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Experimental study on the mean flow characteristics of a supersonic multiple jet configuration (Article)

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Abstract

Systems with multiple jets are encountered in many engineering applications, for example, propulsion units in aircraft and rockets. When more than one jet is placed close to each other, the resultant aerodynamics is complicated due to the mutual interaction of the jets. In the present work, mean flowfield and the mixing characteristics of free supersonic jets from twin and triple converging-diverging nozzles placed in close proximity are studied experimentally. The nozzles are designed for Mach numbers 1.5 and 2.0, with an inter-nozzle spacing of twice the nozzle exit diameter. The typical interaction process and the evolution of the triple jet are discussed using cross-sectional contour plots. The influence of introducing additional similar jets on the near flowfield characteristics such as jet -spread, supersonic core, and the shock wave structure is studied using pressure measurements along the jet centerline. As the number of jets increases, the spreading rate decreases due to a decrease in the entrainment. This causes the jets to decay at a slow rate, and the core length increases in the order of an increased number of jets. Schlieren images of single, twin and triple jets reveal that the supersonic jet core is different in twin and triple when compared with a single jet . © 2020 Elsevier Masson SAS

Author keywords

Experimental study | Mean flow characteristics | Multiple jets interaction | Supersonic jet flow

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