Aviation: Space and Air Traffic Integration
Spaceplanes and Spaceports

What is it all about?

**Spaceplanes** are a new combination of Air- & Spacecraft, which fly with supersonic speed into space and glide back to earth.

**Spaceports** are special airports for take-off and landing of spaceplanes.
Spaceplanes offer interesting opportunities, but are a challenging regarding German and European airspace integration.

DLR investigates how to integrate spaceplanes into the European and German airspace.
Integration of Spaceplanes into the Airspace

Objectives of Research

- How to adapt Air Traffic Management?
- Need of special safety areas/zones in the airspace?
- How to design efficient Spaceports?
- How to validate new operational procedures?
Safety bubbles for safe spaceplane operation

- Spaceport restricted area
- Safe separation trajectory of spaceplane
- Spaceplane trajectory
- Hazard areas underneath spaceplane trajectory

- Spaceport
Air Traffic Surveillance from Space

Integration of Spaceplanes by new space systems
SAT ADS-B

Surveillance of aircraft from space

- ADS-B receiver on satellites
- Special designed antennas
- Dedicated communication network
- New procedures
### DLR's "ADS-B Satellite"

**World's first ADS-B receiver in space on ESA's Proba-V-Satellite**

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Intranet for the air transport system

Global information sharing and planning of trajectories of the spaceplanes

System Wide Information Management (SWIM) as enabler: Global „Intranet for the air transport system“

Joint communication system for all stakeholders

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Identify Hazard Areas for Maintaining Safety

Via SWIM, all air traffic control centers and airspace users are informed online about the actual flight and status of the spaceplane.

Information exchange in the SWIM system:
- **Spaceplane**: Position and forecasted trajectory
- **DLR-System**: Calculate hazard areas
- **Air traffic and control centers**: Information as decision support for ATM
Spaceplane Integration in Germany and Europe

DLR researches for the seamless, efficient and safe integration of spaceplanes into the air traffic of today.

- Maintain the efficiency of the air transport system
- Improved procedures for air traffic control
- Testing in the air transport validation center of DLR
DLR Aviation Branch supports the use of SAT ADS–B technology world wide

The project leading to this application has received funding from the SESAR Joint Undertaking under grant agreement No 699337 under European Union’s Horizon 2020 research and innovation programme.
DLR Aviation Branch is committed to the operation of spaceplanes in Germany and Europe.