University of Stuttgart
Collaborative Research Center 1667 ATLAS

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Bachelor / Master Thesis Opportunity

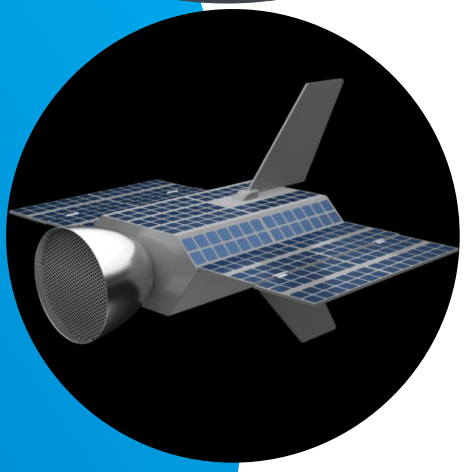
Investigation of Boundary Conditions for the Operations of VLEO Satellite Constellations

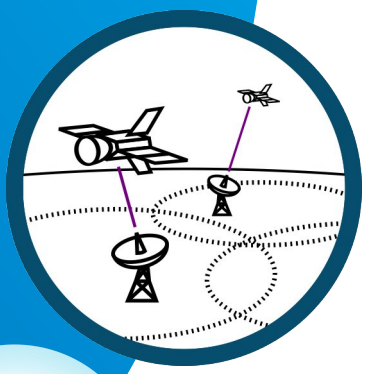
The collaborative research center (CRC) "Advancing Technologies of Very Low Altitude Satellites (ATLAS)" at the University of Stuttgart, funded by the German Research Foundation (DFG), addresses the fundamental scientific and engineering challenges of rendering Very Low Earth Orbit (VLEO) accessible and extending satellite lifetime by an order of magnitude. As part of this research project, the fundamentals of VLEO satellite operations are being investigated by drawing on expertise gained from operating satellites at the University of Stuttgart.

The aim of this thesis is to investigate the boundary conditions for satellite constellations operating in the VLEO regime. While single-satellite missions have to consider the boundary conditions for one satellite system only, constellations introduce additional complexity due to inter-satellite interactions, and increased coordination demands. Compared to conventional LEO constellations, VLEO systems face unique environmental and operational challenges, including increased atmospheric drag and shorter communication windows. These factors must be considered alongside internal system constraints such as communication architecture, orbit maintenance systems, and operational coordination between satellites. The aim of this thesis is to identify and analyze boundary conditions for operating VLEO constellations and to derive mitigation strategies.

Your tasks

- Familiarization with VLEO satellite operations, constellations, and their respective challenges
- Review of existing LEO constellation concepts and applicability to the VLEO regime
- Identification and analysis of external boundary conditions (e.g., environment, mission related)
- Identification and analysis of internal boundary conditions (e.g., inter-satellite communication, formation control, orbit maintenance)
- Investigation of mitigation and optimization strategies for the identified boundary conditions
- Documentation





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