University of Stuttgart
Institute of Space Systems

H S P   TUM

Task Description Master Thesis
Enhancing the Life Support Trade Off Tool for Improved ECLSS Modelling and Mission Analysis

Topic Description:
The Life Support Trade Off Tool (LiSTOT) is an Excel-VBA-based analysis tool developed at the Technical University of Munich (TUM) to support preliminary evaluations of Environmental Closed Life Support Systems (ECLSS) for human spaceflight missions. The tool integrates a variety of life-support technologies, ranging from historically used systems to those currently deployed or under active research, and enables their comparison based on Equivalent System Mass (ESM) and Multi-Criteria Analysis (MCA).

Given a defined mission scenario and crew schedule, LiSTOT allows users to configure different ECLSS architectures and estimate key performance parameters such as system mass, power consumption, consumables demand, and resupply requirements. With ongoing developments in life support technologies, LiSTOT needs continuous updates and usability enhancements to remain a reliable tool for conceptual mission analysis. Therefore, the objective of this thesis is to update and extend LiSTOT, enhance its usability and reliability, and verify that the tool produces correct and consistent results.

Tasks:
- Conduct a comprehensive literature review on current and emerging ECLSS technologies for human spaceflight
- Become familiar with the structure, methodology, and implementation of LiSTOT
- Become familiar with programming in Excel
- Update the technological database in LiSTOT to reflect the current state of the art
- Identify and implement additional relevant ECLSS technologies not yet included in the tool
- Improve LiSTOT's usability, ensuring data transparency, and fixing existing bugs
- Validate and test the updated tool through representative mission scenarios and sensitivity analyses

The thesis will be co-supervised by the Institute of Space Systems at the University of Stuttgart and the Professorship of Human Spaceflight Technology at the Technical University of Munich.

If you are interested in the thesis, please write an e-mail including a short motivation letter, CV and transcript of records to Lina Salman (Lina.Salman@tum.de) and Felicitas Leese (leesef@irs.uni-stuttgart.de).