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

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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
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

- Project Management (DLR-RD)
- Joint Committee
- Management
TerraSAR-X Project Organization
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Project Management (DLR-RD) -> Joint Committee

Space Segment
- Mission Operations Segment (DLR-GSOC)
- Instrument Ops. & Calibration Segment (DLR-HR)
- Payload Ground Segment (DLR-MF/DFD)

Ground Segment

Management
- EADS ASTRIUM

Commercial Service Segment
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

- **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
TerraSAR-X Mission-Design

514 km Orbit

Command & Telemetry

Instrument Data

Groundstation Neustrelitz

Groundstation Weilheim

Mission Control Center Oberpfaffenhofen

DNEPR-1

DLR
TerraSAR-X Mission-Design

- TerraSAR-X Mission
- Mission Control Center Oberpfaffenhofen
- 514 km Orbit
- DNEPR-1
- Instrument Data
- Command & Telemetry
- Groundstation Neustrelitz
- Groundstation Weilheim
- Mission Control Center Oberpfaffenhofen

DLR Deutsches Zentrum für Luft- und Raumfahrt e.V.
TerraSAR-X Mission-Design

514 km Orbit

Command & Telemetry

Instrument Data

Groundstation Neustrelitz

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Mission Control Center Oberpfaffenhofen

DNEPR-1

DAC

DAC

DLR

infoterra
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
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