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Author: Prof. Bingyan Chen
China Academy of Aerospace Aerodynamics (CAAA), China, chen_bingyan@hotmail.com

WAVERIDER DESIGN AND ANALYSIS BASED ON SHOCK-FITTING METHOD

Abstract

Waverider design method methodology was developed based on shock-fitting numerical simulation technique. Most commonly, waverider is defined as an aerodynamic configuration that is inversely created from a prescribed hypersonic flow field based on a planar or conical shock wave. In this work, the prescribed shock wave is numerically created from an arbitrary configuration using shock-fitting method. Several types of shapes, including sharp cone, blunt cone and elliptic cone, .etc., are used as the shock-generating configuration to obtain optimum waverider in terms of aerodynamic performance. Aerodynamic characteristics of waveriders designed from different shock-generating configurations were predicted with numerical simulations based on N-S equations. Comparative studies were conducted on these waveriders and the effects of different shock-generating shapes on aerodynamic performance were investigated. Analysis results shows that the waverider designed from a certain type of shock-generating shape has a better aerodynamic performance in terms of lift-to-drag ratio and longitudinal stability, which indicates that the proposed waverider design methodology is a promising approach for designing waverider vehicles with better aerodynamic performances comparing to traditional waverider design method.