DLR - German Aerospace Center

DLR Research Projects,
a contribution to the Vision 2020
Historical roots

1907 – founding of the „Modellversuchsanstalt der Motorluftschiff-Studiengesellschaft“ - Research Facility for the „Airship development society“, later the „Aerodynamische Versuchsanstalt Göttingen“ AVA

1989 – transformation of the DFVLR in Deutsche Forschungsanstalt für Luft- und Raumfahrt (DLR)
Founding of the German Space Agency „Deutsche Agentur für Raumfahrtangelegenheiten“ DARA

1997 integration of the DARA into the DLR with all their political functions. Since 1997 DLR means „German Aerospace Centre“
DLR
German Aerospace Center

Research Institution
Space Agency
Project Management Agency
Key areas

✓ Aeronautics
✓ Space
✓ Space Agency
✓ Transport
✓ Energy
✓ Security
Financing of DLR and research funding 2010
2.114 Mio. €

- Space Agency: 593 Mio. €
  - German ESA contributions from the BMWi: 185 Mio. €
  - National Space Program*: 593 Mio. €
- Project Management Agency: 678 Mio. €
  - Institutional funding: 86 Mio. €
- Research and Operations: 374 Mio. €
  - Third-party funding: 298 Mio. €

*) without management budget
Percentage of overall income from research and operations

- Space: 52%
- Aeronautics: 34%
- Transport: 8%
- Energy: 6%
Sites and employees

6,200 employees working in 29 research institutes and scientific and technical facilities

- at 9 sites
- in 6 field offices

(7 field offices of the Project Management Agency)


DLR participates in the:

- European Transsonic Wind Tunnel (ETW)
- German-Dutch Wind Tunnels (DNW)
Large-scale facilities

- Research aircraft and helicopter fleet,
- Windtunnels,
- Engine (rocket and aircraft) test rigs,
- Solar furnace, solar fields,
- Autoclaves,
- Traffic tower.
- German Space Operations Center (GSOC),
- German Remote Sensing Data Center (DFD).
Aircraft Research and Test Platforms

Flight Mechanics / Control
Flight Guidance

Aerodynamics
Atmosphere / Environment
Aeronautics

Leading Partner for Research in National Aeronautical Industry

- Air Transport System Concepts and Assessment
- Energy and Cost Efficient Aircraft
- Efficient and low Emission Aero Engines
- Safe and Efficient Air Transport System
- The Future Helicopter
VISION 2020: Challenges and Associated Goals

- **Quality and Affordability**
  - Reduced passenger airfares
  - Increased passenger choice
  - Modernized freight operations
  - Reduced time to market by 50%

- **The environment**
  - Reduction of CO2 by 50%
  - Reduction of NOx by 80%
  - Reduction of external noise by 50%
  - Substantial progress towards ‘Green MMD’

- **Safety**
  - Reduction of accident rate by 80%
  - Drastic reduction in human error and the consequences

- **The Efficiency of the Air Transport System**
  - 3X capacity increase
  - 99% of flights within 15 min of schedule
  - Less than 15’ min waiting time in the airport for short distance flights

- **Security**
  - Airborne – terrorism prevention
  - Airport – prevention of unauthorized access (persons or products)
  - Air navigation - safe control of hijacked aircraft

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ACARE 2000

Deutsches Zentrum für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft
Technology Impact – Extrapolation 2000 - 2050

Index (100 = Year 2000)

Transport Capacity

Fuel Consumption

Moderate Growth Scenario

Without New Aircraft

With New Technology

-50% CO₂ Aircraft Tec.

-50% CO₂ Aircraft & -2% Ops.

-10% ATM

20% Biofuel
Operation Related Technology

2000 2010 2020 2030 2040 2050

Flight Guidance

-50% CO₂

SESAR -12% CO₂

4 D Route Planning -3% CO₂

„Free-Flight“ -6% CO₂

Operation

Efficiency  
Airlines 10 Years -2% CO₂

Formation-Flight -10% CO₂

Air Refueling (Long Distance) -25% CO₂

-100% CO₂
Main Areas of Aeronautics Research at the DLR

- Aircraft Structures
- Engine
- ATM & Airports
- Systems & Cabins
- Weather & Climate
- Air Transport Concepts
- Flight Physics
- Materials, Structures, Simulation and Validation
- Virtual Engines, Propulsion Techniques, Turbines, Fans, Combustion Technology, Validation
- Aerodynamic Systems and Flight Guidance, Virtual Aircraft and new Configurations, Flexible Aircraft
- Rotorcraft

Efficient airport traffic
Low emission
Noise impact, Wake vortex
Air Transport Management
Human Factors
Airport Security
Air Transport
Management
Human Factors
Airport Security

Rainer Scharenberg, 16
Test Activities

- Basic Research
- Materials Characterization
- System Identification
- Validation of Numerical Tools
- Process Simulation
- Component Testing
- Industrial System Tests
European Transonic Windtunnel ETW
European Transonic Windtunnel
High-lift & high-speed “flight-alike” testing

**ETW’s time-cost-quality benefits:**
- Full-scale Flight Reynolds Number
- Independent Variation of Reynolds Number and Structural Loads
- Productivity and Costs Efficiency
- Security and Client Confidentiality

“Flight-alike” testing more accurate than 99%
- Validation of **cutting-edge aircraft-performance** design
- Early confidence in **meeting the design requirements**
- **Valuable risk mitigation**
European Transonic Windtunnel
High-lift testing example

$C_L_{\text{max}}$ vs. $Re_c [\text{Mio}]$

- Conventional Wind Tunnels
- ETW
- Flight

$\approx 5 \text{ kts higher approach speed at constant weight}$
DNW: Deutsch- Niederländische Windkanäle

Common operation of 10 wind tunnels in Germany and the Netherlands
European Cooperation

- EREA Membership

- Close Collaboration with ONERA on
  - Fixed wing A/C Research
  - Rotorcraft Research

- Close Collaboration with NLR on ATM: AT-One

- Joint Operation of Windtunnels with NLR: DNW
  (extended to ATA with ONERA)
  ETW (assisted by NLR, ONERA, DTI, DLR)
Contact in DLR

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International cooperation
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End of Presentation