



Task Description Bachelor's Thesis/ Master's Thesis

System Design of the 5 kW AF-MPD Thruster SUPREME as Flight Model Approach



Boxberger A, Behnke A and Herdrich G, 2019. Current advances in optimization of operative regimes of steady state applied field MPD thruster. 36th IEPC (Vienna).

Motivation:

The EU project *Superconductor-Based Readiness Enhanced Magnetoplasmadynamic Electric Propulsion* (SUPREME) aims to enhance the flight readiness of applied-field magnetoplasmadynamic (AF-MPD) thrusters by successfully integrating a high-temperature superconductor (HTS) coil in conjunction with a radiatively cooled anode for an AF-MPD thruster operating in the 5 kW power range. As part of this endeavor, a prototype is currently under development for comprehensive testing and evaluation at the Institute of Space Systems (IRS) in collaboration with the consortium partners Airbus CRISA, University of Twente, Neutron Star Systems and PEAK Technology. As the SUPREME project progresses towards flight readiness, there is a critical need to transition from the current prototype stage to a flight model design. This work shall derive such a flight model design on a preliminary level, based on an initial study of possible mission scenarios as well as environmental and system requirements resulting from an in-space application. The final goal is to enable an estimation for the overall cost of the propulsion system. The adaptation of the advanced propulsion technologies for spaceflight significantly contributes to the goal of demonstrating the viability of AF-MPD thrusters for future space missions, potentially enabling more efficient and capable spacecraft for deep space exploration, satellite servicing and other advanced space applications.

Task Description:

- Familiarization with AF-MPD thruster technology and possible mission scenarios
- Identification of space environmental requirements and boundary conditions
- Development of a flight model approach based on the SUPREME prototype on PDR level
- Cost estimation of the SUPREME flight model approach ("Bill of Materials and Processes")
- Documentation

Internal advisor:

A. Sperber, D. Wanke, G. Herdrich

sperbera@irs.uni-stuttgart.de

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Professors at IRS:

Prof. Dr.-Ing. Stefanos Fasoulas (Managing Director) · Prof. Dr.-Ing. Sabine Klinkner (Deputy Director) · Prof. Dr.-Ing. Claas Olthoff · Hon.-Prof. Dr.-Ing. Jens Eickhoff · apl. Prof. Dr.-Ing. Georg Herdrich · Hon.-Prof. Dr. rer. nat. Volker Liebig · Hon. Prof. Dr. rer. nat. Christoph Nöldeke · Prof. Dr.-Ing. Stefan Schlechtriem · apl. Prof. Dr.-Ing. Ralf Srama
BW-Bank Stuttgart · IBAN: DE51 6005 0101 7871 5216 87 · BIC: SOLADESTXXX · VAT-ID: DE 147794196