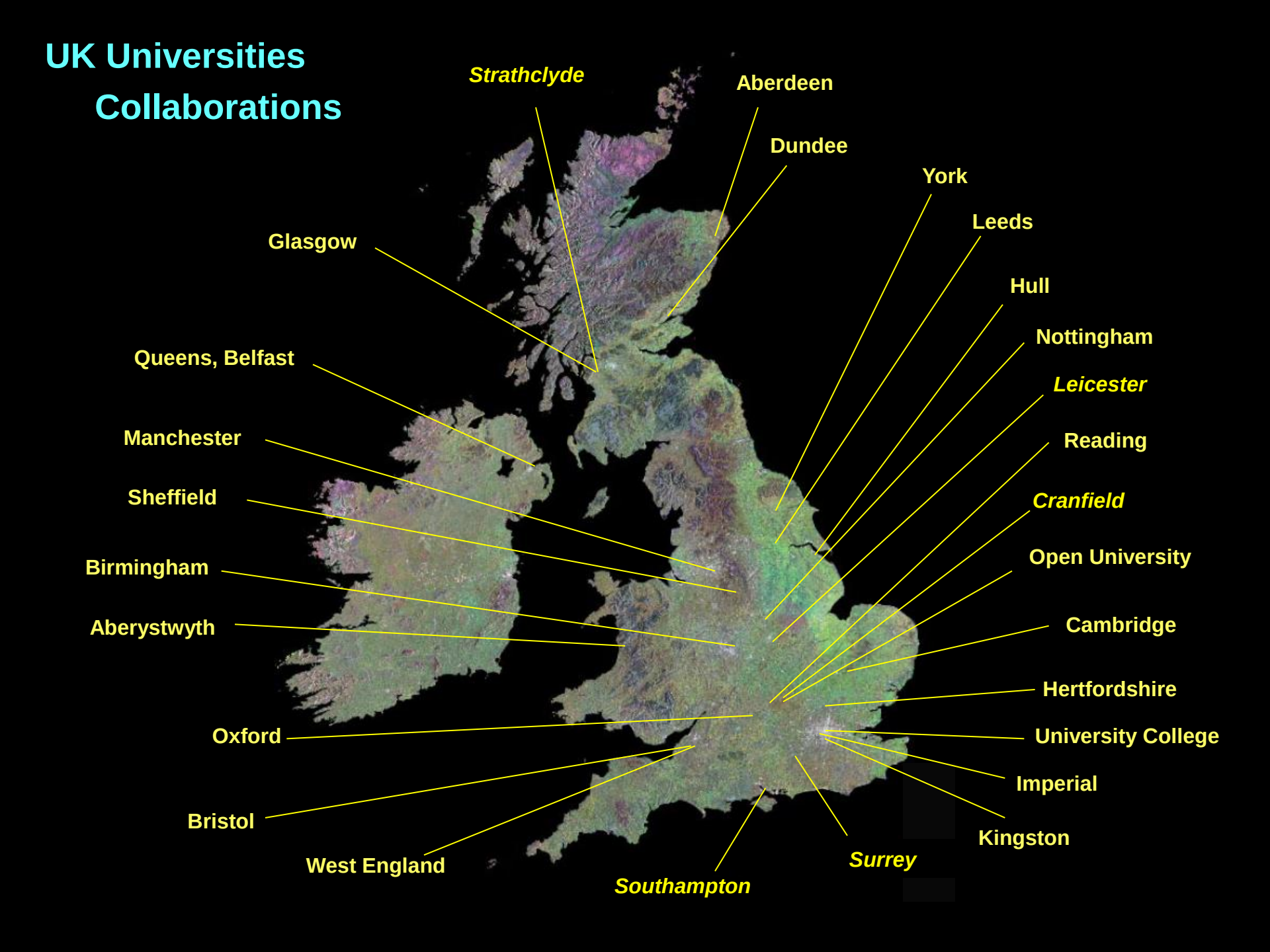
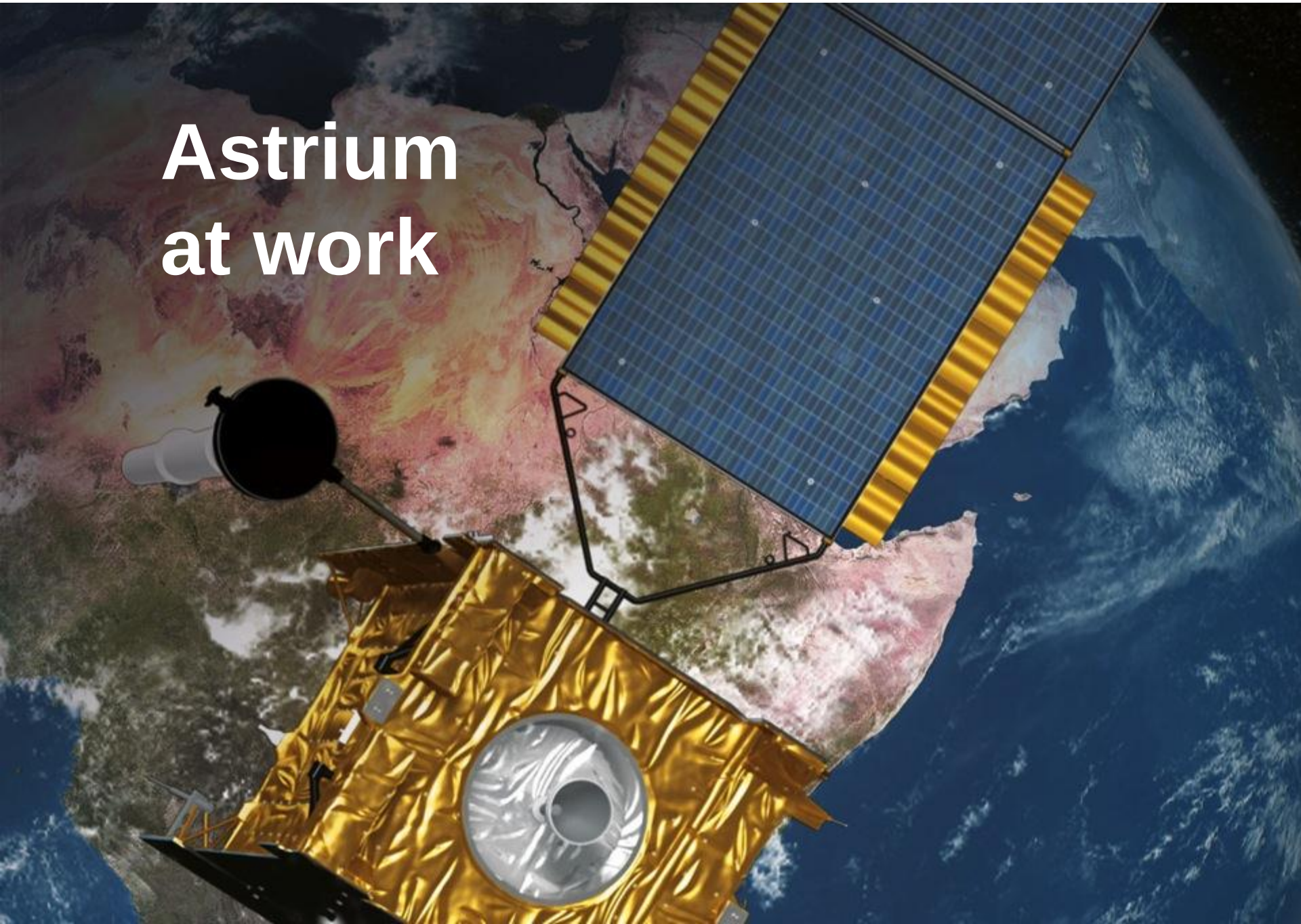
UK Universities Collaborations



Astrium at work



Astrium at work

"Astrium is a global space industry leader, with world-class expertise and extensive prime contractorship experience across all sectors of the space business."

- No. 1 space company in Europe
- No. 3 space company worldwide
- The only European company that covers the whole range of civil and defence space systems and services

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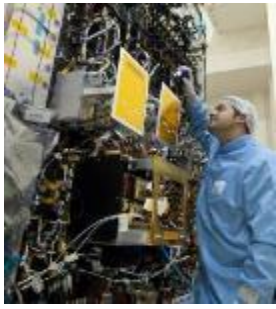
Telecommunications







A market leader

- Established in a challenging commercial market and a major provider of military systems
- Eurostar E3000, best-selling telecom platform
- At the forefront of innovation

Complete capability

- Spacecraft and payload design, manufacture, test, launch and operations
- End-to-end communications system infrastructures
- Civil and military telecom systems

12 communications satellites under construction

- Astra 2E, 2G, 5B
- Alphasat I-XL
- SES-6
- Arabsat 6B
- Measat-3b
- Eutelsat 3B, 9B
- DirecTV 15
- Express AM4R, AM7

In-orbit monitoring for more than 40 satellites

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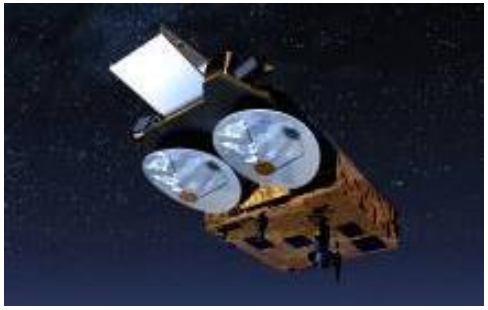
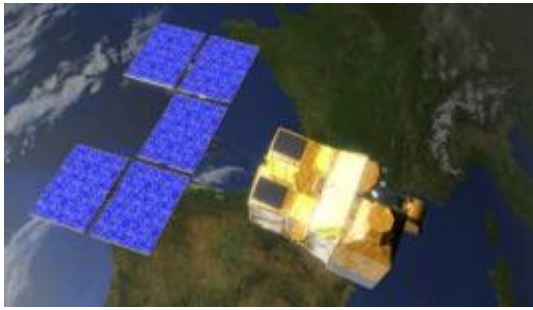
Earth observation



Prime for over 30 Earth observation satellites

- Meteorological forecasting
- Global environment monitoring
- Reconnaissance for national security and peacekeeping

Design and manufacture of highly versatile platforms, optical and radar instruments

Ground segment equipment

Environment: Envisat, CryoSat-2, GOCE, SMOS, Swarm, Sentinel-2, Aeolus, EarthCARE

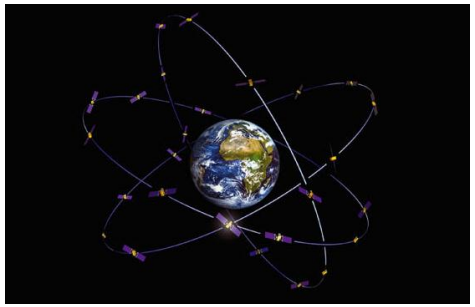
Imaging: Spot 5, TerraSAR-X, TanDEM-X, ALSAT-2, Theos, Pléiades, SSOT, Ingenio, Paz, ERSSS, Spot 6 & 7, VNREDSat-1

Meteorology: MSG, MetOp, COMS

Security: Helios II, ESSAIM, Spirale, ELISA, CSO

Navigation






- A major EC–ESA partner in the design and development of Galileo
- Prime for a concept phase study for ESA on the next generation of the European Geostationary Navigation Overlay Service (EGNOS)
- A leading role in the development of practical and cost-effective solutions for secure and safety-critical Global Navigation Satellite System application infrastructures

Space Segment

- Prime for the GIOVE-B test satellite
- Prime for the four In-Orbit Validation satellites
- Supply of the payloads and platform equipment for the first batch of FOC satellites

System Support Segment

- Major role in systems engineering with leading expertise in signal design, performance and verification

Ground Control Segment

- Prime for the Galileo Ground Control Segment

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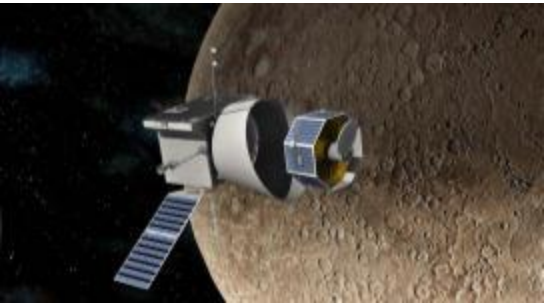
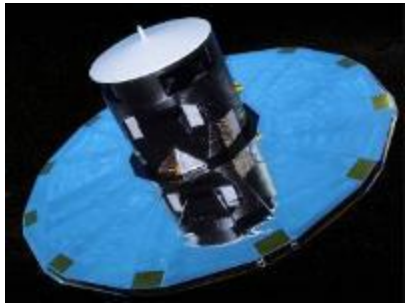
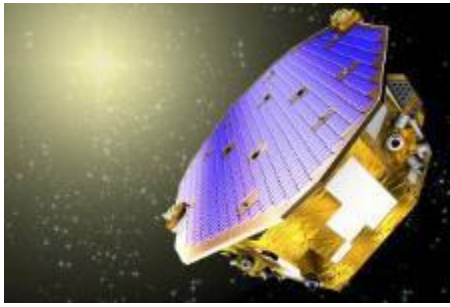
Space science



World-renowned expertise for building satellites, probes and instruments for exploration missions

- Planetary exploration
- Deep space missions
- Astronomy
- Fundamental physics missions
- Monitoring solar activities and Sun-Earth interaction

- **Planetary exploration:** Mars Express, Venus Express, BepiColombo, ExoMars Rover Vehicle
- **Deep space:** Rosetta
- **Astronomy:** XMM-Newton, Herschel telescope, Gaia, JWST instruments
- **Fundamental physics:** LISA Pathfinder
- **Solar science and Sun-Earth interaction:** SOHO, Cluster II, Solar Orbiter

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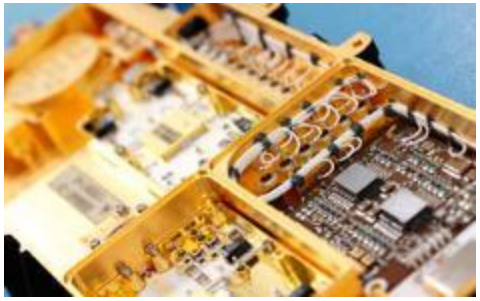
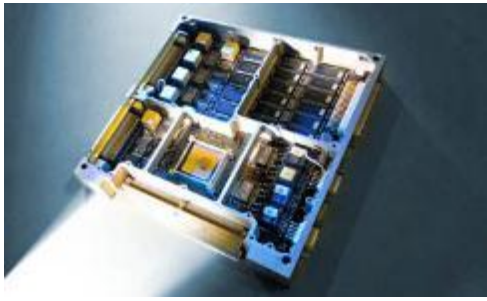
Products



World-class developer and supplier of space products for internal and external customers

In-house development of key equipment, subsystems and leading-edge technologies

- To optimise spacecraft performance
- To enhance cost-effectiveness
- To provide generic products across many fields

Sustained R&D effort to foster innovation breakthrough

- Key space products include
  - Solar generators
  - Power equipment and subsystems
  - Electrical, RF and microwave equipment
  - On-board digital processors
  - Sensors and actuators
  - Mechanisms
  - Optical, radar and navigation payload equipment

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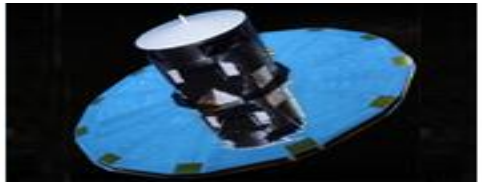
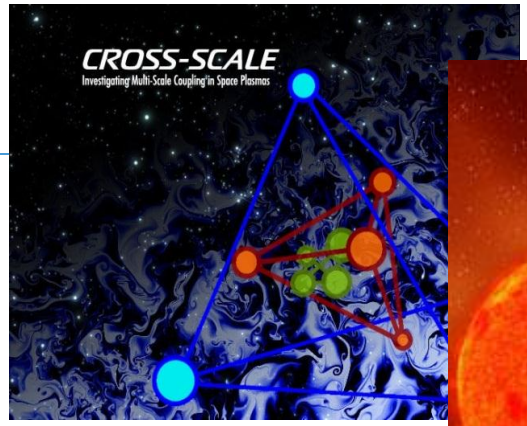
Astrium Collaboration with Imperial College

Astrium Collaboration with Imperial College



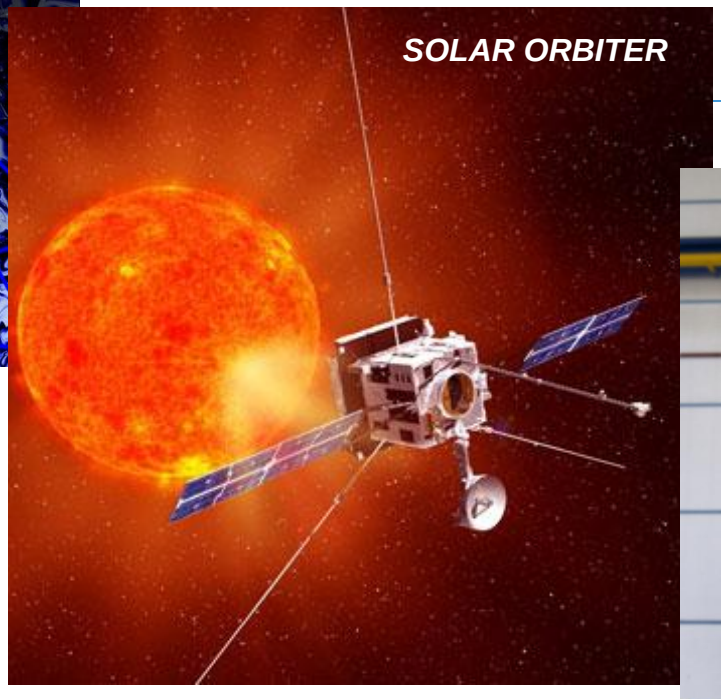



University POC	Area of collaboration	Project Description	Type of Collaboration	Start	End	Astrium BU
Chris Carr	EMC/Magnetic research	EMC	PhD CASE studentship	Nov-11	Nov-14	ENS Erik De Witte
Daniel Jabry, Prof John Harries	Earth Observation (F-IR)	Mission systems	Student Internship	Oct-09	Sep-12	ENS Brian O'Sullivan
Dr Richard Ghail Dr Chris Cochrane	Preparation of Explorer bid to ESA, maritime surveillance	Mission systems	Support to bid	Sep-10	Dec-10	ENS David Hall
Dr. Helen O'Brien	Rad-hard ASIC for Magnetometer	Electrical engineering	Collaboration	Nov-09	2011	ENS Rajan Bedi
Dr. Joao Magueijo	LISA gravity science	Mission systems	Collaboration	2008	2010	ENS Christian Trenkel,
Chris Carr	Space CITI	Magnetometer	Collaboration for proposal	2012	2013	ENS Alex Wishart
Neil Hoose	Smart transport infrastructure	Telecoms	Study concept	2008	2010	Telecoms Products Group
Prof Goran Strbac, Dr Javier Barria	Smart Grid Communications	Telecoms	Study concept	2008	2010	Telecoms Products Group
Chris Carr	PRISM (Integrated payloads)	Magnetometer	Study	2009	2009	ENS Alex Wishart

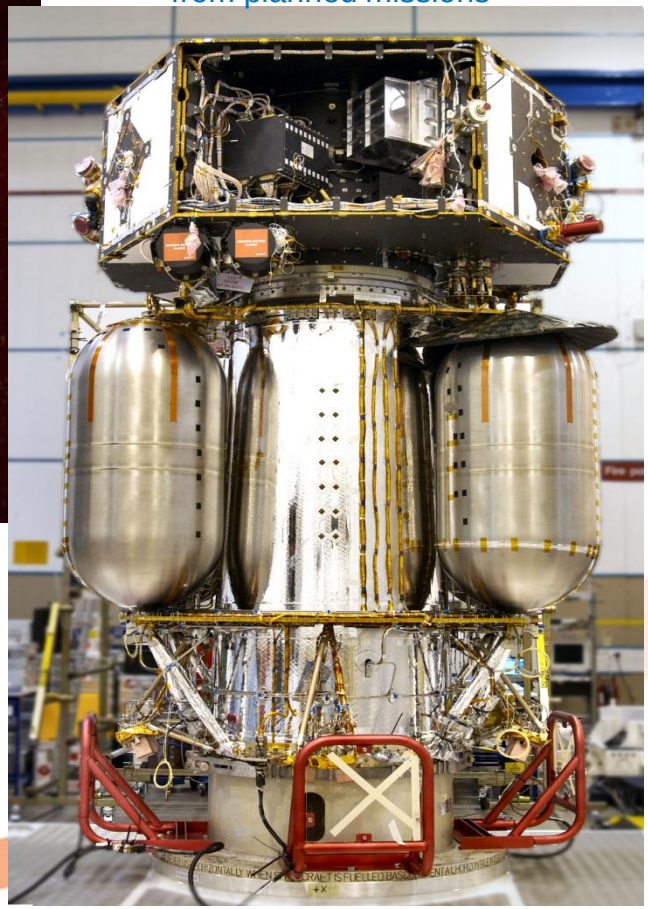


Early Phase Studies

Mission implementation



Inventing new science
from planned missions



LISA PATHFINDER => Testing Modified Gravity

How do Astrium & Imperial interact on science missions when funding lines are partitioned between spacecraft & instruments?

Still exists mutual dependence for ensuring feasibility

=> Astrium seeks to support mission proposals

And for achieving launch schedule & data quality

=> PhD sponsorships (e.g. magnetic cleanliness)

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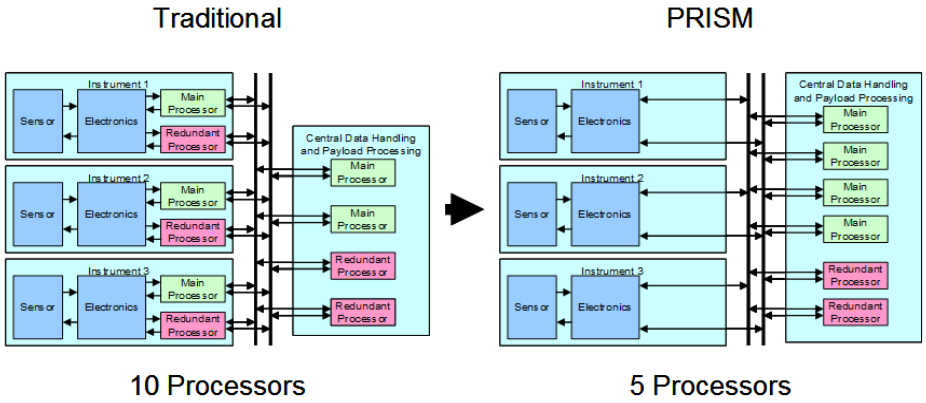
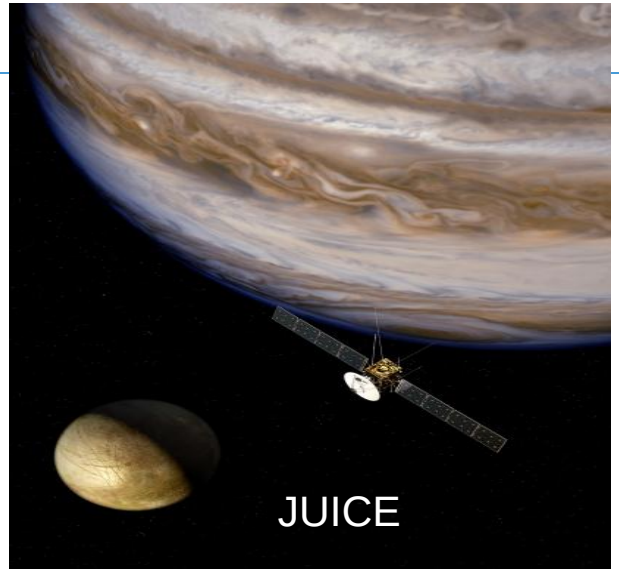
Instrument & spacecraft data processing architecture

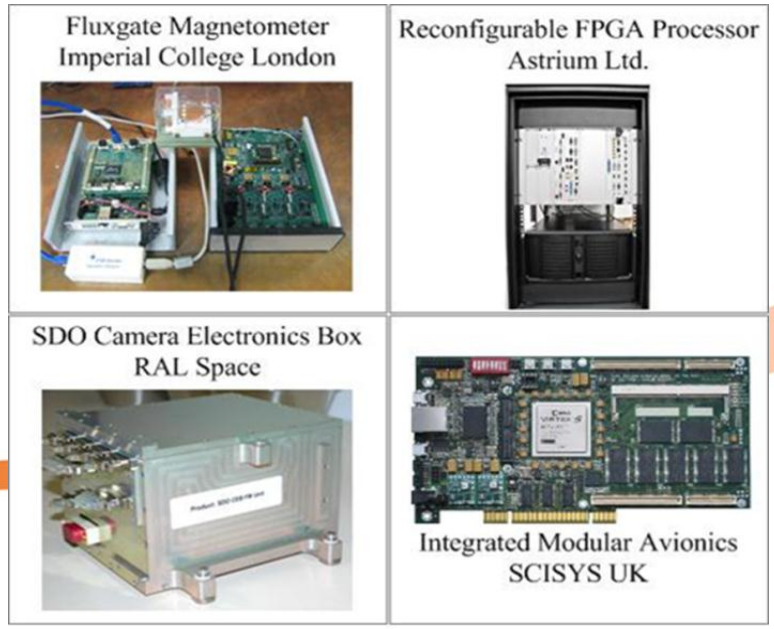
PRISM project





Now a demonstration project under UKSA's SpaceCITI programme

Based at Harwell
Using Imperial Fluxgate Magnetometer & RAL Space SDO camera



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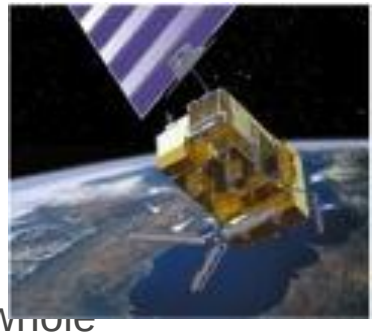
Space Innovation & Growth

Space Innovation and Growth



- The UK space sector:-
  - Currently has ~ £9.5bn annual turnover
  - Has grown at 10% pa over last decade
  - Employs 25,000 people directly and supports a further 70,000 jobs
  - Contributed 4x the GDP per worker than the UK average
  - Invests in R&D at 5% or 3x as R&D intensive as the economy as a whole
  - Has ~ 60% of workers at bachelor degree level or above
- The Space Innovation & Growth Strategy (IGS) sets out a vision
  - Ambition to grow the sector to £40bn or 10% of the global market by 2030
  - The majority of that growth is in the “downstream” applications and services derived from space data and infrastructure
  - Investment in space infrastructure is the enabler for downstream growth
  - All the major UK downstream success stories can trace their origins back to the upstream sector
- The UK Government has
  - Increased its investments in ESA substantially
  - Investing nationally in technology and applications

Space Innovation and Growth

- Astrium is part of the growth story
  - Planning to grow its footprint in the UK to at least a £2bn company by 2030 (i.e. doubling in size)
  - Although the bulk of the space sector growth will be in the downstream and driven by new entrants
  - Astrium provides the essential “critical mass” of enabling technologies and infrastructure
  - Astrium provides skills and man-power to fuel the space economy
  - Astrium implements graduate and apprentice development programmes
- Astrium is a space champion for the UK
  - Competes on a global stage in all our markets against the best in the world
  - Actively seeking to increase exports globally in an intensely competitive market
  - Pursuing numerous export campaigns and engaging with UKTI
  - Is an enabler for SMEs and other “downstream” applications and services industries