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NUMERICAL DESIGN OPTIMIZATION OF A BLOW-DOWN SUPERSONIC WIND TUNNEL

Abstract

The goal of this paper is the design of a supersonic wind tunnel conceived for testing a ramjet under flight conditions ranging from Mach 2-5 and altitudes from 10-20 km by means of a Multidisciplinary Design Optimization (MDO) approach. The primary goal is to enhance the overall performance and efficiency of the wind tunnel by concurrently optimizing its design and schematic. Employing the MDO approach, advanced computational tools are integrated into the design process to iteratively refine various aspects, including tunnel geometry, operative and initial conditions, and test definitions.

The optimization activities are directed towards achieving improved supersonic flow conditions within the wind tunnel, for longer times, ensuring a accurate simulation of real flight conditions. This research aims to improve the wind tunnel's functionality, enabling more precise and cost-effective experimentation within the domain of supersonic aerodynamics.