

IAF SPACE PROPULSION SYMPOSIUM (C4)
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THERMAL ANALYSIS OF THE SCRAMJET ENGINE SYSTEM WITH BURNING FUEL

Abstract

The project aims to help Brazil with a further position in the world aerospace scenario, bringing access to space and technological development when it comes to aerospace through a Brazilian private industry. When it comes to hypersonic technology, one is working with the Scramjet engines, which are aerothermal engines capable of generating great speeds by compressing the airflow and burning fuel, Hydrogen, to generate thrust and fly across the Earth's atmosphere. In relation to hypersonic aerodynamics, the part of the flight spectrum above Mach 5 can be considered, characterized by this high Mach number regime in which certain physical flow phenomena become progressively more important as the Mach number is increased. Due to the characteristics of the flight envelope, the vehicle will be subjected to temperatures of the order of 2500 K to Mach 7 at an altitude of 30 Km, thus causing thermal problems such as thermostructural loads, ablation due to temperature at the stagnation points of the flow and factors economical in the choice of materials to be used. With this work, one aim to establishes the input parameters to perform a thermostructural analysis in different flight stages of the hypersonic airbreathing vehicle, and to develop theoretical mechanisms, with practical application of cooling for full vehicle operation and correlating different cooling models for engines by numerical analysis. Another objective is to seek the development of the country and of the aerospace sector, that will allow us to improve the related technologies and consolidate Brazil as one of the countries that has the intellectual and development capacity of hypersonic airbreathing technology, considered the key-process to a great advance of the Brazilian aerospace program linked to the industry, which will increase the research opportunities for the future.