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Optimization of two-dimensional wedge flow field at supersonic mach number (Article)

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Abstract

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In the present condition, there is a high demand for exact solutions through analytical, computational and measurements in the field of aerospace engineering. For wind tunnel testing it is difficult to bear the cost because of highly expensive materials needed for wind tunnel testing and the time needed to accomplish the experiments. Therefore, in this paper, analytical and numerical methods are used to evaluate the flow field over a wedge at supersonic Mach numbers for attached as well as detached shock cases. The wedge with the various half-wedge angle at Mach number 2 has been considered for the simulation. Closed form solutions are obtained for the various semi-vertex angle of the wedge. Supersonic similarity parameter has been used to obtain the pressure distribution over wedge at a different angle of attack with attached and detached shock wave cases. Results are in good agreement with the theoretical results of the shock-expansion theory. The analytical results are compared with those obtained by simulation. The results are obtained for pressure, temperature, Mach number, and the density using ANSYS code are in good agreement with the results obtained analytically. © 2019 PENERBIT AKADEMIKA BARU-All rights reserved.

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References (30)

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- 1 Tsien, H.-S.
Similarity laws of hypersonic flows
(1946) *Journal of Mathematics and Physics*, 25 (1-4), pp. 247-251. Cited 49 times.

- 2 Carrier, G.F.

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-
- 3 Khan, S.A., Crasta, A.
Hypersonic similitude for planar wedges
(2014) International Journal of Advanced Research in Engineering and Technology, 5 (2), pp. 16-31. Cited 7 times.
-
- 4 Monis, R.S., Crasta, A., Khan, S.A.
An Effect of Sweep Angle on Roll Damping Derivative for A Delta with Curved Leading Edges in Unsteady Flow
(2019) International Journal of Mechanical and Production Engineering Research and Development, 9 (2), pp. 361-374.
-
- 5 Pavithra, S., Musavir Bashir, S.L., Sher Afghan, K.
Estimation of Stability Derivatives in Pitch for an Oscillating Wedge in Hypersonic Flow
(2017) Advances and Applications in Fluid Mechanics, 19 (4), pp. 873-882. Cited 2 times.
-
- 6 Shabana, A., Monis, R.S., Crasta, A., Khan, S.A.
The computation of stiffness derivative for an ogive in the hypersonic flow

(2018) International Journal of Mechanical and Production Engineering Research and Development, 8 (5), pp. 173-184. Cited 2 times.
<http://www.tjprc.org/view-archives.php?year=2018&journal=67&id=67&jtype=2&details=archives>
-
- 7 Shabana, A., Monis, R.S., Crasta, A., Khan, S.A.
Effect of Semi Vertex Angle on Stability Derivatives for an Oscillating Cone for Constant Value of Specific Heat Ratio
(2018) International Journal of Engineering & Technology, 7 (3), pp. 386-390. Cited 2 times.
-
- 8 Crasta, A., Pavitra, S., Khan, S.A.
Estimation of surface pressure distribution on a delta wing with curved leading edges in hypersonic/supersonic flow

(2016) International Journal of Energy, Environment and Economics, 24 (1), pp. 67-74. Cited 2 times.
<https://www.novapublishers.com>
-
- 9 Khan, S.A., Crasta, A.
Oscillating supersonic delta wings with curved leading edges

(2010) Advanced Studies in Contemporary Mathematics (Kyungshang), 20 (3), pp. 359-372. Cited 7 times.
-
- 10 Shabana, A., Monis, R.S., Crasta, A., Khan, S.A.
Computation of Stability Derivatives of an oscillating cone for specific heat ratio = 1.66
(Open Access)

(2018) IOP Conference Series: Materials Science and Engineering, 370 (1), art. no. 012059.
<http://www.iop.org/EJ/journal/mse>
doi: 10.1088/1757-899X/370/1/012059

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-

- 11 Shabana, A., Monis, R.S., Crasta, A., Khan, S.A.
Estimation of Stability Derivatives in Newtonian Limit for Oscillating Cone (Open Access)

(2018) IOP Conference Series: Materials Science and Engineering, 370 (1), art. no. 012061.

<http://www.iop.org/EJ/journal/mse>

doi: 10.1088/1757-899X/370/1/012061

[View at Publisher](#)

- 12 Khan, S.A., Shabana, A., Monis, R.S., Shabana, A., Monis, R.S.
Stability Derivatives of an Oscillating Wedges in Viscous Hypersonic Flow Stability Derivatives of an Oscillating Wedges in Viscous Hypersonic Flow
(2018) IOP Conference Series: Materials Science and Engineering, 370 (1), pp. 12-51.

- 13 Musavir, B.
Dynamic Stability of Unguided Projectile with 6-DOF Trajectory Modeling
(2017) 2017 2Nd International Conference for Convergence in Technology (I2CT), pp. 1-8. Cited 2 times.

- 14 Singh, P.K., Tripathi, A.K., Er, S., Rana, K.
CFD Analysis for Supersonic Flow over a Wedge
(2017) IJARIE, 3 (2), pp. 5645-5663. Cited 3 times.

- 15 Khan, S.A., Aabid, A., Saleel, C.A.
CFD simulation with analytical and theoretical validation of different flow parameters for the wedge at supersonic Mach number

(2019) International Journal of Mechanical and Mechatronics Engineering, 19 (1), pp. 170-177. Cited 5 times.
http://ijens.org/Vol_19_I_01/193101-4545-IJMME-IJENS.pdf

- 16 Khan, S.A., Aabid, A., Baig, M.A.A.
CFD analysis of cd nozzle and effect of nozzle pressure ratio on pressure and velocity for suddenly expanded flows (Open Access)

(2018) International Journal of Mechanical and Production Engineering Research and Development, 8 (3), pp. 1147-1158. Cited 15 times.
<http://www.tjprc.org/publishpapers/2-67-1529468467-119.IJMPERDJUN2018119.pdf>
doi: 10.24247/ijmperdjun2018119

[View at Publisher](#)

- 17 Khan, A., Aabid, A., Khan, S.A.
CFD Analysis of Convergent-Divergent Nozzle Flow and Base Pressure Control Using Micro-JETS
(2018) International Journal of Engineering and Technology, 7 (3.29), pp. 232-235. Cited 10 times.

- 18 Fharukh Ahmed, G.M., Alrobaian, A.A., Aabid, A., Khan, S.A.
Numerical analysis of convergent-divergent nozzle using finite element method (Open Access)

(2018) International Journal of Mechanical and Production Engineering Research and Development, 8 (6), pp. 373-382. Cited 8 times.

<http://www.tjprc.org/publishpapers/2-67-1541583801-42.IJMPERDDEC201842.pdf>

doi: 10.24247/ijmperddec201842

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- 19 Khan, S.A., Aabid, A., Saleel, C.A.
Influence of micro jets on the flow development in the enlarged duct at supersonic Mach number

(2019) International Journal of Mechanical and Mechatronics Engineering, 19 (1), pp. 70-82. Cited 5 times.
http://ijens.org/Vol_19_I_01/191301-2828-IJMME-IJENS.pdf

View at Publisher
-
- 20 Aabid, A., Khan, A., Mazlan, N.M., Ismail, M.A., Akhtar, M.N., Khan, S.A.
Numerical simulation of suddenly expanded flow at mach 2.2

(2019) International Journal of Engineering and Advanced Technology, 8 (3), pp. 457-462. Cited 5 times.
www.ijeat.org
-
- 21 Umair, S.M., Khan, S.A., Alrobaian, A., Ansari, E.
Numerical study of heat transfer augmentation using pulse jet impinging on pin fin heat sink

(2019) CFD Letters, 11 (3), pp. 84-91. Cited 4 times.
<http://www.akademiabaru.com/cfdl.html>
-
- 22 Hamizi, I.B., Khan, S.A.
Aerodynamics investigation of delta wing at low reynold's number

(2019) CFD Letters, 11 (2), pp. 32-41. Cited 6 times.
<http://www.akademiabaru.com/cfdl.html>
-
- 23 Khan, S.A., Al Robaian, A.A., Asadullah, M., Khan, A.M.
Grooved cavity as a passive controller behind backward facing step

(2019) Journal of Advanced Research in Fluid Mechanics and Thermal Sciences, 53 (2), pp. 185-193. Cited 5 times.
http://www.akademiabaru.com/doc/ARFMTSV53_N2_P185_193.pdf
-
- 24 Khan, S.A., Alrobaian, A.A., Asadullah, M., Aswin
Threaded spikes for bluff body base flow control

(2019) Journal of Advanced Research in Fluid Mechanics and Thermal Sciences, 53 (2), pp. 194-203. Cited 5 times.
http://www.akademiabaru.com/doc/ARFMTSV53_N2_P194_203.pdf
-
- 25 Pathan, K.A., Khan, S.A., Dabeer, P.S.
CFD analysis of effect of Mach number, area ratio and nozzle pressure ratio on velocity for suddenly expanded flows

(2017) 2017 2nd International Conference for Convergence in Technology, I2CT 2017, 2017-January, pp. 1104-1110. Cited 18 times.
ISBN: 978-150904307-1
doi: 10.1109/I2CT.2017.8226299

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-
- 26 Pathan, K.A., Khan, S.A., Dabeer, P.S.
CFD analysis of effect of flow and geometry parameters on thrust force created by flow from nozzle

(2017) 2017 2nd International Conference for Convergence in Technology, I2CT 2017, 2017-January, pp. 1121-1125. Cited 12 times.
ISBN: 978-150904307-1
doi: 10.1109/I2CT.2017.8226302

- 27 Pathan, K.A., Khan, S.A., Dabeer, P.S.
CFD analysis of effect of area ratio on suddenly expanded flows

(2017) 2017 2nd International Conference for Convergence in Technology, I2CT 2017, 2017-January, pp. 1192-1198. Cited 16 times.
ISBN: 978-150904307-1
doi: 10.1109/I2CT.2017.8226315

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
- 28 Pathan, K.A., Dabeer, P.S., Khan, S.A.
Optimization of area ratio and thrust in suddenly expanded flow at supersonic Mach numbers (Open Access)

(2018) Case Studies in Thermal Engineering, 12, pp. 696-700. Cited 9 times.
<http://www.journals.elsevier.com/case-studies-in-thermal-engineering/>
doi: 10.1016/j.csite.2018.09.006

View at Publisher

- 29 Bhavikatti, S.S.
(2005) Finite Element Analysis. Cited 43 times.
New Age International Publication

- 30 (2013) ANSYS Fluent Theory Guide, 15317 (11), pp. 724-746. Cited 464 times.

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