T. Murugan

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EDUCATION

Indian Institute of Technology (IIT) — **Kanpur, India** — **October 2008**
PhD, Aerospace Engineering

Dissertation:Flow and acoustic characteristics of high Mach number vortex rings during evolution and wall interaction: An experimental investigation

Indian Institute of Technology (IIT) — **Kanpur, India** — **May, 2003**
Master's Degree in Aerospace Engineering

Dissertation:Hypersonic SERN (Single Expansion Ramp Nozzle) nozzle design and optimization using method of characteristic numerical technique

Madras Institute of Technology
Anna University — **Chennai, India** — **May 2001**
Bachelor's Degree inAeronautical Engineering

Dissertation:Development of a generic code for the structural design of the 100 seater commercial aircraft

AREAS OFRESEARCH INTEREST

- Vehicle Aerodynamics, Turbulence, unsteady aerodynamics, Drag reduction techniques
- High speed impulsive flows, shock/blast wave attenuation, Aeroacoustics
- Thermal, flow and structural stability analysis of generic objects and devices
- Low speed wind tunnel testing, Air breathing missile propulsion
- Vorticity Dynamics, Computational fluid dynamics (CFD),Convective heat transfer,Renewable energy (solar thermal energy)

TECHNICALKNOWLEDGE:

- Qualitative Flow visualization techniques (Smoke, turf, oil, and dye)
- Velocity and turbulence measurements (Hot wire anemometry (HWA), Laser Doppler Velocimetry (LDV) and Particle Image Velocimetry (PIV))
- Pressure, temperature and force measurementsusing Pressure scanners, thermocouples and strain gauge measurements
- Virtual Instrumentation (LABVIEW) programming, Data acquisition and control
- Design of shock tube and blast wave generator, shock/blast wave attenuation techniques, aeroacoustics noise measurements
- Low speed wind tunnel design and testing of models, synthetic jet applications, vortex tube
- Working Knowledge in ANSYS Fluent, CFX, Solid works, ICEM CFD, FORTRAN, C, MATLAB, Tec plot, and Lab VIEW

Contributed Projects

S. No	Project Title and Funding agency	Role
1	Effect of Free Stream Turbulence (FST) on Flow past a Circular Cylinder: An Experimental Investigation**DST Project(2010-2014) completed.**	Principal Investigator
2	Establishment of low speed wind tunnel facility for fluiddynamics, heat and mass transfer R & D study**CSIR - CMERI Institute project (2010-2014) completed.**	Principal Investigator
3	Toward Developing Bio-mimetic Underwater Swimming Robot for Autonomous Surveillance **DST Project on-going (2013-2016) on-going**	Co-Investigator
4	Development and Commercialization of 'Soleckshaw Lite' - An Innovative Electric Green Transport Platform"under **CSIR-NMITLI scheme project (2011-2013)**	Member
5	Numerical Simulation of Blast Wave within a Open Ended Shock Tube and Its Interaction with Generic Objects for Pressure Ratios from 3 to 30.**DRDO ARMREBon-going (2015-2017)**	Principal Investigator
6	Measurement of 3-D unsteady velocity field of impinging transient supersonic jets using Time Resolved PIV to identify noise producing large structures **ISRO Project at IIT Kanpur Completed (2007-2009)**	Research Associate
7	Experimental investigation of flow and noise characteristics of impinging transient supersonic jets for simulating take off of a rocket booster	Research Associate

from launch pad **ISRO Project In IIT Kanpur Completed (2008-2010)**

PROFESSIONAL EXPERIENCE:

CSIR-Central Mechanical engineering research institute (CMERI)
Scientist

- Developed a Low turbulence wind tunnel facility (turbulence intensity of <0.6%) with the data acquisition system for velocity, pressure, and force measurements along witha laser based smoke flow visualization

February 2010 – present

- Numerical simulation of impulsive flow from shock tube for predicting the exact mechanism of formation of counter rotating vortex ring (CRVR)

- Developing a blast wave/shock tube facility for blast/shock wave attenuation and mitigation studies

ACADEMIC OR OTHER EXPERIENCE:

Academy of Scientific and Innovative Research (AcSIR) CMERI-Durgapur

- Assistant Professor in AcSIR from CSIR-CMERI

- Offered "Introduction to turbulence" and "Convective heat and mass transfer" courses for AcSIR students

February 2010 – present

- Designed and executed six laboratory experiments

for turbulence course

- Guided few M. Tech, many B. Tech (NIT, NPTI and Asansol engineering college) and summer internship students (selected byIndian Academy of Science (IAS))

BOOKS AND PATENTS

- Studies on shock tube generated compressible vortex rings: A Practical Guide (ISBN-10: 3846549037, ISBN-13: 978-3846549032)

LAP LAMBERT Academic Publishing

RECENT ACTIVITIES

- Drag reduction studies on road vehicles through wind tunnel experiments and numerical simulations
- Experimental and numerical investigation of synthetic jet for their applications in flow control and electronic cooling
- Shock tube facility for attenuation and mitigation of blast/shock wave
- Flow, thermal and structural analysis of objects immerged fluids

PERSONAL INFORMATION:

Father's Name	:	N. Thangadurai
Date of Birth	:	26.03.1980
Sex	:	Male
Marital Status	:	Married
Nationality	:	Indian
Permanent Address	:	163, W-4 East Street,

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Theni District, Tamil Nadu, India

PEER-REVIEWED JOURNAL PUBLICATIONS:

1. **Murugan, T**., and Das, D., "On evolution and acoustic characteristics of compressible vortex ring," International Journal of Aeroacoustics, 7, 2008, 199-222

2. **Murugan, T**., Das, D., Jain, M., "On the Collision of Compressible Vortex Ring with Wall," Journal of Visualization, 11, 2008, 277

3. **Murugan, T**., and Das, D., "On the Evolution of Counter Rotating vortex ring Formed Ahead of a Compressible Vortex Ring," Journal of Visualization, 12, 2009, 3

4. **Murugan, T**., and Das, D., "Characteristics of Counter-Rotating Vortex Rings Formed Ahead of a Compressible Vortex Ring" Experiments in Fluids, 49, 2010, 1247–1261

5. **Murugan, T**., and Das, D., "Characteristics of noise produced during impingement of a compressible vortex ring on a wall," International Journal of Aeroacoustics, 9, 2010, 815-824

6. Sudipta De, **Murugan, T**., Numerical simulation of shock tube generated vortex: effect of numerics, Intl. J. Comput. Fluid Dyn.,25(6), 2011, 345–354

7. **Murugan, T**., Sudipta De., Laxmana Dora and Das, D., "Numerical Simulation and PIV study of Formation and Evolution of Compressible Vortex Ring, Shock waves, 22 (1), 2012, 69-83

8. **Murugan, T**., Sudipta De., Numerical visualization of counter rotating vortex ring formation ahead of shock tube generated vortex ring, Journal of Visualization, 15 (2), 2012, 69-83

9. **Murugan, T**., and Das, D., "Experimental Study on a Compressible Vortex Ring in Collision with a Wall." J. Vis. 15, 2012, 321–332

10. **Murugan, T**., Sudipta De.,Dora, C. L., Das, D., and Prem Kumar, P.,A study of the counter rotating vortex rings interacting with the primary vortex ring in shock tube generated flows, Fluid Dyn. Res. 45 (2), 2013, 025506

11. Dora C. L, **Murugan T**, De S, Das D., Role of slipstream instability in formation of counter rotating vortex rings ahead of a compressible vortex ring, Journal Fluid Mechanics, 753, 2014, 29-48

12. **Murugan, T.,** De, S., Thiagarajan, V., Three Dimensional Simulation of Flow through Hypersonic Air-breathing Engine - A Validation Study. Defence Science Journal, 65(4), 2015, 272-278

13. **Murugan, T.**, De, S., Sreevatsa, A., Dutta, S., Numerical Simulation of Compressible Vortex - Wall Interaction, Shockwaves. 26 (3), 2016, 311–326

14. Kundu, A., De, S., Murugan T, Dora, C. L., Das, D., Numerical visualization of shock tube-generated vortex–wall interaction using a fifth-order upwind scheme.Journal of Visualization. 2016, doi:10.1007/s12650-016-0362-x

15. Murugan, T., Deyashi, M., Dey, S., Rana, S. C., Chatterjee, P. K., Recent Developments on Synthetic Jets. Defence Science Journal, 66 (5), 2016, 489-498

16. Vinoth Kumar, S., Singh, M., Murugan, T., Chatterjee, P. K.,Effect of Free Stream Turbulence on flow past a Circular Cylinder at Low ReynoldsNumbers, Accepted in Journal of The Institution of Engineers (India): Series C

17. Murugan, T., Rajesh kumar, Rana, S.C., CFD and Experimental Investigation on Aerodynamic Characteristics of a Sport Car with Rear Wing/Spoiler. Submitted to Journal of Wind Engineering andIndustrial Aerodynamics

CONFERENCE PRESENTATIONS:

1. **Murugan, T**., and Das, D., "Simulation of Flow in a Compressible Vortex Ring Generator Using Smoothed Particle Hydrodynamics Method," 2nd International Congress on Computational Mechanics and Simulation, 8-10, December, 2006, IIT Guwahati, India

2. **Murugan, T**., and Das, D., "Experimental Investigation of the Acoustic Characteristics of Shock-Vortex Ring Interaction Process," 13th AIAA/CEAS Aeroacoustics Conference, 21-23, May 2007, Rome, Italy

3. **Murugan, T**., and Das, D., "Propagation and Wall Interaction of Compressible Vortex Ring: Qualitative Study," The 9th Asian Symposium on Visualization, 4-9, June 2007, Hong Kong, China

4. **Murugan, T**., and Das, D., "On the Wall Interaction of Compressible Vortex Rings and Associated Noise," 37th AIAA Fluid Dynamic Conference and Exhibit, 25-28, June 2007, Hyatt Regency, Miami, Florida, U S A

5. **Murugan, T**., and Das, D., "Experimental Investigation of Acoustic Characteristics of compressible vortex rings," 2nd European conference for Aerospace science, 1-6, July 2007, Brussels, Belgium

6. **Murugan, T**., and Das, D., "Structure and Acoustic Characteristics of Supersonic Vortex Rings," FLUCOME 2007 (9th International Symposium on Fluid Control, Measurement and Visualization), 16-19, September 2007, Tallahassee, Florida, USA

7. **Murugan, T**., and Das, D., "Characteristics of Shock Generated High Mach Number Compressible Vortex Rings," International Symposium Fluids Days, 31 Dec 07-01 Jan 08, JNCASR, Bangalore, India

8. **Murugan, T.,** and Das, D., "On the collision of supersonic vortex ring with wall" IISc Centenary – International Conference on Advances in Mechanical Engineering (IC-ICAME), Bangalore, India, July 2-4, 2008

9. **Murugan, T.,** Dora, C. L., Kawale, A. N., Agarwal, M., and Das, D., "On the Acoustic Emission of Vortex ring Interaction with Generic Geometries" 3rd European conference for Aerospace science, 6-9, July 2009, Versailles, Paris, France

10. **Murugan, T.,** Dora, C. L., Ghosh, S. K., Saravanan, D., and Das, D., "Initial Acoustic Load distribution on Launch Vehicle Model during Flow Development" 3rd European conference for Aerospace science, 6-9, July 2009, Versailles, Paris, France

11. Dora,C.L.,Ghosh, S. K.,Saravanan, D.,**Murugan, T**, and Das, D., "Flow Field Analysis of Compressible Vortex ring at High Mach Numbers Using Particle Image Velocimetry" 8^{TH} INTERNATIONAL SYMPOSIUM ON PARTICLE IMAGE VELOCIMETRY - PIV09, Melbourne, Victoria, Australia, August 25-28, 2009

12. **Murugan, T**., and Das, D., "An experimental investigation on the flow and acoustic characteristics of impulsive flow from a shock tube" 37th National & 4th International Conference on Fluid Mechanics and Fluid Power December 16-18, 2010, IIT Madras, Chennai, India

13. Saravanan, D., Dora, C.L., **Murugan, T**., Sankaran, S., Satyanarayana, TNV., Das, D., "Experimental investigation of flow and noise characteristics of impinging twin jets, simulating starting flow from a rocket booster on a launch pad" National Conference on Space Transportation Systems: Opportunities and Challenges (STS-2011), 16-18 December 2011

14. **Murugan, T**., Sudipta De and Sreevasta, "Numerical simulation of compressible vortices near wall"Proceedings of the Thirty Ninth National Conference on Fluid Mechanics and Fluid Power (FMFP2012), December, 2012, SVNIT Surat, Gujarat, India

15. Murugan,T.,Sonu, A. K., Singh, M., Subhendra, Vinoth Kumar, Singh,and R. P. Singh, Chatterjee, P. K., "Measurement of turbulence statistics using hot wire anemometry, ICRTET 2014" International Conference on Recent Trends in Engineering and Technology, 18-19 January, 2014, Cochin, India

16. Murugan, T., Singh, M., Vinoth Kumar, and Chatterjee, P. K., "Effect of FST on Sub-critical Flow Past a Circular Cylinder:An Experimental Investigation", FMFP2014, 5^{th} International and 41^{st} National Conference on Fluid Mechanics and Fluid Power, 12-14 December, 2014, IIT Kanpur, India

17. Murugan, T., Vinoth Kumar, Thanki, D. L., and Chatterjee, P. K.,"A Study on the Decay of Grid Turbulence and Its Statistics using Hotwire Anemometry", FMFP2014, An Experimental Investigation", 5^{th} International and 41^{st} National Conference on Fluid Mechanics and Fluid Power, 12-14 December, 2014, IIT Kanpur, India

18. Murugan, T., Sudipta De and Thiagarajan V., "Numerical Simulation of Impulsive Supersonic jet from open end of shock tube: A Comparative Study" IUTAM Symposium on Advances in Computation, Modeling and Control of Transitional and Turbulent Flows, December 15-18, 2014 at Hotel Marriott, Goa

19. Kapil, M., Roy, D., Sharma, B., Murugan, T., Flow and Thermal Characteristics of Synthetic Jet at Low Actuation Frequencies. Proceedings of the 6th International and 43rdNational Conference on FMFP, December 2016

20. Chatterjee, A., Murugan, T., Particle Image Velocimetry Study of Insect based Flapping Wing Mechanism in Hover. Proceedings of the 6th International and 43rdNational Conference on FMFP, December 2016

REFERENCES

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