Cluster of Excellence SE²A - Sustainable and Energy Efficient Aviation

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

Adaptive Compressors

(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.

In the Integrated Cluster Area "Energy Storage and Conversion", the JRG "Adaptive Compressors" will exploit the synergies between shape-adaptive compressor blades and active flow control and develop advanced design and analysis methods for actively flow-controlled compressors. Studies of fundamental flow physics and heat transfer will contribute to a profound understanding of unsteady 3D aerodynamics and thermal effects in compressors. This new knowledge will help to realize the full technological potential of innovative concepts for highly-loaded but shape-flexible and robust transonic airfoils, and unsteady closed-loop active-flow control (AFC). The consideration of thermal effects will benefit a full integration of the compressor into the aircraft thermal management system. In conceptual design studies, the highly unsteady effects of aspirated flow, which is injected in upstream blade rows and driven by the inter-stage pressure difference is evaluated with regard to compressor stability. Shape-adaptive compressor blades will be required to perform active stage-matching and thus contribute to a most flexible energy-supply system. The research data obtained will be used to derive advanced design and analysis methods for adaptive compressors. The JRG will comprise the lead and 2 doctoral candidates, funded initially for 4 years as part of the overall project. The group will work in close collaboration with related research efforts.

Expected research focus: Combining flow aspiration in downstream blade rows with a flow injection in upstream blade rows results in an increasing compressor efficiency and an enhanced operating range. A research focus is placed on the highly unsteady local flow phenomena, thermal effects, and the unavoidable impacts on the aerodynamic stage matching. Contributions of shape adaptive compressor blades to AFC benefits are investigated in terms of flexible flow re-conditioning in the compressor system. A close collaboration of the group with the junior research group "Scale-resolved aerodynamics of turbomachinery flows" at TU Braunschweig is expected. The feasibility and potential of compressor thermal-management strategies are assessed with a focus on their benefit on the compressor performance and flexibility. The research data obtained by the research group is used to derive advanced design and analysis methods for adaptive compressors.

Vorreiter, A., Fischer, S., Saathoff, H., Radespiel, R., Seume, J.R. (2012): “Numerical Investigations of the Efficiency of Circulation Control in a Compressor Stator”, J. Turbomach 134(2), 021012 (11 pages), doi: 10.1115/1.400328.

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.

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. Joerg R. Seume, seume@tfd.uni-hannover.de, +49 511 762 2733

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 to salary group 14 TV-L. Contracts include health, retirement and unemployment benefits.

About the employer: At Leibniz Universität Hannover 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.