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Studies on flows development in a suddenly expanded circular duct at supersonic mach numbers (Article) (Open Access)

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Abstract

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This article focuses on the flow development and the static wall pressure distribution along the circular duct from the convergent-divergent (CD) nozzle. The study aims to examine the quality of the stream in the conduit when the control is employed. The microjets are activated at the base at (PCD) of 13 mm, and the diameter of the microjets is 1 mm. Mach numbers of the investigation are 1.3, 1.9, and 2.4. The length of the duct considered was from L = 10D to 1D. The diameter of the enlarged tube was 16 mm. The experiments were conducted for NPRs from 3 to 11. The results revealed that the lowest duct length mandatory for the flow continued to attach with the circular duct wall are L/D = 1, 2, and 3 for Mach numbers 1.3, 1.9, and 2.4, respectively. The investigation outcome indicates that there are mild oscillations in the flow-field for correctly expanded flows. The oscillatory trend has a pronounced impact on the duct's flow when the jets are operated at higher NPRs. The control does not adversely affect the flow field, and the magnitude of wall pressure is nearly similar.

Author keywords

Duct | Mach number | Nozzle | Nozzle pressure ratio | Wall pressure

Indexed keywords

Engineering controlled terms: Aerodynamics | Flow fields | Jets | Mach number | Quality control | Wall flow

Engineering uncontrolled terms: Circular ducts | Flow development | Micro jet | On flow | Wall pressure | Wall-pressure distribution

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