Astrium

First ELIXIR School
Ottobrunn
30th of May to 2nd of June 2010
Astrium at work

- Access to space
- A safer world
- Daily life benefits
- Our Earth
- Exploring the Universe
- Man in space

The company
- Organization
- Satellite Projects
Astrium is a global space industry leader, with world-class expertise and extensive prime contractorship experience across all sectors of the space business.
Access to space

- Without launchers, no space activity would be possible

Astrium provides Europe with a full, flexible launch capability

- Ariane 5
- Soyuz
- Rockot
- Vega
A safer world

- Space systems have become key factors in defence and security systems. Astrium provides space-based defence systems, technologies and services

- Reconnaissance
- Secure communications systems
- Ballistic missiles
- Future space-based defence systems
Daily life benefits

- Space technology is very much a part of the fabric of our daily lives. Astrium offers its customers tailor-made solutions for every field of application

- Communications
- Navigation
- Geo-information
- Weather forecasting
Our Earth

- Earth observation from space has truly revolutionised how we view our home planet

Astrium is an established leader in Earth observation satellite systems and a key partner in major ESA and national European space agency programmes

- Radar systems
- Optical systems
Exploring the Universe

- From his earliest days, Man has been fascinated by the stars above

Astrium’s technology enables us to explore the solar system and the secrets of the Universe

- Earth & Sun
- Planetary missions
- The wider Universe
Man in space

- The International Space Station (ISS) is an uplifting example of international co-operation and ambition not only for advances in space technology and engineering, but also for all kinds of scientific research.

Astrium is leading the European contribution to this project and was selected by ESA as prime contractor for major elements:

- Columbus laboratory
- Automated Transfer Vehicle ATV
- Operation & utilisation
Astrium is passionate about space!
Astrium at work

The company
- Basics
- Facts & figures
- Our sites
- Core activities

Organization
Satellite Projects
Astrium: part of EADS, a global leader in aerospace and defence
Facts & Figures 2009

Employees: 15,000
Sites: F, G, UK, S, NL
Turnover: €4.8 billion
Order backlog: €14.7 billion
CEO: François Auque

Employees per country

- France 42%
- Germany 27%
- UK 22%
- Spain 5%
- Netherlands 1%
- Others 3%
Astrium: the heritage and expertise of the leading European space nations

France
- Limeil-Brévannes (Sodern)

Germany
- Backnang (Tesat)
- Potsdam (Infoterra)

UK
- Colerne (Paradigm)
- Corsham (Paradigm)
- Farnborough (Infoterra)
- Guildford (SSTL)
- Hawthorn (Paradigm)
- Leicester (Infoterra)
- Newcastle (Infoterra)
- Oakhanger (Paradigm)

Spain
- Barcelona (Infoterra)

Saudi Arabia
- Riyadh (GPT)
Astrium is a global space industry leader, with unrivalled world class expertise
Astrium’s activities are based in three key areas

Astrium Space Transportation
The European prime contractor for civil and military space transportation and manned space activities

Astrium Satellites
A world leader in the design and manufacture of satellite systems

Astrium Services
At the forefront of satellite services in the secure communications, Earth observation and navigation fields
Astrium at work
The company

Organisation
- Astrium Space Transportation
- Astrium Satellites
- Astrium Services

Satellite Projects
Astrium: an integrated company

Central Functions

Astrium

Space Transportation

Satellites

Services

Corporate Secretary
Chief Technical Officer
Chief Financial Officer
Human Resources
Strategy & Business Development
Institutional Relations
Communications & Public Relations
Astrium Space Transportation

- The European prime contractor for space transportation, orbital infrastructure and manned space

CEO: Alain Charmeau

**Business Divisions:**

- Launchers
- Defence
- Orbital System & Space Exploration
- Propulsion & Equipment
Astrium Services

- A provider of satellite services in the secure communications, Earth observation and navigation fields

CEO: Eric Béranger

Business Divisions:

- Telecom Services
- Navigation Services
- Earth Observation Services
- Secure Satcom Systems
A world leader in the design and manufacture of satellite systems

CEO: Evert Dudok

Business Divisions:

- Earth Observation & Science
- Navigation
- Subsystems, Equipment & Operations
- Telecom Satellites
Astrum at work
The company
Organisation

Satellite Projects

- Operational Mission
- Current Satellite Projects
Satellite Projects at Astrium
Operational Missions – Earth Observation

- ERS II
- Envisat
- Champ
- Grace
- MetOp-Payload Module
- TerraSAR-X
- GOCE
Satellite Projects
EOS in Orbit Status: Observation Satellites

Earth Observation Satellites - 162 years accumulated in orbit
Prime contractor of 25 satellites
Satellite Projects at Astrium
Operational Mission – Science:

- Ulysses
- Cluster
- Huygens
- Rosetta
- XMM
- Herschel
Satellite Projects
EOS in Orbit Status: Science Satellites

Science & Exploration Satellites – 87 years accumulated in orbit
Prime contractor of 18 satellites
Satellite Projects
EOS in Orbit Status: Optical Instruments

Instrumentation – 276 years accumulated in orbit
Prime contractor of 30 instruments
Satellite Projects
EOS in Orbit Status: Radar Instruments

Radar Instrumentation – 38 years accumulated in orbit
Astrium at work
The company
Organisation

Satellite Projects

- Operational Mission
- Current Satellite Projects
Satellite Projects at Astrium
Current Satellite Projects Overview

- Earth Observation:
  - Cryosat 2
  - TanDEM-X
  - Aeolus
  - MetOp
  - SWARM
  - MSG-2, -3, -4
  - Sentinel-2
  - EarthCARE
Satellite Projects at Astrium
Current Satellite Projects Overview

- **Science:**
  - LISA Pathfinder
  - Gaia
  - BepiColombo

- **Instruments:**
  - NIRspec
  - LTP Instrument
  - Kompsat 3, Kompsat 3A
  - Sentinel-1 C-Band Radar
Current Satellite Projects – E/O
Meteorology: Meteosat Second Generation (MSG 1-4)

Mission: Meteorology & climate observation from GEO; 4 satellites
Customer: EUMETSAT via ESA contract (Alcatel Prime)
Mass: Launch mass 2035 kg (MSG2)
Orbit: Geostationary
Astrium Role: AEF Instrument Prime, AED Propulsion, AOCS & Power System; Structure and Telescope of SEVIRI Instrument

Status:
MSG 1+2: in orbit
MSG 3: in storage
MSG 4: it is planned to enter storage in 2010
Current Satellite Projects – E/O
Meteorology: MetOp

Mission: Meteorology & climate observation from polar orbit; measurement of ozone layer; 3 satellites
Customer: SSST (EUMETSAT via ESA contract)
Mass: 4.086 kg
Orbit: 820 km SSO, LTDN 10:30
Astrium Role: AEF mission prime,
AED PLM Prime, ASCAT, GRAS

Status:
PLM 1: in storage / maintenance
PLM 2: in orbit since 19.10.2006
PLM 3: in storage / maintenance
## Current Satellite Projects – E/O

### Earth Explorer Opportunity Mission: Cryosat 2

<table>
<thead>
<tr>
<th><strong>Mission:</strong></th>
<th>Measurement of ocean &amp; land ice thickness variations in polar regions. Altitude resolution 2–5 cm, spatial resolution 280 m</th>
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<tbody>
<tr>
<td><strong>Customer:</strong></td>
<td>ESA</td>
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<tr>
<td><strong>Launch:</strong></td>
<td>08.04.2010</td>
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<tr>
<td><strong>Mass:</strong></td>
<td>720 kg</td>
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<tr>
<td><strong>Orbit:</strong></td>
<td>720 km polar Orbit (no SSO, i=92°)</td>
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<td><strong>Astrium Role:</strong></td>
<td>AED Satellite Prime</td>
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**Status:**
- Rebuilt of Cryosat after failure of launcher
- Spacecraft in final check-out

**FAR:** 13.11.2009
Mission: provide the best ever survey of the geomagnetic field and its temporal evolution, and gain new insights into improving our knowledge of the Earth’s interior and climate.

Customer: ESA
Launch: early 2012
Mass: 500 kg
Orbit: 3 S/C;
    single sat: 530 km;
    pair sats: 450 km;
    drifting polar orbit; i=87,6°

Astrium Role: AED Satellite Prime

Status:
Phase C/D
CDR successfully passed on April 2009
FM1 and FM2 integration on-going
Current Satellite Projects – E/O
Earth Explorer Core Mission: AEOLUS

Mission: The Earth Explorer Atmospheric Dynamics Mission (ADM-Aeolus) will provide global observations of wind profiles from space to improve the quality of weather forecasts, and to advance our understanding of atmospheric dynamics and climate processes.

Customer: ESA
Launch: end 2011
Mass: 1200 kg
Orbit: 405 km, SSO, dawn-dusk
Astrium Role: AEU Mission Prime

AED Electrical Systems

Status: Platform activities close to completion. Afterwards platform will be put into storage until availability of flight instrument.
Current Satellite Projects – E/O
Earth Explorer Core Mission: EarthCARE

Mission: EarthCARE (Earth Clouds, Aerosols and Radiation Explorer) addresses the need for a better understanding of the interactions between clouds, aerosols and radiation. There are still large deficiencies in the representation of clouds, aerosols and radiative transfer in atmospheric models - the source of large uncertainties in predicting climate change.

Customer: ESA
Launch: 2014
Mass: 2000 kg
Orbit: 393 km SSO; LTDN 14:=0
Astrium Role: AED Satellite Prime with AEU involved in platform elements

Status:
System PDR (End of Phase B) October 2009
Current Satellite Projects – E/O
GMES: Sentinel 1

Mission: GMES C-Band SAR Operational Mission:
- Monitoring of sea ice zones,
- Surveillance of marine environment,
- Mapping of land surfaces,
- Mapping in support of humanitarian aid
  and in crisis situations;
- „high performance“ SAR mission compared
to ERS 1, ERS 2 and Envisat

Customer: ESA/EU (Thales Alenia Space Italy Prime)
Launch: 2013 (Soyuz)
Mass: 2.300 kg
Orbit: 692 km, SS, dusk-dawn
Astrium Role: AED SAR Instrument Prime
AEU SAR Electronic

Status: SAR Instrument CDR April 2010
Current Satellite Projects – E/O
GMES: Sentinel 2

Mission: GMES superspectral Mission
Global land mission for mapping, monitoring and security
Wide 290 km swath with high resolution (10-60m),
13 VNIR/SWIR bands 0.4-2.4 mm
Landsat/SPOT type of mission
2 satellites in baseline

Customer: ESA/EU
Launch: 2013
Mass: ca. 1.100 kg
Orbit: ca. 800 km, SSO, LTDN 10:30
Astrium Role: AED Satellite Prime
AEF Instrument Prime

Status:
PDR in Nov 2008
Phase CD since 2009
Current Satellite Projects – E/O

DLR: Tandem-X

Mission: TanDEM-X is a rebuild of TerraSAR-X – both satellites will perform bistatic SAR interferometry while flying in a close tandem constellation – mission goal is to create a global Digital Elevation Model (DEM) of unprecedented accuracy

Customer: DLR
Launch: 21.06.2010 (Dnepr)
Mass: 1.320 kg
Orbit: 514 km, SSO, dusk-dawn
Astrium Role: AED Satellite Prime, Launch- & In-orbit commissioning service

Status:
Environmental Tests / FAR successfully completed
Pre-Shipment Review on 25.03.2010
Current Satellite Projects – Science

GAIA

Mission: Global space astrometry
(map of our galaxy with more than 1000 million stars)

Customer: ESA (AEF as Prime)

Launch: June 2012 (Soyuz Fregat)

Mass: 1.940 kg

Orbit: Lagrange Point 2
(Sun – Earth System)

Astrium Role: AEF Prime & Payload & AIT
AED Mechanical Package
(incl. thermal & propulsion)
AEU Electrical Package

Status:
• Start of AIT Phase July 09
• CDR 15.06.2010
Current Satellite Projects – Science
BepiColombo

Mission: BepiColombo will provide the most complete exploration yet of Mercury. Two orbiters, one (MPO) will map the planet, the other (MMO) will investigate its magnetosphere. (The MMO will be provided by JAXA)

Customer: ESA
(first ESA mission in co-operation with Japan)

Launch: August 2014

Astrium Role: AED Satellites Prime
AEU Mechanical Propulsion Bus
AEF AOCS analyses & CSW

Status:
• Definition phase 2001 – 2005
• Start of Phase B2/C/D on Nov. 2006
• PDR successfully passed on 06/2009
Current Satellite Projects – Science
NIRSPEC (James Webb Telescope – JWST)

Mission: Study the origin and evolution of galaxies, stars and planetary systems Optimized for infrared observations (0.6 – 28 µm)

Customer: ESA / NASA
Launch: mid 2014
Orbit: L2
Astrium Role: AED Instrument Prime

Status:
• Instrument level and subsystem level CDR passed
• Instrument Development model completed and delivered
• FM integration ongoing
• Instrument delivery early 2011
Current Satellite Projects – Science
LISA Pathfinder and LISA Technology Package

Mission: LISA Pathfinder
Customer: ESA / DLR
Launch: 2013
Orbit: Lagrange Point 1 (Sun – Earth System)
Astrium Role: AED Instrument (LTP) Prime
AED Instrument operations prime
(Drag-free Control)

Status:
• Implementation Phase
• FM integration started
• Instrument delivery to LPF in October 2011
Astrium provides all the space you need for science