Chair of Space Mobility and Propulsion
TUM School of Engineering and Design
Technische Universität München

The Chair of Space Mobility and Propulsion is offering a

PhD position in water-based in-space propulsion (m/f/d)

About us and the position

The EIC-funded research project 'Solar for Ice-to-Thrust' (S4I2T), with TUM in the leading role, aspires to advance (self-)sustainable space mobility and consequently develop and demonstrate a water-based propulsion system and infrastructure. Goals of the project are lab demonstrations of an end to end in-situ-resource-utilisation (ISRU) process (turning icy regolith into thrust) and an AI-based autonomous docking and water transfer of two CubeSats. These worldwide unique demonstrations shall pave the way for a more efficient, cost-effective and eco-friendly space mobility infrastructure and enable economically viable in-orbit servicing such as spacecraft assembly, refilling or active debris removal.

This PhD position investigates multiple aspects of this endeavour by theoretical and experimental means. This includes systemic studies and trade-off analyses of broader infrastructure considerations and options, as well as derivation of requirements, development and testing of a water-based attitude control system and fluidic interface hardware for the specific CubeSat docking scenario at hand. The work will be carried out in close collaboration and coordination with partners across Europe as well as between two chairs at TUM with several PhD positions working on the project.

Required Skills & Experience

- At the time of appointment holding a Master of Science/Engineering degree with excellent results in disciplines like Aerospace Engineering, Mechanical Engineering or a comparable field of study subject
- Knowledge and skills in:
  - Spaceflight and especially space propulsion
  - Proven ability to identify and solve problems through a proactive, systematic approach
  - Mechanical design as well as analysis of structural and fluid dynamic engineering problems
  - Ability to work in a team as well as independent
  - Engineering tools like CAD-programs (e.g. SolidWorks)
  - Programming language skills in Matlab and/or Python
  - Fluent communication skills, both in written and spoken English
  - Willingness to attend international conferences and publish internationally
- Advantageous Skills:
  - Highly motivated to carry out a research project and to advance a new space propulsion technology
  - Experience in hands-on engineering projects and previous work on Water-Electrolysis-Propulsion is a plus
  - Strong interest in economically sustainable space mobility
  - German language level B1 or higher (optional)

Responsibilities

Within the S4I2T project your main responsibilities will be the following

- Evaluation of the potential ISRU architectures and subsequent derivation of a holistic in-space mobility, in-orbit servicing (IOS) and propellant supply architecture concepts which are using water as propellant
- Perform trade-off studies to identify the most promising mobility & IOS architecture, which will be further developed and assessed regarding its economic viability
- Develop an implementation roadmap illustrating a step-wise and inherently sustainable implementation of the architecture

- Development of a Concept of Operations (ConOps) on how the projected infrastructure can be operated, which stakeholders will be involved, and which additional elements might be necessary (e.g. ground support)
- Derive the ConOps for the close proximity, docking and propellant re-filling operations as well as
- Requirements identification for the Attitude Determination and Control System as well as for a docking and water transfer adapter
- Design, manufacturing, assembly and testing of the docking adapter and propellant transfer system prototypes under vacuum conditions and an iterative improvement of the water transfer system incl. docking adapter design
- Contribute to the development of test benches and test campaigns of the project
- Collaboratively contribute to the overall success of the project together with the other team members
- Contribute to technical, administrative and financial reporting to be done through the duration of the project

What we offer

- Full position (100% / 40h, pay grade E13, TV-L) with a 3 year contract and the goal to obtain a PhD (Dr.-Ing.)
- Flexible solutions for home office and 30 days of paid holidays
- An amazing team and the possibility of getting involved in something big
- A large network of people in the space business
- Possibility to enroll as PhD-student and various employer benefits
- Please note: The position is based in Ottobrunn / Munich with the potential for regular required on-site presence in Oberpfaffenhofen
- We value diversity, equity, and inclusion and encourage candidates from underrepresented groups to apply. We are dedicated to offering an inclusive research environment and encourage applicants of all backgrounds to apply, including individuals with disabilities. The position is suitable for disabled persons.

Application

Interested candidates should send their application (incl. CV, motivation letter (max. 1 page), current and past transcript of records, as well as any supporting documents) via E-Mail at: **rfa-jobs.rfa@ed.tum.de** (preferably in a single PDF). We look forward to your application.

- The vacancy will be open until filled
- The position shall start in September 2024

Data Protection Information:

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.

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