FM5S_11560

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Numerical Optimization of 2D Scramjet Inlets

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A scramjet engine is viewed as a promising propulsion system for a spaceplane, and significant research is in progress worldwide on scramjet engine design and performance. An automated design optimization process for hypersonic inlets was developed and validated. The test case for the process was the evolution of an optimimal design for hypersonic inlets, where optimality was based on the maximization of the total pressure recovery at the isolator exit. This optimization process links together an optimizer with a full Reynolds Averaged Compressible Navier–Stokes solver into an automated optimization loop. This paper presents the implementation of these new design techniques and their application to hypersonic inlet case in flight condition of Mach 8. The improvements obtained using the optimizer are presented and compared. Results indicate the development of the geometric perturbation and a consequent increase in total pressure recovery during the convergence to the optimal geometry.

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