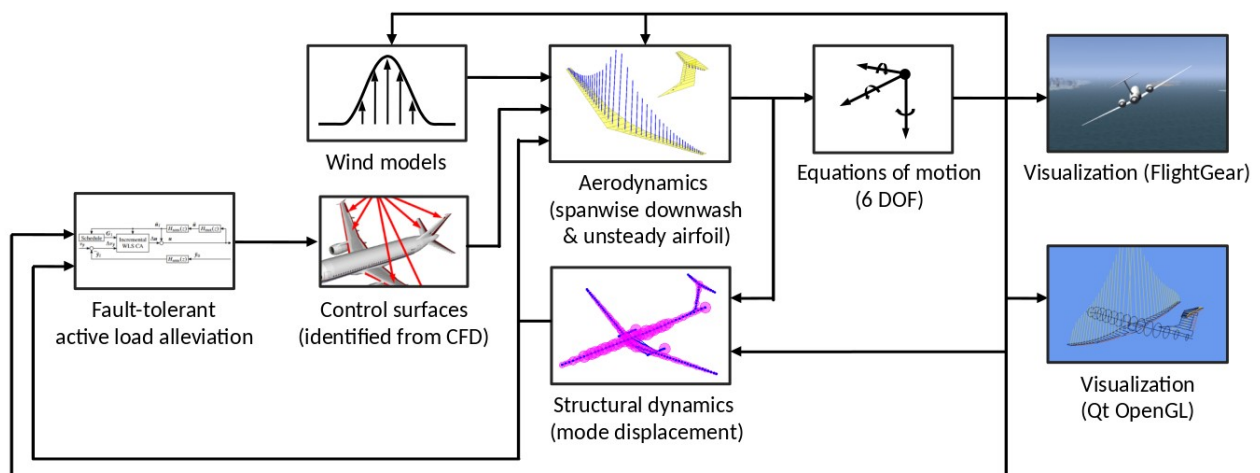**PhD-Researcher Position (m/f/d) within the SE²A Research Cluster**
Integrated Design of Control Methods within an Air Traffic Simulation
Temporary Position (up to 3 years), up to Salary Level EG 13 TV-L, 100%

Background:

The Cluster of Excellence *SE²A - Sustainable and Energy-Efficient Aviation* is a DFG-funded interdisciplinary research center investigating technologies for a sustainable and eco-friendly air transport system. Scientists from aerospace, electrical, energy and chemical engineering as well as economics and social science are working on the reduction of drag, emissions and noise, life-cycle concepts for airframes, improvements in air traffic management and new technologies for energy storage and conversion. Technische Universität Braunschweig, the German Aerospace Center (DLR), Leibniz University Hannover (LUH), the Braunschweig University of Art (HBK) and the National Metrology Institute of Germany (PTB) have joined forces in this extraordinary scientific undertaking. The overall project is structured into the three core research areas "Assessment of the Air Transport System", "Flight Physics and Vehicle Systems" and "Energy Storage & Conversion". (www.tu-braunschweig.de/en/se2a)

This project is part of "Flight Physics and Vehicle Systems" and makes an important contribution to the overall SE²A project by actively reducing loads, thereby lowering structural weight and saving fuel.

Employment:

The position is located at the Institute of Flight Guidance (IFF, www.tu-braunschweig.de/iff) in Braunschweig. The entry date is as soon as possible, and the duration is initially limited until December 2025. The position is part-time suitable, but should be occupied 100%. For all doctoral researchers of the cluster, an active participation in SE²A's own qualification programme is mandatory, the time effort for this training measure entails 10% of the working time. The payment is made according to task assignment and fulfillment of personal requirements up to salary group EG 13 TV-L. International applicants may have to successfully complete a visa process before hiring can take place. Applications from international scientist are welcome. The Cluster SE²A aims to increase the share of women in academic positions. Applications from female candidates are very welcome. Where candidates have equal qualifications, preference will be given to female applicants. Candidates with handicaps will be preferred if equally qualified. Please enclose a proof.

The opportunity to pursue a PhD degree is given and encouraged.

Task:

You will work in the SE²A projects ARGO² and SONAR.

ARGO² aims at investigating active and partially passive wing control functions combining active flutter control with "rigid-body" (manual flight modes and/or autopilot) and flexible laws (manoeuvre and gust load alleviation functions). The load alleviation functions shall significantly reduce gust and manoeuvre loads down to a level equivalent to steady 1.5g to 2.0g flight and the flutter control law shall permit to fly right at the limit or even slightly beyond the open-loop flutter speed. Sensor networks integrated into the wings and fuselage will facilitate accurate evaluation of the aircraft current and future state. In ARGO-1, an aeroelastic flight dynamics model has already been developed[1] and an INDI (incremental nonlinear dynamic inversion) controller for active gust load alleviation has been implemented in Matlab/Simulink[2]. The INDI controller uses as "measured values" the eigenmodes of the flexible aircraft and their time derivatives, which, however, cannot be measured directly in reality. The focus in ARGO² will be on extending the controller to active flutter suppression. In addition, a state estimator for the eigenmodes and their time derivatives will be implemented, which allows the use in real systems. You will work closely with the EverScale project, in which the algorithms will be demonstrated in flight tests with scaled modes.

SONAR is based on AdAS of the previous funding period and is about advanced air traffic system simulation. The goal is to evaluate the impact of novel SE²A aircraft on the overall air transportation system and to identify bottlenecks of future air traffic systems and corresponding modeling methods. In addition, reduced-order models based on flight guidance systems to be developed in ARGO² will be integrated into this simulation and their impact on air traffic will be investigated.

The tasks can be summarized as follows:

- Development of a distributed sensor network and state estimation for assessing the bending state of a flexible aircraft wing in the institute's toolbox LADAC[2]

---

1 Video about aeroelastic flight dynamics model: https://youtu.be/cO5q06Qkkgk

2 The flight simulation code is based on the open source code LADAC: https://github.com/iff-gsc/LADAC

- Evaluation of the state estimator and support for the transfer of the concept to the scaled flight demonstator
- Integration and maintenance of SE²A reference aircraft updates
- Development of a flight guidance and a flight management functionality in the institute's toolbox LADAC²
- Enhancement of an air traffic simulation framework
- Publication of results
- Collaboration with other partners within the ICA-A2 and ICA-B2.3 project as well as within the SE²A cluster
- The opportunity to pursue a PhD degree is given and encouraged.

Who we are looking for:

- Persons with completed Masterstudies in Air and Space Sciences or similar
- In-Depth knowledge of flight dynamics and flight controls as well as MATLAB/Simulink are mandatory
- Knowledge of Air Traffic Management processes and good programming skills are essential
- Knowledge in aerodynamics are welcome
- Good English (in writing and speaking) is mandatory, knowledge of German language is desirable

Application Process:

Applications should be sent by e-mail to m.steen@tu-braunschweig.de or by regular post to Institut für Flugführung, TU Braunschweig, Hermann-Blenk-Str. 27, 38108 Braunschweig and must contain the following documents:

- Motivation Letter
- Curriculum Vitae including complete address, phone number, email address, educational background, language skills, and work experience
- Copies of bachelor and master diploma and transcript of grades in original language and in english or german translation
- Additional Documents must be provided on request

All documents should be in PDF format, preferably in a single file. Personal data and documents relating to the application process will be stored electronically.

Please note that application costs cannot be refunded. For the purpose of carrying out the application process, personal data will be stored.

For more information, please call Dr. Meiko STEEN on +49 (0) 531 391-9837.