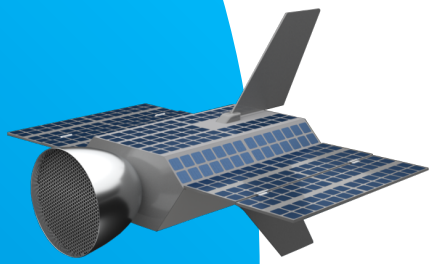
University of Stuttgart
Collaborative Research Center 1667 ATLAS

Laying the Groundwork for a Design and Dimensioning Framework for ABEP Spacecrafts

Master Thesis Opportunity

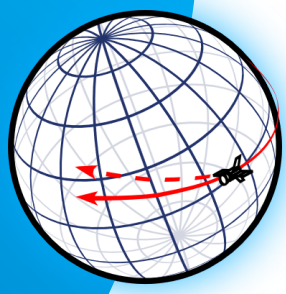
Very Low Earth Orbits (VLEOs) offer benefits such as higher-resolution Earth observation, lower communication latency, and reduced launch costs. Operating in VLEO, however, is challenging due to increased atmospheric drag and the need for sustained propulsion. Atmosphere-Breathing Electric Propulsion (ABEP) systems address these challenges by using atmospheric particles for propulsion, reducing onboard propellant needs. In order to better develop these systems, it is essential to advance not only technological developments related to hardware, but also the development of appropriate simulation and design tools. While the focus in this regard has so far been primarily on either an assessment of the orbital mechanics aspects and associated dynamic dependencies (e.g. atmospheric variability, satellite aerodynamics etc.) or on the design of the spacecraft itself, a true evaluation can only be made by taking a holistic view.



The objective of this thesis is to lay the groundwork for a comprehensive, modular design and dimensioning framework for an ABEP spacecraft, embedding dynamic dependencies into the design process.

Your tasks:

- Familiarization with Very Low Earth Orbits, ABEP spacecraft, design strategies and the existing frameworks
- Conceptualization of a holistic design strategy
- Implementation of the strategy
- Demonstration of the functionality based on selected examples
- Documentation



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