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Control of Nozzle Flow Using Microjets at Supersonic Mach Regime

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Abstract

This article reports the active control of base flows using the experimental procedure. Active control of base pressure helps in reducing the base drag in aerodynamic devices having suddenly expanded flows. Active control in the form of microjets having 0.5 mm radius placed at forty-five degrees apart is employed to control the base pressure. The Mach numbers of the present analysis are 1.7, 2.3, and 2.7. The length to diameter (L/D) ratio is varied from 10 to 1 and the nozzle pressure ratio (NPR) being changed from 1 to 10 in steps of 1 for base pressure measurements. The area ratio for the entire analysis is fixed at 2.56. Wall pressure distribution along the enlarged duct is also recorded. No change in base pressure increase/decrease is thoroughly analysed as well. From the experimental investigation, it is found that control plays an important in modifying the base pressure without disturbing the wall pressure distribution. The base pressure variation is entirely different at L/D = 1 compared to a higher L/D ratio due to change in reattachment length and the requirement of the duct length at higher inertia levels. The quality of the flow in the duct in the presence and absence of control remained the same.

Keywords

Author Keywords: Active Control; Area Ratio; Base Drag; Base Flow; Base Pressure; Micro Jets

KeyWords Plus: SUDDENLY EXPANDED FLOWS; ACTIVE CONTROL

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By: Arobaian, A.A.; Khan, S.; Asadullah, M.

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- Low-Cost Base Drag Reduction Technique** Times Cited: 2

By: Asadullah, M.; Khan, S. A.; Asrar, W.; et al.

LOW COST BASE DRAG R Volume: 7 Pages: 428-432 Published: 2018

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INTERNATIONAL CONFERENCE ON AEROSPACE AND MECHANICAL ENGINEERING (AEROMECH17) Book Series: IOP Conference Series-Materials Science and Engineering Volume: 370 Article Number: UNSP 012050 Published: 2018

4. **Passive control of base drag employing dimple in subsonic suddenly expanded flow** Times Cited: 4
 By: Khan , S.; Asadullah , M.; Sadhiq , J.
 Int. J. Mech. Mechatron. Eng. IJMME-IJENS Volume: 18 Pages: 69-74 Published: 2018

5. **Base pressure control by supersonic micro jets in a suddenly expanded nozzle** Times Cited: 1
 By: Khan, S.; Chaudhary, Z.I.; Shinde, V.B.
 International Journal of Mechanical and Mechatronics Engineering Volume: 18 Issue: 4 Pages: 101-113 Published: 2018

6. **Control of suddenly expanded flow** Times Cited: 16
 By: Khan, S. A.; Rathakrishnan, E.
 AIRCRAFT ENGINEERING AND AEROSPACE TECHNOLOGY Volume: 78 Issue: 4 Pages: 293-309 Published: 2006

7. **Passive control of base drag in compressible subsonic flow using multiple cavity** Times Cited: 4
 By: Khan, S. A.; Mohammed , A.
 IJMPERD Volume: 8 Pages: 39-44 Published: 2018
 F. A. GM

8. **Active Control of Base Pressure in Supersonic Regime** Times Cited: 6
 By: Khan, S. A.; Rathakrishnan, E.
 Journal of Aerospace Engineering, Institution of Engineers, India Volume: 87 Pages: 1-8 Published: 2006
 May

9. **Active control of suddenly expanded flows from underexpanded nozzles - Part II** Times Cited: 4
 By: Khan, SA; Rathakrishnan, E
 INTERNATIONAL JOURNAL OF TURBO & JET-ENGINES Volume: 22 Issue: 3 Pages: 163-183 Published: 2005

10. **Active control of suddenly expanded flows from underexpanded nozzles** Times Cited: 15
 By: Khan, SA; Rathakrishnan, E
 INTERNATIONAL JOURNAL OF TURBO & JET-ENGINES Volume: 21 Issue: 4 Pages: 233-253 Published: 2004

11. **Control of suddenly expanded flows from correctly expanded nozzles** Times Cited: 13
 By: Khan, SA; Rathakrishnan, E
 INTERNATIONAL JOURNAL OF TURBO & JET-ENGINES Volume: 21 Issue: 4 Pages: 255-278 Published: 2004

12. **Control of suddenly expanded flows with micro-jets** Times Cited: 18
 By: Khan, SA; Rathakrishnan, E
 INTERNATIONAL JOURNAL OF TURBO & JET-ENGINES Volume: 20 Issue: 1 Pages: 63-81 Published: 2003

13. **Active control of suddenly expanded flows from overexpanded** Times Cited: 18
 By: Khan, SA; Rathakrishnan, E
 INTERNATIONAL JOURNAL OF TURBO & JET-ENGINES Volume: 19 Issue: 1-2 Pages: 119-126 Published: 2002

14. **Nozzle expansion level effect on suddenly expanded flow** Times Cited: 7
 By: Khan, Sher Afghan; Rathakrishnan, E.
 INTERNATIONAL JOURNAL OF TURBO & JET-ENGINES Volume: 23 Issue: 4 Pages: 233-257 Published: 2006

15. **Effect of ribs on suddenly expanded flows** Times Cited: 9
 By: Rathakrishnan, E
 AIAA JOURNAL Volume: 39 Issue: 7 Pages: 1402-1404 Published: JUL 2001

16. **INFLUENCE OF CAVITIES ON SUDDENLY EXPANDED FLOW FIELD** Times Cited: 14
 By: RATHAKRISHNAN, E; RAMANARAJU, OV; PADMANABAN, K
 MECHANICS RESEARCH COMMUNICATIONS Volume: 16 Issue: 3 Pages: 139-146 Published: MAY-JUN 1989

17. **Control of base pressure with micro-jets : part I** Times Cited: 9
 By: Rehman, Shafiqur; Khan, S. A.
 AIRCRAFT ENGINEERING AND AEROSPACE TECHNOLOGY Volume: 80 Issue: 2 Pages: 158-164 Published: 2008

18. **FLOW THROUGH PIPES WITH SUDDEN ENLARGEMENT** Times Cited: 7
 By: SRIKANTH, R; RATHAKRISHNAN, E
 MECHANICS RESEARCH COMMUNICATIONS Volume: 18 Issue: 4 Pages: 199-206 Published: JUL-AUG 1991

19. **Base Pressure Fluctuations on Typical Missile Configuration in Presence of Base Cavity** Times Cited: 1
 By: Vikramaditya, N. S.; Viji, M.; Verma, S. B.; et al.
 JOURNAL OF SPACECRAFT AND ROCKETS Volume: 55 Issue: 2 Pages: 335-345 Published: MAR 2018

20. **PASSIVE DEVICES FOR AXISYMMETRIC BASE DRAG REDUCTION AT TRANSONIC SPEEDS** Times Cited: 5
 By: VISWANATH, PR
 JOURNAL OF AIRCRAFT Volume: 25 Issue: 3 Pages: 258-262 Published: MAR 1988

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