Active Control of Base Pressure with Counter Clockwise Rotating Cylinder at Mach 2

By: Asadullah, M (Asadullah, Mohammed)[1]; Khan, SA (Khan, Sher Afghan)[1]; Asrar, W (Asrar, Waqar)[1]; Sulaeman, E (Sulaeman, E.)[1]

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Abstract

The effect of dynamic cylinder as an active controller to control the base pressure for different level of expansion have been experimentally investigated at Mach 2 through CD nozzle for area ratio 9. Solitary counter clockwise rotating cylinder of 2 mm diameter when seen from top, at 2 mm from side wall of square duct and 8 mm from square nozzle exit in the base region is mounted as a controller. Base pressure in the wake area after sudden expansion of jets from the exit of nozzle has been measured. The length-to-width ratio of sudden expansion duct taken is 10. The experiments were carried out by operating jets for different nozzle pressure ratios (NPR). The wall pressure distribution was also measured for with and without control cases in the duct to see that the amplitude of oscillations does not adversely influence the flow field in the duct. Counter clockwise rotating cylinder as an active controller were found to increase the base pressure as high as 62 percent at NPR 8.5 and 53 percent at NPR 7.8. The control effectiveness is marginal for over expanded nozzles. The wall pressure flow field with and without control are identical with minor fluctuations.

Keywords

Author Keywords: Base pressure; Wall pressure; Nozzle pressure ratio; Mach number; Active control
KeyWords Plus: DRAG REDUCTION; CIRCULAR-CYLINDER; REYNOLDS-NUMBERS; TURBULENT-FLOW; BODY

Author Information

Reprint Address: Asadullah, M (reprint author)

+ Int Islamic Univ Malaysia, Dept Mech Engn, Kuala Lumpur 53100, Malaysia.

Addresses:

+ [1] Int Islamic Univ Malaysia, Dept Mech Engn, Kuala Lumpur 53100, Malaysia

E-mail Addresses: shiblibhai@gmail.com

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