

DLR Cessna C 208B Grand Caravan 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 Flight Facility Oberpfaffenhofen is exclusively dedicated to the provision and operation of aircraft for atmospheric research and earth observation and is Europe's largest operator for this kind of research platforms.

Among its fleet of highly modified aircraft the single-engine Turboprop Cessna C208 B is the smallest research aircraft. Equipped with modern avionic systems the aircraft is capable to operate out of shortest runways and under IFR and known icing conditions. The aircraft is equipped with an oxygen breathing system for flight above 12.000ft. For lower altitude up to 20.000 ft atmospheric research and earth observation at low speed (between 100 and 160 kts) the Caravan is a highly efficient low cost solution.

DLR operates a huge pool of in situ and remote sensing instrumentation for environmental airborne research and offers access to various scientific institutes dedicated to atmospheric physics and chemistry, active and passive remote sensing , meteorology, modelling, as well as different calibration and test facilities.

Performance

The Cessna 208B Caravan is a very reliable and robust light aircraft designed for any kind of airwork operation. Its simple and strong mechanical design makes the aircraft ideal for operation out of short and unpaved airstrips.

Overall length	12.7 m
Wingspan	15.9 m
Number of seats	2+8
Max takeoff weight (MTOW)	3.96 t
Engines	Pratt&Whitney PT6A-114A (675 SHP)
Max altitude (ISA):	7.6 km (25 000 ft)
Max range (max.cruise power, FL100)	1660 km (900 nm)
Max endurance	5:30 h
Max Payload (with max fuel)	500 kg
Max fuel	1.0 t
Speed at max. cruise power (FL 100, TAS)	314 km/h (170 kts)
Landing reference speed (MLW, IAS)	144 km/h (78 kts)



Aircraft System

The aircraft is equipped with a modern avionic system and certified for IFR flights and flights into known icing conditions. 2 generators are providing experimental power and a highly redundant electrical aircraft system.

The avionic system consists of the following components :

- Weather Radar
- Radio altimeter
- 2 VHF Radios
- R-NAV certified GPS System
- Stand-alone GPS-Approach capability
- 1 ADF with RMI indicator
- 2 VOR / DME with 1 HSI display and 1 CDI display
- 2 ILS, Marker
- Autoflight system including yaw-damper and vertical speed selector
- 2 ATC-Transponder



Modifications

Due to various modifications on the aircraft structure and aircraft system the DLR C208B is a unique multipurpose research aircraft



External experimental power supply



High power generator
(300A @ 28V)



2 under wing hard points



Additional small floor opening



large cargo door



2 openings on top of fuselage



Special exhaust system to prevent measurement interference



2 covered large openings in the bottom of fuselage

Precision Navigation System

Computer Controlled Navigation System (CCNS4) and AEROcontrol for Aerial Survey Flight Missions (manufactured by IGI, Germany)

The Standard CCNS4 is a guidance, positioning, and sensor management system for aerial survey flight missions. It provides complete and comprehensive solutions for mission planning, aircraft guidance and camera (as well as other sensors) management during photo flights or scanner missions, additionally post-flight record keeping, data management and documentation. Since the complete mission can be prepared before flight, the pilots are guided by the system from waypoint to waypoint.

The system consists of the airborne computer unit, 2 control & display units (5 "), the AEROcontrol system, the DGPS Omnistar system and the CCNS World Wide Mission Planning software (WWMP).

Meteo Sensors & Data Acquisition

The DLR Caravan will be equipped with a sensor package for meteorological measurements. The sensors will measure the basic units like temperature, pressure and humidity as well as wind speed and direction using a boom mounted flow angle sensor. The sensor system is capable of turbulence measurements.

Since the Cessna Caravan is a single engine aircraft, it does not allow for measurements on the aircraft nose. Therefore the sensor package has been designed as an underwing installation using the existing hardpoints. The meteo pod is presently under development and scheduled to be operational by late 2002.

As part of the sensor package the Caravan will be equipped with a data acquisition system which is capable of storing analog signals of the meteorological sensors. The system can be scaled according to the number of existing data channels and is able to also acquire and store data from additional user systems.

An onboard quicklook system will allow scientific users to look at the meteorological and aircraft data during flight. This information can be used for example to adjust the flight parameters or the flight pattern according to the present conditions.



Service

The Flight Facility is an autonomous institution within DLR which 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
- High quality data evaluation of meteorological basic sensors and aircraft system data immediately after flight
- Certified calibration of pressure, temperature and humidity

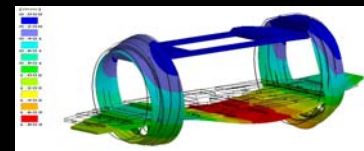
The Flight Facility is a certified "Luftfahrttechnischer Betrieb - Approved Aeronautical Workshop" (LTB) and thus authorized to perform maintenance and repair on the research aircraft. This fact is mandatory for the operation of aircraft in remote locations and extreme climatic environment.

DLR's certification as "Entwicklungsbetrieb - Approved Design Organisation" (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.

- Heated hangar (50 x 30 x 6 m) with avionics and hydraulic workshop
- 6500 m² apron with refueling station for Jet A 1 and 100 LL
- Mechanical and electronic workshop
- Fully equipped office and laboratories for external users
- Large environmental simulation chamber (pressure and temperature, 500 l) for testing of equipment
- Highly sophisticated calibration benches for pressure, temperature and humidity sensors.



Flight Facility Braunschweig

German Aerospace Center

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