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Experimental Analysis for the Inlet of the Brazilian Aerospace Vehicle 14-X B

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Abstract : Nowadays, the scramjet is a topic that has attracted the attention of several scientific communities (USA, Australia, Germany, France, Japan, India, China, Russia), that are investing in this in this type of propulsion system due its interest to facilitate access to space and reach hypersonic speed, who have invested in this type of propulsion due to the interest in facilitating access to space. The Brazilian hypersonic scramjet aerospace vehicle 14-X B is a technological demonstrator of a hypersonic airbreathing propulsion system based on the supersonic combustion (scramjet) intended to be tested in flight into the Earth's atmosphere at 30 km altitude and Mach number 7. The 14-X B has been designed at the Prof. Henry T. Nagamatsu Laboratory of Aerothermodynamics and Hypersonics of the Institute for Advanced Studies (IEAv) in Brazil. The IEAv Hypersonic Shock Tunnel, named T3, is a ground-test facility able to reproduce the flight conditions as the Mach number as well as pressure and temperature in the test section close to those encountered during the test flight of the vehicle 14-X B into design conditions. A 1-m long stainless steel 14-X B model was experimentally investigated at T3 Hypersonic Shock Tunnel, for freestream Mach number 7. Static pressure measurements along the lower surface of the 14-X B model, along with high-speed schlieren photographs taken from the 5.5° leading edge and the 14.5° deflection compression ramp, provided experimental data that were compared to the analytical-theoretical solutions and the computational fluid dynamics (CFD) simulations. The results show a good qualitative agreement, and in consequence demonstrating the importance of these methods in the project of the 14-X B hypersonic aerospace vehicle.

Keywords : 14-X, CFD, hypersonic, hypersonic shock tunnel, scramjet
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