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STUDY OF EFFECT ON COMBUSTION FLOW-FIELD DUE TO VARIATION OF INLET BOUNDARY CONDITIONS IN DUAL-CAVITY SCRAMJET COMBUSTOR

Abstract

At present launch vehicles place an important role for various space explorations purpose, the satellites which are launched in the earth orbit or beyond with the help of orbital rockets such as ISRO-PSLV, GSLV. These rockets are multi staged rockets which carry oxidizer along with the fuel in order to generate a high amount of thrust to overcome earth's gravitational field. The maximum amount of weight which is carried by the rocket consists of 65%-70% of propellant (fuel & oxidiser) and these systems are not reusable. Therefore, the new generation propulsion system must be built which have the capabilities of reusability, efficiency and lightweight so here the concept of air breathing propulsion system which offers a routine excess to space with a cheaper cost. There are various concepts of air breathing engines such as the ramjet, scramjet dual mode ramjet engines; these technologies are being developed by various space agencies. These engines compress incoming air for combustion without a rotating compressor. Fuel is injected in the combustion chamber where it mixes with the hot compressed air and ignites. Recently ISRO tested its scramjet-based system in their Rohini class rocket achieving a Mach no 6. The overall research aim is to develop an upper stage scramjet (Supersonic Combustion Engine) based propulsion system which can travel at a hypersonic velocity reaching Mach Number 8-10. The scramjet engine propellant consists of fuel which is hydrogen for oxidiser the atmospheric oxygen will be used. The engine can be reused for multiple testing purpose hence lead to cost reduction. The main motive to develop this system is to improve the performance, reusing and reducing the overall cost of production and testing.

Keywords: Orbital Rockets, Scramjet Engine, Hypersonic.