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A critical review of supersonic flow control for high - speed applications

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Abstract

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Abstract

In high - speed fluid dynamics, base pressure controls find many engineering applications , such as in the automobile and defense industries. Several studies have been reported on flow control with sudden expansion duct. Passive control was found to be more beneficial in the last four decades and is used in devices such as cavities, ribs, aerospikes, etc., but these need additional control mechanics and objects to control the flow . Therefore, in the last two decades, the active control method has been used via a microjet controller at the base region of the suddenly expanded duct of the convergent–divergent (CD) nozzle to control the flow , which was found to be a cost-efficient and energy-saving method. Hence, in this paper, a systemic literature review is conducted to investigate the research gap by reviewing the exhaustive work on the active control of high - speed aerodynamic flows from the nozzle as the major focus. Additionally, a basic idea about the nozzle and its configuration is discussed, and the passive control method for the control of flow , jet and noise are represented in order to investigate the existing contributions in supersonic speed applications . A critical review of the last two decades considering the challenges and limitations in this field is expressed. As a contribution, some major and minor gaps are introduced, and we plot the research trends in this field. As a result, this review can serve as guidance and an opportunity for scholars who want to use an active control approach via microjets for supersonic flow problems. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.

Author keywords

CD nozzle; CFD; De Laval nozzle; DOE; Flow control ; Microjet; Supersonic flow

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References (180)

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Aabid, A. , Khan, S.A.
(2021) Arabian Journal for Science and Engineering

Control of nozzle flow using microjets at supersonic Mach regime

Ahmed, F.G.M. , Khan, S.A.
(2019) International Journal of Engineering, Transactions A: Basics

Response surface analysis, clustering, and random forest regression of pressure in suddenly expanded high-speed aerodynamic flows

Afzal, A. , Aabid, A. , Khan, A.
(2020) Aerospace Science and Technology

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Authors Keywords

1 Khan, S.A., Rathakrishnan, E.
Control of Suddenly Expanded Flows with Micro-Jets

(2003) *International Journal of Turbo and Jet Engines*, 20 (1), pp. 63-81. Cited 57 times.
http://www.degruyter.com/view/j/tjj.2012.29.issue-2/issue-files/tjj.2012.29.issue-2.xml
doi: 10.1515/TJJ.2003.20.1.63

View at Publisher

2 Aabid, A., Khan, S.A.
Investigation of High-Speed Flow Control from CD Nozzle Using Design of Experiments and CFD Methods

(2021) *Arabian Journal for Science and Engineering*, 46 (3), pp. 2201-2230. Cited 2 times.
https://link-springer-com.ezlib.iium.edu.my/journal/13369
doi: 10.1007/s13369-020-05042-z

View at Publisher

3 Ramanjaneyulu, S.
Design and flow analysis of Convergent Divergent nozzle using CFD
(2019) *Int. J. Res. Appl. Sci. Eng. Technol*, 7, pp. 4020-4029.

4 Singh, J., Zerpa, L.E., Partington, B., Gamboa, J.
Effect of nozzle geometry on critical-subcritical flow transitions
(Open Access)

(2019) *Heliyon*, 5 (2), art. no. e01273. Cited 5 times.
http://www.journals.elsevier.com/heliyon/
doi: 10.1016/j.heliyon.2019.e01273

View at Publisher

5 Rathakrishnan, E.
(2019) *Applied Gas Dynamics*. Cited 85 times.
Wiley: Hoboken, NJ, USA

6 Greyvenstein, G.P.
An implicit method for the analysis of transient flows in pipe networks

(2002) *International Journal for Numerical Methods in Engineering*, 53 (5), pp. 1127-1143. Cited 87 times.
doi: 10.1002/nme.323

View at Publisher

7 Keir, A.S., Ives, R., Hamad, F.
CFD analysis of C-D nozzle compared with theoretical & experimental data (Open Access)

(2018) *INCAS Bulletin*, 10 (2), pp. 53-64. Cited 2 times.
https://doi-org.ezlib.iium.edu.my/10.13111/2066-8201.2018.10.2.6
doi: 10.13111/2066-8201.2018.10.2.6

View at Publisher

8 Ferrás, L.L., Afonso, A.M., Alves, M.A., Nóbrega, J.M., Pinho, F.T.
Newtonian and viscoelastic fluid flows through an abrupt 1:4 expansion with slip boundary conditions
(2020) *Phys. Fluids*, 32, p. 043103. Cited 10 times.

9 Poole, R.J., Pinho, F.T., Alves, M.A., Oliveira, P.J.
The effect of expansion ratio for creeping expansion flows of UCM fluids
(Open Access)

(2009) *Journal of Non-Newtonian Fluid Mechanics*, 163 (1-3), pp. 35-44. Cited 20 times.
doi: 10.1016/j.jnnfm.2009.06.004

View at Publisher

10 Poole, R.J., Alves, M.A., Oliveira, P.J., Pinho, F.T.
Plane sudden expansion flows of viscoelastic liquids (Open Access)

(2007) *Journal of Non-Newtonian Fluid Mechanics*, 146 (1-3), pp. 79-91. Cited 34 times.
doi: 10.1016/j.jnnfm.2006.11.001

View at Publisher

11 Dhinakaran, S., Oliveira, M.S.N., Pinho, F.T., Alves, M.A.
Steady flow of power-law fluids in a 1:3 planar sudden expansion
(Open Access)

(2013) *Journal of Non-Newtonian Fluid Mechanics*, 198, pp. 48-58. Cited 27 times.
doi: 10.1016/j.jnnfm.2013.01.006

View at Publisher

12 Francisco, A.R.L.
(2013) *Nozzles. J. Chem. Inf. Model*, 53, pp. 1689-1699. Cited 1430 times.

13 Ramesh Kumar, R., Devarajan, Y.
CFD simulation analysis of two-dimensional convergent-divergent nozzle

(2020) *International Journal of Ambient Energy*, 41 (13), pp. 1505-1515. Cited 5 times.
http://www-tandfonline-com.ezlib.iium.edu.my/toc/taen20/current
doi: 10.1080/01430750.2018.1517683

View at Publisher

14 Khan, A., Aabid, A., Khan, S.A.
(2018) *CFD Analysis of Convergent-Divergent Nozzle Flow and Base Pressure Control using Micro JETS*
(accessed on 26 July 2021)
www.sciencepubco.com/index.php/IJET

15 Khan, S.A., Rathakrishnan, E.
Active control of suddenly expanded flows from overexpanded nozzles

(2002) *International Journal of Turbo and Jet Engines*, 19 (1-2), pp. 119-126. Cited 60 times.
http://www.degruyter.com/view/j/tjj.2012.29.issue-2/issue-files/tjj.2012.29.issue-2.xml
doi: 10.1515/TJJ.2002.19.1-2.119

View at Publisher

16 Raman, R.K., Dewang, Y., Raghuwanshi, J.
A review on applications of computational fluid dynamics
(2018) *Int. J. LNCT*, 6, p. 8. Cited 6 times.

17 Xu, G., Luxbacher, K.D., Ragab, S., Xu, J., Ding, X.
Computational fluid dynamics applied to mining engineering: a review

(2017) *International Journal of Mining, Reclamation and Environment*, 31 (4), pp. 251-275. Cited 37 times.
http://www-tandfonline-com.ezlib.iium.edu.my/toc/nsme20/current0930
doi: 10.1080/17480930.2016.1138570

View at Publisher

18 Alobaid, F.
Computational fluid dynamics

(2018) *Springer Tracts in Mechanical Engineering*, (9783319762333), pp. 87-204. Cited 2 times.
http://www.springer.com.ezlib.iium.edu.my/series/11693
doi: 10.1007/978-3-319-76234-0_3

View at Publisher

19 Tapasvi, V., Gupta, M.S., Kumaraswamy, T.
Designing and Simulating Compressible Flow in a Nozzle
(2015) *Int. J. Eng. Adv. Technol*, 6, pp. 46-54.

20 Lai, Y.G., Wu, K.
A three-dimensional flow and sediment transport model for free-surface open channel flows on unstructured flexible meshes (Open Access)

(2019) *Fluids*, 4 (1), art. no. 18. Cited 5 times.
https://www.mdpi.com/2311-5521/4/1
doi: 10.3390/fluids4010018

View at Publisher

21 Chong, M.S., Perry, A.E., Cantwell, B.J.
A general classification of three-dimensional flow fields

(1990) *Physics of Fluids A*, 2 (5), pp. 765-777. Cited 1296 times.
doi: 10.1063/1.857730

View at Publisher

22 Sakaki, K., Shimizu, Y.
Effect of the increase in the entrance convergent section length of the gun nozzle on the high-velocity oxygen fuel and cold spray process

(2001) *Journal of Thermal Spray Technology*, 10 (3), pp. 487-496. Cited 55 times.
doi: 10.1361/105996301770349268

View at Publisher

23 Viswanath, P.R.
Aircraft viscous drag reduction using riblets (Open Access)

(2002) *Progress in Aerospace Sciences*, 38 (6-7), pp. 571-600. Cited 212 times.
doi: 10.1016/S0376-0421(02)00048-9

View at Publisher

24 Ishide, T., Itazawa, M.
Aerodynamic improvement of a delta wing in combination with leading edge flaps (Open Access)

(2017) *Theoretical and Applied Mechanics Letters*, 7 (6), pp. 357-361. Cited 2 times.
http://www.journals.elsevier.com/theoretical-and-applied-mechanics-letters/
doi: 10.1016/j.taml.2017.11.010

View at Publisher

25 Khurana, S., Suzuki, K., Rathakrishnan, E.
Flow field around a blunt-nosed body with spike

(2012) *International Journal of Turbo and Jet Engines*, 29 (4), pp. 217-221. Cited 16 times.
doi: 10.1515/tjj-2012-0002

View at Publisher

26 Khurana, S., Suzuki, K.
Towards heat transfer control by aerospikes for lifting-body configuration in hypersonic flow

(2013) *44th AIAA Thermophysics Conference*. Cited 5 times.

27 Khurana, S., Suzuki, K.
Assessment of Aerodynamic Effectiveness for Aerospike Application on Hypothesized Lifting-Body in Hypersonic Flow
Proceedings of the Fluid Dynamics and Co-Located Conferences, pp. 24-27. Cited 4 times.
San Diego, CA, USA, 24–27 June 2013

28 Khurana, S., Suzuki, K., Rathakrishnan, E.
Flow field behavior with Reynolds number variance around a spiked body

(2016) *Modern Physics Letters B*, 30 (30), art. no. 1650362. Cited 6 times.
http://www.worldscinet.com.ezlib.iium.edu.my/mplb/mplb.shtml
doi: 10.1142/S0217984916503620

View at Publisher

29 Sinclair, J., Cuia, X.
A theoretical approximation of the shock standoff distance for supersonic flows around a circular cylinder (Open Access)

(2017) *Physics of Fluids*, 29 (2), art. no. 026102. Cited 18 times.
http://scitation.aip.org/content/aip/journal/pof2
doi: 10.1063/1.4975983

View at Publisher

30 Viswanath, P.R.
Passive devices for axisymmetric base drag reduction at transonic speeds (Open Access)

(1988) *Journal of Aircraft*, 25 (3), pp. 258-262. Cited 17 times.
doi: 10.2514/3.45586

View at Publisher

31 Viswanath, P.R.
Flow management techniques for base and afterbody drag reduction

(1996) *Progress in Aerospace Sciences*, 32 (2-3), pp. 79-129. Cited 81 times.
doi: 10.1016/0376-0421(95)00003-8

View at Publisher

32 Singh, N.K., Rathakrishnan, E.
Sonic jet control with tabs

(2002) *International Journal of Turbo and Jet Engines*, 19 (1-2), pp. 107-118. Cited 44 times.
http://www.degruyter.com/view/j/tjj.2012.29.issue-2/issue-files/tjj.2012.29.issue-2.xml
doi: 10.1515/TJJ.2002.19.1-2.107

View at Publisher

33 Vijayaraja, K., Senthilkumar, C., Elangovan, S., Rathakrishnan, E.
Base pressure control with annular ribs

(2014) *International Journal of Turbo and Jet Engines*, 31 (2), pp. 111-118. Cited 12 times.
http://www.degruyter.com/view/j/tjj.2012.29.issue-2/issue-files/tjj.2012.29.issue-2.xml
doi: 10.1515/tjj-2013-0037

View at Publisher

34 Vikramaditya, N.S., Viji, M., Verma, S.B., Ali, N., Thakur, D.N.
Base pressure fluctuations on typical missile configuration in presence of base cavity (Open Access)

(2018) *Journal of Spacecraft and Rockets*, 55 (2), pp. 335-345. Cited 8 times.
http://arc.aiaa.org/loi/jsr
doi: 10.2514/1.A33926

View at Publisher

35 Kreth, P.A., Alvi, F.S.
Using high-frequency pulsed supersonic microjets to control resonant high-speed cavity Flows

(2020) *AIAA Journal*, 58 (8), pp. 3378-3392. Cited 2 times.
https://doi-org.ezlib.iium.edu.my/10.2514/1.J058912
doi: 10.2514/1.J058912

View at Publisher

36 Liu, Y., Zhang, H., Liu, P.
Flow control in supersonic flow field based on micro jets (Open Access)

(2019) *Advances in Mechanical Engineering*, 11 (1). Cited 7 times.
http://ade.sagepub.com/
doi: 10.1177/1687814018821526

View at Publisher

37 Rathakrishnan, E., Ramanaraju, O.V., Padmanaban, K.
Influence of cavities on suddenly expanded flow field

(1989) *Mechanics Research Communications*, 16 (3), pp. 139-146. Cited 27 times.
doi: 10.1016/0093-6413(89)90051-7

View at Publisher

38 Sethuraman, V., Khan, S.A.
Effect of sudden expansion for varied area ratios at subsonic and sonic flow regimes

(2016) *International Journal of Energy, Environment and Economics*, 24 (1), pp. 99-112. Cited 10 times.
https://www.novapublishers.com

39 Asadullah, M., Khan, S.A., Asrar, W., Sulaeman, E.
Active control of base pressure with counter clockwise rotating cylinder at Mach 2 (Open Access)

(2018) *4th IEEE International Conference on Engineering Technologies and Applied Sciences, ICETAS 2017*, 2018-January, pp. 1-6. Cited 16 times.
ISBN: 978-153862106-6
doi: 10.1109/ICETAS.2017.8277857

View at Publisher

40 Khan, S.A., Asadullah, M., Sadhiq, J.
Passive control of base drag employing dimple in subsonic suddenly expanded flow

(2018) *International Journal of Mechanical and Mechatronics Engineering*, 18 (3), pp. 69-74. Cited 24 times.
http://ijens.org/Vol_18_I_03/181303-5757-IJMME-IJENS.pdf

41 Gutmark, E.J., Grinstein, F.F.
Flow control with noncircular jets

(1999) *Annual Review of Fluid Mechanics*, 31, pp. 239-272. Cited 476 times.
doi: 10.1146/annurev.fluid.31.1.239

View at Publisher

42 Samimy, M., Webb, N., Crawley, M.
Excitation of free shear-layer instabilities for high-speed flow control

(2018) *AIAA Journal*, 56 (5), pp. 1770-1791. Cited 20 times.
http://arc.aiaa.org/loi/aiaaj
doi: 10.2514/1.J056610

View at Publisher

43 Rathakrishnan, E.
AR 4 elliptic jet control with limiting tab

(2018) *Fluid Dynamics Research*, 50 (2), art. no. 025505. Cited 4 times.
http://iopscience.iop.org/article/10.1088/1873-7005/aa9b96/pdf
doi: 10.1088/1873-7005/aa9b96

View at Publisher

☐ 44 Khan, A., Kumar, R.
Experimental study and passive control of overexpanded plug nozzle jet

(2018) *Journal of Spacecraft and Rockets*, 55 (3), pp. 776-782. Cited 4 times.
http://arc.aiaa.org/loi/jsr
doi: 10.2514/1.A34039

View at Publisher

☐ 45 Jacksi, K., Ibrahim, F., Ali, S.
Scholars Journal of Engineering and Technology (SJET)
(2018) *Sch. J. Eng. Technol*, 9523, pp. 49-53. Cited 2 times.

☐ 46 Akram, S., Rathakrishnan, E.
Control of Supersonic Elliptic Jet with Ventilated Tabs

(2020) *International Journal of Turbo and Jet Engines*, 37 (3), pp. 267-283. Cited 3 times.
http://www.degruyter.com/view/j/tjj.2012.29.issue-2/issue-files/tjj.2012.29.issue-2.xml
doi: 10.1515/tjj-2017-0033

View at Publisher

☐ 47 Arun Kumar, P., Aileni, M., Rathakrishnan, E.
Impact of tab location relative to the nozzle exit on the shock structure of a supersonic jet

(2019) *Physics of Fluids*, 31 (7), art. no. 076104. Cited 11 times.
http://scitation.aip.org/content/aip/journal/pof2
doi: 10.1063/1.5111328

View at Publisher

☐ 48 Khan, A., Panthi, R., Kumar, R., Mohammed Ibrahim, S.
Experimental investigation of the effect of extended cowl on the flow field of planar plug nozzles

(2019) *Aerospace Science and Technology*, 88, pp. 208-221. Cited 10 times.
doi: 10.1016/j.ast.2019.03.011

View at Publisher

☐ 49 Manigandan, S., Vijayaraja, K.
Flow field and acoustic characteristics of elliptical throat CD nozzle

(2019) *International Journal of Ambient Energy*, 40 (1), pp. 57-62. Cited 13 times.
http://www-tandfonline-com.ezlib.iium.edu.my/toc/taen20/current
doi: 10.1080/01430750.2017.1360205

View at Publisher

☐ 50 Khan, A., Akram, S., Kumar, R.
Experimental study on enhancement of supersonic twin-jet mixing by vortex generators

(2020) *Aerospace Science and Technology*, 96, art. no. 105521. Cited 11 times.
https://www.journals.elsevier.com/aerospace-science-and-technology
doi: 10.1016/j.ast.2019.105521

View at Publisher

☐ 51 Panthi, R., Krishna, T.V., Nanda, S.R., Khan, A., Kumar, R., Sugarno, M.I.
Experimental study of impinging plug nozzle jet using a vortex generator

(2020) *Journal of Spacecraft and Rockets*, 57 (6), pp. 1414-1418.
http://arc.aiaa.org/loi/jsr
doi: 10.2514/1.A34760

View at Publisher

52 Aravindh Kumar, S.M., Rathakrishnan, E.
Elliptic jet control with triangular tab

(2017) *Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering*, 231 (8), pp. 1460-1477. Cited 8 times.
http://pig.sagepub.com/content/by/year
doi: 10.1177/0954410016652921

View at Publisher

53 Tam, C.K.W., Tanna, H.K.
Shock associated noise of supersonic jets from convergent-divergent nozzles

(1982) *Journal of Sound and Vibration*, 81 (3), pp. 337-358. Cited 281 times.
doi: 10.1016/0022-460X(82)90244-9

View at Publisher

54 Liu, J., Johnson, R.F., Ramamurti, R.
Numerical study of supersonic jet noise emanating from an f404 nozzle at model scale

(2019) *AIAA Scitech 2019 Forum*. Cited 11 times.
ISBN: 978-162410578-4
doi: 10.2514/6.2019-0807

View at Publisher

55 Akatsuka, J., Hromisin, S.M., Falcone, J., McLaughlin, D.K., Morris, P.J.
Mean flow measurements in supersonic jets with noise reduction devices

(2019) *AIAA Scitech 2019 Forum*. Cited 3 times.
ISBN: 978-162410578-4
doi: 10.2514/6.2019-1304

View at Publisher

56 Prasad, C., Morris, P.J.
Unsteady simulations of fluid inserts for supersonic jet noise reduction

(2019) *AIAA Scitech 2019 Forum*. Cited 8 times.
ISBN: 978-162410578-4
doi: 10.2514/6.2019-0808

View at Publisher

57 Gao, J., Xu, X., Li, X.
Numerical simulation of supersonic twin-jet noise with high-order finite difference scheme

(2018) *AIAA Journal*, 56 (1), pp. 290-300. Cited 7 times.
http://arc.aiaa.org/loi/aiaaj
doi: 10.2514/1.J055751

View at Publisher

58 Chen, B., Wang, Y.
Active aerodynamic noise control research for supersonic aircraft cavity by nonlinear numerical simulation

(2021) *International Journal of Electrical Engineering Education*
http://ije.sagepub.com/content/by/year
doi: 10.1177/0020720921996589

View at Publisher

59 Zhu, W., Xiao, Z., Fu, S.
Numerical modeling screen for flow and noise control around tandem cylinders

(2020) *AIAA Journal*, 58 (6), pp. 2504-2516.
http://arc.aiaa.org/loi/aiaaj
doi: 10.2514/1.J058636

View at Publisher

60 Patel, T.K.
(2020) *Analysis of Supersonic Jet Noise in the Sideline and Upstream Directions Using the Navier-Stokes Equations*. Cited 2 times.
Ph.D. Thesis, University of Florida, Gainesville, FL, USA

61 Coombs, J., Schembri, T., Zander, A.
The effect of hemispherical surface on noise suppression of a supersonic jet
Proceedings of the Acoustics 2019—Sound Decisions: Moving forward with Acoustics, pp. 1-10.
Location: Mornington Peninsula, Australia, 13–14 May 2019

62 Mondal, K., Das, S., Hamada, N., Abu, A.B.H., Das, S., Faris, W.F., Toh, H.T., (...), Ahmad, A.
An improved narrowband active noise control system without secondary path modelling based on the time domain (Open Access)

(2019) *International Journal of Vehicle Noise and Vibration*, 15 (2-3), pp. 110-132.
http://www.inderscience.com/ijvnv
doi: 10.1504/IJVNV.2019.106372

View at Publisher

63 Berton, J.J., Huff, D.L., Seidel, J.A., Geiselhart, K.A.
Supersonic technology concept aeroplanes for environmental studies (Open Access)

(2020) *AIAA Scitech 2020 Forum*, 1 PartF. Cited 6 times.
ISBN: 978-162410595-1
doi: 10.2514/6.2020-0263

View at Publisher

64 Prasad, C., Morris, P.J.
A study of noise reduction mechanisms of jets with fluid inserts (Open Access)

(2020) *Journal of Sound and Vibration*, 476, art. no. 115331. Cited 7 times.
http://www.elsevier.com.ezlib.iium.edu.my/inca/publications/store/6/2/2/8/9/9/index.htt
doi: 10.1016/j.jsv.2020.115331

View at Publisher

65 Salehian, S., Mankbadi, R.R.
A review of aeroacoustics of supersonic jets interacting with solid surfaces

(2020) *AIAA Scitech 2020 Forum*, pp. 1-31.
ISBN: 978-162410595-1
doi: 10.2514/6.2020-0006

View at Publisher

66 Rahmani, S., Alhawwary, M., Wang, Z.J., Phommachanh, J., Hill, C., Hartwell, B., Collicott, B., (...), Zheng, Z.
Noise mitigation of a supersonic jet using shear layer swirl

(2020) *AIAA Scitech 2020 Forum*, 1 PartF, pp. 1-30. Cited 3 times.
ISBN: 978-162410595-1
doi: 10.2514/6.2020-0499

View at Publisher

67 Horner, C., Sescu, A., Afsar, M., Collins, E., Azarpeyvand, M.
Passive noise control strategies for jets exhausting over flat surfaces: An les study (Open Access)

(2020) *AIAA AVIATION 2020 FORUM*
ISBN: 978-162410598-2
doi: 10.2514/6.2020-2552

View at Publisher

68 Prasad, C., Morris, P.J.
Steady active control of noise radiation from highly heated supersonic jets (Open Access)

(2021) *Journal of the Acoustical Society of America*, 149 (2), pp. 1306-1317. Cited 2 times.
http://scitation.aip.org/content/asa/journal/jasa
doi: 10.1121/10.0003570

View at Publisher

69 Pourhashem, H., Kumar, S., Kalkhoran, I.M.
Flow field characteristics of a supersonic jet influenced by downstream microjet fluidic injection (Open Access)

(2019) *Aerospace Science and Technology*, 93, art. no. 105281. Cited 6 times.
https://www.journals.elsevier.com/aerospace-science-and-technology
doi: 10.1016/j.ast.2019.07.014

View at Publisher

70 Li, B., Ye, C.-C., Wan, Z.-H., Liu, N.-S., Sun, D.-J., Lu, X.-Y.
Noise control of subsonic flow past open cavities based on porous floors

(2020) *Physics of Fluids*, 32 (12), art. no. 25101. Cited 4 times.
http://scitation.aip.org/content/aip/journal/pof2
doi: 10.1063/5.0028689

View at Publisher

71 Martin, R., Soria, M., Rodriguez, I., Lehmkuhl, O.
On the Flow and Passive Noise Control of an Open Cavity at Re = 5000

(2021) *Flow, Turbulence and Combustion*
http://www.springeronline.com/sgw/cda/frontpage/0,11855,1-40109-70-35731861-0,00.html
doi: 10.1007/s10494-021-00265-y

View at Publisher

72 Ye, C.-C., Zhang, P.-J.-Y., Wan, Z.-H., Sun, D.-J., Lu, X.-Y.
Numerical investigation of the bevelled effects on shock structure and screech noise in planar supersonic jets

(2020) *Physics of Fluids*, 32 (8), art. no. 086103. Cited 4 times.
http://scitation.aip.org/content/aip/journal/pof2
doi: 10.1063/5.0013263

View at Publisher

73 Su, Z., Liu, E., Xu, Y., Xie, P., Shang, C., Zhu, Q.
Flow field and noise characteristics of manifold in natural gas transportation station (Open Access)

(2019) *Oil and Gas Science and Technology*, 74, art. no. 70. Cited 62 times.
https://ogst.ifpenergiesnouvelles.fr/
doi: 10.2516/ogst/2019038

View at Publisher

74 Wei, X.F., Mariani, R., Chua, L.P., Lim, H.D., Lu, Z.B., Cui, Y.D., New, T.H.
Mitigation of under-expanded supersonic jet noise through stepped nozzles

(2019) *Journal of Sound and Vibration*, 459, art. no. 114875. Cited 6 times.
http://www.elsevier.com.ezlib.iium.edu.my/inca/publications/store/6/2/2/8/9/9/index.htt
doi: 10.1016/j.jsv.2019.114875

View at Publisher

75 Coombs, J., Zander, A., Schembri, T.
Influence of a Hemispherical Noise Reduction Reflector on Transonic Jet Flows
Proceedings of the 22nd Australasian Fluid Mechanics Conference AFMC2020
Brisbane, Australia, 7–10 December 2020

76 Cuppoletti, D., Gutmark, E., Hafsteinsson, H., Eriksson, L.-E.

Elimination of shock associated noise in supersonic jets by destructive wave interference

(2018) *AIAA Aerospace Sciences Meeting, 2018*, (210059). Cited 4 times.
ISBN: 978-162410524-1
doi: 10.2514/6.2018-0262

View at Publisher

77 Arun Kumar, P., Aravindh Kumar, S.M., Surya Mitra, A., Rathakrishnan, E.

Empirical scaling analysis of supersonic jet control using steady fluidic injection

(2019) *Physics of Fluids*, 31 (5), art. no. 056107. Cited 11 times.
http://scitation.aip.org/content/aip/journal/pof2
doi: 10.1063/1.5096389

View at Publisher

78 Mancini, S., Kolb, A., Gonzalez-Martino, I., Casalino, D.

Effects of wall modifications on pressure oscillations in high-subsonic and supersonic flows over rectangular cavities

(2019) *25th AIAA/CEAS Aeroacoustics Conference, 2019*. Cited 2 times.
ISBN: 978-162410588-3
doi: 10.2514/6.2019-2692

View at Publisher

79 Xiansheng, W., Dangguo, Y., Jun, L., Fangqi, Z.

Control of pressure oscillations induced by supersonic cavity flow

(2020) *AIAA Journal*, 58 (5), pp. 2070-2077. Cited 6 times.
http://arc.aiaa.org/loi/aiaaj
doi: 10.2514/1.J059014

View at Publisher

80 Robertson, G., Kumar, R.

Effects of a generic store on cavity resonance at supersonic speeds
(Open Access)

(2020) *AIAA Journal*, 58 (10), pp. 4426-4437. Cited 3 times.
http://arc.aiaa.org/loi/aiaaj
doi: 10.2514/1.J059427

View at Publisher

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