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AERODYNAMIC ANALYSIS OF AN UNMANNED AERIAL VEHICLE AT HYPERSONIC SPEED

Abstract

This paper deals with the aerodynamic performance analysis at hypersonic speed of an unmanned aerial vehicle suitable for research activities in re-entry flight technologies. The concept under investigation belongs to the winged vehicle configurations, and features a rather blunt body architecture. Both engineering-based and computational fluid dynamics methods have been considered to assess vehicle aerodynamics in the framework of a conceptual design phase. Indeed, perfect gas and thermo-chemical non-equilibrium computational fluid dynamics simulations, with the air modeled as a mixture of five or more (up to eleven) species, are carried out at several flow conditions compatible with a typical re-entry trajectory, according to the space-based design approach. The range between Mach 2 and Mach 25 was analyzed. A summary review of the concept aerodynamic characteristics, including longitudinal and lateral-directional stability, is performed and reported in the paper.