

## Study Thesis / Master Thesis

# Experimental Study of Heat Transfer in a GO<sub>2</sub>/GCH<sub>4</sub> Thruster with Coaxial Injectors

At the Institute of Space Systems (IRAS) at TU Braunschweig, research focuses on next-generation in-space propulsion systems using gaseous oxygen and methane, evaluated using a small-scale thruster. The injector of the engine significantly influences the performance and heat transport to the combustion chamber wall. The latter is characterized by the heat flux. This quantity cannot be measured directly, it is inferred from thermocouples placed at varying depths within the wall using an inverse method. This is a numerical scheme that applies a forward heat conduction solver to an estimated profile, iteratively updating it until simulated results match experimental data. In the scope of this thesis, experimental test data is gathered during a hot-fire test campaign of coaxial-type injectors. Based on the temperature measurements, the inverse method shall be implemented. Different solution strategies shall be compared to obtain precise results with limited computational effort.



### Tasks and Deliveries Include:

1. Conduct a literature review, familiarise with the topic
2. Assist with hot-fire test campaigns of the research thruster
3. Implement the inverse method in MATLAB, building on existing code
4. Test and compare different solution strategies with regard to precision and computational effort.
5. Compare the heat flux distributions with results from other methods
6. Document the outcomes in a comprehensive report and presentation.

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