Safer, cleaner and lighter: DLR demonstrates developments for the aviation of tomorrow at ILA 2012

28 August 2012

Microscopic holes in the outer skin of an aircraft, wings with elastically deforming leading edges and steep approach flights - these are just some of the innovations from the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) for the future of aviation, offering greater comfort and safety while simultaneously consuming less fuel and generating less noise. At the ILA Berlin Air Show 2012, from 11 to 16 September, DLR is presenting a total of 18 spectacular developments in modern aviation research, along with three aircraft and two helicopters from the largest civilian research fleet in Europe. A Quadrocopter-Parcours will tempt visitors to have a go at flying themselves.

Eco-efficient flight

An aircraft as elegant as a bird of prey, with wings extended forwards in the air: DLR has been researching this wing configuration in the LamAIR (Laminar Aircraft Research) project, which will lead to a significant reduction in air resistance and thus fuel consumption. In addition, under the same project, the researchers have developed a vertical stabiliser with a microperforated outer skin, within which a pump system sits. Turbulence is siphoned through these microscopic holes, creating uniform fuselage flow.

Lower flow resistance is also the goal in the development of the droop nose, a seamless, flexible wing leading edge that can be seen as a moving original part at the DLR stand (Hall 4, Stand 4301). DLR is also demonstrating the optimum combustion of alternative fuels for aviation based on gas (GtL, Gas to Liquid) and biomass (BtL, Biomass to Liquid), with two flames for comparison. DLR researchers are presenting compressor blades with flow-optimised edges for an engine that is more economical with regard to fuel consumption.

Another development towards aircraft with lower emissions is lightweight construction. DLR is working on stiffened panels made of carbon-fibre-reinforced plastic (CFP) that are used in load tests for the material. Another exhibit demonstrates the thermography developed by DLR as a new method for testing CFP materials in an automated manufacturing process.

Flight technology for greater comfort and safety

In the Multiple Swashplate System (META), DLR researchers have developed a new technology for controlling rotor blades individually. This limits rotor noise and vibration. DLR is presenting a fully mobile, functioning META demonstrator at ILA. In addition, a new cooling system for aircraft (Cooling Center) that is positioned centrally in the tail section is being demonstrated.

The newly-developed DLR propeller brake disk can get very hot. It is made of fibre-ceramics that can withstand high thermal loads. Aircraft propellers can be stopped more quickly after landing using this technology. This limits loading and unloading times. The search for the right material is also important in the development of an artificial bird. Tail sections, wing leading edges and engines have to withstand the risk of bird strike. The DLR artificial bird will be used in tests and the approval process of new aircraft components in the future.

Unmanned disaster relief

For the first time, DLR is demonstrating the small unmanned superARTIS research helicopter, used to develop demanding automated flight missions. superARTIS stands out because of its high payload capacity, range and flight speed.

DLR is also displaying images of a disaster operation in Cyprus, where DLR scientists investigated a heavily damaged power station using an unmanned octocopter and quadrocopter. A DLR_School_Labs Quadrocopter-Parcours invites visitors to the booth to have a go at controlling the unmanned aircraft themselves.

Air traffic efficiency

DLR researchers want to achieve greater environmental sustainability and less noise from air traffic using optimised flight paths. Modern satellite navigation systems will make future flight paths more flexible. An animation demonstrates potential, steeper, more oblique approach flights. Also based on satellite data is a new system for short-term weather forecasting for air traffic. The process developed at DLR can detect weather cells in real time every five minutes and make predictions of up to an hour.

Flawless air traffic control requires personnel with the right nerves - visitors can have a go at a few aerospace psychology selection tests at the DLR booth. Anyone fancy being a pilot or flight controller? In addition, a simplified version of the indoor navigation system used at airports - using a smartphone app and QR code - is being demonstrated, as is a software package that calculates the connection of an airport to the international air traffic network in real time.

DLR research fleet at the new ILA site

Part of the DLR research fleet will also be on display at ILA 2012. Five examples from the largest European fleet of civilian research aircraft and helicopters are set to impress visitors at the open-air grounds of the new exhibition area: the Antares DLR-H2 hydrogen power glider, the Falcon 20E, the Cessna 208B Grand Caravan 'flying auditorium' and the lightweight BO-105 multipurpose helicopter and EC-135 FHS flying helicopter simulator.

A particular highlight will be a visit by the A300 ZERO-G parabolic flight aircraft. A parabolic flight uses steep flight manoeuvres to achieve around 22 seconds of virtual weightlessness for experiments in weightlessness research.

The International Forum for Aviation Research (IFAR) is being hosted at the DLR booth in Hall 4. The Forum was founded in 2010 by initiative of DLR and, with 21 institutions involved at present, is the only network for aviation research organisations in the world.

All the exhibits with photographs and background information can be found on the DLR website dedicated to the ILA Berlin Air Show 2012.

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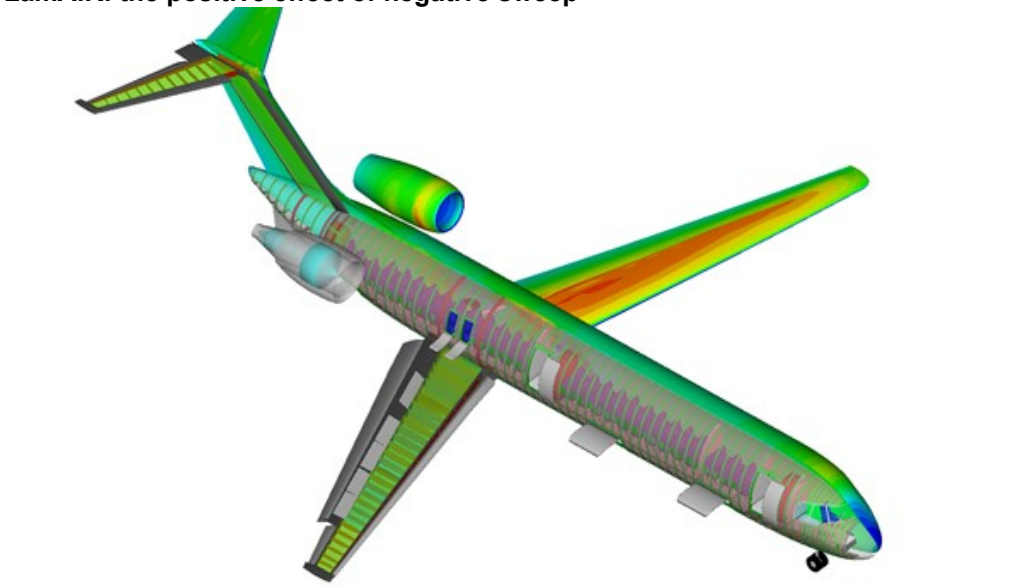
'Flying Helicopter Simulator' EC-135 FHS

Thanks to its optical and electronic control system, the FHS can simulate the flight behaviour of other helicopters.

Credit: DLR (CC-BY 3.0).

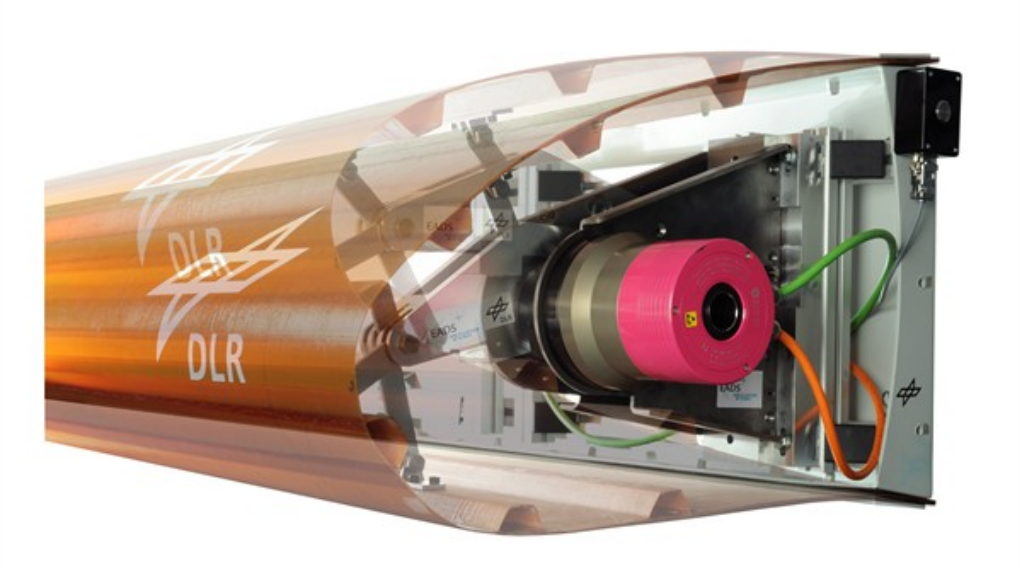
LamAiR: the positive effect of negative sweep



Under the LamAiR project, DLR has developed a passenger plane configuration with a forward-swept wing.

Credit: DLR (CC-BY 3.0).

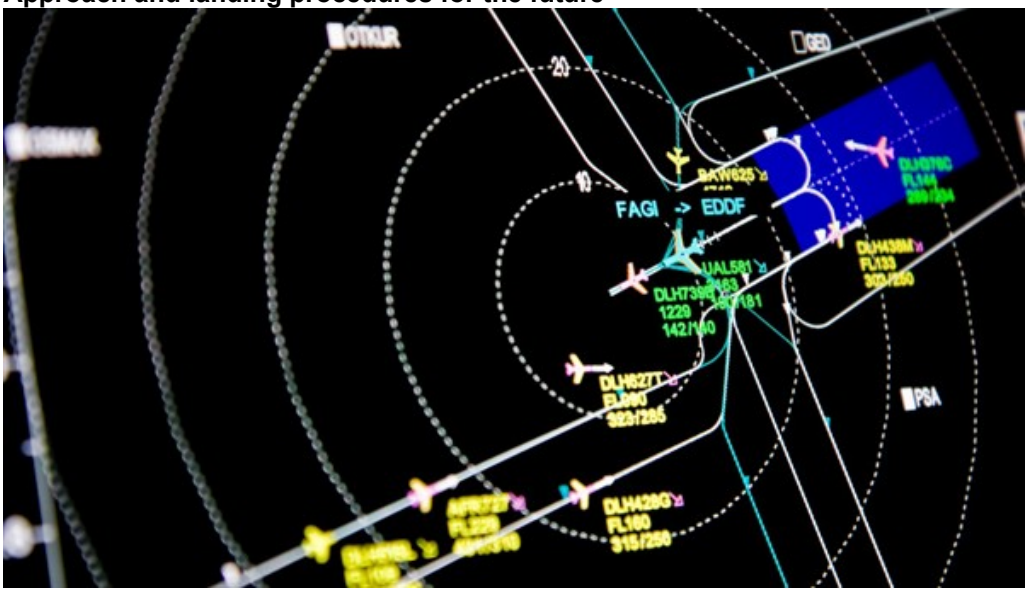
The ‘Smart Droop Nose’



Structural design with morphing – an enabling technology for lower emissions and reduced noise.

Credit: DLR (CC-BY 3.0).

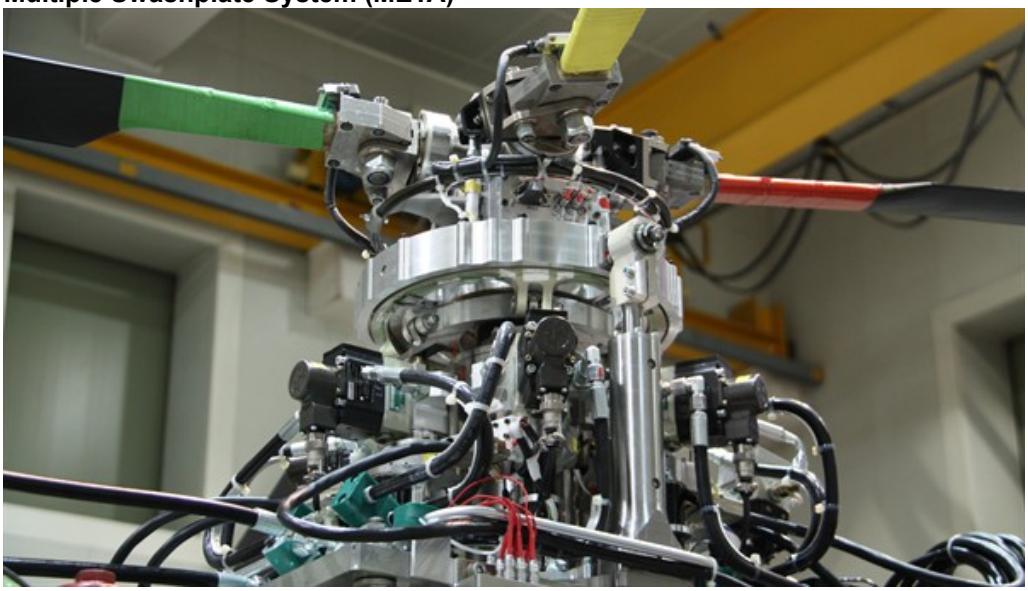
Approach and landing procedures for the future



At present, civilian air transport is getting close to the limits of its capacity. Still, the demand and the traffic volume keep growing: the SESAR research initiative expects that Europe's air transport structures will have to increase their capacity by 73 per cent over 2005 until 2020.

Credit: DLR (CC-BY 3.0).

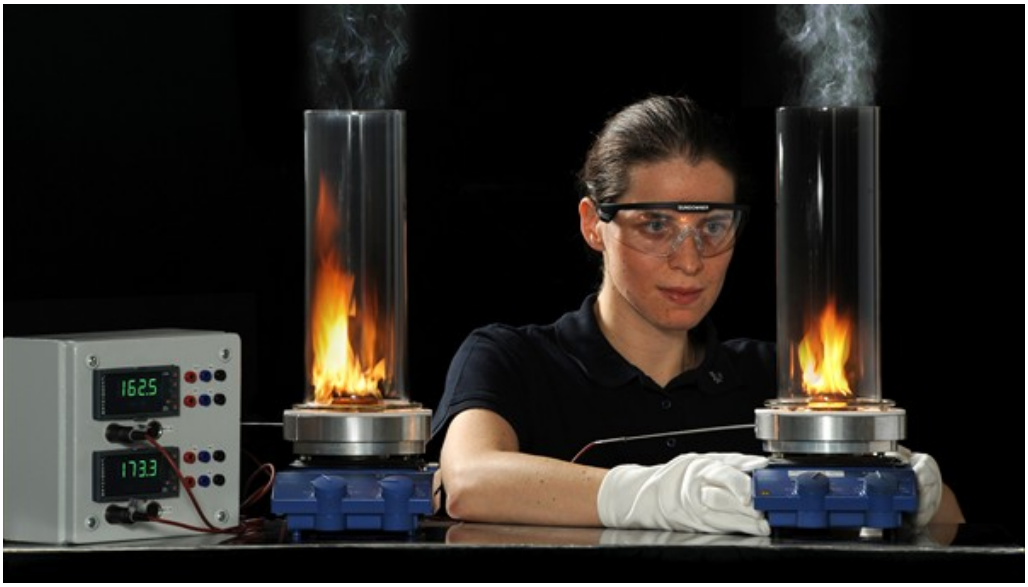
Multiple Swashplate System (META)



he Multiple Swashplate System (META) represents a unique, DLR-patented solution for active rotor control. Using this system, individual blade control inputs can be transmitted to the rotor. This way rotor noise, vibrations and other undesirable rotor-induced phenomena can be mitigated and the overall power consumption of the rotor system can be reduced.

Credit: DLR (CC-BY 3.0).

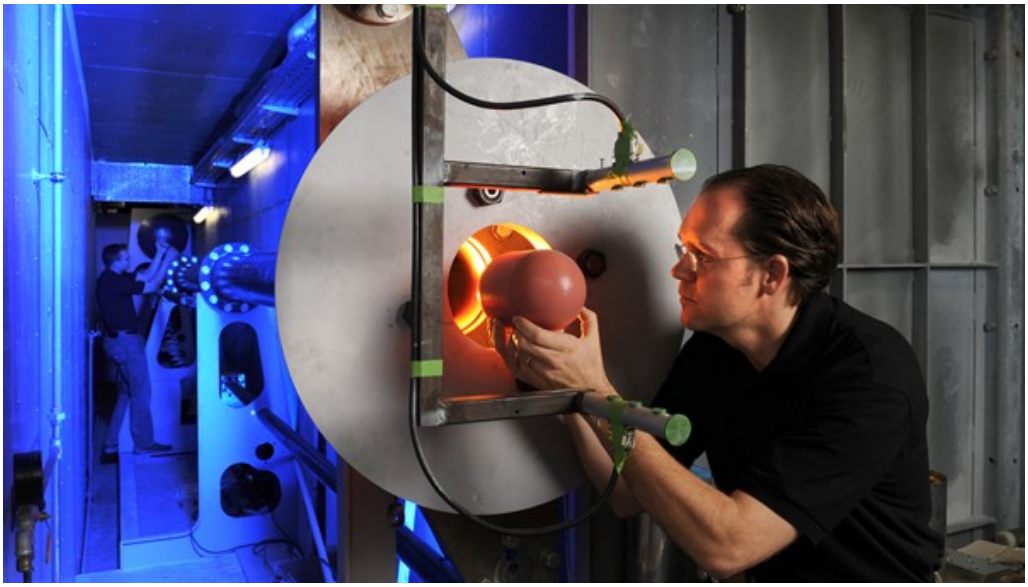
Alternative fuels for aviation



DLR's ILA exhibit shows two flames, one fuelled by conventional kerosene and one by a GtL fuel. It is easy to see that the two fuels differ in the amount of soot they produce: because of its greatly reduced number of aromatic hydrocarbons, the GtL fuel is sooting a great deal less.

Credit: DLR (CC-BY 3.0).

DLR's artificial bird



Aircraft should be able to return safely to their airport even after a bird strike. However, real birds are still being used for certifying finished components. To avoid this practice in the future, the DLR Institute of Structures and Design is working on an improved artificial bird which resembles a real bird in the damage it causes.

Credit: DLR (CC-BY 3.0).

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