CFD DRIVEN AERO-PROPULSIVE DESIGN OF A DUCTED RAMJET MISSILE

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Abstract

Detailed Computational Fluid Dynamics (CFD) simulations are carried out for a ducted ramjet missile. Combined internal and external flow fields are numerically simulated by solving 3D RANS equations along with Menter's SST turbulence model. Aero-propulsive configuration is evolved progressively by improving radome shape, intake ramps, intake bleed system, diverter height etc. Numerical simulations have revealed that ogive radome has less drag compared to power law shaped radome and provide better flow characteristics at the intake entry leading to superior intake performance. Appropriate boundary layer diverter height and bleed system in the intake improve the intake performance. Aero-propulsive performance of the complete vehicle is estimated for different Mach numbers and angles of attack. It is demonstrated that improved performance of the ducted ramjet missile can be obtained through use of high fidelity numerical method.

Keywords: Air Breathing Missile, Combined External Internal Flow CFD, Solid Fuel Ramjet, Air Intake