

# Air Traffic Validation Center

Simulators, sensor systems and flight testing equipment together form the **Air Traffic Validation Center** of the DLR Institute of Flight Guidance. The entire center offers researchers the right tools for testing and evaluating new ideas, concepts and technologies for all areas of air traffic management. It allows each development step to be continuously reviewed, from the initial idea down to the testing of prototypes and their implementation under realistic conditions.

The **Institute of Flight Guidance** performs long-term engineering research preceding industrial developments in the field of flight control and air traffic management. Its main areas of research are operational procedures, technology development and human-centered automation. The goal is to ensure a safe, efficient, environmentally friendly and reliable air transport system.

## DLR at a glance

DLR is Germany's national research centre for aeronautics and space. Its extensive research and development work in Aeronautics, Space, Energy, Transport and Security is integrated into national and international cooperative ventures. As Germany's space agency, DLR has been given responsibility for the forward planning and the implementation of the German space programme by the German federal government as well as for the international representation of German interests. Furthermore, Germany's largest project management agency is also part of DLR.

Approximately 7300 people are employed at 16 locations in Germany: Cologne (headquarters), Augsburg, Berlin, Bonn, Braunschweig, Bremen, Goettingen, Hamburg, Juelich, Lampoldshausen, Neustrelitz, Oberpfaffenhofen, Stade, Stuttgart, Trauen, and Weilheim. DLR also operates offices in Brussels, Paris, and Washington D.C.

Fast-Time Simulation

## Fast-Time Simulation



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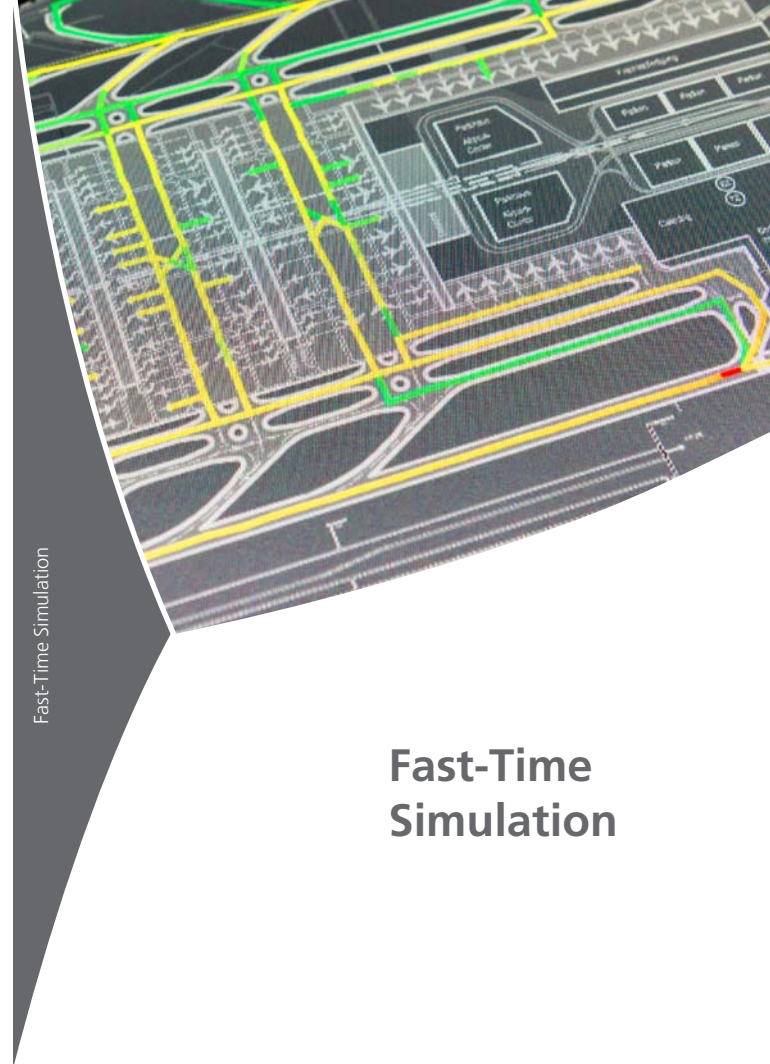
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# Fast-Time Simulation

**Air transport today means responsible planning in terms of capacity, resource conservation and cost-effectiveness. Ideally, the needs of the environmental and humans are considered just as much as safety and punctuality. How can we increase capacity as awareness of our environment grows?**

Waiting times stress passengers and systems, while congestion in the air and on the ground damage our ecological system due to pollutants and noise emissions. Developing an active awareness of the problem and finding innovative solutions are the basis for implementing scenarios in fast-time simulations later on.

A day in fast motion - at the Institute of Flight Guidance, planned concepts for the optimal design of airspaces and airports are realistically portrayed and evaluated in fast-time simulations. They are a precursor to the detailed real-time simulation. In a fast-time simulation, aircraft move along their planned flight routes and taxiways. Any conflicts that arise are automatically solved by diversions or delays, with the latter measured as an evaluation criterion.

Faster, higher, further? Not always, and more importantly not at all costs. Sensitivity analyses incorporate complex systems and problems in a wide cause-effect network in order to ensure capacity increases while maintaining quality standards (e.g. punctuality). The priority of safety over feasibility, and the interdependence of human and machine - these issues are discussed and simulated. Then the day turns into minutes.

## Research areas

- Lower separation minima for arrivals and departures
- More direct flight routes with timely precision and apron operations that are adapted accordingly
- Monitoring of traffic flows, travel times and delays
- Weather effects on air traffic
- Innovative concepts for descents that offer economic advantages due to reduced engine power
- Performance of capacity studies for airports and terminal control areas
- Design of airport apron that is more needs-oriented
- Participation in large infrastructure projects, such as prior to construction of new runways at major airports
- Fuel and emissions savings by using new technologies
- Future-oriented analyses and evaluations within the scope of EU research projects



## Technical background

At the Institute of Flight Guidance, four fast-time simulators are currently in use: Simmod PLUS, Simmod RRO!, AirTOP and TrafficSim.

The required information is provided by airlines or contracted service providers. Just as with model-making, scenarios are then developed that are later run in a matter of minutes, thereby allowing improvements or weak points to be identified at a glance. In this way, bottlenecks can be reliably detected and countermeasures initiated at an early stage. Apart from using real circumstances, completely new structures or those being planned can also be implemented.

The introduction of a program developed by DLR called EWMS (Extensible Workflow Management for Simulations) makes it possible to link simulation data independently of the simulation environment and evaluate them using uniform procedures. This enables the automated analysis and comparison of the abundance of heterogeneous individual data that are generated from different simulations.

As a result, the time and effort required in this case is also reduced to a minimum. At the touch of a button, the scientists can avail of the uniform evaluations and diagrams generated by the EWMS for the assessed parameters.