



DLR Falcon makes a stopover at ILA

21 May 2014

DLR and NASA present initial results of the joint test flights with biofuels

In time for the start of the Berlin Air Show (Internationale Luft- und Raumfahrtausstellung; ILA) and coming straight from joint flight trials with NASA in Palmdale, California, the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) Falcon 20 E research aircraft landed at the Berlin Show Ground, where NASA, DLR and the Canadian National Research Council (NRC) held a press conference on 21 May 2014 to discuss their cooperation and to present initial results from the NASA-led ACCESS-II mission (Alternative Fuel Effects on Contrails and Cruise Emissions). With a better carbon dioxide balance and significantly reduced amounts of carbon particulates in the exhaust emissions when compared to kerosene, the biofuels demonstrated the potential of renewable fuels for environment-friendly developments within aviation. Trade fair visitors can take a look at the DLR Falcon and its instruments during a static display on 21 May 2014. A global ILA ambassador, it carries the show's logo. Afterwards, the research aircraft will travel to the DLR site in Oberpfaffenhofen to be prepared for its next scientific mission in New Zealand.

Close cooperation

"We are pleased with this successful joint research mission with NASA," said Rolf Henke, the DLR Executive Board Member for Aeronautics Research. "The scientists, engineers and pilots cooperated very closely and trustingly during the research flights in California. This is an excellent foundation from which to expand joint projects in aeronautics research and to cooperatively address new research topics within an international framework," Henke continued. Examples include two agreements that NASA and DLR signed at ILA 2012 regarding cooperation in the field of Air Traffic Management (ATM). Since then, the partners have engaged in joint research to develop new solutions to boost the efficiency of take-offs, landings and ground operations at airports.

Jaiwon Shin, Associate Administrator for the Aeronautics Research Mission Directorate at NASA, emphasised: "These ACCESS flight tests are a current and perfect example of the kind of international collaboration that is so important in developing innovative technology in today's interconnected world." NASA and DLR are complementary partners in the ongoing flight trials and beyond. Shin continued: "By contributing resources of every kind – personnel, facilities, finances – and approaching the same technical challenges from different directions, our respective talents and technical capabilities ideally combine to complement each other."

[//www.youtube.com/embed/5PS8MFJ2Jts?rel=0](http://www.youtube.com/embed/5PS8MFJ2Jts?rel=0)

Reduced emissions from biofuels

In measuring the biofuel exhaust, the DLR researchers concentrated on the identification of carbon particulates and sulphur compounds, and the size distribution of ice crystals contained in the condensation trails. Initial analysis of the measurements has shown that biofuels substantially cut particulate emissions in the exhaust gases – and soot emissions in particular – when compared with standard kerosene. There is also a distinct reduction in both gaseous and particulate emissions of sulphur compounds. The flight trials were also an ideal setting to measure the microphysical properties of condensation trails when using biofuels. This data enables analysis of possible distinctions in the properties of contrails produced by different fuels, as well as their possible impact on Earth's climate.

Robust research aircraft

A NASA DC-8 using a number of different fuels led the flight formation during the research flights. The DLR Falcon and a NASA Falcon trailed the DC-8 at a distance of roughly 100 metres, collecting data on exhaust gas composition. A T 33 from the Canadian National Research Council (NRC) provided support during the measurements. "Once more, the DLR Falcon has proven its qualities as a particularly robust research aircraft," said Oliver Brieger, Head of DLR Flight Operations. The NASA researchers operated the four CFM56 engines on the DC-8 alternately with regular Jet A1 aviation fuel and a 1:1 mixture of Jet A1 and the biofuel HEFA (Hydroprocessed Esters and Fatty Acids). HEFA is produced using oil from the Camelina plant. The flight tests set off from the NASA Armstrong Flight Research Center in Palmdale, California.

International evaluation of the tests

The results of the joint NASA, DLR and NRC flight tests will be discussed at the next meeting of the International Forum for Aviation Research (IFAR). An international team from 23 IFAR member states will receive access to the results of the test flights. IFAR is an active forum that brings together the leading international participants in aeronautics research. DLR plays, together with NASA, a leading role in IFAR.

Next mission: New Zealand

"After ILA, we will send the Falcon to Oberpfaffenhofen to be fitted with another suite of instruments before the research aircraft sets off for the DEEPWAVE mission in New Zealand," said Markus Rapp, Director of the DLR Institute of Atmospheric Physics. "There, the Falcon will complete a five-week flight campaign in June and July along the Southern Alps to study atmospheric gravity waves." DEEPWAVE is an acronym for Deep Propagating Gravity Wave Experiment. Gravity waves influence the weather and long-term climate-related atmospheric processes. They are produced when disturbances affect atmospheric circulation systems. The main cause of this phenomenon in New Zealand is the mountainous region located directly adjacent to the Pacific Ocean, which triggers atmospheric waves deep into the middle atmosphere at an altitude of roughly 100 kilometres.

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DLR Falcon at the ILA Berlin Air Show after a research flight campaign with NASA



The DLR Falcon 20 E at the ILA Berlin Air Show after returning from a research flight campaign conducted at the NASA Armstrong Flight Research Center in Palmdale, California.

Credit: DLR (CC-BY 3.0).

In front of the Falcon at ILA



Group photograph in front of the DLR Falcon 20E at the ILA Berlin Air Show. From left to right: Rolf Henke, DLR Executive Board Member for Aeronautics Research; Jaiwon Shin, NASA Associate Administrator for the Aeronautics Research Mission Directorate; Jerzy Komorowski, General Manager for Aerospace, National Research Council Canada (NRC); Markus Rapp, Director of the DLR Institute of Atmospheric Physics.

Credit: DLR (CC-BY 3.0).

DLR Falcon on landing



DLR Falcon on landing – the German Aerospace Center (DLR) Falcon 20-E is a robust research aircraft which is used, for example, to investigate condensation trails.

Credit: NASA.

Installation of a measurement probe



Installation of a measurement probe. Particulate measurement probes are installed under the wing of the Falcon. Here, one of the probes is being maintained before it is used again.

Credit: NASA.

DLR Falcon and NASA DC-8



DLR Falcon and NASA DC-8. During the research flights, a NASA DC-8 led the flight formation and burned different fuels. The DLR Falcon and a NASA Falcon followed the DC-8 at a distance of about 100 metres and collected data on the composition of the exhaust gases.

Credit: NASA.

Group picture with the research aircraft



Group picture with research aircraft. Scientists, technicians and pilots from NASA, DLR and the NRC in front of the research aircraft involved in the trials.

Credit: NASA.

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