

# ***DLR Eurocopter BO 105***

## ***Airborne Research Platform***



DLR

German Aerospace Center  
Flight Operations

## Introduction

DLR is Germany's aerospace research center and space agency with about 4700 employees in 31 research institutes distributed over 8 main research centers in Germany. DLR performs basic research and operates large scale test facilities which include two Research Flight Facilities in Braunschweig and Oberpfaffenhofen.

The **DLR Flight Facility Braunschweig** is a major test site for aerodynamic research, in-flight simulation and testing of flight management and remote sensing systems.

The Facility provides a fleet of research aircraft including sailplanes and single-engine-piston aircraft, a Bo 105 helicopter, a twin engine turboprop DO228 and the two advanced flying simulator EC 135 FHS for helicopter and VFW 614 ATTAS for fixed wing aircraft.

The latter two are used as primary testbeds for a broad range of research activities such as flight control, flying qualities, guidance, navigation and man-machine interface.

ATTAS and FHS offer unique modifications and capabilities which make them 'programmable' multipurpose testbeds, that can be configured to the specific needs of multiple applications.

The DLR-Institutes of Flight Research, Guidance and Control, Design Aerodynamics, Structure and Materials are also situated in Braunschweig and provide the complete scientific know-how in conducting complex flight tests and system evaluation.

Real flight tests in an early stage of a comprehensive research and development process give realistic results to validate the design requirements and to minimize risks in product development.

Especially the EC 135 'Flying Helicopter Simulator', as the worldwide first fly-by-light helicopter, features a ultra modern approach to this challenging task.



## Aircraft System

The BO 105 is a five-place, multi-purpose, utility helicopter having a hingeless, four-bladed main rotor and a semi-rigid, two-bladed tail rotor. The main and tail rotor blades are constructed of fiber-reinforced composite materials. Due to the wide range of operation, the aircraft is equipped and certified for VFR and IFR operation. Very special equipment like instrumented rotor blades, nose boom or air data computer has been developed and is available for lots of tasks.

- Radio altimeter
- 2 VHF radios
- GPS system
- ADF
- 2 VOR / DME
- 2 ILS, Marker
- Transponder
- Low Airspeed Sensing and Indicating Equipment (LASSIE)
- Experimental power DC 28V/100A, AC115V
- External cargo hook system
- Main Rotor Folding System

## Performance

### BO 105 C

Overall length		11.86 m
Rotor diameter		9.84 m
Number of seats	1+4	
Max takeoff weight (MTOW)		2300 kg
Engines		2 x Allison 250-C20 ( 2 x 313 KW )
Max altitude (ISA):		17000 ft
Max range ( max.cruise power, FL100 )		560 km (300 nm)
Max endurance		3:00 h
Max Payload		600 kg
Max fuel		456 kg
Speed at max. cruise power		120 kts



## Modifications

Due to various modifications on the aircraft structure and aircraft system the DLR BO 105 is a unique multipurpose research aircraft



instrumented tail rotor



external cargo hook system



experimental power system



hardpoints for external mountings





instrumented rotor blades



instrumented rotor head



low air speed sensing + indicating equipment



nose boom



IFR - Cockpit



fuel flow measurement system

## Instrumentation

*The helicopter can be equipped with the following sensors:*

- 3 rate gyros with a range of  $\pm 40$  deg/sec to measure pitch, roll and yaw rates.
- A vertical gyro to measure pitch and bank angle.
- 3 linear accelerometers, installed close to the center of gravity along the body axes, to measure the components of the acceleration
- Potentiometers to measure the control inputs
- The LASSIE (Low Air Speed Sensing and Indicating Equipment) air data system, which provides velocity components and barometric rate of climb and pressure altitude
- A potentiometer at the root of each blade to measure the blade pitch angles
- A ramp potentiometer to measure rotor azimuth
- Strain gauges applied to the rotor shaft and rotor head to measure main rotor torque, thrust and mast moments
- A heading gyro ( the heading gyro from the basic BO 105)
- Special main and tail rotor blades instrumented with pressure sensors (Kulite) and strain gauges
- Differential GPS
- Telemetry system
- Fuel flow measurement system
- A nose boom with a 7-hole probe

## Data Acquisition

The data acquisition will be done by a complex data acquisition system (air data computer), which synchronously measures, digitizes and stores the relevant data. All data are automatically synchronized by the GPS time.

During the flights the data can be monitored in a telemetry station, after landing of the helicopter data out of the air data computer can be evaluated in a ground station.



## Service Braunschweig

The Flight Facility is an autonomous institution within DLR which intends to support scientists from in- and outside DLR in planning, setting up and conducting flight campaigns on their research aircraft. Besides the research flight operation various groups within the Facility offer a variety of related services to achieve this goal:

- Logistical support
- Support in integration and certification of user equipment
- Flight planning, flight permits
- Flight testing

The Flight Facility is a certified “LBA Maintenance Facility” (LTB) and thus authorized to perform maintenance and repair on the research aircraft. This fact is mandatory for the operation of aircraft in remote locations and extreme climatic environment.

DLR’s certification as “JAR21 Design Organization” (EB) assures that user designed sensors and instrumentation can be integrated and certified.



## Infrastructure

The infrastructure associated with the Flight Facility is prerequisite for these services and can also be used by the visiting scientists.

- Two heated hangars (20m x 30m & 29m x 58m) with all necessary ground support equipment
- 6500 m<sup>2</sup> apron
- Mechanical and electronic workshop
- Fully equipped office for external users
- Hydraulic test bench
- Room for packing and storing of parachutes





Flight Facility Braunschweig

## German Aerospace Center

### **DLR Flight Operations**

Head : Volkert Harbers  
Oberpfaffenhofen

### **Flight Facility Braunschweig**

Head : Richard Koesters  
DLR Flugabteilung Braunschweig  
D-38108 Braunschweig  
Tel: +49 (531) 295-2240  
Fax: +49 (531) 295-2220  
richard.koesters@dlr.de  
<http://www.dlr.de/fb/bs>

Flight Facility Oberpfaffenhofen