Dresden University of Technology

TUD Dresden University of Technology, as a University of Excellence, is one of the leading and most dynamic research institutions in the country. Founded in 1828, today it is a globally oriented, regionally anchored top university as it focuses on the grand challenges of the 21st century. It develops innovative solutions for the world's most pressing issues. TUD has established the Research Training Group "AirMetro - Technological & Operational Integration of Highly Automated Air Transport in Urban Areas" (RTG 2947), funded by the German Research Foundation (DFG). This interdisciplinary group, involving five faculties and the German Aerospace Centre (DLR), will conduct research on 11 research topics. The goal is to address the technical and social challenges of Innovative Air Mobility (IAM), considering ecological, economic, technological, and sociological factors. The RTG's structured PhD program aims to train young researchers in highly automated, networked mobility, featuring international collaboration with mentors from the USA, Asia, and Europe. TUD and the RTG embody a university culture that is characterized by cosmopolitanism, mutual appreciation, thriving innovation and active participation. For TUD diversity is an essential feature and a quality criterion of an excellent university. Accordingly, we welcome all applicants who would like to commit themselves, their achievements and productivity to the success of the whole institution.

The **Research Training Group RTG 2947 "AirMetro"**, funded by the DFG, offers a position, as

Research Associate / PhD Student (m/f/x)

(subject to personal qualification employees are remunerated according to salary group E 13 TV-L)

starting **May 1, 2026**. The position is limited until April 30, 2029. The period of employment is governed by the Fixed Term Research Contracts Act (Wissenschaftszeitvertragsgesetz - WissZeitVG). The position aims at obtaining further academic qualification (PhD).

Job ID:	**RTG2947-T6/2**
Title:	Design of Robust eVCA Flight Trajectories accounting for Polymorphic uncertainties in Sensor Models and Sensor Fusion for IAM Operations
Supervisor:	Prof. Michael Kaliske, Chair of Structural Analysis and co-supervised by at least one additional professor plus an international tutor of the RTG

Description of the PhD topic:
Accurate real-time position and intent estimation and prediction of Innovative Air Mobility (IAM) operations using electrical powered Vertical takeoff and landing Capable Aircraft (eVCA) are challenged by various external and internal disturbance sources tending to produce a gap between computational – physical or data driven - models and the physical system. This gap arises from inherent incomplete system status knowledge as well as limited precision in sensor measurements. To address this challenge, uncertainty-aware methods are employed to explicitly quantify and propagate both epistemic and aleatoric uncertainty in IAM operations. We aim to develop robust real-time estimation and prediction techniques, forming a reliable basis for assessing current and future states of IAM-vehicles, to be used for traffic planning and surveillance, either in decision support tools or building the foundation of IAM Digital Twin being developed in the RTG.

This PhD project aims to develop a multi-physical simulation framework for various localization sensors (such as e.g., GPS, IMU, SLAM, RTK) that determines the vehicle’s position, explicitly accounting for their dependence on temperature and radio coverage fields. This includes the classical problems of sensor-fusion models in determining the figures of merit for each sensor and their dependencies to allow for prioritization or weighting. The framework shall enable an accurate characterization of the uncertainty in sensor-specific position measurements, which is subsequently approximated using surrogate models to support real-time operation and improved flight simulations.

Objectives:

- develop physics-based models of GPS sensor behavior for IAM applications and other sensors that explicitly account for multi-physical influences such as temperature effects and spatially varying radio coverage in urban environments
- quantify and represent both epistemic and aleatoric uncertainties in position measurements using high-fidelity simulation approaches, serving as a reference for safety-relevant positioning performance assessment

- employ physics-informed modeling concepts to ensure consistency between surrogate models and the underlying physical processes governing sensor behavior
- identify and validate sensor models using measurement data obtained from reference trajectories and high-accuracy positioning systems such as RTK, providing a reliable basis for uncertainty propagation in state estimation and trajectory prediction

Tasks:

- independent and cooperative qualification through scientific research within one of the PhD study projects on offer
- training in the technical tasks of the individual dissertation topics through study of the literature and in making the objectives more precise
- working on the individual PhD study project with experimental, numerical in collaboration with other RTG members (fellow students and supervising professors)
- implementation of the planned research program, evaluation and interpretation of the results and transferring them to a RTG internal ex-change platform, elaboration and presentation of the state-of-the-art in the respective research fields
- participation in lectures, workshops and summer schools according to the guidelines of the RTG curriculum
- supporting scientific graduation work (Bachelor/Master/Diploma) in the subject-specific research field
- regular reporting on research progress to the supervising professors
- publishing the results of the research work individually and in concert with others
- cooperative maintenance of exchange platforms (database, information pages, etc.)
- summarizing the results of the individual PhD study project in a dissertation within the due time of three years
- Successful candidates will work together with an experienced PhD researcher at the Chair of Air Transport Technology and Logistics and together with other chairs being part of the RTG.

Requirements:

- good or very good university degree as M.Sc. or Dipl.-Ing. in civil engineering or mechanical engineering or comparable with deep knowledge in continuum mechanics, structural analysis, advanced mathematics, modelling and simulation
- We are looking for first-class graduates with expertise in the RTG-addressed PhD subjects, high interdisciplinary desire to learn and willingness to cooperate, very good verbal and written English communication skills as well as the absolute determination to submit the dissertation after three years of research.

We offer:

- **Pioneering Research Environment:** Shape the future of advanced air mobility through involvement in innovative drone-related projects that bridge technology, urban planning, material sciences, sensors and aviation. With the upcoming Smart Mobility Lab in Lusatia, Saxony, you will have access to state-of-the-art and extensive facilities for experiments. This includes a hall measuring 100x100x30 meters and outdoor space (available from 2027).
- **Cross-Disciplinary Collaboration:** Immerse yourself in a highly collaborative and interdisciplinary research environment, where you'll work alongside experts from fields such as engineering, data science, urban studies, and aerospace.
- **Skill Development:** Our extensive qualification concept goes beyond research, offering targeted training in drone technology, data analytics, regulatory aspects, project management, and leadership skills. This ensures you graduate not only as a specialist in your field but also as a well-rounded professional.
- **Global Networking:** Collaborate with our network of local and international partners, fostering connections that transcend geographical boundaries and enrich your academic and professional network. This includes a paid research stay abroad for three months.
- **Career Advancement:** Receive dedicated support for fellowship applications and tailored guidance for your career.
- **Quality of Life in Dresden:** Experience a high quality of life in Dresden, with its dynamic urban scene, relatively affordable living, rich cultural offerings, and vibrant nightlife.

Further questions regarding this call can be addressed to Prof. Dr.-Ing. Michael Kaliske (michael.kaliske@tu-dresden.de).

TUD strives to employ more women in academia and research. We therefore expressly encourage women to apply. The University is a certified family-friendly university. We welcome applications from candidates with disabilities. If multiple candidates prove to be equally qualified, those with disabilities or with equivalent status pursuant to the German Social Code IX (SGB IX) will receive priority for employment.

Please submit your detailed application including a cover letter detailing your research interests stating the **job-ID "RTG 2947-T6/2"** along with your curriculum vitae, academic transcripts with marks, a letter of recommendation and your publications (if applicable) by **February 4, 2026** (stamped arrival date of the university central mail service or the time stamp on the email server of TUD applies), preferably via the TUD SecureMail Portal https://securemail.tu-dresden.de by sending it as a single pdf file to **airmetro@tu-dresden.de** or to:

TU Dresden, RTG 2947 "AirMetro", Prof. Hartmut Fricke, Helmholtzstr. 10, 01069 Dresden, Germany.

Please submit copies only, as your application will not be returned to you. Expenses incurred in attending interviews cannot be reimbursed.

AirMetro
Research Training Group
2947 at TU Dresden

TUD is a founding partner in the DRESDEN-concept alliance.

DRESDEN concept

Reference to data protection: Your data protection rights, the purpose for which your data will be processed, as well as further information about data protection is available to you on the website: https://tu-dresden.de/karriere/datenschutzhinweis.