

Master Thesis Work

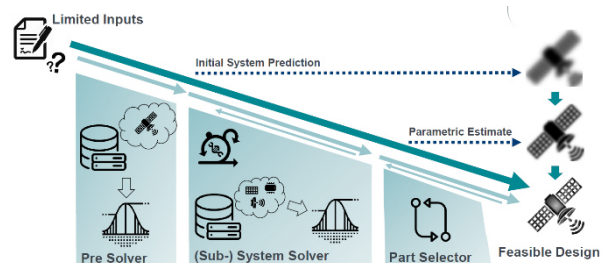
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Konzeptstudie für ein lunares Niedrigschub-Spacetug Massenmodell

Concept study for a cislunar low-thrust space tug mass model

Motivation:

Currently space agencies reveal increasing interest in large scale and crewed lunar activities. Results are projects such as the Lunar Gateway, the European Large Logistics Lander and advanced concepts for lunar research stations. All these activities face the need to efficiently transfer payload from Earth to cis-lunar orbits. Solar electric propulsion has significant heritage for LEO/GTO transfers to MEO and GEO due to its high I_{sp} . Thus, this technology is a great basis to achieve cislunar transfers with significant reduction in propellant mass. Utilizing electrically propelled space tugs, any payload could be transported. To design a realistic space tug model, one needs to know the power requirements and masses for various subsystems, for example the electrical power system that supplies the electrical propulsion system. The goal of this thesis is to perform a literature research to extend an already existing data base with hardware and system data. An existing tool is capable to derive corresponding fitting functions to scale system solutions. These functions should then be used to establish an initial and subsequently refined design estimate for various cislunar space tug subsystem masses. In a last step this approach should be coupled with a trajectory tool for first mission analysis.



Task description of the Master thesis work:

- Literature research focused on electric propulsion, solar arrays, and various other SC subsystems technologies
- Extend an existing database with additional mass and power parameter for the above-mentioned technologies and, if necessary, adapt parametric models
- Define mass and power budget tables for cislunar low-thrust space tugs with flexible input, for example constraints such as radiation dose, transfer time, and Δv .
- Documentation

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Acknowledgement of receipt:

I hereby confirm that I read and understood the task of the master thesis, the juridical regulations as well as the study- and exam regulations.

Date
Prof. Dr. Reinhold Ewald
(Responsible Professor)

Date
Signature of the student

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