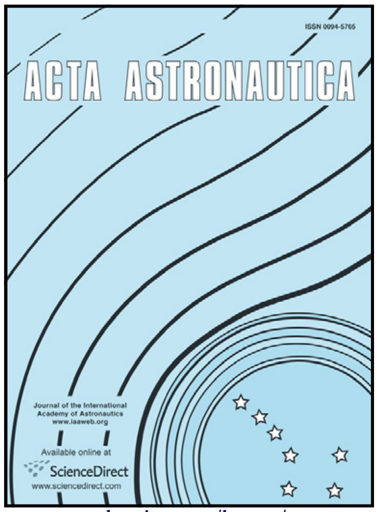

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Numerical study of Shock Wave Interaction on Transverse jets through Multiport Injector Arrays in Supersonic Crossflow

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Abstract- In the present paper, the influence of shock wave position on sonic transverse hydrogen micro-jets in supersonic crossflow is investigated. This study focuses on mixing and shock interaction of the hydrogen jet in a Mach 4.0 crossflow with various jet conditions. Flow structure and fuel/air mixing mechanism were investigated numerically. Parametric studies were conducted on the position of the shock wave by using the Reynolds-averaged Navier–Stokes equations with Menter's Shear Stress Transport turbulence model. Complex jet interactions were found in the downstream region with a variety of flow features dependent on the shock position. Results show a different flow structure than for a typical micro jet, with a location of the oblique shock on the flow of the hydrogen jet. According to the results, for oblique shock on the first jet, the mixing performance in high Pressure Ratio increases more than 20% in downstream. Furthermore, a significant reduction (up to 20%) occurs in the maximum concentration of the hydrogen jet at downstream when the intersection of incident shock is on the top of the last jets. Moreover, hydrogen-air mixing rate increase and the concentration of the hydrogen micro jet are uniformly distributed in the surface close to shock. Thus, an enhanced mixing zone occurs in the vicinity of the intersection of the jet and the shock wave.

Keywords: Supersonic flow; Numerical simulation; Mixing of transverse micro jets; Hydrogen jet; Incident shock position

1. Introduction

Recently, several researchers are extensively focused on aerothermodynamic aspects of high-speed flight. Scramjets as next-generation engines with airbreathing propulsion are efficient systems

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