Sustainable and Energy Efficient Aviation

Junior Research Group Lead (m/f/d):

Long-Range Aircraft Configurations and Technology Analyses

(EG 14 TV-L, 100%, 4 years, for the next possible date)

Motivation: TU Braunschweig has defined one of its core research areas to create safe, efficient and sustainable mobility for the future (https://www.tu-braunschweig.de/en/mobility-1). In aviation research, we follow an interdisciplinary research concept, jointly with DLR and Leibniz University Hannover, within the Cluster of Excellence "SE²A - Sustainable and Energy Efficient Aviation" (EXC 2163). The Cluster defines scientific and technological foundations for a sustainable future global air transport system to meet the mobility demands. It defines solutions for transformation needs of the air transport system by introducing new aircraft technologies, new energy storage and conversion approaches, and fundamental evaluations of the overall aviation system. (https://www.tu-braunschweig.de/en/se2a).

Approach: The Cluster of Excellence is structured into the three core research areas, namely "Assessment of the Air Transport System", focusing on Operations Research, technology assessment and life cycle analysis, "Flight Physics and Vehicle Systems" for new aircraft technologies in flight physics and aircraft structures, and "Energy Storage and Conversion", focusing on vehicle energy storage and conversion systems and full- and hybrid-electric aircraft drive systems. The Cluster has established Junior Research Groups (JRG) as an effective means to generate effective thrusts in critical research fields. We therefore search for JRG leads with a doctoral degree and a strong research background in their respective fields for the next possible date.

The JRG "Long-Range Aircraft Configurations and Technology Analyses" will be part of the core research area "Flight Physics and Vehicle Systems". A comprehensive analysis of new aircraft configurations for long range air travel is important to overcome the limitations of current designs in terms of economic feasibility and compliance with the requirement of drastically reduced emission and climate impact for future aviation. Moreover, such configurations serve as reference aircraft to analyze the potentials of novel aircraft technologies, as developed within the Cluster with consideration given to often conflicting economic and environmental objectives. The JRG will be comprised of the lead and 2 doctoral researchers, funded initially for 4 years as part of the overall Cluster effort. The group will work in close collaboration with the Cluster's fundamental research thrusts in the fields of aerodynamic drag reduction, noise reduction, weight reduction, and new approaches for energy storage and conversion. Therefore, we expect a full commitment to undertaking interdisciplinary research.

Expected research focus: Two major research directions are forseen for the new Junior Research Group. **(1) The conceptual design** of future long-range aircraft will combine medium-fidelity and physics-based methods such as simplified FEM and efficient 2.5D flow simulation tools, tightly coupled with an overall aircraft design methodology such as SUAVE. Efficient computational chains in this respect are available from previous works of the present design team of the Cluster. The methods shall be used for conceptual design of long-range aircraft configurations comprising classical tube-and-wing, classical Blended Wing Bodies, Hybrid Wing Bodies, and Flying-V configurations and analyze their potentials and limitations. **(2) Higher-fidelity methodologies** need to be developed that address the simulation of design features of future long-range configurations beyond the current knowledge and methods used for conceptual design. These comprise the simulation of flight dynamics and control, the structural analysis of unconventional aircraft, the aeroelastic assessment of unconventional configurations, the integration of models of on-board power networks (the latter being developed by other research teams in the Cluster), and well as physics-based modeling of future hydrogen fuel tanks on board.

Friedrichs, J., Elham, A., Hühne, C., Radespiel, R., Bauknecht, A., Vehicle Technologies towards Sustainable and Energy Efficient Aviation, AIAA SciTech Forum 2022, doi 10.2514/6.2022-0685.

Qualifications: The Junior Research Group lead must hold, beside a completed scientific higher education (master, university diploma), a PhD and is expected to have an excellent record of publications in good venues in their field, international exposure and have participated in competitive research projects. The lead is expected to devise, coordinate, and actively contribute to the methodological extensions and applications of simulating conceptual aircraft design as described above. Therefore, we seek a researcher with a strong background in overall aircraft design to apply for the open lead position. In-depths experience in higher-fidelity methodologies as noted above would be seen as an advantage.

Application Process:
Please send a complete written application in English as a single PDF file to: se2a@tu-braunschweig.de.

Applications have to consist of a cover letter (statement of purpose, including your motivation), your idea of methodical and contextual contribution to the project (length about two pages), full CV, academic certificates and transcripts (bachelor, master, and PhD), and other supporting certificates.

Please check our website www.tu-braunschweig.de/se2a for further details and detailed description of the available positions linked to the JRG topics. Please specify in your application which JRG you are applying for. We thank all applicants, but only short-listed candidates will be contacted.

The deadline for submitting applications is the 31st of May 2022.

For further questions, please contact: Prof. Dr.-Ing. Rolf Radespiel, +49 531 391 94250

Benefits: We offer a fixed-term full-time contract with an average weekly working time of 39.8 hours for a period of up to four years. The payment will be according to task assignment and fulfillment of personal requirements up to salary group 14 TV-L. Contracts include health, retirement and unemployment benefits.

At TU Braunschweig we appreciate a team-oriented and communicative style of work. Gender Equality is an important factor for us. We aim to increase the share of women in academic positions and therefore particularly welcome applications from women. We support all our academics in their scientific and personality development and we offer a family-friendly workplace. Applications from international scientists are welcome. International applicants may have to successfully complete a visa process before hiring can take place. Severely disabled persons with equivalent qualifications will be given preference. Please attach a form of evidence of your handicap to your application. Your personal data will be saved for the application procedures. Application costs cannot be reimbursed.