

# **DLR - The Year Ahead in Space R&D Space Program**

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**Deutsches Zentrum  
für Luft- und Raumfahrt e.V.**  
in der Helmholtz-Gemeinschaft

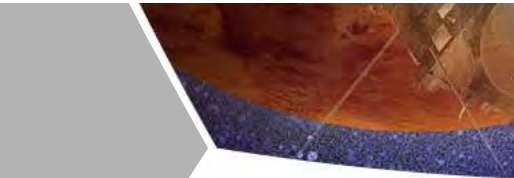
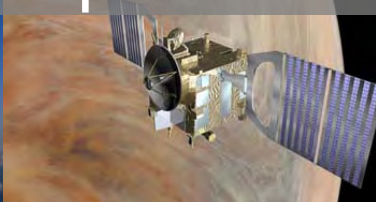
Aeronautics

Space

Energy

Transport

Security



**Research Center  
&  
German Space Agency  
&  
Project Management Office**

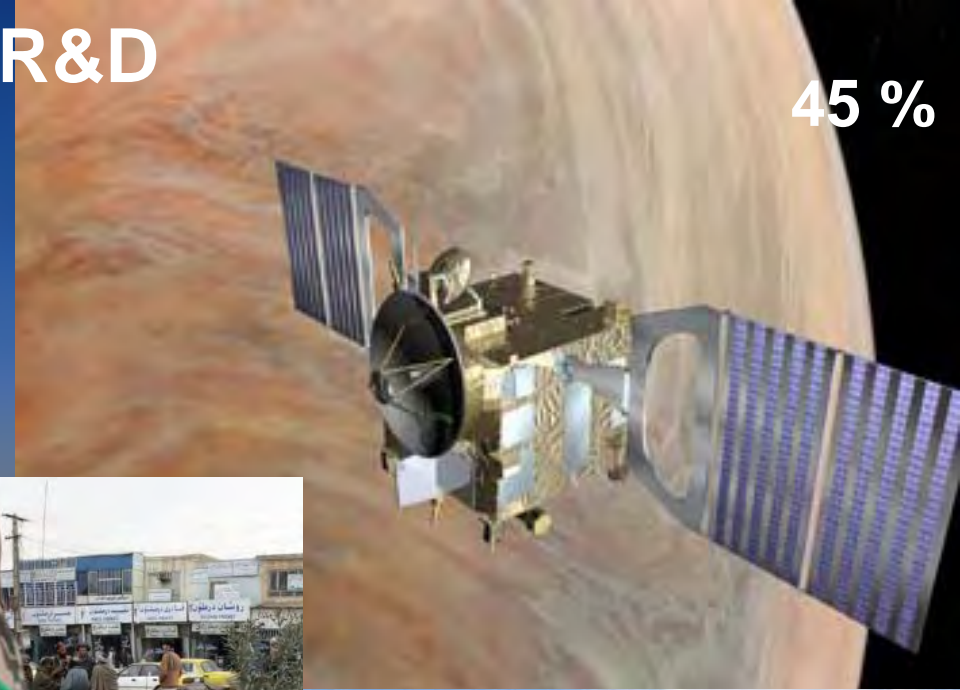


# DLR R&D

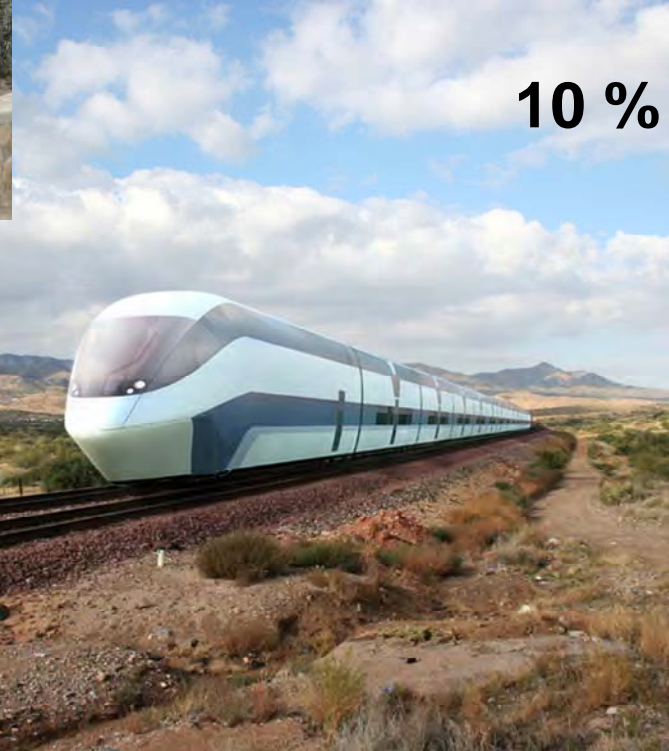
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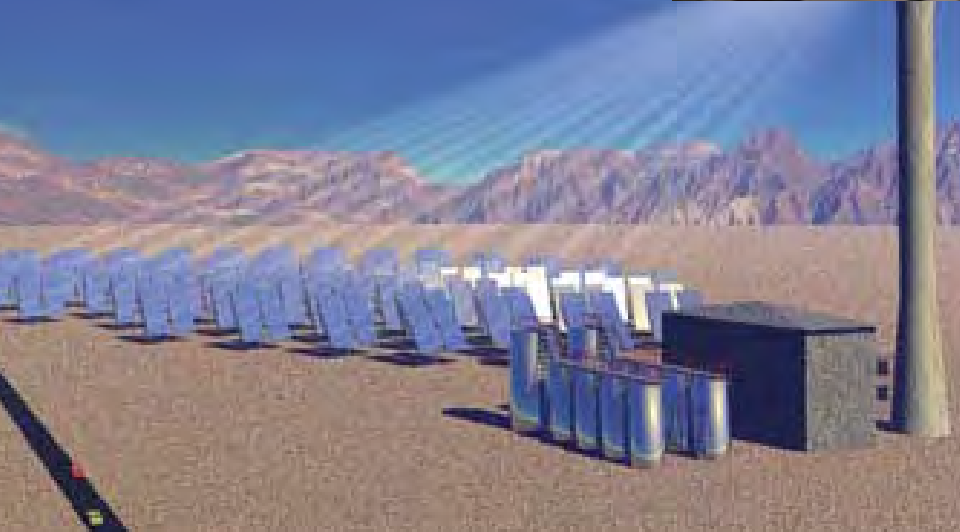
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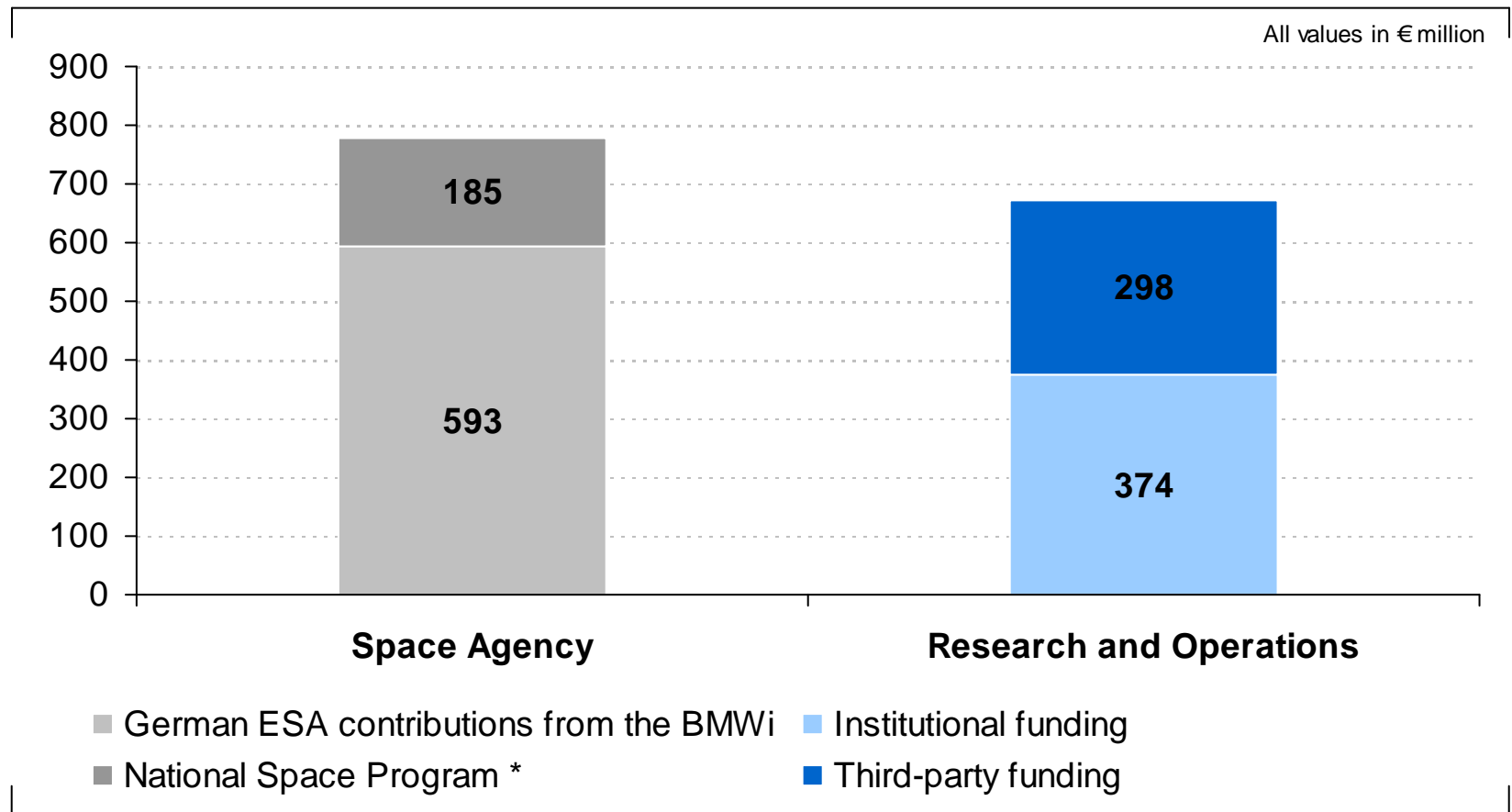


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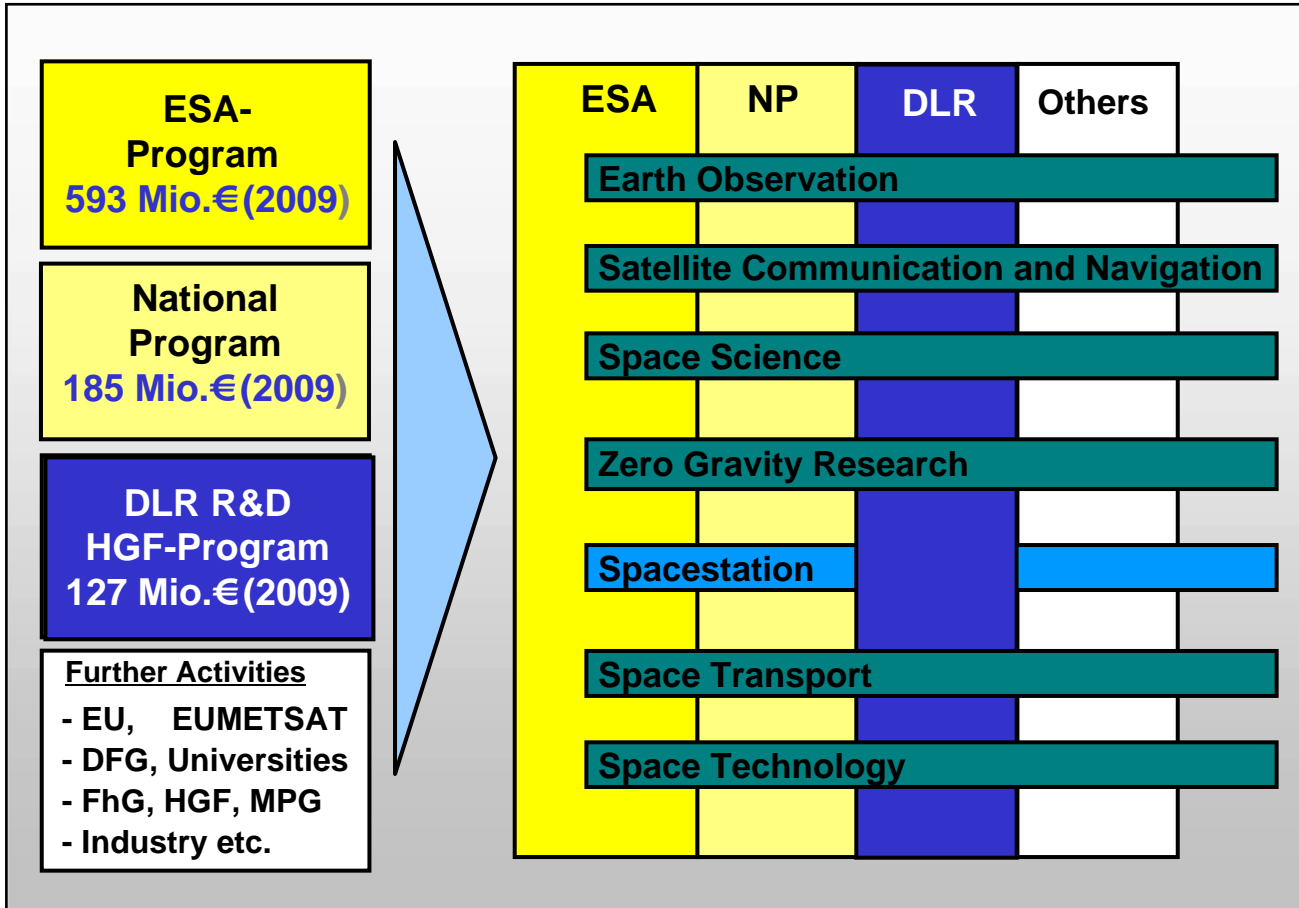
# Budget Figures 2010

€1450 million

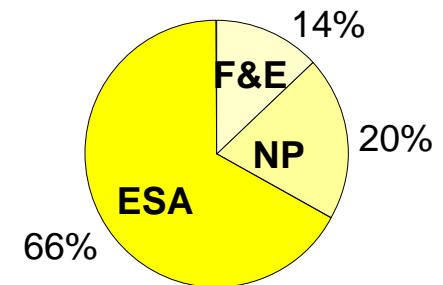


\* without management budget

# Space Budget - Germany

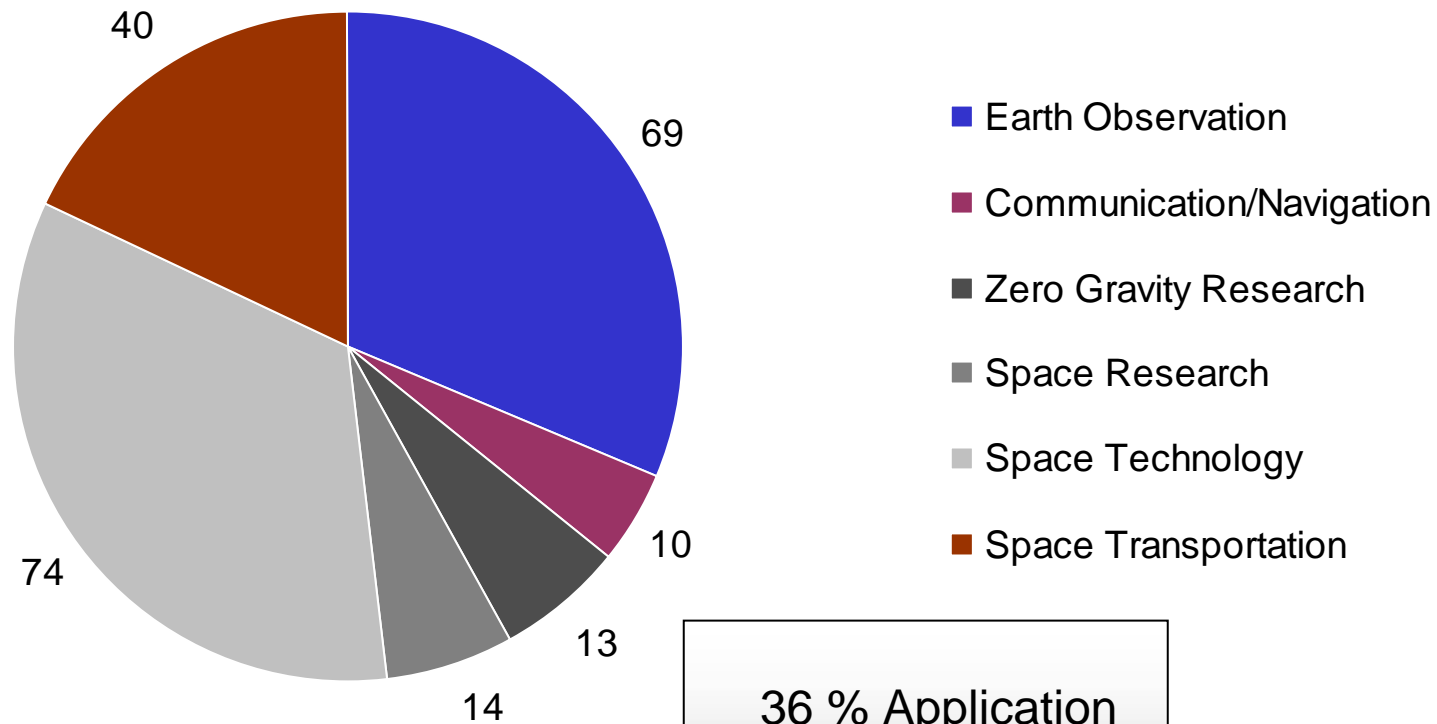


Budget Distribution:  
(905 Mio. € in 2009)



# R&D Space Budget Share including third party funding

in Mio. Euro



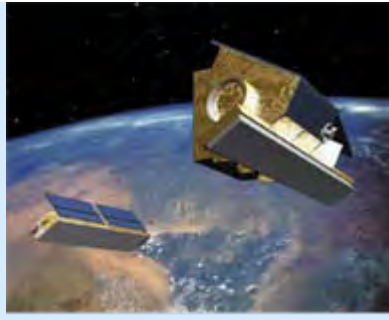
36 % Application  
12 % Science  
52 % Technology



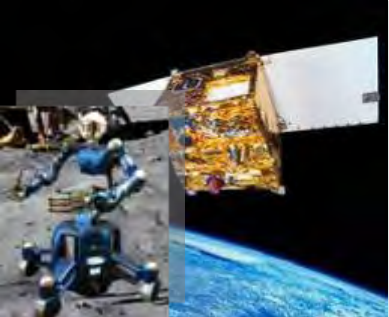
# DLR Space Research Program



- Space Science
- Zero Gravity Research



- Earth Observation
- Communication & Navigation



- Space Transportation
- Space Technology e.g. Robotics

# Goals and Strategies of the Space Research Area

## Primary goals

Development of space flight for the benefit of society

- **Scientific knowledge:**  
Research into the Earth, the universe and conditions in space
- **Commercial applications:**  
Internationally competitive commercial applications
- **Space flight for public service functions:**  
Meteorology, environment, resources, civilian and defence security

## Fundamental strategic components

Development and deployment of key technologies

- **Infrastructure:**  
Launchers, platforms, instruments/sensors, ground segments
- **Application:**  
Methodology development, potential applications





# DLR Space Research – Earth Observation

## Focus:

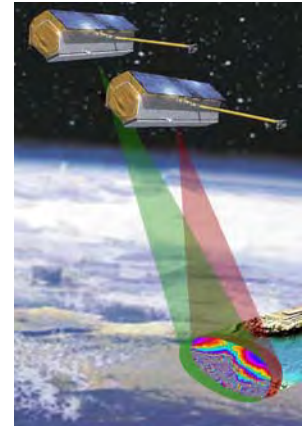
- Sensors: SAR, Lidar, IR, optical, aircraft-based sensors
- Ground segments: Satellite control, payload ground segments
- Application areas: Land, atmosphere, sea, risks/disasters

## Highlights:

- TerraSAR-X: in operational use since beginning of 2008
- Tandem-X: launch 2010 , DEM of the earth
- EnMAP: start of phases C/D in 2008, operational 2014

## Future:

- Tandem-L, Grace follow on
- Optical high-resolution national satellite mission,
- GMES operational...



# DLR Space Research – Communication/Navigation

## Focus:

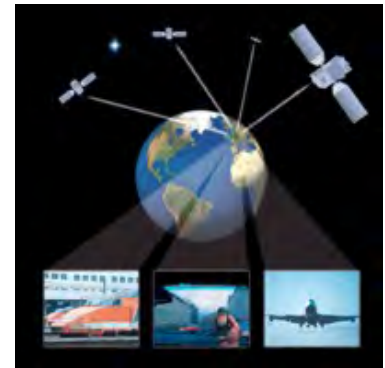
- Satellite communications: optical communications, transmission standards (DVB-S2/RCS), applications/services
- Navigation: Galileo operation and operational support, applications (including indoor navigation)

## Highlights:

- Galileo Control Center
- LCT application on TerraSAR-X and NFIRE

## Future:

- Development of GALILEO II technologies
- Safety-of-life applications
- Combination of communications, navigation and earth observation



# DLR Space Research – Space exploration

## Focus:

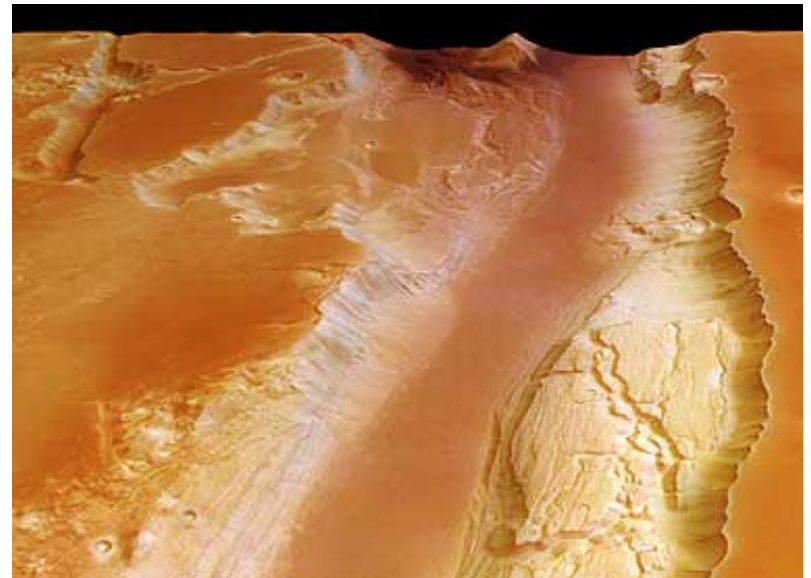
- Exploration of the solar system
- Search for extrasolar planets

## Highlights:

- Mars Express: high-resolution measurement of the Martian surface
- Venus Express: research into the atmosphere around Venus
- Cassini: exploration of Saturn and its moons
- COROT: Search for extrasolar planets
- Dawn: NASA asteroids mission
- Rosetta: ESA comet lander mission

## Future:

- 'Mission to Mars' – ExoMars
- Participation in moon missions (national, European, or international)



# DLR Space Research – Zero Gravity Research

## Focus:

- Research under conditions experienced in space
- On sounding rockets, parabolic flights and the International Space Station
- In the fields of life sciences and materials science

## Highlights:

- Biological radiation experiments on the ISS (Matroshka)
- Research under microgravity on parabolic flight campaigns and sounding rockets
- Bed rest studies for development of methods to prevent muscle and bone wastage

## Future:

- Utilisation of ISS/Columbus
- Studies with the new ESA short-arm centrifuge



# DLR Space Research – Space Transportation

## Focus:

- Ariane ‘Next Generation Launcher’ research
- Propulsion systems – research and test
- System analysis, innovative materials and simulation

## Highlights:

- Flight experiments with SHEFEX (sounding rocket)
- Upper stage propulsion unit: altitude simulation
- Materials: innovative thermal protection

## Future:

- European ‘Future Launcher Preparatory Programme’ (FLPP)
- Ceramic propulsion system



# DLR Space Research – Space Technology

## Focus:

- Servicing in space – robotics
- Future space systems – satellite technology, verification and operation



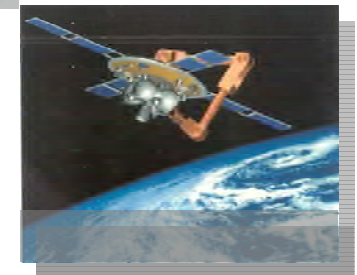
## Highlights:

- Robotics missions: ROKVISS, on-orbit recovery (OLEV)
- Satellite missions: on-orbit technology verification program



## Future:

- Exploration technology, compact satellites



# Institutes and Facilities Involved in Space Research

- [Bremen](#)
- [Berlin](#)
- [Braunschweig](#)
- [Goettingen](#)
- [Hamburg](#)
- [Koeln](#)
- [Lampoldshausen](#)
- [Oberpfaffenhofen](#)
- [Stuttgart](#)



# Facilities – Space

- Research aircraft
- Infrastructure for receiving, refining and distributing data
- Wind tunnels
- Mobile rocket base, MORABA
- Control centres
- Research test beds

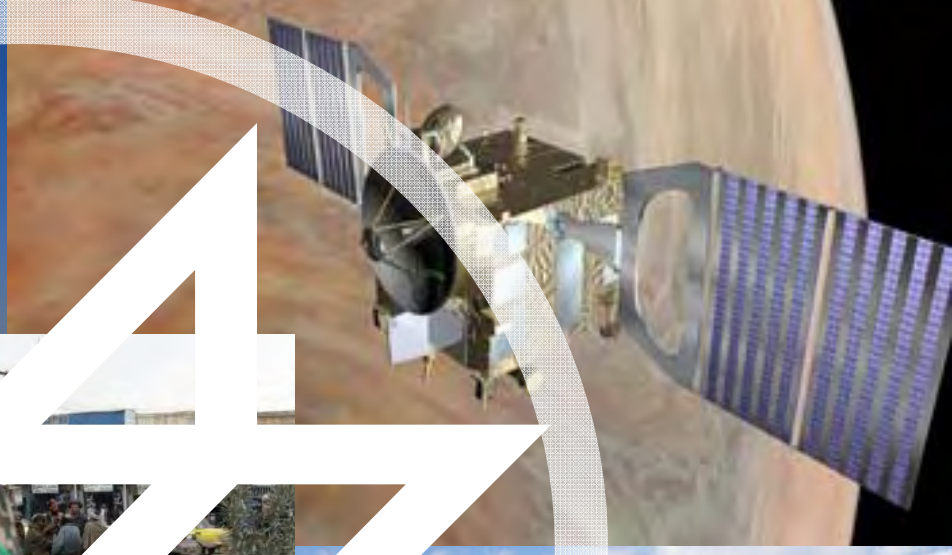




# DLR R&D

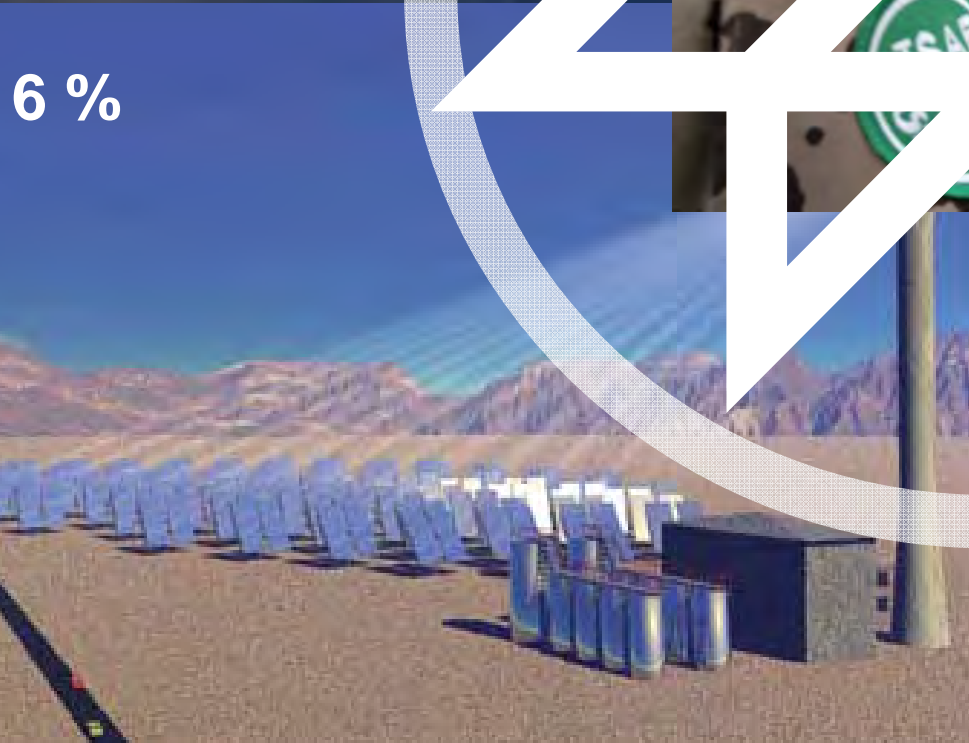
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# DLR

**Knowledge for \_\_\_\_\_  
Tomorrow**



**DLR**