

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Future Space Transportation Systems Verification and In-Flight Experimentation (6)

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BRAZILIAN SUBORBITAL ROCKETS FOR HYPERSONIC FLIGHT TESTING: A REVIEW AND A  
MARKET PERSPECTIVE**Abstract**

Hypersonic flight testing in real flight conditions is crucial to mature hypersonic technologies including scramjet engines, high-speed vehicles, high-temperature materials and autonomous flight control. Brazilian suborbital rockets made by Institute of Aeronautics and Space (IAE) have provided frequently to the hypersonic research community affordable access to high Mach number in endoatmospheric flight conditions. For instance, IAE provided hypersonic flight-testing capabilities for fundamental research and technological development of SHEFEX, HIFiRE, and ScramSpace programs by using the vehicles VS-30/Orion, VSB-30 and VS-40 in a total of eight launch missions (from 2005 to 2017). Future launches, among others, include flight testing of a scramjet engine in 2020 by using a hypersonic accelerator vehicle, based on the suborbital rocket VSB-30, under the Brazilian hypersonic research project 14-X. Especially, the ground-launched two-stage solid rocket VSB-30 has demonstrated to be technically very suitable and reliable for hypersonic flight research and development at flight Mach number up to 7 into the stratosphere zone. This review paper gives both successes and failures cases studies of hypersonic flight testing already powered by IAE suborbital solid rockets, discusses about the current Brazilian suborbital rocket motors capabilities in terms of possible configurations and approaches to offer extreme hypersonic flight conditions including their flight dynamics, and addresses some commercial perspectives of utilizing them in hypersonic flight testing oriented by practical lessons learned from such cases studies.