The Company
Astrium: part of EADS – a global leader in aerospace and defence
ASTRIUM: Facts & Figures 2012

Employees:
18,000

Turnover:
€5.8 billion

Order backlog:
€12.7 billion

CEO:
François Auque

Employees by country:

- France: 40%
- Germany: 27%
- UK: 20%
- Spain: 5%
- Netherlands: 2%
- Norway: 1.5%
- USA: 1.5%
- Others: 3%
Astrium: a global company with European roots
Astrium’s activities are based in three key areas to serve governmental and commercial markets

<table>
<thead>
<tr>
<th>Astrium Space Transportation</th>
<th>Astrium Satellites</th>
<th>Astrium Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>The European prime contractor for space transportation and orbital infrastructure</td>
<td>A world leader in the design and manufacture of satellite systems and ground segments</td>
<td>A global provider of end-to-end solutions for satellite communications and geo-information services</td>
</tr>
<tr>
<td>-Launchers</td>
<td>-Telecommunications Satellites</td>
<td>-Government Communications</td>
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<tr>
<td>-Defence</td>
<td>-Earth Observation, Navigation &amp; Science</td>
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<tr>
<td>-Orbital Systems &amp; Space Infrastructure</td>
<td>-Products</td>
<td>-Geo-information Services</td>
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<td>-Propulsion &amp; Equipment</td>
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</table>
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.
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
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**

Imperial Space Laboratory Launch – July 2013
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

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


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

PRISM project

Traditional

PRISM

Now a demonstration project under UKSA's SpaceCITI programme

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

Imperial Space Laboratory Launch – July 2013
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