



Wind tunnels, air traffic and research aircraft – the fascination of aviation during German Aerospace Day at DLR

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Anyone who has ever wanted to know what a combustion chamber test stand looks like from the inside, how a wind tunnel works or how big the Airbus A380 really is must come to German Aerospace Day, held at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) in Cologne on 18 September 2011. Research activities will be showcased in the exhibition areas at the airport. Along with DLR research aircraft such as the A320 ATRA (Advanced Technology Research Aircraft) and the FHS (Flying Helicopter Simulator), the SOFIA airborne observatory - a Boeing 747 with an infrared telescope installed in the rear of the fuselage - will be making a guest appearance in Cologne. On this, the eleventh German Aerospace Day – under the patronage of Germany's Federal Minister of Economics and Technology, Philipp Rösler – DLR, the European Space Agency (ESA) and the European Astronaut Centre (EAC) are presenting exciting research projects in the fields of aeronautics, space, energy and transport.

Research on high-pressure combustor test benches and miniature wind tunnels

The DLR Institute of Propulsion Technology will be offering visitors a glimpse of the future by exhibiting two small engines and demonstrating the recent progress in aircraft engine technology. Those who are interested can also have a look around the HBK-1 high-pressure combustor test stand. Here, scientists are researching low-emission combustion chambers for aircraft engines. Even the youngest researchers won't miss out: using small aircraft models, children will be able to experience the power of airflow in miniature wind tunnels and learn about the lift and drag of wing and blade profiles. With the help of an iPad App, they will also be able to directly influence the flow and make the effects visible on the screen.

Air traffic at the airport

The DLR Institute of Air Transport and Airport Research will enable visitors to view the air traffic over Germany and experience the environment at Cologne airport in real time. In collaboration with German air traffic control (Deutsche Flugsicherung; DFS) and Cologne/Bonn Airport, DLR will be displaying the air traffic on multiple large-format screens. Webcams at Cologne/Bonn Airport will be showing the events taking place at the terminal and on the runway in real time. At the same time, visitors will be able to follow flight movements across Germany using DFS radar data.

Visitors can also download an App for their mobiles, to navigate to particular points on the site. This application has been developed for use in the airport terminal, to show travellers the way to their check-in desks or other important locations.

Ramjets for high speeds

Is it possible to fly to Australia in four to five hours? It could be with a visionary high-speed transport vehicle. Scientists at the DLR Institute of Aerodynamics and Flow Technology are researching this aircraft's main component, the engine, in supersonic and hypersonic wind tunnels. Since conventional aircraft engines would fail at such high speeds, ramjets are the favoured candidates. Such engines decelerate the incoming air with little energy loss and compress it – without any moving parts. Critical components of this type of engine are designed and developed in the Super- and Hypersonic Technology Department. On German Aerospace

Day, visitors to the wind tunnels will gain a better understanding of this research area through exhibitions of ramjet tests, wind tunnel models and posters.

Tests in the cryo-tunnel

Tests on models of the Airbus A380 have already been carried out in the Cologne Cryo-Tunnel (Kryo-Kanal-Köln), and on German Aerospace Day visitors will get to see an Alpha Jet model. Here, complete models, half models or wing profiles are exposed to wind speeds of up to Mach 0.42 (over 500 kilometres per hour). Using the cryo-tunnel, DLR researchers can measure the pressures and forces generated by airflows and obtain information about lift and drag. What makes this wind tunnel special is that these measurements are made at temperatures as low as minus 183 degrees Celsius. Such low temperatures are achieved using nitrogen and are needed because aircraft in the cryo-tunnel are not tested at full size but using scale models; scientists need to adapt the ambient air conditions to the size of the object being tested. By cooling the air in this way, its viscosity is reduced and its density is increased at the same time.

Helicopters and aircraft

The FHS Flying Helicopter Simulator

The DLR ACT/FHS Flying Helicopter Simulator is based on a Eurocopter EC 135 series production helicopter and has been substantially modified for use as a research and experimental vehicle. Along with its measuring equipment, the helicopter is characterised primarily by its unique fly-by-wire/light (FBW) control system. FBW means that the control inputs are transmitted using electrical cables and fibre optics instead of mechanical couplings. The conventional cockpit controls were replaced by two active sidesticks in 2009. These joystick-like controls give the pilot feedback on the aircraft's behaviour. The FHS has a broad spectrum of application; DLR uses it to support the training of test pilots and DLR researchers can test out new control systems or simulate the flight behaviour of other helicopters under real-life conditions.

The largest member of the DLR research fleet – the Airbus A320-232 ATRA

The ATRA (Advanced Technology Research Aircraft) is the biggest member of the DLR research fleet and provides a unique experimental platform. The Airbus A320 offers a wide range of applications in the form of an airliner, from pure research to R&D activities for the European aerospace industry. The maximum configurability, a primary design aim for the ATRA, enables application-related research to be carried out in various disciplines. These research areas extend from comfort- and safety-focused cabins and systems to aerodynamics, avionics and communication, as well as innovative aircraft structures and materials. With the ATRA, DLR and its partners open up new possibilities for commercially available aviation research. Pioneering innovations are expected in the medium term; these will contribute to strengthening the global market position of the European aircraft industry in the long term.

The flying auditorium – the Cessna 208B Grand Caravan

The Cessna 208B Grand Caravan is the smallest machine operated by DLR flight operations in Oberpfaffenhofen. The single-engine turboprop aircraft is mainly used by DLR for remote sensing. It is especially well suited for camera flights, such as those involving the HRSC (High Resolution Stereo Camera), operated by DLR, which is also used for space missions. Its light yet robust construction makes it ideal for a range of research applications involving smaller instrument packages. In 2006, the Cessna 208B was converted into a flying auditorium and equipped with an underwing meteorological measurement system capable of measuring turbulence. Since this conversion, the Cessna has seven individual measuring stations for aerospace students.

Airbus A380 and A300 Zero-G and German armed forces aircraft

Visitors to the site at Cologne Airport will also have the opportunity to see many other aircraft besides those in the DLR research fleet; the Airbus A300 Zero-G parabolic flight aircraft, an Airbus A380 and the SOFIA Boeing 747 will also be on display. The German Air Force is also a partner in German Aerospace Day and has contributed aircraft such as the ECR Tornado, the F4 Phantom and the Eurofighter, as well as a Transall C160 and the Airbus A310 MedEvac, which has already been used for international relief missions. The two Airbus A340s of the German armed forces Special Air Mission Wing will be on show for the first time.

Cologne/Bonn Airport, ESA and EAC are joint organisers of German Aerospace Day with DLR. Media partners include broadcaster WDR, the Kölner Stadt-Anzeiger and Kölner Express newspapers and the trade magazines Flugrevue and Aerokurier.

German Aerospace Day will take place on 18 September at DLR in Cologne-Porz, from 10:00 to 18:00. More information is available at the event website.

Media representatives can use the accreditation form to register for German Aerospace Day. Entry to all areas of the main exhibition is free.

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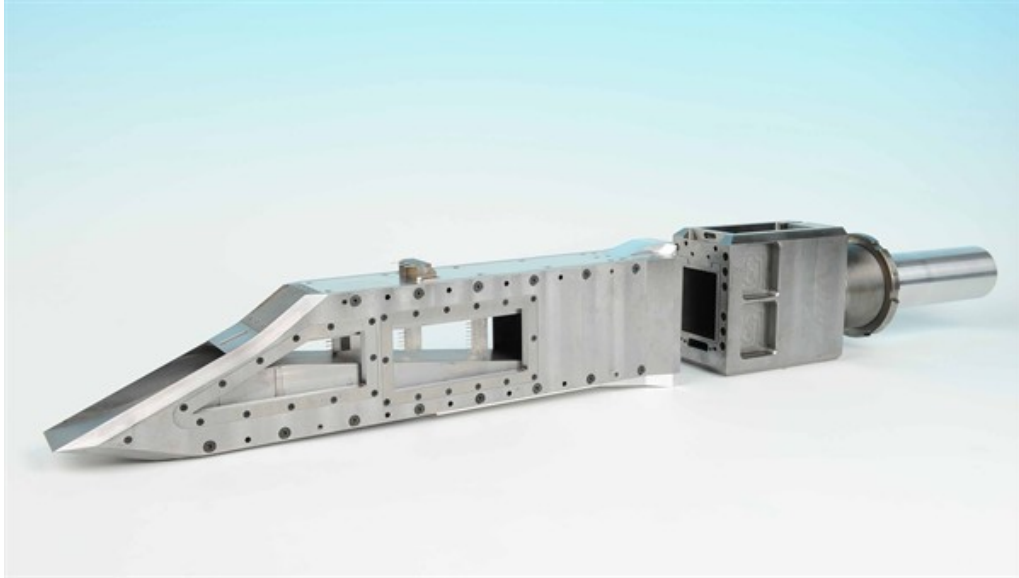
Aircraft at Cologne/Bonn Airport



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Credit: DLR (CC-BY 3.0).

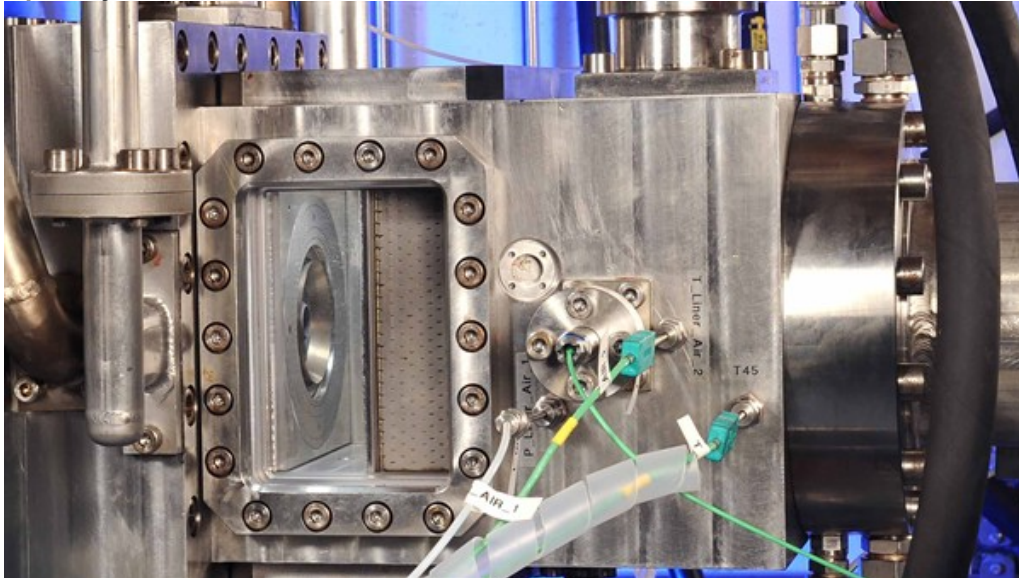
Wind tunnel model



Wind tunnel model of the air intake for a ramjet.

Credit: DLR (CC-BY 3.0).

Optically accessible combustion chamber



Visitors to DLR's German Aerospace Day will be able to take a look at the HBK-1 high-pressure combustor test bench. Scientists here are researching low-emission combustion chambers for aircraft engines.

Credit: DLR (CC-BY 3.0).

View inside the DLR cryo-tunnel in Cologne



Tests have already been carried out on models of the Airbus A380 in the Cologne Cryo-Tunnel (Kryo-Kanal-Köln) – and on German Aerospace Day visitors will get to see an Alpha Jet model. Here, complete models, half models or wing profiles are exposed to wind speeds of up to Mach 0.42 (over 500 kilometres per hour).

Credit: DLR (CC-BY 3.0).

The Airbus A380 on German Aerospace Day 2009



On 18 September 2011, the German Aerospace Center (DLR) is holding its Aerospace Day in Cologne-Porz. On this date, DLR and the European Space Agency (ESA) – alongside other partners, will be showcasing their research projects from the aerospace, energy and transport sectors.

Credit: DLR (CC-BY 3.0).

The Falcon 20E DLR research aircraft



The DLR Falcon 20E research aircraft was selected as the most appropriate aircraft for measurement flights. The Falcon has a full range of instruments to record flight dynamics and a nose boom that records the local incidence angle at the front of the aircraft in an undisturbed airflow.

Credit: DLR (CC-BY 3.0).

DLR ATRA research aircraft



The Airbus A320-232 D-ATRA, DLR's largest fleet member, has been in operation since the end of 2008.

Credit: DLR (CC-BY 3.0).

ATTAS in flight



The 'chameleon aircraft' ATTAS celebrated its 25th birthday in October 2010.

Credit: WTD.

Flying Helicopter Simulator (ACT/FHS)



Its optical and electronic control system enables the FHS to simulate the flight performance of other helicopters, using fly-by-light and fly-by-wire control.

Credit: DLR (CC-BY 3.0).

Cessna 208B Grand Caravan in flight



The smallest aircraft of DLR's Oberpfaffenhofen flight facility is a Cessna 208B Grand Caravan, registration D-FDLR. The single-engine turboprop aircraft is mainly used by the German Aerospace Center (DLR) for remote sensing. It is especially well suited for camera flights, such as those with the HRSC (High Resolution Stereo Camera), operated by DLR and also used in space missions.

Credit: DLR (CC-BY 3.0).

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