Music from the cabin wall and a cautious walking robot – DLR at ILA 2014

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From 20 to 25 May 2014, the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) will be at the Berlin Air Show (Internationale Luft- und Raumfahrtausstellung; ILA), presenting numerous concepts for more sustainable, safer and comfortable air travel. In the outdoor area at the air show, DLR will be exhibiting a number of its research aircraft, including the Falcon 20E atmospheric research aircraft. The Space Pavilion, designed by DLR in collaboration with its partners, will be showcasing the TORO walking robot and a number of current European space missions.

From America to New Zealand – the DLR Falcon research aircraft

The DLR Falcon 20E atmospheric research aircraft will fly directly to ILA in Berlin after concluding a mission with the US space agency NASA at Edwards, California. In this mission, researchers at the DLR Institute of Atmospheric Physics and the DLR Research Flight Department are currently investigating the emission of pollutants from alternative fuels and their effects on the climate and atmosphere. While a NASA DC-8 with a modified engine conducts flights using different mixtures of alternative fuels, the DLR Falcon follows it, investigating the emissions in flight – especially carbon particulates and condensation trails. The measurements are being carried out as part of the ACCESS II (Alternative Fuel Effects on Contrails and Cruise Emissions) project. After ILA, the researchers will replace the instruments on the Falcon at the DLR site in Oberpfaffenhofen, and prepare the aircraft for its next mission, the DEEPWAVE (Deep Propagating Gravity Wave Experiment) research mission in New Zealand. Once there, the DLR research aircraft will fly along the Southern Alps in New Zealand, investigating atmospheric gravity waves, which influence short-term weather patterns as well as long-term climate events.

Real-time vibration monitoring

Everything on an aircraft vibrates – for example the wings, the tail and the engines. It is important that the amplitude of the vibrations does not become too large. Aircraft are getting lighter and lighter and, at the same time, becoming more susceptible to strong natural oscillations caused, for example, during abrupt aircraft manoeuvres or by a wind gust. For this reason, the vibration stability of new aircraft must be measured before being certified. Using a system developed at the DLR Institute of Aeroelasticity, vibrations in aircraft or models can be safely and efficiently monitored in a wind tunnel. An array of sensors continually records all movements during the process. The measurement data is sent directly to a software package developed at DLR to be assessed and displayed in real time. In this way, the engineers can monitor how the vibrations are changing and whether they are approaching a critical threshold value while the aircraft is operating, or on a model. “We can approach such critical points very accurately without destroying the model or structures in a wind tunnel, where extreme situations are investigated,” explains Marc Böswald, Head of Structural Dynamics and Aeroelastic System Identification, describing the benefits of the system. The sensors can be attached to models that are tested in a wind tunnel, but they can also monitor an aircraft while in flight. Scientists will be demonstrating the system using a model of an Airbus A350 on the DLR stand at ILA.

Music from the cabin wall

Music and crew announcements from the side panel of the aircraft instead of from a loudspeaker – and some quietness if preferred. The DLR Institute of Composite Structures and

Adaptive Systems has developed an aircraft side panel to provide good acoustics and less noise in the cabin. Actuators integrated into the aircraft side panel cause it to vibrate, enabling passenger announcements and music to be played and rendering separate loudspeakers redundant. These actuators can also be used to reduce vibrations and, hence, noise levels in the cabin. Low frequency noise, which can be particularly noticeable, can be reduced by up to eight decibels. The passive noise insulation used until now, which significantly increases the weight of an aircraft due to the heavy insulating material used, can be reduced using the new system.

Rubbing shoulders with the DLR TORO walking robot

In the Space Pavilion, DLR and its partners – the European Space Agency (ESA) and the German Aerospace Industry Association (Bundesverband der Deutschen Luft- und Raumfahrtindustrie; BDLR) – will be presenting current Earth observation projects and space exploration missions, including the Rosetta comet mission with the Philae landing probe, and the MASCOT asteroid lander. DLR will be showcasing the TORO humanoid walking robot at ILA for the first time. Perhaps TORO will follow in the footsteps of the famous C-3PO, the humanoid, shiny, golden android in the Star Wars saga, and explore other planets. For Michael Suppa and his team at the DLR Robotics and Mechatronics Center, the 1.70-metre-tall robot, at its 75 kilos, is already a hero: “Unlike his older brother Justin, TORO can not just roll but walk on two legs – this is an important step into a new dimension for us, in the truest sense of the word,” the engineer reports. TORO is based on the technology of the DLR lightweight robot. Using numerous sensors, the walking robot can sense its surroundings, respond sensitively to influences from its environment and move around it autonomously.

More information on DLR’s extensive presence at ILA and important information on the air show can be found on our special ILA website. The latest reports, webcasts and images will also be found there during ILA.

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In use around the world – Falcon 20E

The DLR Falcon 20E atmospheric research aircraft will make a stopover at ILA 2014 before preparing for a mission in New Zealand.

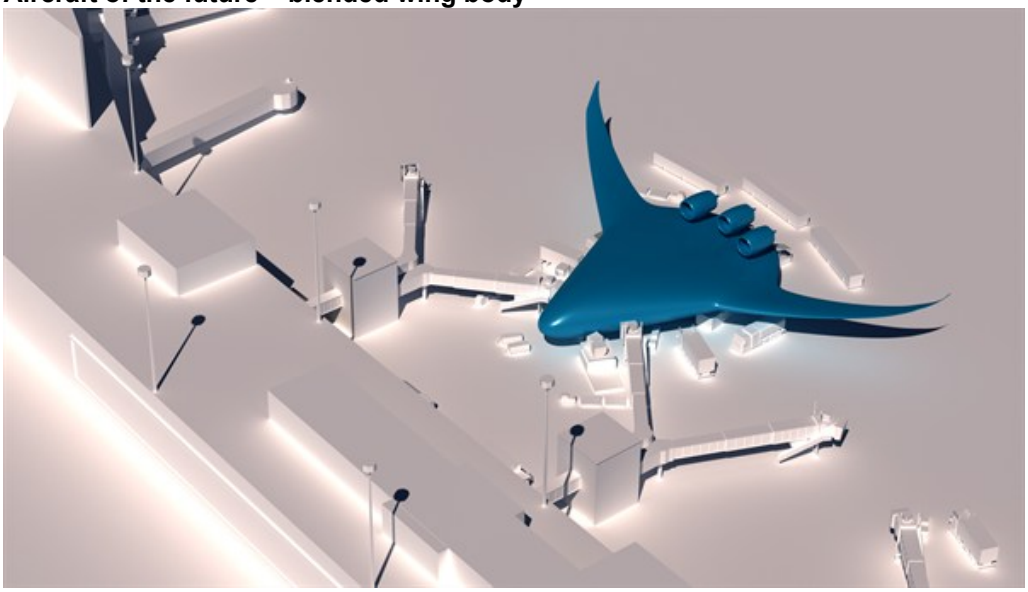
Credit: Dietmar Plath.

DLR research aircraft ATRA

ATRA (Advanced Technology Research Aircraft) is the largest member of the DLR research fleet; it has been in service since late 2008.

Credit: DLR (CC-BY 3.0).

Aircraft of the future – blended wing body



The DLR Institute of Air Transportation Systems, as part of Airport 2030, is examining how a Blended Wing Body (BWB), whose shape significantly differs in comparison to conventional aircraft, fits into the operations at the airport of the future. Due to the higher positioning of the wings, the dispatch of a BWB aircraft will require some changes during refuelling, de-icing, engine checks and baggage handling. However, extensive use can still be made of the existing infrastructure.

Credit: DLR (CC-BY 3.0).

TORO walking robot

It is 1.70 metres tall and weighs 75 kilograms; the TORO walking robot will be on display at ILA 2014 in the Space Pavilion.

Credit: DLR (CC-BY 3.0).

Philae landing on comet

Artist’s impression of the Rosetta orbiter deploying the Philae lander to comet 67P/Churyumov–Gerasimenko (not to scale).

Credit: ESA–C. Carreau/ATG medialab.

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