

# *The TerraSAR-X Mission: A German Public-Private Partnership Undertaking*

Rolf Werninghaus

TerraSAR-X Project Manager, DLR



Deutsches Zentrum  
für Luft- und Raumfahrt e.V.

EUSAR2006

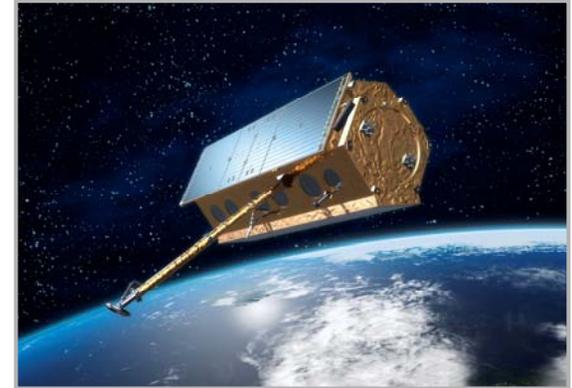
# Agenda

- Introduction
- Public-Private-Partnership
- Mission Design
- Data Availability
- Project Status
- Outlook

# Introduction

- National, German Radar-Satellite
  - High geometric resolution
  - Flexible operational modes
  - Multi-Polarisation → high information content
- Scientific and commercial Applications
  - cartography and planning
  - agriculture and forestry
  - environment
  - risk management and security
  - geology, mining and exploration
- Launch: October 2006

TERRA SAR X



**SRTM**



**SIR-C/X-SAR**

# Public-Private Partnership



TerraSAR-X is the first space-mission in Germany to be implemented in a public-private partnership scheme

➤ Cooperation Agreement (PPP-contract)

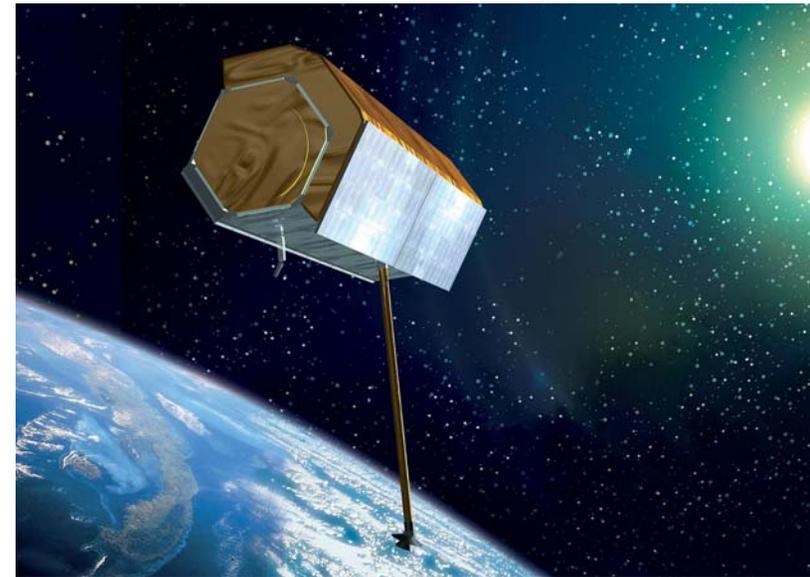
➤ DLR ↔ EADS Astrium GmbH



➤ Scientific Exploitation



➤ Commercial Exploitation



# Public-Private Partnership (2)

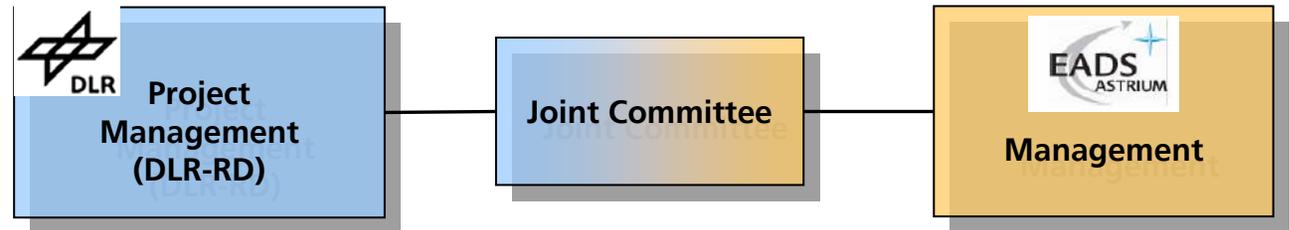


- Cooperation-agreement defines the tasks and obligations of DLR and EADS Astrium:
  - EADS Astrium GmbH contributes funds for implementing TerraSAR-X
  - Exclusive commercial exploitation rights for EADS Astrium GmbH / Infoterra GmbH
  - DLR coordinates the scientific utilization of TerraSAR-X Data
  - Satellite tasking will be shared equally 50/50 (scientific/commercial)
  - In case of conflict commercial order will have priority
  - DLR is the owner of all TerraSAR-X data

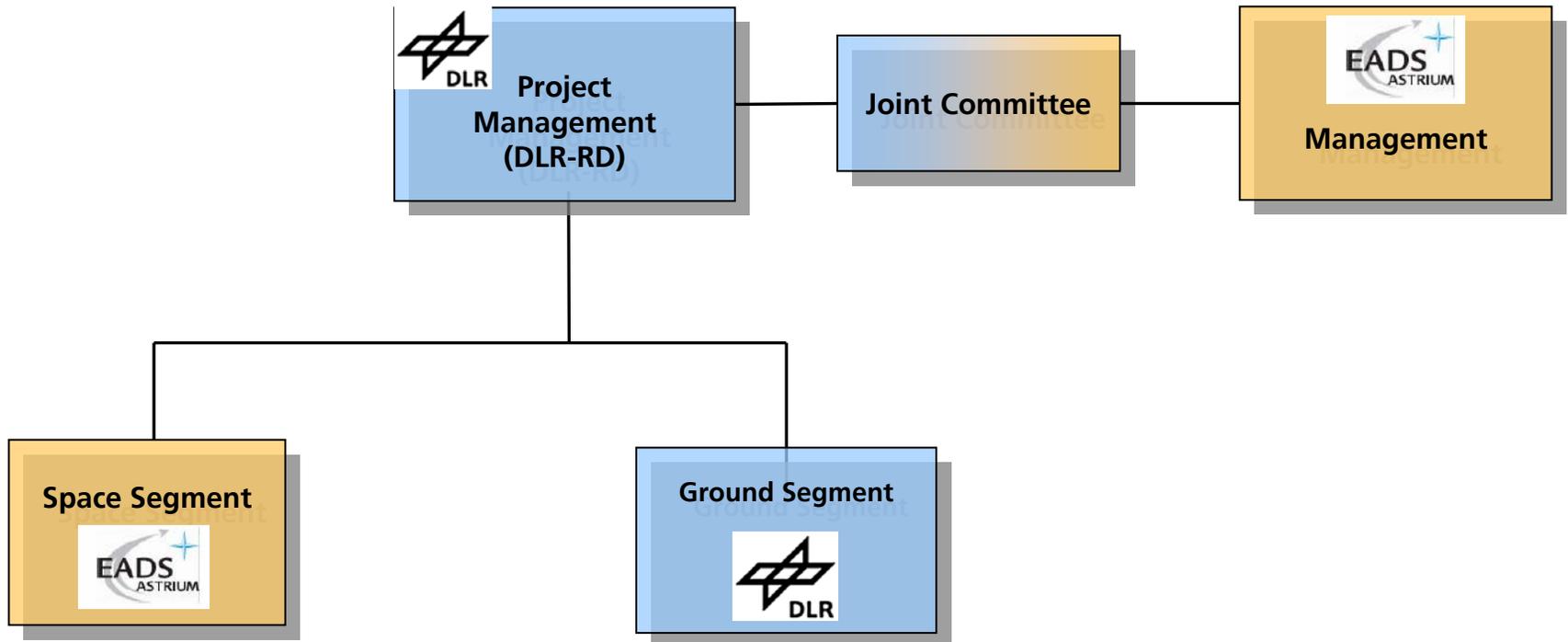


- If commercially successful → TerraSAR-X2 (to be financed by industry)

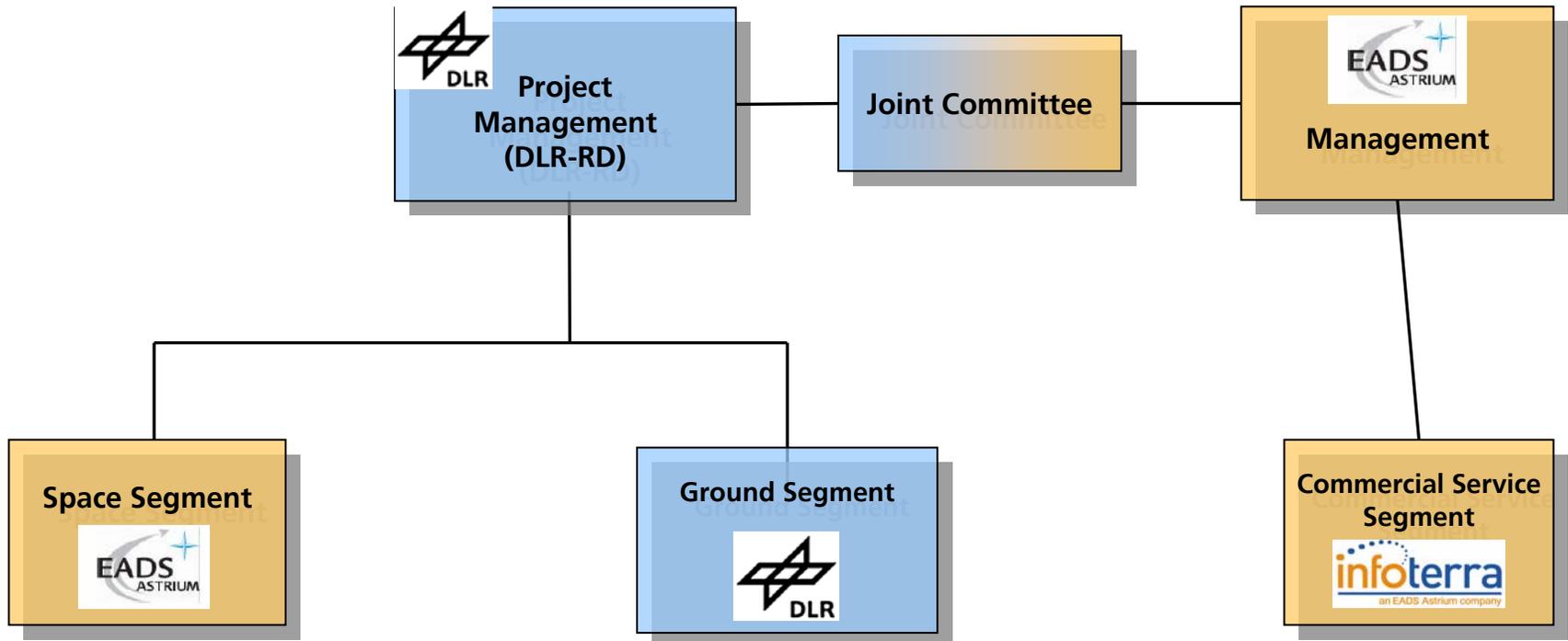
# TerraSAR-X Project Organization



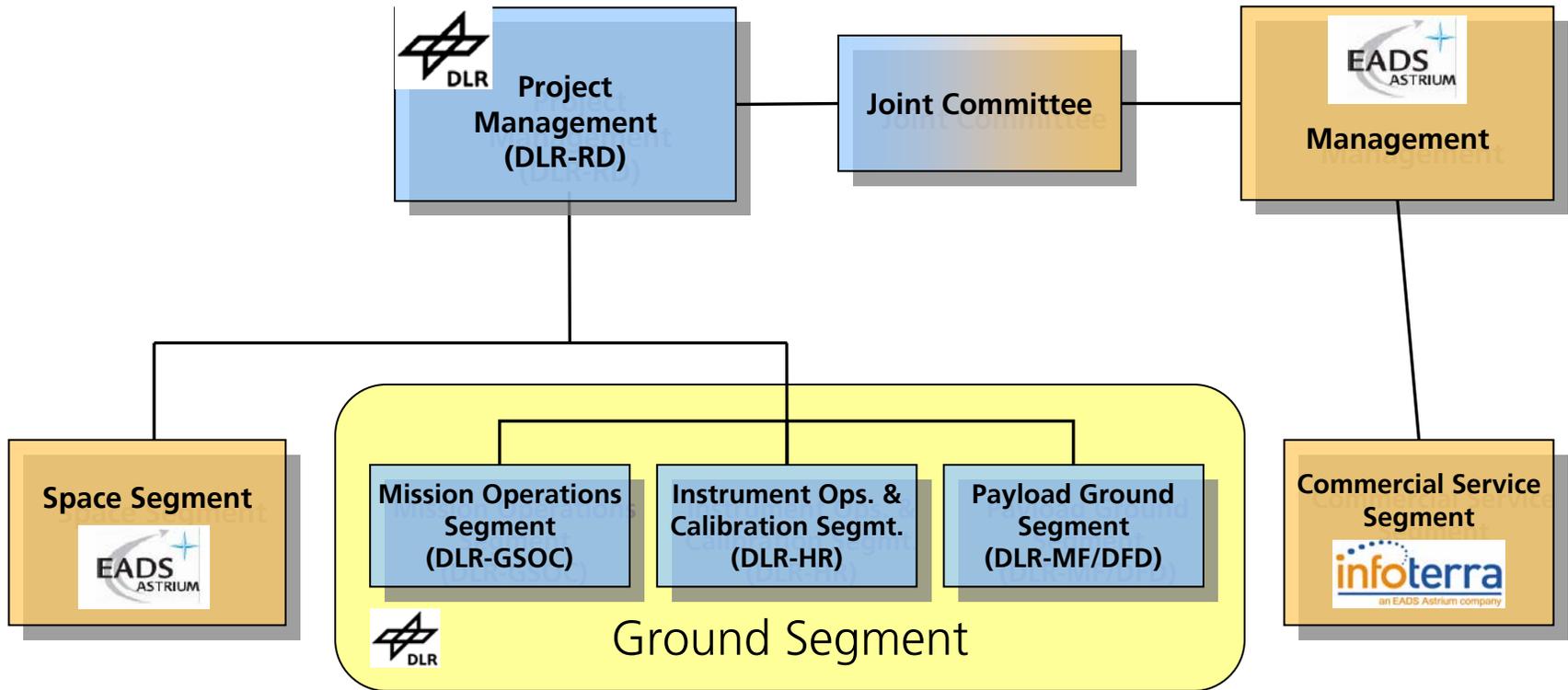
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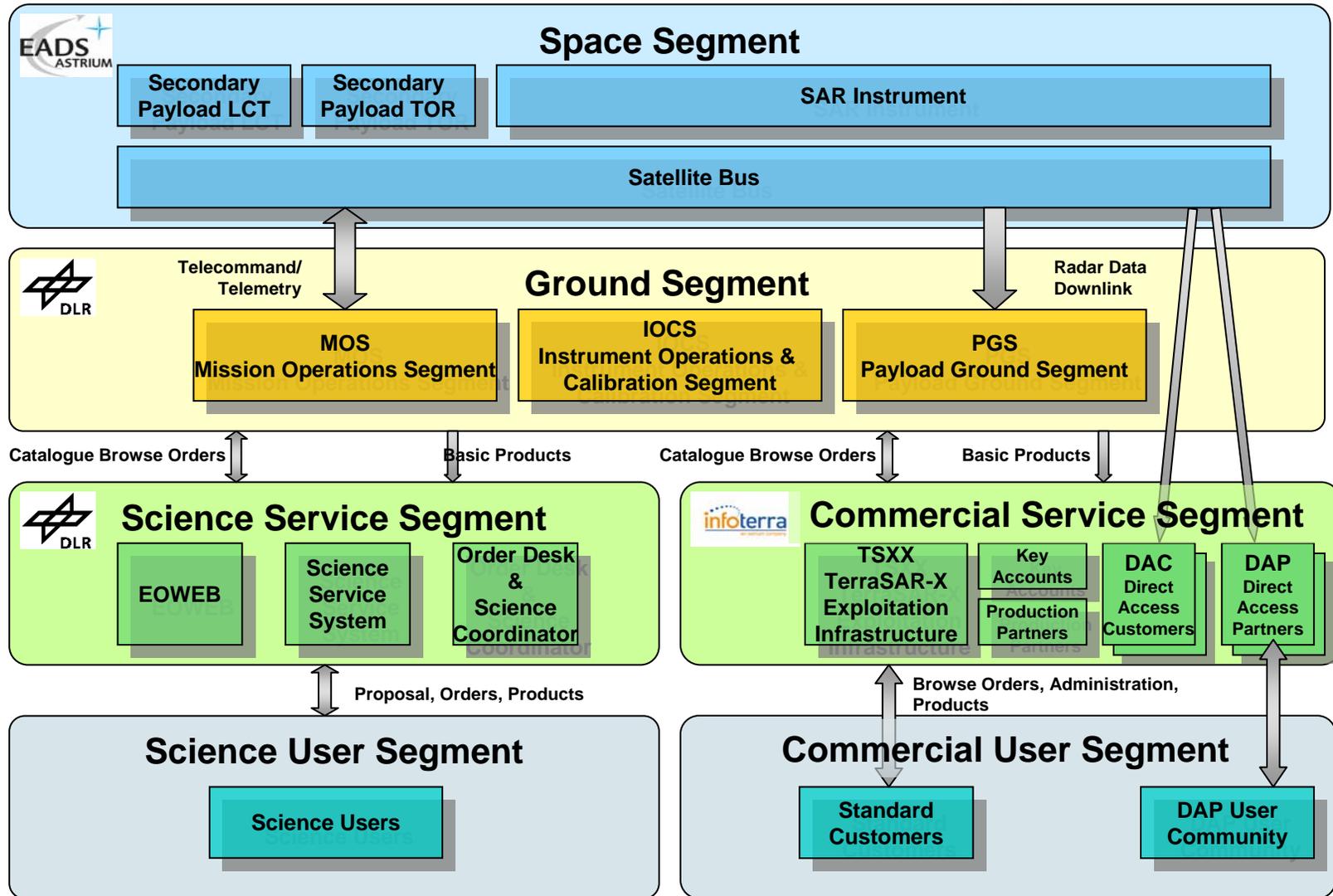
# TerraSAR-X Project Organization



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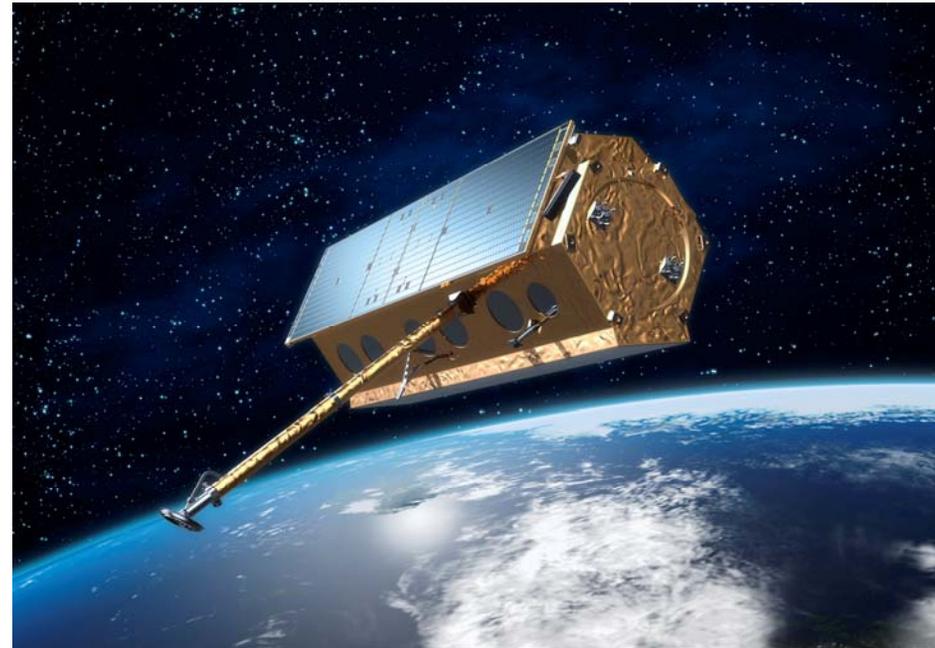
# TerraSAR-X System



# TerraSAR-X Features



- High resolution in SpotLight mode
- Possibility of large area coverage by utilizing ScanSAR mode
- Multi-polarization capability
- Left Looking Mode (Roll of S/C)
- Dual Receive Antenna Mode (ATI, MTI)
- Repeat Pass Interferometry (250m orbit tube)
- Prepared for TanDEM operation (synchronization)



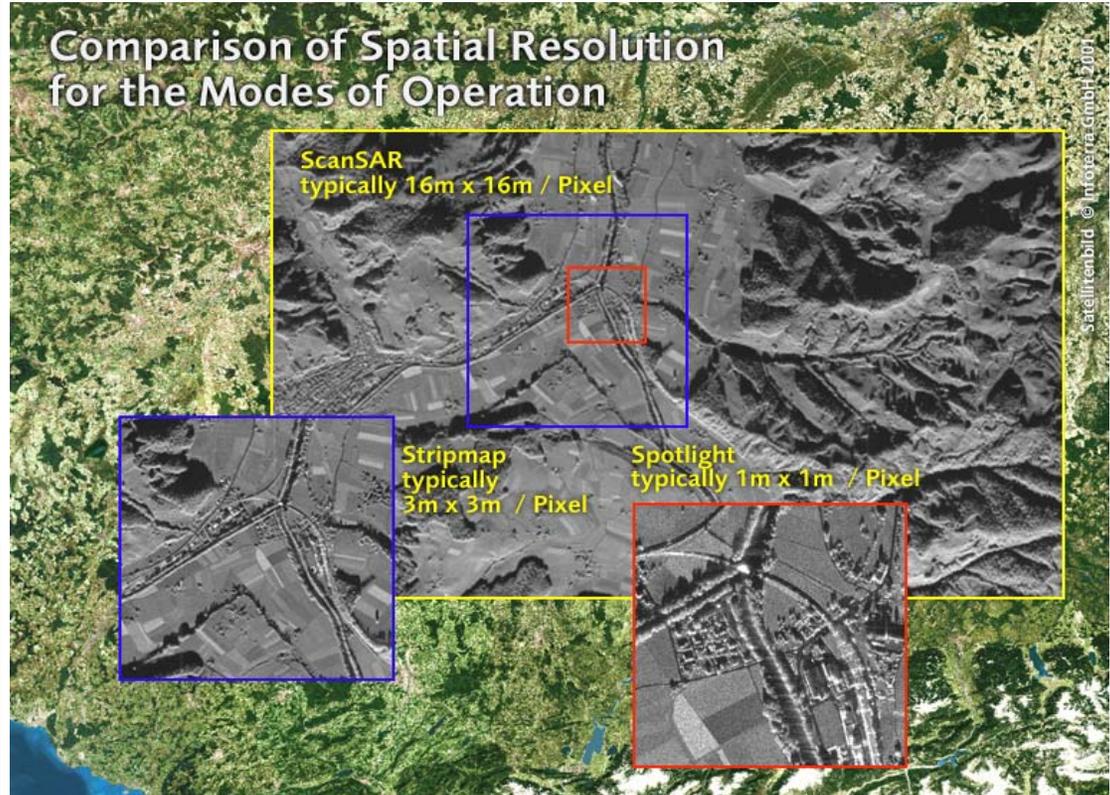
# Imaging Modes

- Stripmap Mode
  - 30 km swath width
  - 3 m resolution

- ScanSAR Mode
  - 100 km swath width
  - 16 m resolution

- Spotlight Mode
  - 5 km x 10 km scene
  - 1 m resolution

## Comparison of Spatial Resolution for the Modes of Operation

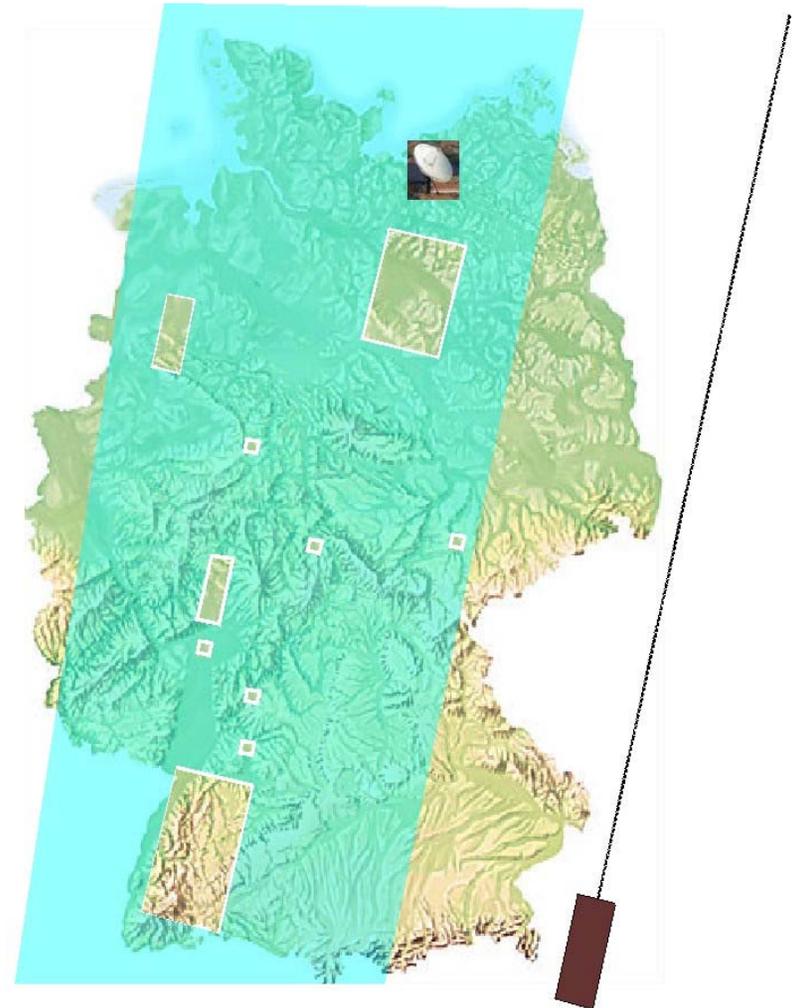


- Dual Receive Antenna Mode
  - Along-Track Interferometry, Moving Target Identification

# TerraSAR-X: high operational flexibility



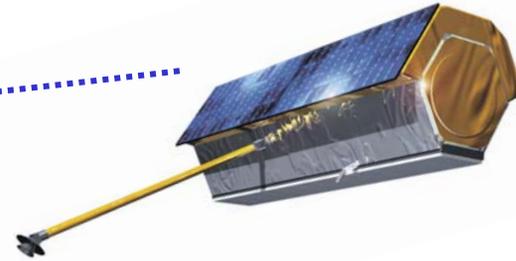
- Very fast change between different imaging modes and target areas
- Simultaneous imaging and data downlink possible
- Secure operation by encryption of commands and data downlink



# TerraSAR-X Mission-Design



514 km Orbit



Launch: October 31, 2006



DNEPR-1



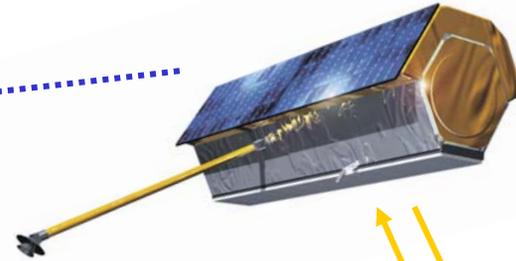
# TerraSAR-X Mission-Design



514 km Orbit



DNEPR-1



Command & Telemetry



Mission Control Center Oberpfaffenhofen

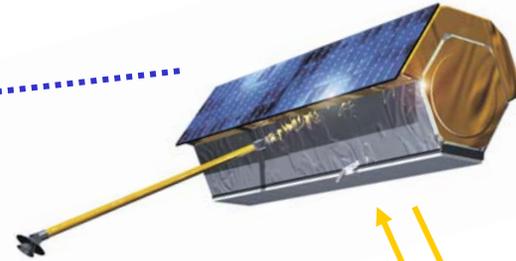
# TerraSAR-X Mission-Design



514 km Orbit



DNEPR-1



Instrument Data

Command & Telemetry



Mission Control Center Oberpfaffenhofen

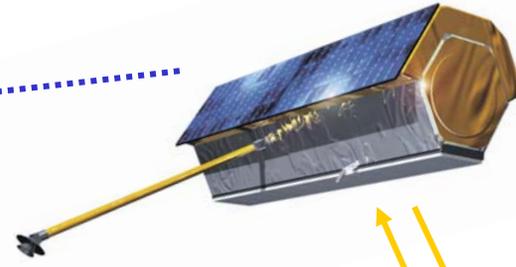
# TerraSAR-X Mission-Design



514 km Orbit



DNEPR-1



Instrument Data

Command & Telemetry



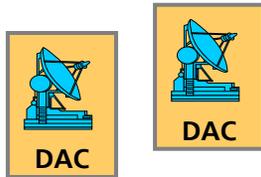
# TerraSAR-X Mission-Design



514 km Orbit

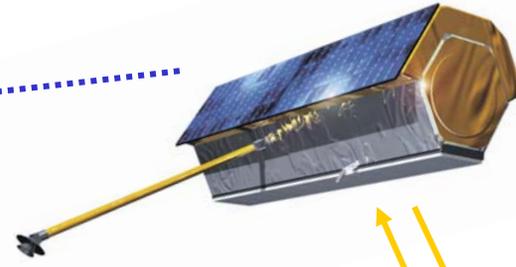


DNEPR-1



DAC

DAC



Instrument Data

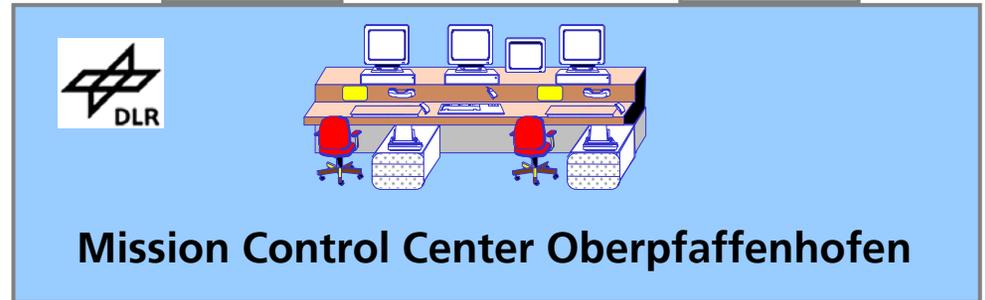
Command & Telemetry



Groundstation  
Neustrelitz



Groundstation  
Weilheim



Mission Control Center Oberpfaffenhofen

# Data availability

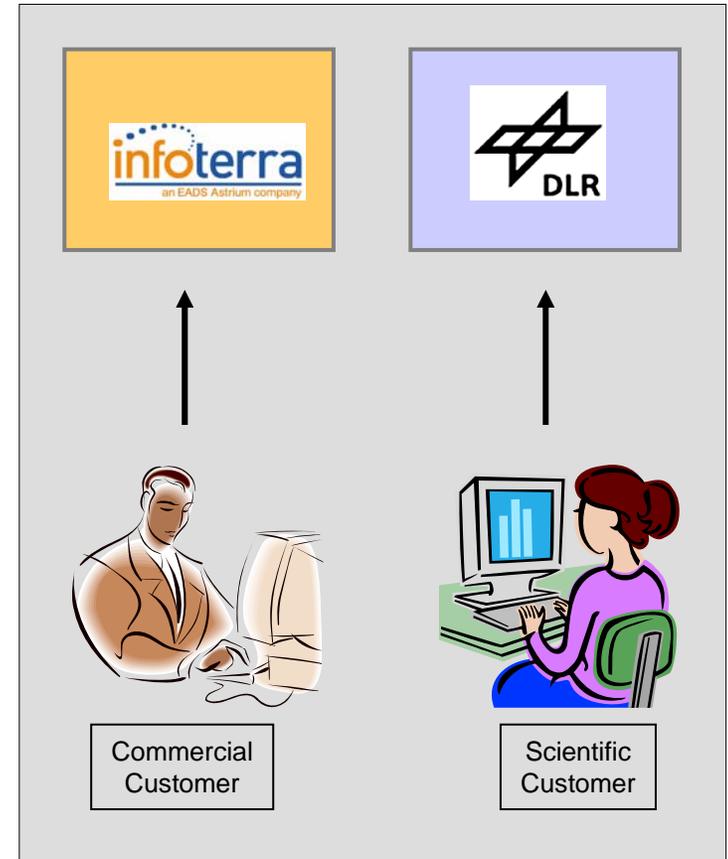


## Scientific Data:

- DLR is in charge of coordinating the scientific use of the TerraSAR-X data
- Data will be generally provided via a Announcement of Opportunity (AO)
- The pre-launch AO has already been released
- Data will be provide for COFUR-cost (cost of fullfilling the user request)
- License agreement is required

## Commercial data:

- Commercial Customers will receive data via Infoterra GmbH
- Market price will be determined by Infoterra GmbH



[http://www.eid.dlr.de/tsx/start\\_en.htm](http://www.eid.dlr.de/tsx/start_en.htm)

# Security Considerations



TerraSAR-X data are regarded as highly sensitive due to their high information content

- German „data security law“ in preparation
- Satellite commanding and SAR-data will be encrypted
- Customer authentication and authorization is required
  - „Sensitivity check“ for every order
    - „Who is ordering ?“
    - „What type of data ?“
    - „Which target area ?“
- License agreement for use of data

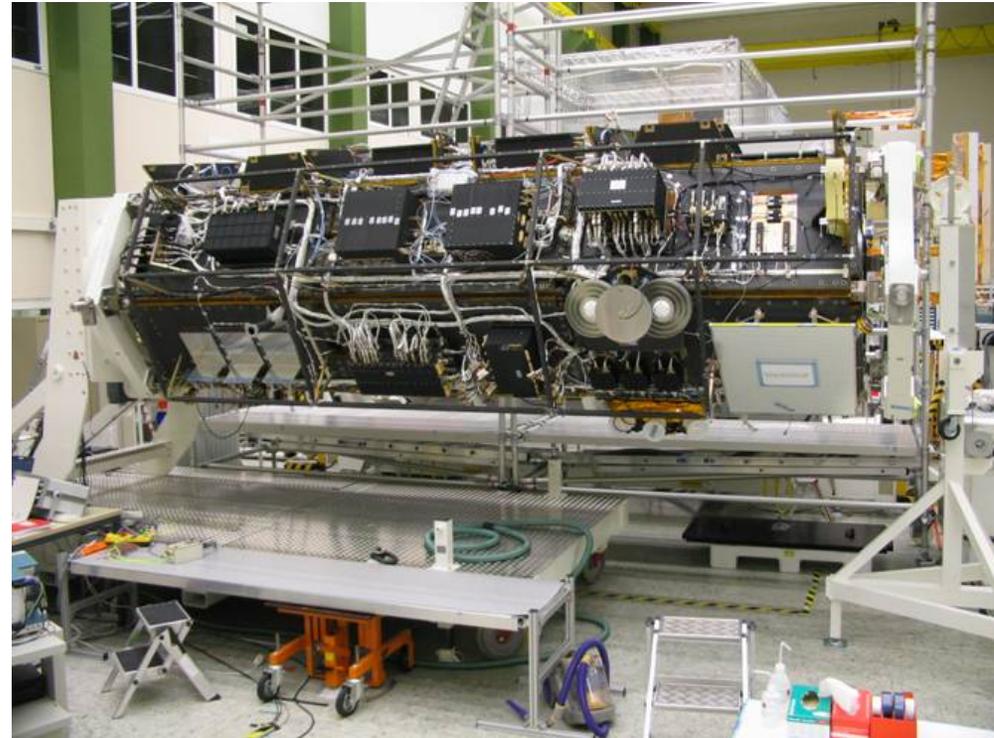


# Project Status

- TerraSAR-X project has been initiated in 2001
- Satellite integration (almost) completed
- Satellite has just been released for environmental testing
- Shipment to IABG early June
- Final Acceptance Review scheduled for early September



Launch:  
October 31, 2006



# Project Status (2)

- Shipment to Baikonur end of September
- Ground Segment in Verification Phase
- GS Readiness Review in September
- 5 months Commissioning Phase after launch
  - Check-out of satellite bus
  - Check-out of SAR-instrument
  - Calibration activities
- Fully operational by April 2007



Launch:  
October 31, 2006

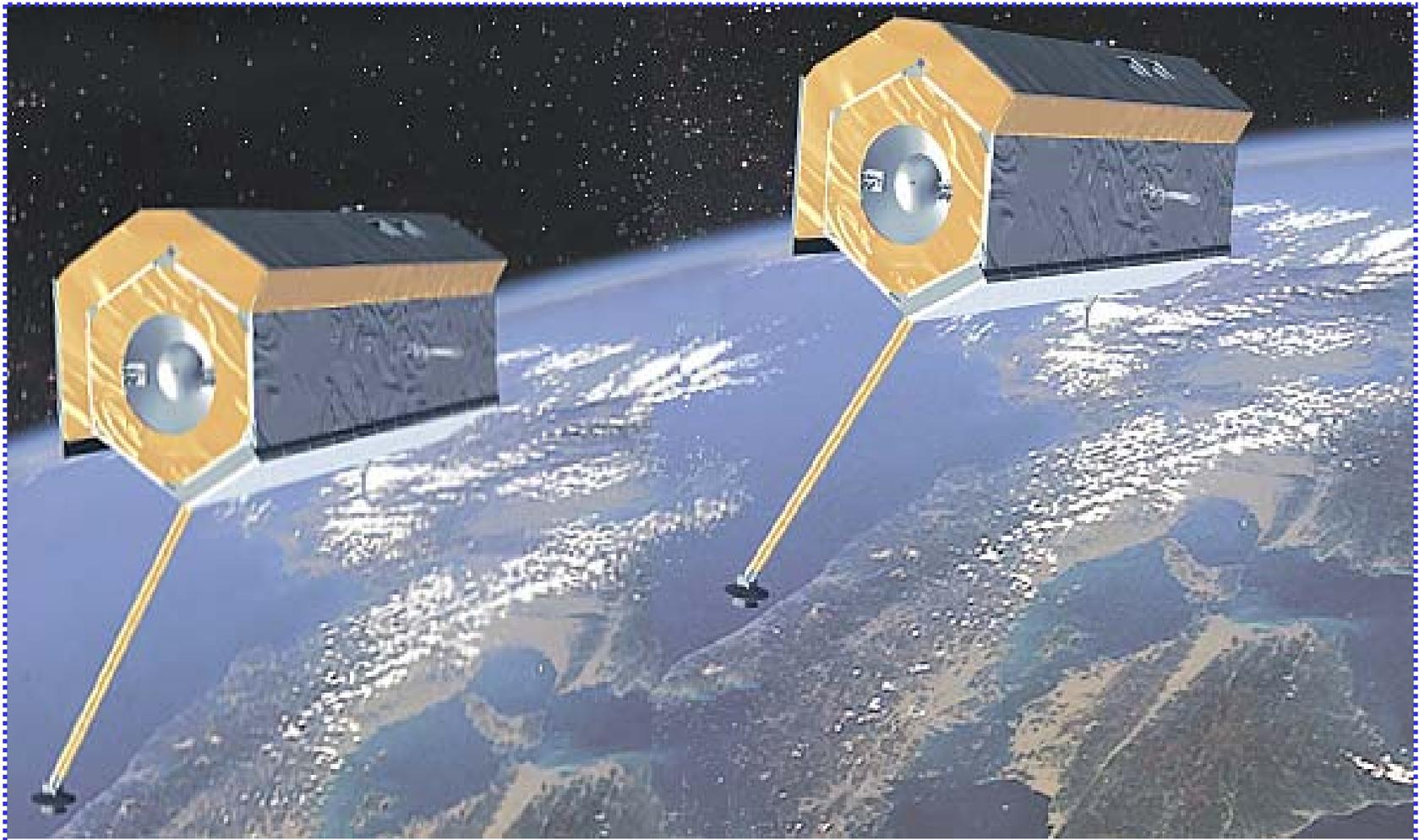


# TerraSAR-X Vision



- The only thing more useful than TerraSAR-X ...

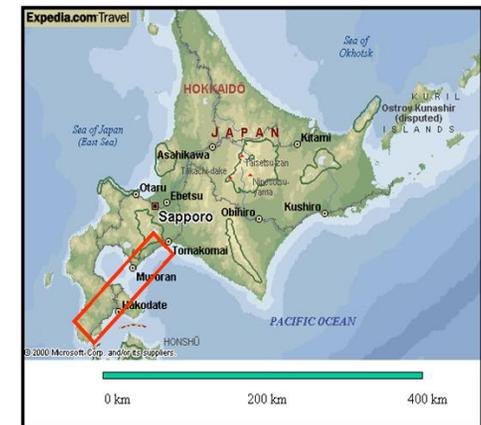
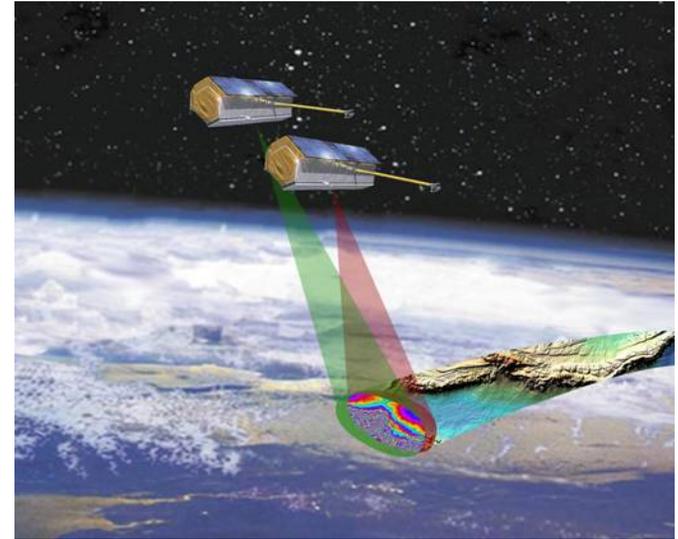
# TanDEM-X Mission



- **The only thing more useful than TerraSAR-X ... is two of them.**

# TanDEM-X

- TanDEM-X main mission objective is to generate a high precision, global Digital Elevation Model (DEM)
- TanDEM-X is a national SAR interferometry mission employing
  - the TanDEM-X satellite as a rebuild of TerraSAR-X
  - TSX-1 to form the tandem constellation
- Planned launch early 2009
- TanDEM-X Public Private Partnership (PPP) model amending the TerraSAR-X PPP scheme



TERRA SAR X

