

Initiative for aeronautics research and teaching in Austria

New research group and university master's degree program in Aeronautical Engineering for sustainable aviation and green technologies, in close cooperation with industry and research institutions

In recent years, there has been increasing international interest from the public, authorities and industry in making aviation more sustainable and ultimately climate-neutral. In order to plan and create a combined Austrian effort to contribute to greening aviation, the Federal Ministry for Climate, Environment, Energy, Mobility, Innovation and Technology (BMK), together with industrial companies endowed a professorship for aircraft systems. The position was established at the TU Wien in 2021.

Objective

The research group for aircraft systems at the TU Wien aims to:

- increase Austria's scientific contributions to climate-neutral aviation
- establish an international cooperation network with industry and research institutes
- establish a university master's program in Aeronautical Engineering in Austria
- become an internationally recognized partner for aviation as well as a coordinator of innovation projects

Approach

Our approach is to provide state-of-the-art, industry-oriented research and attractive teaching opportunities for students, using future-oriented methods and tools.

The focus of our research is on the development and testing of new concepts, systems and components, in particular:

- the replacement of fossil fuels with sustainable drop-in fuels
- electric propulsion technologies based on liquid hydrogen (LH₂) and fuel cells or batteries
- efficient thermal management of new propulsion technologies and their integration into the airframe
- functionally tailored, shape-variable single and multiple winglets systems



- aerodynamic and aero-acoustic simulation and optimization of aircraft, propulsion systems, aircraft components and systems
- the development of reduced-order models and corresponding software tools for aircraft concept design and system simulation

The first step on the path to introducing a new master's program for aeronautical engineering in Austria was to create an individual study program "Aeronautical Engineering" at the TU Wien.

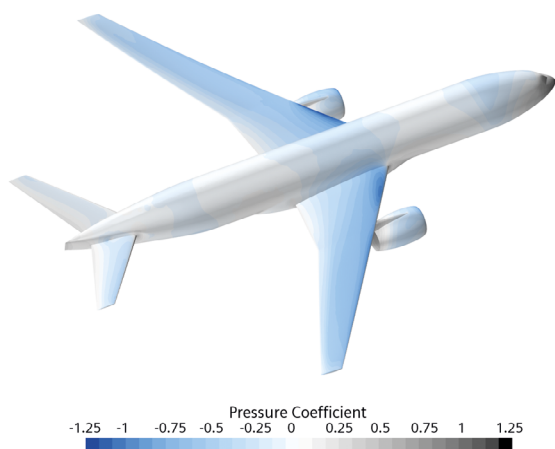
New courses will gradually be introduced covering areas such as aircraft systems, flight physics and related lab subjects, systems engineering, and an applied study project in which a system or specific aircraft functionality is developed by a team of students.

Students will learn to comprehend and manipulate physical phenomena through laboratory exercises that address applied problems of aircraft propulsion, aerodynamics, heat transfer, and avionics.

The entire program is offered in English to meet international demand. The new, widely accessible master's program is scheduled to start in 2024.

Both conventional experimental and computational methods as well as special in-house developments are used as tools in research and teaching.

An aircraft systems laboratory will be established, including an avionics and integration workshop for test preparation, as well as a facility for conducting the tests. Air for the test stands and wind tunnel tests will be provided by low-pressure compressors that can be operated in a versatile manner in either intake or exhaust mode. Modern sensor technology, measuring equipment, IR cameras, and data acquisition and processing provide inputs for the development of new design and simulation methods as well as for the validation of numerical simulations.



Pressure coefficients of the NASA "Common Research Model" configuration during cruise at Mach 0.2

A dedicated platform for the rapid synthesis and analysis of new aircraft concepts will provide a foundation for new research. In this context, the overall design contains specific embedded system models from different accuracy classes. This allows those subsystems and components which are of particular interest to be embedded in the overall aircraft models at the specific level of detail required in each case.

The design of new aircraft is facilitated by reduced-order models calibrated either by experimental testing or computational simulation data. When low computation times are important, fast CFD codes, such as XFLR5 and VLM++ are used.

Complex aircraft geometries for flow analyses are created or adapted with CATIA V5. In addition to commercial software for flow problems (RANS solvers such as StarCCM+, FLUENT), the DLR code TAU (which focuses on aeronautics) is also applied together with the mesh generator CENTAUR. For combined aeroacoustic investigations, transient Lattice-Boltzmann calculations are used. These calculations can be done in short time with the supercomputer VSC (Vienna Scientific Cluster) operated at TU Wien.

International Network

Affiliations

- Austrian representative in the International Forum for Aviation Research (IFAR) and member of the IFAR working group Sustainable Aviation
- European Aeronautics Science Network (EASN)
- Aviation Industry Austria (AI Austria)
- German Aerospace Society (DGLR)

Supporters

The research group is financed by the Federal Ministry for Climate, Environment, Energy, Mobility, Innovation and Technology (BMK) via the Research Promotion Agency (FFG) and by co-financing from the following companies:

- Diamond Aircraft Industries GmbH
- FACC Operations GmbH
- TEST-FUCHS GmbH
- Frequentis AG
- Rübigen GmbH & Co. KG

What we offer

For cooperative projects with industry and research:

- rapid execution of tests in test facilities
- comprehensive know-how and many years of experience in the aviation industry
- Pre-development and analysis of aircraft and their components
- applied CFD expertise for aircraft aerodynamics, internal flows and combined problems

For students and researchers:

- Master's program Aeronautical Engineering (from 2024)
- Collaboration as doctoral student or post-doctoral researcher

Contact

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