



Electric flight

Environment-friendly air transport of the future

The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) believes that electric flight is a key driver for reducing climate-damaging emissions as the volume of air traffic increases. It is therefore seeking political support for the early and long-term testing of hybrid-electric aircraft propulsion systems; these are a combination of a gas turbine and one or more electric motors.

Agreeing on global air transport capacity and climate protection objectives

In its coalition agreement, the German Federal Government has committed to abiding by the 'Paris Agreement' on climate protection and the European 2050 climate strategy. The objectives of Germany's 'Climate Action Plan 2050' envisage a 40 to 42 percent reduction in carbon dioxide emissions from the transport sector by 2050, in comparison with 1990. This high-tech strategy promotes research work to reduce greenhouse gases, develop new energy storage systems and devise alternative propulsion technologies. The European Union's 'Flightpath 2050' aeronautics strategy also sets ambitious emission reduction targets. These include reducing carbon dioxide emissions by 75 percent and nitrogen oxide emissions by 90 percent, with respect to 2000 values. The International Civil Aviation Organisation (ICAO) has set a target of no rise in climate-damaging emissions from 2020, despite the growth in air transport. With its aeronautics research programme, the German Federal Government is supporting activities that will ensure that these goals can be met.

Concerted efforts will be needed to develop new, climate-neutral technologies to reconcile the requirements for both increased capacity and climate compatibility in the air transport sector. According to the German government's High-Tech Strategy 2025, 'the demand for alternative, pollution-free propulsion systems and electric mobility (...) should remain central to research and technology transfer activities'. The basis for this lies in the advantages of electric propulsion systems, which are emission-free at a local level, as well as being quiet and energy-efficient. As a result, one of the most important objectives is to enable the use of electric propulsion systems in cargo and passenger aircraft.

DLR has in-depth systems expertise for the development of electrically powered air transport

DLR has already achieved considerable success with its work on electric propulsion systems for aircraft. For example, its researchers developed the powertrain of the world's first four-seat passenger aircraft, which uses a hydrogen fuel cell and battery system. However, greater research efforts are required if the ambitious political objectives are to be achieved. This poses a challenge, due to the wide range of design possibilities offered by the availability of various energy sources, propulsion technologies, vehicle design concepts and operating methodologies. DLR is well placed to address all the necessary research questions.

Although aeronautics researchers are already working hard on suitable technologies, there is still a long way to go before electric propulsion systems can be used in large commercial aircraft. This requires the development of increasingly powerful hybrid propulsion systems, the involvement of an array of different research disciplines and the cultivation of in-depth systems expertise.

Strengthening research and development with secure, long-term support

For this reason, research requires secure and long-term funding. Strengthening research and development for electric flight is necessary to answer key questions surrounding this endeavour, such as increasing range, the impact on other systems and the reassessment of certification criteria. In addition, propulsion architectures and technologies have to be tested both in extensive simulations and in actual operation on research aircraft. With these testing options, the transition from small, electrically powered aircraft to large commercial aircraft will be successful.

DLR's leading role in electric flight research

As a major research institution, DLR is playing a leading role in the development of new technologies and in the successful implementation of electric flight. All aspects of electrification, such as integration, flight testing, the involvement of other systems and overall system evaluation are the subject of current research. As the national research centre of the Federal Republic of Germany, DLR offers expertise in both fundamental and application-oriented research. At the European level, only DLR has the experience, systems expertise and flight test capabilities necessary for this task. DLR also has a prominent role in an interdisciplinary consortium made up of industry and other research institutions, and is coordinating the various participants and their work to exploit the potential of electric flight in a targeted manner.

Germany as a pioneer

Political support for key technologies to enable the research and development of new, innovative products and electric flight is needed in order for Germany to maintain its place as a world leader in high-performance, environment-friendly air transport. Financial resources must also be made available for this purpose. This is the only way to promote sustainable air transport and meet the goals of the German 'Climate Action Plan 2050' and the 'Paris Agreement'.

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