Technical University of Munich, Department of Aerospace and Geodesy

Open PhD candidate (research assistant) position on investigation of aeromechanical-electrical coupling effects in electric aircraft

Application closing date: 31 December 2020

Expected starting date: 1 March 2021

Applications are invited for a PhD candidate / Research Assistant position in the Department of Aerospace and Geodesy at the Technical University of Munich. The successful candidate will join the recently founded eAviation Group and will perform research in the area of electric aviation, investigating subsystem interactions in electric aircraft.

Research overview

Recent disruptive developments in many areas have paved the way for radically new types of aircraft. Driven by electrification and automation, the current phase is sometimes called the third revolution of aviation. New electric and hybrid propulsion approaches, in particular, may not only provide solutions to the urgent problem of environmental impact, but also open up new opportunities. Visions of air taxis populating the skies of tomorrow have already become omnipresent and new configurations, such as electric vertical take-off and landing vehicles, promise new modes of mobility. While numerous heavily-funded development projects are underway, several exciting engineering challenges still need to be tackled for such visions to be realised.

One important aspect to consider is that electric aircraft are characterised by significant couplings between subsystems and disciplines that are traditionally independent in conventional aircraft. Unlike in traditional aircraft, the propulsion system becomes part of the primary control system. This means that the influence of the propulsion system is no longer restricted to performance aspects but also extends to stability, controllability and handling qualities. Hence it is no longer sufficient to consider the mechanical domain alone – rather, the propulsion, control and electrical systems are interconnected and in turn influence flight performance. This leads to challenges that do not arise in conventional air vehicles, and considerably increases the complexity of the overall aircraft system. Ensuring a smooth, efficient and safe operation of such vehicles throughout their flight envelope requires an in-depth understanding of the separate subcomponents and their reciprocal interactions, as well as an appreciation of the aircraft system as a whole, with its performance and safety requirements. The high complexity of the system also complicates the development of suitable analysis methods, including models, design approaches and experimental setups.

While extensive research has been performed on several aspects of electric aircraft design and operation, the tight interactions between aeromechanical and high-power electric domain pose new challenges that have not been addressed so far. The aim of this project is to improve our understanding of such effects and their impact on flight performance, safety and efficiency. This will be done through the application of mathematical modelling, systems theory and experiments. The project is expected to lead to new insight on electric aircraft from a systems perspective, new detailed and comprehensive models, and new methods and tools for the analysis of such vehicles. The obtained results will support future electric aircraft development, making a valuable contribution to a more sustainable aviation landscape.

Come and help to shape the aviation of tomorrow!

Our expectations

The candidate will perform research in the outlined areas, and will be expected to publish their findings in peer-reviewed journals and present their work at major national and international conferences. Collaboration will be encouraged, both with colleagues in the department/university, and with external academic or industrial partners. In addition to research, the candidate will supervise students and support educational activities in the group.

Requirements

Candidates are expected to demonstrate the following:

- MSc in a relevant field, e.g. aerospace, mechanical or electrical engineering
- Technical background in control theory, system dynamics and/or electric systems
- Basic knowledge of the following topics will be advantageous: aircraft (mechanics, control, propulsion), electric propulsion, mathematical modelling
- Initial experience of relevant experimental work will be advantageous, e.g. flight testing, electrical system characterisation
- Interest in sustainable aviation and new aircraft concepts
- Programming experience, e.g. in MATLAB, Python or C/C++
- Ability to work independently and willingness to familiarise with new research fields
- Motivation to work in a multi-disciplinary team and collaborate across research domains
- Excellent communication and writing skills
- Very good command of spoken and written English

What we offer

This position is fully funded for 3 years, with an initial contract of 1 year. The candidate will be employed according to the collective wage agreement for the civil service (TV-L E13). The desired starting date is February 2021 or as soon as possible thereafter. TU Munich strives to raise the proportion of women in its workforce and explicitly encourages applications from qualified women. Applications from disabled persons with essentially the same qualifications will be given preference.

The successful applicant will join the eAviation group at TU Munich's newly-established Faculty of Aerospace and Geodesy. The eAviation group applies dynamics, modelling and control theory to investigate novel sustainable flight solutions across all scales and for both manned and unmanned air vehicles. The group has access to an indoor flight arena, as well as outdoor flight testing sites for larger prototypes. The candidate will be based in Ottobrunn, at a short distance from central Munich, at the newest TU Munich campus, and in close proximity to several major industry partners.

How to apply

Interested candidates should submit their application (in English) to applications.eav@lrg.tum.de by 31 December 2020 with "PhD application" in the subject. Please include the following documents as a single pdf file: detailed CV (including publications if applicable), cover letter, full academic transcript, MSc thesis summary, names and contact details of two referees.

For informal enquiries on the position, please contact Prof. Dr. Sophie Armanini s.f.armanini@tum.de), for enquiries on the application process please contact applications.eav@lrg.tum.de.

If you apply in writing, we request that you submit only copies of official documents, as we cannot return your materials after completion of the application process.

As part of your application, you provide personal data to the Technical University of Munich (TUM). Please view our privacy policy on collecting and processing personal data in the course of the application process pursuant to Art. 13 of the General Data Protection Regulation of the European Union (GDPR) at https://portal.mytum.de/kompass/datenschutz/Bewerbung/. By submitting your application you confirm to have read and understood the data protection information provided by TUM.

Find out more about us at www.tum.de.