

SPACE PROPULSION SYMPOSIUM (C4)
Hypersonic and Combined Cycle Propulsion (9)

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AIRFRAME-PROPULSION INTEGRATED DESIGN AND WIND TUNNEL TEST FOR
AIR-BREATHING HYPERSONIC VEHICLE

Abstract

A hypersonic cruise vehicle was designed, to deal with the integrated design problem of airframe and propulsion, considering the all performance index, developed the integrated design of forebody/body for the air-breathing hypersonic vehicle, respectively, CFD simulations and wind tunnel tests were carried out to examine the hypersonic performances of the vehicle and inlet. The results showed:1) the performances of forebody/inlet satisfied all the performance index at the design condition, and the results of wind tunnel test validate the numerical design method; 2)the numerical results and the wind tunnel test results agree well when the mach number is 5 and 6, the max error of mass flow ratio is 4% and the max error of total pressure recovery coefficient is 4.2%,that means the numerical method is effective; 3)the hypersonic wind tunnel size is limitwhich meas the test model and the throat height of scramjet inlet is small, so the pre-arranged planning should be made in case the failure of the wind tunnel test because the inlet may not be able to start, which we should consider when design the wind tunnel test scheme.