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POSITIONS HELD

- Professor (HAG): Department of Aerospace Engineering, IIT Kanpur.
- (ex) Chair Professor, Pandit Ramchandra Dwivedi Chair.
- (ex) Adjunct Professor, IIST Shibpur.

ACADEMIC POSITIONS

- Professor (HAG): Aerospace Engineering Dept., IIT Kanpur (2016 to present)
- Professor and Head: Aerospace Engineering Dept., IIT Kanpur (2017 to 2020)
- Professor: Aerospace Engineering Dept., IIT Kanpur (2007 to 2016)
- Associate Professor: Aerospace Engineering Dept., IIT Kanpur (2003-2007)
- Assistant Professor: Aerospace Engineering Dept., IIT Kanpur (2000 - 2003)

INDUSTRY POSITIONS

- Scientist D: Armament Research and Development Establishment (ARDE), Defence Research Development Organizations (DRDO) Pune (1993 - 1999)
- Scientist C: ARDE, DRDO Pune (1988 - 1993)
- Scientist B: ARDE, DRDO Pune (1982 - 1988)

EDUCATION

- PhD - Indian Institute of Technology Kanpur (1999)
- M.Tech - Indian Institute of Technology Kanpur (1989)
- B.Tech - Indian Institute of Technology Kanpur (1982)

RESEARCH

RESEARCH FOCUS

System identification through flight tests using conventional and neural network based methods, design of aircrafts and airborne projectiles, supercavitation, unmanned aerial systems

JOURNAL PUBLICATIONS

1. Salahuddin., Dwivedi V.S., Dwivedi, P.N., Giri, D. K., and Ghosh, A.K., "Aircraft Flat-Spin Recovery using Sliding-Mode Based Attitude and Altitude Control," Part G: Journal of Aerospace Engineering.
2. Dwivedi V.S., Salahuddin., Giri, D. K., Ghosh, A.K., and Kamath, G. M., "Optimal Energy Utilization for a Solar-Powered Aircraft using Sliding Mode-Based Attitude Control," IEEE Transactions on Aerospace and Electronic Systems.
3. Kumar, Ajit, and Ajoy K. Ghosh., "Decision Tree and Random Forest Methods Based Novel Unsteady Aerodynamics Modeling Using Flight Data" Journal of Aircraft, AIAA, 2018.
4. Kumar, Ajit, and Ajoy K. Ghosh., "GPR based Novel Approach for Nonlinear Aerodynamic Modeling from Flight Data" The Aeronautical Journal, pp 1-14, 2018.

5. Kumar, Ajit, and Ajoy K. Ghosh., "ANFIS-Delta Method for Aerodynamic Parameter Estimation using Flight Data" Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering, 2018
6. Kumar, Ajit, and Ajoy K. Ghosh., "A GPR Based Novel Approach for Aerodynamic Parameter Estimation from Flight Data" International Review of Aerospace Engineering, 2018
7. Subrahmanyam Saderla, Dhayalan R, Ajoy Kanti Ghosh, (2016),"Longitudinal parameter estimation from real flight data of unmanned cropped delta flat plate configuration", International Journal of Intelligent Unmanned Systems, Vol. 4 Iss 1 pp. 2–22.
8. Saderla, S., Rajaram, D., and Ghosh, A. (2017). "Parameter Estimation of Unmanned Flight Vehicle Using Wind Tunnel Testing and Real Flight Data." J. Aerosp. Eng., Vol. 30 Iss 1.
9. S. Saderla, R. Dhayalan, A. K. Ghosh (2017) "Parameter Estimation From Near Stall Flight Data Using Conventional And Neural Based Methods", Defence Science Journal, Vol. 67, No. 1, January 2017, pp. 3-11.
10. Dhayalan. R, Subrahmanyam S and Ajoy K. Ghosh. "Parameter Estimation of UAV from flight data using Neural Network", Aircraft Engineering and Aerospace Technology, Emerald publishers.
11. Saderla, S., Dhayalan R, and Ghosh, A.K., "Lateral Directional Parameter Estimation of a small Unmanned Aerial Vehicle using Conventional and Neural based Methods," The Aeronautical Journal, Royal Aeronautical Society, UK.
12. Kumar, R., Ghosh, A. K., "Estimation of lateral directional aerodynamic derivatives from flight data using conventional and neural based methods," The Aeronautical Journal (Royal Aeronautical Society UK), Vol118,no 1210,Dec 2014.
13. Sazawal, P., Ghosh, A. K., "Lateral adaptive control of parafoil payload system", Journal of Aerospace Sciences and Technologies, 2014
14. Kumar, R., Misra, A., Ghosh, A. K., "Parameter Estimation from Flight Data of Hansa-3 Aircraft using Quasi-steady Stall Modeling," Journal of Aerospace Engineering (ACSE, USA), Vol. 26, No.3, 2013.
15. Sinha, M., Kuttieri R. A., Misra, A., Ghosh, A. K., "Parameter Estimation of Cascade-Fins at High Angle of attack using Neural Networks," Journal of Aircraft (AIAA), 2013.
16. Sharma, S., Ghosh, A. K., "Simulation and Control of Highly Maneuverable Aircraft under Turbulent Atmosphere using Nonlinear Dynamics Inversion Technique," Chaotic Modeling and Simulation, Vol. 1, 499-507, 2012.
17. Peyada, N. K., Ghosh, A. K., Go, T. H., "Mathematical Modeling, Simulation and Estimation of Aircraft Parameters using 5 DOF Dynamic Test Rig," IMechE, Part G: Journal of Aerospace Engineering, Vol. 226(1), 55-63, 2012.
18. Sri Raman, Ghosh, A. K., "Investigation of the Effect of Cavitator Angle and Dimensions for Supercavitating Vehicle," International Journal of Mechanical and Aerospace Engineering, Vol.26, 424-431, 2012.
19. Kumar, R., Ghosh, A. K., "Nonlinear Modeling of Cascade Fin Aerodynamics using Kirchhoff's Steady-stall Model," Journal of Aircraft (AIAA), Vol. 49(1), 315-319, 2012.
20. Garg, A. K., Burnwall, S., Pallapothu, A., Alawa, R., Ghosh, A. K., "Impact of Helium Permeability on Endurance & Altitude Control of Geostationary Stratospheric Airship - A Mathematical Model," Journal of Aerospace Sciences and Technologies, Vol. 64(3), 2012.
21. Kumar, R., Ghosh, A. K., "Parameter Estimation using Unsteady Downwash Model from Real Flight Data of Hansa-3 Aircraft," The Aeronautical Journal (Royal Aeronautical Society UK), Vol. 115(1170), 577-588, 2011.
22. Kumar, R., Ghosh, A. K., "Nonlinear Longitudinal Aerodynamic Modeling using Quasi-steady Stall Model and Neural Gauss-Newton Method," Journal of Aircraft (AIAA), Vol. 48(5), 1809-1812, 2011.
23. Kumar, R., Misra, A., Ghosh, A. K., "Modeling of Cascade Fin Aerodynamics near stall using Kirchhoff's Steady-stall Model" Defense Science Journal, Vol. 61(2), 157-164, 2011.

24. Kumar, R., Ghosh, A. K., "Nonlinear Aerodynamic Modeling of Hansa-3 Aircraft using Neural Gauss-Newton Method," *Journal of Aerospace Sciences and Technologies*, Vol. 63(3), 194-204, 2011.
25. Kumar, R., Misra, A., Ghosh, A. K., "Nonlinear Aerodynamic Modeling of Cascade Fins and Delta-wing Aircraft Model," *Journal of Aerospace Sciences and Technologies*, Vol. 63(4), 306-317, 2011.
26. Kumar, R., Ghosh, A. K., Srivastava, S., Gupta, B., "Parametric Trend Study during the Stability Analysis of a Tethered Aerostat," *Journal of Aerospace Sciences and Technologies*, Vol. 63(2), 1-18, 2011.
27. Gupta, B., Kumar, V., Krishna, R., Upadhyaya, S. C., Ghosh, A. K., "Estimation of Load on Control Lines of Ram Air Parachute Designed for Precise Delivery Using 9 - DOF Model," *Journal of Aerospace Sciences and Technologies*, Vol. 63(2), 144-152, 2011.
- Peyada, N. K., Ghosh, A. K., "Longitudinal Aerodynamic Parameter Estimation using Neural Network and Gauss-Newton Method," *Journal of Aerospace Sciences and Technologies*, Vol. 61(2), 295-304, 2009.
28. Peyada, N. K., Ghosh, A. K., "Aircraft Parameter Estimation using New Filtering Technique based on Neural Network and Gauss-Newton Method," *Aeronautical Journal (UK)*, Vol. 113(1142), 243-252, 2009
29. Peyada, N. K., Sen, A., Ghosh, A. K., "Longitudinal Aerodynamic Characteristic of HANSA-3 Aircraft using Real Flight Data," *Journal of Institution of Engineers*, Vol. 35(1), 9-14, 2008.
30. Dutta, G. G., Singhal, A., Ghosh, A. K., "Estimation of Drag Coefficient from Radar tracked Flight Data of a Cargo Shell," *Defense Science Journal*, Vol. 58(3), 377-389, 2008.
31. Gupta, S. K., Saxena, S., Singhal, A., Ghosh, A. K., "A Test Case on Implementation of Trajectory Correction Flight Control System Using Pulse Jet on An Artillery Rocket," *Defense Science Journal*, Vol. 58(1), 15-23, 2008.
32. Singh, S., Ghosh, A. K., "Estimation of lateral-directional parameters from real-flight data using neural networks based modified delta method," *Aeronautical Journal (UK)*, Vol. 111, Paper. 1124, 503-509, 2007
33. Singh, S., Ghosh, A. K., "Longitudinal Parameter Estimation using Wind Tunnel and Simulated Flight Data of Tactical Missile," *Journal of Aerospace Sciences and Technologies*, Vol. 59(2), 102-120, 2007.
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41. Ghosh, A. K., Raisinghani, S. C., "Parameter Estimation from Flight Data of an Unstable Aircraft using Neural Networks," *Journal of Aircraft*, Vol. 39(5), 892-894, 2002.

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CONFERENCE PUBLICATIONS

1. Salahudden., Dwivedi V.S., and Ghosh, A.K., " Roll Angle Optimization in Coordinated Level Turn Flight and its Analytical Validation for UAV," *IEEE Aerospace Conference, Big Sky, Montana*, 2-9 March 2019, pp. 1-6
2. Dwivedi, V.S., Salahudden., Ghosh, A.K., and Kamath, G. M., " Design Studies to Achieve Energy Optimal Attitude for a Solar-Powered Aircraft," *IEEE Aerospace Conference, Big Sky, Montana*, 2-9 March 2019, pp. 1-8.
3. Subham, D., Dwivedi, V.S., Salahudden., and Giri, D. K., " Fixed-Time Attitude Control of Satellite Using Combined Magnetic and Magneto-Coulombic Actuators," *IEEE Aerospace Conference, Big Sky, Montana*, 2-9 March 2019, pp. 1-10.
4. Salahudden., Kumar Praful., Giri, D. K., and A.K Ghosh., "Quaternion Based Optimal Controller for Momentum Biased Nadir Pointing Satellite," *IEEE Aerospace Conference, Big Sky, MT*, 7-14 March 2020
5. Salahudden, Giri, D. K., and A.K Ghosh., "Robust Controller Design for Bank to Turn Asymmetric High-Speed Projectile with Uncertainties." *IEEE Aerospace Conference, Big Sky, MT*, 7-14 March 2019.
6. Salahudden, Giri, D. K., Subham, D., and Mukherjee., B. K., "Angular rate stabilization using fixed-time continuous sliding mode control," *2019 Fifth Indian Control Conference (ICC), IITH, Hyderabad*, 18-20 December, 2019.
7. Salahudden., Dwivedi V.S., and Ghosh, A.K., "Flight-States and Control Inputs Computation using Nonlinear Programming for Unmanned Air vehicle" *AIAA Aviation Forum, Reno, Nevada*, 2020.
8. Salahudden., and Ghosh, A.K., "Steady-Straight-Level Flight Study: A Mathematical Optimization Approach and Flight Test" *AIAA Aviation Forum, Reno, Nevada*, 2020.
9. Salahudden., Giri, D. K., and Ghosh, A.K., "Aircraft Stall Recovery using Sliding-Mode Based Pitch-Attitude and Altitude Control," *International Conference on Unmanned Aircraft Systems, Athens, Greece*, 9-12 June 2020,
10. Salahudden., Dwivedi, P.N., and Ghosh, A.K., "Aircraft Flat-Spin Recovery with Altitude Loss Reduction using Sliding-Mode-Based Closed-Loop Thrust Control" *AIAA SciTech Forum*, 2020.
11. S. Dey, D. K. Giri, V. Laxmi, and A. K. Ghosh, "Time-Varying Non-Singular Terminal Sliding Mode Attitude Control of Reusable Launch Vehicle", *15th International Conference on Control, Automation, Robotics and Vision, Singapore*, 19-21 Nov., 2018.
12. Kumar, Ajit, and Ajoy K. Ghosh. "Data-Driven Method based Aerodynamic Parameter Estimation from Flight Data." In *2018 AIAA Atmospheric Flight Mechanics Conference*, p. 0768. 2018
13. Kumar, Ajit, and Ajoy Kanti Ghosh. "Aerodynamic Parameter Estimation using LASSO Regression Method from Flight Data" *Proceedings of ICTACEM, IIT Kharagpur*, December, 2017
14. Kumar, Ajit, and Ajoy Kanti Ghosh. "Lateral-Directional Aerodynamic parameter Estimation using Neuro-Fuzzy based Method." *Proceedings of International Conference on Computational Intelligence: Theories, Applications and Future Directions, IIT Kanpur*, December, 2017

15. Kumar, Ajit, Subrahmanyam Saderla, and Ajoy Kanti Ghosh. "Aerodynamic parameter estimation using neuro-fuzzy model based method." International Conference on Recent Advances in Aerospace Engineering, IEEE, Coimbatore, 2017.
16. Srivastava, Ambuj, Ajit Kumar, and A. K. Ghosh. "Estimation of lift and drag characteristics of light transport aircraft in the presence of ground effect during landing." International Conference on Recent Advances in Aerospace Engineering, IEEE, Coimbatore, 2017.
17. Subrahmanyam S, Sunil S and A. K. Ghosh, "Analytical Modeling Trajectory Simulation and Control of Guided Projectiles". presented in Control Automation and Robotics conference 2011, Singapore.
18. Dayalan, R., Ghosh, A. K., "Estimation of Nonlinear Parameters from Simulated Data of an Aircraft," 2nd CEAS specialist conference on guidance, navigation, and control, (Netherlands) 2013.
19. Kumar, R., Ghosh, A. K., "Lateral Parameter Estimation using conventional and Neural based methods," 15th Australian International Aerospace Congress (AIAC-15), (Australia) 2013.
20. Kumar, R., Ghosh, A. K., "Longitudinal Stability Analysis of an Aerostat," International Conference on Applications of Fluid Engineering (CAFÉ-12), 2012.
21. Kumar, R., Ghosh, A. K., "The effect of Indicial Lift Function on Parameter Estimation," International Conference on Applications of Fluid Engineering (CAFÉ-12), 2012.
22. Sharma, S., Ghosh, A. K., "Simulation and Control of Highly Maneuverable Aircraft under Turbulent Atmosphere using Nonlinear Dynamics Inversion Technique," 4th Chaotic Modeling and Simulation International Conference, (Greece) 2011.
23. Subrahmaniam, S., Sharma, S., Ghosh, A. K., "Analytical Modeling Trajectory Simulation and Control of Guided Projectiles," Control Automation and Robotics (CAR) conference, (Singapore) 2011.
24. Garg, A. K., Burnwal, S., Pallapothu, A., Alawa, R., Ghosh, A. K., "Stability Analysis of Geostationary Stratospheric Airship - An Analytical Approach," 5th Symposium on Applied Aerodynamics and Design of Aerospace Vehicles- SAROD, 2011.
25. Sharma, S., Garg, A. K., Burnwal, S., Pallapothu, A., Alawa, R., Ghosh, A. K., "Implementation of NDI Control Technique for control of Geostationary Stratospheric Airship," 5th Symposium on Applied Aerodynamics and Design of Aerospace Vehicles- SAROD, 2011.
26. Dayalan, R., Ghosh, A. K., "Improved NGN Algorithm for Parameter Estimation from Flight Data," 5th Symposium on Applied Aerodynamics and Design of Aerospace Vehicles- SAROD, 2011.
27. Subrahmaniam, S., Kumar, S., Ghosh, A. K., "Aerodynamic Characterization of Guided Projectile Configurations," 8th International Exhibition on Aerospace, Defence & Civil Aviation (Aero India), 2011.
28. Garg, A. K., Burnwal, S., Pallapothu, A., Alawa, R., Ghosh, A. K., "Design Analysis and Optimization of Geostationary Stratospheric Airship Hulls and Fins," 8th International Exhibition on Aerospace, Defence & Civil Aviation (Aero India), 2011.
29. Garg, A. K., Burnwal, S., Pallapothu, A., Alawa, R., Ghosh, A. K., "Modeling and Simulation of Possible Controlled and Un-Controlled Launch Modes of a Stratospheric Airship," 4th Chaotic Modeling and Simulation International Conference, (Greece) 2011.
30. Garg, A. K., Burnwal, S., Pallapothu, A., Alawa, R., Ghosh, A. K., "Solar Panel Area Estimation and Optimization for Geostationary Stratospheric Airships," 11th AIAA Aviation Technology, Integration and Operations Conference, (USA) 2011.
31. Kumar, R., Ghosh, A. K., "Parameter Estimation using Maximum Likelihood Method from Flight Data at High Angles of Attack," International Conference on Aerospace, Propulsion and Energy Sciences (ICAPES-11), (Italy) 2011.
32. Kumar, R., Ghosh, A. K., "Parameter Estimation from Real Flight Data of Hansa-3 Aircraft using Three different Estimation Methods," International Conference on Theoretical, Applied, Computational and Experimental Mechanics (ICTACEM-10), 2010.

33. Kumar, R., Misra, A., Ghosh, A. K., "Effect of Gap-to-chord Ratio on Nonlinear Modeling of Cascade Fin Aerodynamics," International Conference on Theoretical, Applied, Computational and Experimental Mechanics (ICTACEM-10), 2010.
34. Peyada, N. K., Dhiman, M. K., Ghosh, A. K., "Aerodynamic Characterization of Scale Model Aircraft using 5 DOF Dynamic Test Rig," 2010 NSBE Aerospace Systems Conference (USA) 2010.
35. Kumar, R., Ghosh, A. K., "Parameter Estimation from Real Flight Data of Hansa-3 Aircraft using Quasi-steady Stall Modeling," International Conference on Theoretical, Applied, Computational and Experimental Mechanics (ICTACEM-10), 2010.
36. Kumar, R., Ghosh, A. K., "Unsteady Aerodynamic Modeling for Parameter Estimation," International Conference on Aerospace, Propulsion and Energy Sciences (ICAPES-11), Venice, Italy, Oct.
37. Kumar, R., Ghosh, A. K., "Unsteady Aerodynamic Modeling for Parameter Estimation," International Conference on Aerospace, Propulsion and Energy Sciences (ICAPES-09), Venice, Italy, Oct.
38. Kumar, R., Misra, A., Ghosh, A. K., "Analysis of Parameter Estimation from Flight Data for various 3-2-1-1 Control Inputs," 4th Symposium on Applied Aerodynamics and Design of Aerospace Vehicles, SAROD, 2009.
39. Kumar, R., Ghosh, A. K., "Effect of Unsteady Aerodynamics on Parameter Estimation," Symposium on Applied Aerodynamics and Design of Aerospace Vehicles, SAROD, 2009.
40. Peyada, N. K., Ghosh, A. K., "Aircraft Parameter Estimation using Neural Network based Algorithm," AIAA Atmospheric Flight Mechanics Conference, Chicago, (USA) 2009.
41. Peyada, N. K., Sen, A., Dutta, G. G., Singhal, A., Rajan, K. M., Raj, A., Ghosh, A. K., "Effect of Mach Number on Supersonic Wrap Around Fin Aerodynamics," National Conference on Advances in Armament Technology, ARDE, Pashan, Pune, India, 2008 .
42. Sen, A., Peyada, N. K., Subrahmanyam, S., Wahi, P., Ghosh, A. K., "5-Degree of Freedom Dynamic Rig for Wind Tunnel Tests of Aerospace Vehicles," National Conference on Advances in Armament Technology, ARDE, Pashan, Pune, India, 2008.
43. Peyada, N. K., Ghosh, A. K., "Parameter Estimation from Real Flight Data using Neural Network based Method," INCPAA- 2008: Mathematical Problems in Engineering Aerospace and Sciences, (Italy) 2008.
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45. Peyada, N. K., Sen, A., Ghosh, A. K., "Aerodynamic Characterization of HANSA-3 Aircraft using Equation Error, Maximum Likelihood and Filter Error Methods," International Multi-conference of Engineers and Computer Scientists, (Hong Kong) 2008.
46. Peyada, N. K., Ghosh, A. K., "Estimation of Aerodynamic Parameters from Real Flight Data Using Filter Error Method with Typical Initial Process Noise," International Conference and Exhibition on Emerging Challenges in Design and Manufacturing Technologies, Sathyabama University, Chennai, India, 2007.
47. Peyada, N. K., Ghosh, A. K., "Dynamic Stability Analysis of a Parafoil-Payload System using Analytically Derived Stability Derivative," SAROD, Kerala, 2007.
48. Kumar, R., Ghosh, A. K., "Relevance of Aircraft Maintenance Course in the Curriculum of Aeronautical Engineering," 21st National Convention of Aerospace Engineers, IIT Kanpur, India, 2007.
49. Peyada, N. K., Sen, A., Ghosh, A. K., "Longitudinal Aerodynamic Characteristic of Hansa-3 Aircraft Using Real Flight Data," 21st National Convention of Aerospace Engineers, IIT Kanpur, India, 2007.
50. Peyada, N. K., Singhal, A., Ghosh, A. K., "Trajectory Modeling of a Parafoil in Motion Using Analytically Derived Stability Derivative at High Angle of Attack," 19th AIAA Aerodynamic Decelerator Systems Technology Conference and Seminar, Virginia (USA) 2007.
51. Misra, A., Uma, P., Singhal, A., Ghosh, A. K., Ghosh, K., "Identification of aerodynamic model of lattice fin for parameter estimation from the flight data ," International Conference on

Theoretical, Applied, Computational and Experimental Mechanics (ICTACEM), IIT Kharagpur, 2007.

52. Singh, S., Ghosh, A. K., "Data compatibility check and estimation of longitudinal parameters from flight data," International Conference on Theoretical, Applied, Computational and Experimental Mechanics (ICTACEM), IIT Kharagpur, 2007.
53. Singh, S., Ghosh, A. K., "Modified delta method for Longitudinal parameter estimation from flight data of unstable aircraft," International Conference on Theoretical, Applied, Computational and Experimental Mechanics (ICTACEM), IIT Kharagpur, 2007.
54. Peyada, N. K., Ghosh, A. K., "Estimation of Aerodynamic Parameters from Real Flight Data Using Filter Error Method with Typical Initial Process Noise," ECHDEM, International Conference and Exhibition on Emerging Challenges in Design & Manufacturing Technologies, 2007.
55. Singh, S., Singhal, A., Ghosh, A. K., "Estimation of Longitudinal Stability and Control derivatives from Flight Data using Modified Delta Method," SAROD, Kerala, 2007.
56. Misra, A., Apparao, A., Roy, S., Vishwakarma, A., Prakash, O., Singhal, A., Ghosh, A. K., "Longitudinal Aerodynamic Characterization of an Aircraft bomb with Ringtail Configuration Using Wind Tunnel," SAROD, Kerala, 2007.
57. Misra, A., Ghosh, A. K., Ghosh, K "Experimental and Analytical Investigation of Cascade Fins," SAROD, Kerala, 2007.
58. Peyada, N. K., Ghosh, A. K., "Dynamic Stability Analysis of a Parafoil-Payload System using Analytically Derived Stability Derivative," SAROD, Kerala, 2007.
59. Roy, S., Sandilya, A., Prakash, O., Ghosh, A. K., "GUI based Simulation and Integration of Flight Mechanic Models of Artillery Projectiles," AIAA Australia-Asia student conference (Australia) 2007.
60. Misra, A., Ghosh, A. K., Ghosh, Kunal, "Wind Tunnel Investigation of Grid and Cascade Fins," Proceedings of the National Conference on Wind Tunnel Testing, IIT Kanpur, 2007.
61. Singh, S., Ghosh, A. K., "Improved delta Method for Parameter Estimation from Real Flight Data of an Aircraft using Neural Networks," 17th IFAC Symposium on Automatic Control in Aerospace, Toulouse (France) 2007.
62. Peyada, N. K., Singhal, A., Ghosh, A. K., "Trajectory Modelling of a Parafoil in Motion Using Analytically Derived at High Angle of Attack," 19th AIAA Aerodynamic Decelerator Systems Technology Conference Seminar, Virginia, USA, 2007.
63. NGR Iyengar, Ghosh, A. K., Singhal, A., "Concurrent approach for aviation infrastructure and manpower development," National Seminar on "Aviation Infrastructure in India", Kochi, 2007.
64. Dutta, G.G., Singhal, A., Ghosh, A. K., "Estimation of Drag Coefficient from Flight Data of an Artillery Shell and Rocket," International Congress on Computational Mechanics and Simulation (ICCMS-06), IIT Guwahati, 2006.
65. Ujjwala Darvemula, Singhal, A., Ghosh, A. K., "Application of Maximum Likelihood Method for Aerodynamic Parameter Estimation from Flight Data of a Typical Parafoil," International Congress on Computational Mechanics and Simulation (ICCMS-06), IIT Guwahati, 2006.
66. Dutta, G. G., Singhal, A., Ghosh, A. K., "Estimation of Drag Coefficient Using Real Radar Tracked Data of an Artillery Shell," Proceedings AIAA Atmospheric Flight Mechanics Conference and Exhibit-06, Keystone, Colorado (USA) 2006.
67. Singh, S., Ghosh, A. K., "Parameter Estimation From Flight Data Using Maximum Likelihood Method And Neural Network," Proceedings AIAA Atmospheric Flight Mechanics Conference and Exhibit-06, Keystone, Colorado (USA) 2006.
68. Gupta, S. K., Saxena, S., Ghosh, A. K., "On Implementation of Trajectory Correction System on a Routinely Used Artillery Rocket," Proceedings AIAA Atmospheric Flight Mechanics Conference and Exhibit-06, Keystone, Colorado (USA) 2006.
69. Chandra, K. V., Dutta, G. G., Singhal, A., Sridhar, I. V. S., Ghosh, A. K., "Estimation of Drag Coefficient from Free Flight Trajectory Data of an Artillery Shell," 19th Convention for Aerospace Engineer-2005, Institution of Engineers 2006.

70. Ujjwala, Darvemula, A, Singhal, A. K., Ghosh, A. K., "Parameter Estimation from Flight Data of A Typical Parafoil Using Maximum Likelihood Method," Proceedings of 19th Convention for Aerospace Engineer, Institution of Engineers (INDIA), Rajasthan Chapter, Jaipur, INDIA, 2006.
71. Singal, A., Jha, A., Ghosh, A. K., "Flight Path Prediction of an Artillery Shell Using Feed Forward Neural Networks," Proceedings AIAA Atmospheric Flight Mechanics Conference, Texas (USA) 2005.
72. Ghosh, A. K., Dewedi, P. N., "Non-Linear Control Law with Application to High Angle-of-Attack of Flight Using Neural Network," Conference on Non-Linear Dynamic Systems, IIT Bombay, 2005.
73. Singal, A., Ujjwala D and A, Ghosh, A. K., "On application of Parameter estimation methods to flight data of a typical parafoil," Conference held at ADRDE, Agra, 2005.
74. Prakash, O., Ghosh, A. K., "Neural Models for Predicting Trajectory Performance of an Artillery Rocket," AIAA Atmospheric Flight Mechanics Conference, Texas (USA) 2003.
75. Ghosh, A. K., Raisinghani, S. C., "Parameter Estimation of an Unstable Aircraft in Turbulent Atmosphere using Neural Networks," AIAA Atmospheric Flight Mechanics Conference, California (USA) 2002.
76. Ghosh, A. K., Singhal A, Aslam Sqn. Ldr., Khan S., "Trajectory Modelling for Prediction of Forward Throw of Aircraft Store Using Neural Networks," Proceedings of 52nd AGM & Seminar on Aerospace System & Mechanisms, Agra, 2001.
77. Ghosh, A. K., Raisinghani, S. C., Patnaik, L. K., "Parameter Estimation from Flight Data with Process and Measurement Noise Using Neural Networks," AIAA Atmospheric Flight Mechanics Conference, Colorado (USA) 2000.
78. Ghosh, A. K., Raisinghani, S. C., "Parameter Estimation from Flight Data of an Unstable Aircraft Using Neural Networks," AIAA Atmospheric Flight Mechanics Conference, Colorado (USA) 2000.
79. Ghosh, A. K., Raisinghani, S. C., Bhaskar, G. V. S., "Parameters Estimation of an Augmented Aircraft using Neural Networks," AIAA Atmospheric Flight Mechanics Conference, Oregon (USA) 1999.
80. Ghosh, A. K., Raisinghani, S. C., Rao, C. S., "Effects of Measurement Errors on Parameter Estimation via Neural Networks," AIAA Atmospheric Flight Mechanics Conference, Oregon (USA) 1998.
81. Ghosh, A. K., Raisinghani, S. C., Kalra, P. K., "Aircraft Lateral- Directional Parameter Estimation via Neural Networks," Proceedings of 49th AGM, The Aeronautical Society of India, 1998.
82. Ghosh, A. K., Joshi, D. K., Rao, A. V., "A Simplified approach for prediction of Fire for unguided Rockets," 15th International Symposium of Ballistics, Jerusalem (Israel) 1995.
83. Ghosh, A. K., Raisinghani, S. C., "Parameter Estimation of an Augmented Airplane with Unsteady Aerodynamic Modelling," Proceedings of the 17th International Symposium on Space Technology and Science, Tokyo (Japan) 1990.

BOOKS

1. Ulrich L. Rohde, G. C. Jain, Ajay K. Poddar, A. K. Ghosh (2011), Introduction to Integral Calculus: Systematic Studies with Engineering Applications for Beginners, John Wiley & Sons, Inc., New York
2. Ulrich L. Rohde, G. C. Jain, Ajay K. Poddar, A. K. Ghosh (2011), Introduction to Differential Calculus: Systematic Studies with Engineering Applications for Beginners, John Wiley & Sons, Inc., New York

PROFESSIONAL PRESENTATIONS

SELECTED INVITED TALKS

1. Indian Institute of Science (IISc) Bangalore, 2013
2. ADRDE Agra, 2013
3. Tata Institute of Social Sciences (TISS), 2011
4. Proof and Experimental Establishment (PXE) Balasore, 2011
5. ARDE Pune, 2010

6. Hindustan College of Engineering, 2009
7. Indian Institute of Technology Bombay, 2008
8. Conference on Advances in Control and Optimization of Dynamic Systems (ACODS), 2014
9. Montfort University, 2015 Collaboration with Prof. M. Goman

TEACHING

TEACHING FOCUS

Airplane Performance, Flight Mechanics, Flight Dynamics , Aircraft design and flight testing, Aero modelling, Unmanned Aerial Vehicle, Guidance & Control

TEACHING AWARDS

Various commendations from Chairman, Academic Senate, IIT Kanpur

TEACHING EXPERIENCE

1. Graduate Courses Taught: Flight dynamics (AE 647)
2. Flight stability and control (AE 648)
3. Undergraduate Courses Taught:
4. Flight mechanics-I (AE 321)
5. Flight mechanics-II (AE 322)
6. Aero modelling design and fabrication (AE 361)
7. Experiments in flight mechanics (AE 422)
8. Aircraft design-I (AE 461)

NPTEL TEACHING EXPERIENCE

Course 1: Introduction to Airplane performance (MOOCS)

Course 1: Introduction to experiments in flight(MOOCS)

Course 2: Aircraft stability and Control(MOOCS)

Course 3: Airplane performance, stability and Control (Web Course)

Course 4: Aircraft Design(MOOCS)

Course 5: Aircraft Dynamic Stability & Design of Stability Augmentation System (MOOCS)

DOCTORAL THESIS ADVISOR (On going)

(06 STUDENTS)

1. Prashant Kumar
2. Vijay Shankar Dwivedi
3. Balaji J
4. Salahudden
5. Sarvesh Sonkar (IME) (Co-Supervisor)
6. Ms. Sonal (EE) (Co-Supervisor)

COMPLETED DOCTORAL THESIS

1. Singh, Sanjay (Estimation of Aircraft Parameters from Flight Data Using Neural Network Based Methods, Jul-07)
2. Dutta, Gour Gopal(On Use of The Conventional And Unconventional Parameter Estimation Methods to Aerodynamically Characterize Artillery Projectiles, Jul-10)
3. Peyada, Naba Kumar(Parameter Estimation from Flight Data Using Feed Forward Neural Networks, Nov-08)
4. R, Dhayalan(Parameter Estimation of Flight Vehicles Using Conventional And Neural Based Methods, Dec-15)
5. Kumar, Rakesh(Parameter Estimation Using Flight Data of Air Vehicles At Low And Moderately High Angles of Attack Using Conventional And Neural Based Methods, May-11)

6. Saderla, Subrahmanyam(Parameter Estimation Using Flight Data of Unmanned Flight Vehicles At Low And Moderately High Angles of Attack Using Conventional Methods, Dec-15)
7. Ajith Kumar (ADRDE, An investigation into static and dynamic analysis of an air borne tethered aerostat)
8. Misra, Ajay (Aerodynamics of Lattice Fins) (co-supervisor)
9. Srivastava, Shantanu(Control of Supersonic Square Jet, Sep-15) (co-supervisor)
10. Kaushik, Mrinal (Effects of Tab On Supersonic Jet Control, Mar-12) (co-supervisor)
11. G, Kumaravel (Investigation of Acceleration Effects On Rocket Aerodynamics, Dec-12) (co-supervisor)
12. P, Arun Kumar(Triangular Tabs For Supersonic Jet Control, Sep-13) (co-supervisor)
13. Ambuj Srivastava (HAL, Submitted)
14. Ajit Kumar (DRDO) Ajit Kumar (Machine Learning Methods for Aerodynamic Modeling and Parameter Estimation)

DOCTORAL THESIS COMMITTEES

- IISc Bangalore
- IIT Bombay
- IIT Kharagpur
- IIT Patna
- DIAT Pune
- Hindustan College of Engineering

MASTERS THESIS Supervisor

1. Akash Taru Das (Ongoing)
2. Shweta Jaiswal (Ongoing)
3. Rajat Patel (Design of auto pilot for Vtol Airtaxi)
4. Rajat Tripathi (Design of gimbal for payload (uav))
5. Salahudden (Parametric Investigation, Computation and Experimental Validation of Trim States and Control inputs for an Aerial Vehicle in Miscellaneous Trim Flights)
6. Abhilash Shivkumar kshtriya (Super cavitation of Under Water Vehicle)
7. Saderla, Subrahmanyam(Aerodynamic Characterizatin and Trajectory Estimation of Guided Projectiles, Jul-10)
8. Nipane, Atul(Aerodynamic Characterization of Glider Based Torpedo Through Wind Tunnel Testing, May-12)
9. P, Uma(Aerodynamic Characterization of Lattice Fins, May-07)
10. Singh, Yogendra(Aerodynamic Characterization of Micro Air Vehicle Configuration Using Wind Tunnel and Flight Test Data, May-12)
11. Kumar G, Vasanth(Aerodynamics of Projectile With Wrap Around Fins, Jul-08)
12. Kshtriya, Abhilash Shivkumar(Analytical Study of A Supercavitating Projectile including Stability Analysis in Different Mediums, May-17)
13. Sen, Arpita(Application of Conventional Parameter Estimation Techniques To Various Aerospace Vehicles, Apr-08)
14. Samal, Mahendra Kumar(Application of Neural Network Methods For Estimation of Aerodynamic Parameters of Aircraft With Various Degree of Flexibility, May-05)
15. Sharma, Sunil(Application of Nonlinear Dynamic inversion Control Technique On Various Aerospace Vehicles, Jun-11)
16. Rajarao, P I(Computation of Flows Past Missile Configuration Using Spalart- Allmaras Turbulence Model, Aug-05)
17. Vasantbhai, Patel Pranavkumar(Design and Control For Glider Based Payload Delivery System, May-12)

18. Kumar, Prashant(Design and Development of Autonomous Light Weight Powered Paraglider, Jul-14)
19. Dwivedi, Vijay Shankar(Design and Development of Autopilot For Tailless Flying Wing Uav, May-14)
20. Donni, Praveen N(Design and Development of Hybrid Vtol Uav, Jul-16)
21. Kejriwal, Gaurav(Design and Development of Solar Electric Powered Uav, Jul-16)
22. Kumar, Manoj(Design of 5-Dof Dynamic Test Rig For Aerodynamic Characterization of Flight Vehicle, May-10)
23. Alawa, Rohit Singh(Design of Geostationary Stratospheric Airship, May-11)
24. Kumar, Anurag(Design of Low Altitude Long Endurance Solar Uav, Jun-15)
25. Kumar, Manish(Design of Low Altitude Long Endurance Uav: Configuration, Design and Stability Assessment, Jun-15)
26. Negi, Piyush(Dynamic Response of Tethered Aerostat Using Recursive Rigid Body Dynamics, Feb-15)
27. Chintala, Srinivasa Rao(Effects of Measurement Errors On Parameter Estimation Via Neural Networks, Dec-98)
28. Khubchandani, Sunil(Estimation of Lateral-Directional Parameters From Flight Data Using Neural Networks, Jan-97)
29. Khan, Squadron Leader Asiam Shahzad(Estimation of Stability and Control Derivatives From Flight Data of Kiran Aircraft Using Feed Forward Neural Networks, Dec-2000)
30. Merchant , Salman Akhtar(Flight Data Aquisition of Parafoil Load System and Its Control Using Non-Linear Dynamic inversion, Apr-11)
31. RAMAN A, SRI(Flight Dynamic Modeling and Control of A Typical Supercavitating Vehicle, May-12)
32. Popat, Bhang Niteen(Full Scale Flight Dynamic Simulation of Variuous Aerospace Vechicles, Dec-08)
33. Murthy, P V Satyanarayana(Fuzzy Aerodynamic Model of An Aircraft For Parameter Estimation From Flight Data, May-98)
34. Darvemula, Ujjwala(Longitudinal Aerodynamic Parameter Estimation From Flight Data of A Parafoil, May-05)
35. Singh, Parul(Lqr Based Attitude Controller Design For Glider-Assisted Torpedo and Its Comparison With Dynamic inversion Based Controller Design For The Same, May-12)
36. Singh, Ashwani(Mathematical Formulation For Controlling A Parafoil-Payload System, Jul-11)
37. Dhayalan, R(Modeling of Rocket Trajectory and Estimation of Aerodynamic Parameters, May-07)
38. Burnwal, Santosh Kumar(Modeling & Simulation of High Speed Supercavitating Vehicle, Jun-11)
39. Meshram, Rahul(Modelling Jof Performance of An Guided Artillery Projectaile Using Neural Networks, Sep-04)
40. Om Prakash(Modelling of Performance of An Artillery Rocket Using Neural Networks, Dec-01)
41. Dehury, Santosh Kumar(Modelling of Performance of An Artillery Shell Using Neural Networks, Dec-2000)
42. Venkata, Chandra Sekhar K(On Application of Maximum Likelyhood Method and Kalman-Filter Technique To Estimate Parameters From Flight Data of Rickets and Shells, Jun-04)
43. Patnaik, L K(Parameter Estimation From Flight Data in Turbulent Atmosphere Using Neural Networks, Dec-99)
44. Sridhar, I V S(Parameter Estimation From Reader Tracked Flight Data of An Artillery Shell, May-03)
45. Gopal, A Hari(Parameter Estimation of A Flexible Aircraft Using Kalman Filter Algorithm, May-05)
46. E, Pugazharasan(Parameter Estimation of Aircraft At Low and High Angle of Attack, Jun-15)
47. Reddy, G V S Bhaskar(Parameter Estimation of An Augmented Aircraft Using Neural Networks, Dec-98)

48. Nakkala, Anil Kumar(Parameter Estimation Using Real Flight Data, Jun-16)
49. Gupta, Archit(Parametric Study On A Typical Underwater Supercavitating Vehicle, Jan-14)
50. Sagoo, Grish Kumar(Preliminary Configuration Design of Cannon Launched Guided Missile, May-03)
51. Dhawan, Salil(Range Enhancement Techniques For Aircraft Deliverable Bombs., May-07)
52. Singh, Devendra(Range Extension of Artillery Rocket Using Canard Control, May-10)
53. Wadwankar, Nachiket Shyam(Six Degrees of Freedom Simulation of Airborne Stores, Jul-09)
54. Srivastava, Shashank(Stability Analysis and Parameter Trend Study of Single Tether Aerostats, Apr-09)
55. Mittal, Shruti(A Study On Flight Performance of Micro/Mini Air Vehicle, Jun-13)
56. Chawla, Ankur(Study On Water Impact and Size Optimisation of Disk Cavitator of Under- Water Supercavitating Vehicle, Jun-13)
57. Gupta, Anuj(Theoretical Modeling of Parachute inflation, Jun-10)
58. Jha, Ayush(Trajectory Modelling of An Artillery Shell Using Conventional and Neural Modelling, Jan-02)

PROFESSIONAL SERVICE

EDITORIAL/ RESEARCH BOARDS

- Armament Research Board, 2008 - today
- DST TIFAC Core, 2010 – today

AD HOC REVIEWING

- Journal of Aircraft (AIAA)
- Journal of Aerospace Science and Technology
- Part G: Journal of Aerospace Engineering
- Journal of Indian Institute of Engineers
- Journal of Aerospace Technologies, India

ACADEMIC GOVERNANCE & SERVICE COMMITTEES

- Dean of Student Affairs, IIT Kanpur (2011 - 2014)
- Advisor to Sports & Physical Education Committee, IIT Kanpur (2011 – 2014)
- Chairperson, Student Senate Affairs Committee, IIT Kanpur (2011 – 2014)
- Chairperson, Festival Advisory Committee, IIT Kanpur (2011 – 2014)
- Chairperson, Hall Management Committee, IIT Kanpur (2011 – 2014)
- Head, Counselling Services, IIT Kanpur (2009 - 2011)
- Vice Chairperson, Joint Entrance Examination (JEE) (2006 - 2007)
- Faculty In-charge, Flight Laboratory, IIT Kanpur (2000 – today)
- Accountable Manager, Director General of Civil Aviation (2000 – today)
- Member, Taskforce for Student welfare in Centrally Funded Technical Institutes (CFTI), Ministry of Human Resource Development (2011 – 2013)
- Chairperson, various staff selection committees, IIT Kanpur (2011 – today)
- Member, various staff selection committees, IIT Kanpur (2010 – today)
- Member expert, Selection committee (senior scientist) of ISRO (2010 – 2011)
- Member expert, Selection committee (senior scientist) of DRDO (2009 – 2010)

ACADEMIC LABORATORY DEVELOPMENT

- Flight Laboratory of IIT Kanpur: The only facility in Asia to have an operational air strip with five operational aircrafts. The facility in 2000 had only one operational aircraft, from which four more aircrafts were augmented to enhance the teaching and research associated with this lab. Students from all over India, including other IITs, Madras Institute of Technology, Panjab Engineering College, and some 15+ private colleges visit this facility as part of their core courses.

Other departments of the institute like Civil Engineering use the aircrafts for environmental and geospatial research.

- Unmanned Aerial Systems Laboratory of IIT Kanpur: The first facility in India, where Low Altitude Long Endurance (LALE) UAV is being designed, developed, and augmented for defense and civilian usages. The facility includes machining options, fabrication systems, propulsion test rigs, auto-pilot gain tunings, etc. This facility is being established and expected to be fully operations by end of 2015.

SERVICE TO PROFESSIONAL ORGANIZATIONS

1. Vice-president, Aeronautical Society of India (AeSI), (2020 – present)
2. Assistant Director, ARDE Pune, DRDO (1993 – 1995)
3. Member, TIFAC Core Committee of DST, (2006-07 – today) with responsibilities of bettering quality of technical education in Hindustan College of Engineering
4. Organizing member, Advances in Control and Optimization of Dynamic Systems (ACODS), 2014
5. Publication chairperson, Computational Intelligence: Theories, Applications and Future Directions, 2014
6. Chairperson, ADRDE Agra project review committee (2011 – today) Member, ARDE Pune project review committee (2010 – today)
7. Member, High Energy Materials Research laboratory (HEMRL) Pune project review committee member (2009 – today)
8. Member, Armament Research Board (ARMREB) Delhi (2009 – today)
9. Member: Council, Aerosociety of India
10. Member: National Task Force for Drone Development.

AWARDS & HONORS

1. Technology Award, DRDO, 1993
2. Best paper award in peer reviewed journals – 01
3. Best paper award in in-house journal (Shastra Shakthi) - 01 Best paper award in conferences – 02
4. Best B. Tech Project (BTP) under supervision – 03
5. Project proficiency medal for BTP projects under supervision – 02 Commendation from Director, ARDE Pune for exemplary research contributions towards Pinaka MK-I rocket program (Letter attached) Commendation from Director, PXE Balasore for outstanding academic contributions and leadership towards Pinaka MK-II rocket program (Letter attached)
6. First and only scaled design that was fabricated and flight tested for a vertical tail-less configuration (Commendation by DRDO executive board)
7. *Member National Advisory Board (DRDO mentoring Young Scientist Centre as the Directives of Honorable Prime Minister of India)*

STARTUP MENTORSHIP

1. Aurora Integrated Systems, Bangalore
2. Shashtra Automation Laboratories, Kanpur
3. Taral Solutions, Kanpur
4. Aeron Systems, Pune
5. VTOL AIRTAXI Ind. Ltd.
6. CDSpace robotics, Bangalore
7. Arav UAs, Bangalore

INDUSTRY CONTRIBUTIONS

Private Industries:

1. Design of UAV for BEML: Joint Development with IIT Kanpur.
2. Design of Drone for Covid-19 Vaccine Delivery on Remote Areas.
3. Cloud Seeding Aircraft Platform: Joint Development with HAL Kanpur.
4. Consulting TASL for development of Unmanned Aerial Vehicle under MoU between TASL and IIT Kanpur.
5. Consulting L&T for the development of Unmanned Aerial Vehicle under MoU between L&T and IIT Kanpur.
6. Consulting Aeron for the development of Unmanned Aerial Vehicle under MoU between Aeron and IIT Kanpur.
7. MoU with VTOL Aviation for the development of Airtaxi (4-6 passengers).
8. MoU with TATA SED completed, agreement for project is under progress.
9. MoU with Sensebird completed, agreement for project is under progress.
10. Discussion is in progress for the project with 'Delivery', a pvt. Company for the development of UAV for store delivery.

Government Industries:

1. Flight dynamic design of high speed low drag aircraft bomb (250 kg & 450 kg): ARDE, DRDO Pune (1982 - 1987) – This indigenous achievement was the first in India, which the Indian Air Force (IAF) continues to use.
2. Flight dynamic configuration design and analysis for smooth separation of aircraft bomb (1000 kg unconventional): DRDO (1987 - 1995) – This is the heaviest and largest aircraft bomb ever designed and developed by DRDO for IAF.
3. Flight dynamic design and modelling of field artillery rocket: Pinaka Mk-I (40 km range): ARDE, DRDO Pune (1986 - 1995) – This indigenous achievement was the first Multi-Barrel Rocket Launch (MBRL) system in India, which the Indian Army continues to use.
4. Design of modified 105 mm sabot round for Arjun MBT: ARDE, DRDO Pune (1987 - 1989) – MBT Arjun had major targeting problems with FSAPDS hyper-sonic projectile. A new sabot was designed which ensured enhanced accuracy and inducted into the MBT Arjun ammunition system.
5. Aerodynamic characterization of Light Combat Aircraft (LCA) Tejas through flight data using neural network method: IIT Kanpur (2003 – 2004) – This work helped in creating a reliable database specifically on the directional aerodynamic derivatives of the aircraft. It helped in predicting the handling qualities of the airframe.
6. Dynamic stability and range enhancement of field artillery rocket with wrap-around fins (Pinaka MK-II): IIT Kanpur (2011 – 2013) – This work helped in solving the predicted dynamic stability issues of Pinaka rocket beyond Mach 3.4. However, through modified fin design and other aerodynamic modifications, the rockets are currently reaching 60+ km without dynamic stability issues.
7. Design of a glide torpedo for naval applications: IIT Kanpur (2010 – 2012) – This work is now accepted by NSTL Hyderabad and is now in serial production for flight testing.
8. Design validation of Aerostat through simulation and flight testing: IIT Kanpur (2013 – 2014)

CURRENT PROJECTS

1. BEML Bangalore: (6Cr)
2. Vtol AirTaxi: (2Cr)
3. Delivery Drone for Covid Medicine: (15Lakh)
4. Defence Corridor (UAV): (2Cr)
5. UAV TIH: (6Cr)

COMPLETED PROJECTS

1. Aeronautical Research and Development Board (ARDB), "Design of a solar powered unmanned aerial vehicle".
2. IIT Kanpur, "Development of a small size fixed wing Low Altitude Long Endurance (LALE) UAV"
3. Project design of Super Cavitating – NTSL Vishakhapatnam
4. Aeronautical Development Agency (ADA), "Design and fabrication of a flying wing vertical tailless adapted aura model"
5. Naval Research Board (NRB), "Underwater dynamic Modeling of a underwater supercavitating vehicle in motion"
6. Aeronautical Research and Development Board (ARDB), "Modified rig and compensator control system for dynamic rig"
7. DRDO, "Aerodynamic characterization and performance estimations through flight test"
8. Armament Research Board (ARMREB), "Design and evaluation different control strategies for upgrading existing aircraft bomb to guided bombs"
9. ARDB, "Aerodynamic Parameters Estimation of HANSA-III Aircraft with unsteady aerodynamic Modelling Conventional and Neural method" Ma
10. ARDB, "High Alpha Aero Dynamic Testing".
11. ARDB, "Identification of a parafoil longitudinal Aerodynamic characteristics using ground based-Flight test".
12. DRDO, "Design Fabrication and characterization of Atomizers".
13. ARMREB, "Study on Trajectory Correction System using Impulse Jet to Reduce the Impact Point Dispersion".
14. ARMREB, "Aerodynamic Study of Lattice Fins using Wind Tunnel Testing for High Angle of Maneuver of Strategic Aircraft Bomb".
15. ARDB, "Design Studies on Motor Glider".
16. ARMREB, "Aerodynamic Parameter Estimation of Artillery Projectiles from Radar-Tracked Flight Data".
17. ARMREB, "Neural Network Modelling of Range performance of Armament Stores".
18. ARDB, "Introduction to experiments in Flight using indigenously augmented instrumented aircraft at Flight lab., IIT Kanpur".
19. ADA, "Parameter Estimation from flight data using neural network".

GRANT FUNDING IN PROCESS

1. DRDO, "Centre of excellence for development of stealth unmanned aerial vehicle"

CONSULTANCY PROJECTS COMPLETED

1. IITK, "Flight Lab. Training Program for Engineering colleges other than IITs," 2010 – today.
2. ADRDE, "Non-Linear Modeling, Simulation And Instrumentation Through Flight Trial Data Acquisition And Data Analysis And Trial Of 2000 Cum Aerostat," 2012 – 2014.
3. ADRDE, "Aerodynamic characterization of a UAV through flight test," 2011 – 2014.
4. ADRDE, "Design and development of control algorithm using artificial neural networks," 2011 – 2014.
5. ADRDE, "Design and fabrication of a reflex aerofoil by using composites," 2011 – 2014.
6. NSTL, "Limited wind tunnel testing for generation of longitudinal, stability and control characteristics," 2012 – 2013.
7. NSTL, "Glider based payload (torpedo) delivery system," 2011 – 2012.
8. NSTL, "GPS and INS based control system integrated and glider torpedo kit," 2011 – 2012.
9. ARDE, "Theoretical study on under water dynamics and hydro-ballistics for anti-submarine rocket," 2011 – 2012.

10. ADRDE, "Estimation of flight characteristics of ram air parachute," 2010 – 2011.
11. ADRDE, "Acquisition of flight data for ram air parachute," 2010 – 2011.
12. ADRDE, "Research work on stratospheric airship," 2010 – 2011.
13. ADRDE, "Development of artificial neural network based control law for parachute assisted UAV," 2010 – 2011.
14. ADRDE, "Design of parachute assisted unmanned aerial vehicle," 2010 – 2011.
15. ARDE, "Aerodynamic studies and characterization of 120mm bomb," 2009 – 2010.
16. ARDE, "Separation and stability studies of 250kg pre-fragmented bomb," 2009 – 2010.
17. ADRDE, "Trajectory and stability analysis of conventional parachute payload combination for FAE," 2009 – 2010.
18. ADRDE, "Dynamics stability analysis of aerostat with 2000 cu.m. size," 2009 – 2010.
19. ARDE, "Theoretical studies on the configuration design of FSAPDS stabilizer unit stability analysis and sabot separation dynamics," 2008 – 2009.
20. ZEUS Numerix Pvt. Ltd., "6DOF simulation of missiles dynamics", 2007 – 2008.
21. HEMRL, "Generation of longitudinal and lateral directional aerodynamic force coefficients of FAE Bomb with ring tail configuration by wind tunnel testing at subsonic and supersonic speeds," 2006 – 2007.
22. ARDE, "Aerodynamic Characterization of Lattice Fin for Aircraft Bombs," 2005 – 2006.
23. HEMRL, "Safe Separation Study on FAE Bomb," 2005 – 2006.
24. HEMRL, "Prediction of Aerodynamics Parameters Aerodynamic Load, Lug Loads and Stability Characteristics of FAE Bombs," 2005 – 2006.
25. ARDE, "Design Evaluation and Finalization of Arming Mechanism for Fuze DA/SD for Non-Spinning Sub-munition," 2004 – 2005.
26. ARDE, "Missile Dynamics, Sizing of Control Fins and Wind Tunnel Testing of Cannon Launched Guided Missile," 2002 – 2003.
27. ARDE, "Modelling of Separation Phenomena and Aerodynamic of Cargo Ammunition," 2002 – 2003.
28. ARDE, "Aerodynamic Studies/125 KG Bomb with Ballistic Unit," 2000 – 2001.

Dr N Nayak
Sc 'G'

Associate Director

दूरभाष : ०६७८२-२७२२८७

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129/130



भारत सरकार
Government of India

रक्षा मंत्रालय

Ministry of Defence

रक्षा अनुसंधान तथा विकास संगठन

Defence R & D Organisation (DRDO)

प्रमाण तथा प्रायोगिक स्थापना (पीएक्सई)

Proof & Experimental Establishment (PXE)

चान्दीपुर, बालेश्वर - ७५६ ०२५ (उड़िसा)

Chandipur, Balasore-756025 (Orissa).

D.O. No.PXE/Asso/Dir/Gen

Dated 23 Jul' 2014

To

Prof AK Ghosh

Dean

IIT Kanpur- 208 016

SUCCESSFUL LAUNCH OF PINAKA-MK-II

Dear Sir,

I express my sincere thanks and gratitude to you for recognizing the contributions of our staff and officers of PXE, may be in a small way, towards the grand success of PINAKA-MK-II.

We at PXE, take pride to be a part of such a wonderful team headed by an inspirational team leader like you. This has no doubt been an eye opener for young scientists to be part of a typical development story where academic excellence has been put to use resulting in a dream product.

We are looking forward for your valuable guidance in the times to come.

With regards.

डा. के. एम. राजन

Dr. KM Rajan



No. ARDE/24/2/11-TECH

03 Jun 2014

Dear Prof. Giovanni Manna,

At the outset I wish to thank you for making available services of Prof AK Ghosh, Dept. of Aerospace Engg during the recently conducted Flight Trial of 214mm PINAKA MK-II Rockets at Proof & Experimental Establishment (PXE), Balasore from 27th to 30th May 2014. Prof Ghosh has been associated with this project right from its inception and also been member of PEER and various Design review committees. This is one of the most prestigious projects of our Establishment and the recently concluded flight trial was very crucial for the rocket system being developed by us totally indigenously.

Three trials were conducted prior to this flight trial. During these trials, although, rocket propulsion system performed as expected, there had been issues related to dynamic stability of the rockets resulting in inconsistency as well as at times underperformance. Prof Ghosh has been associated right from 1st trial and he was instrumental in identifying these problems in a very systematic & phased manner. Crux of the problem had been out-of-plane moment & peculiar roll-reversal characteristics exhibited by curved wrap-around-fins used for stabilization of rockets; this was in fact the outcome of on-site analysis of the recorded flight data carried out during the 1st flight trial under the guidance of Prof Ghosh. These findings were confirmed during the next day's flight trial conducted on innovative recommendations of Prof Ghosh, wherein rockets with brake rings were fired to confirm the hypothesis.

During the second & third flight trials attempts were made to solve the problem by modifying the in-use 4-fin WAF design and evolving a new 6 curved WAF design, wherein, while, one of the rockets achieved a maximum range of 65km under prevailing meteorological conditions, the same was not repeated by the other rockets fired on the same occasion. Detailed analysis of radar tracked & telemetered data was carried out by our team under the guidance of Prof Ghosh. It revealed that the problem of out-of-plane moment of curved WAF has been resolved with these modifications. However, a close scrutiny of roll-time & acceleration-time data recorded for all rocket flights indicated that the issues related to roll-reversal with possibility of roll-pitch lock in has resulted in the inconsistent performance of the rockets.

Congratulations to Prof. Ghosh.

Contd. 2

Tue 4.6.14

$$F_{\text{eff}} = 0.99 - 0.000166 \cdot \text{Temp}^2$$
$$E = \frac{1}{2}mv^2 = \frac{1}{2}m\left(\frac{h}{m\lambda}\right)^2 = \frac{h^2}{2m\lambda^2}$$

Congratulations Prof. Ghosh.
2. 5/6

cc. scanned copy of
a faculty list.

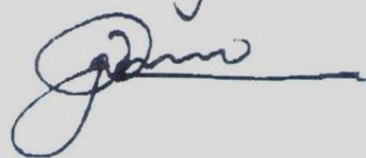
~~Through: HoD, AE~~
Prof. A K Ghosh

// 2 //

Prof Ghosh then suggested several alternative design modifications with emphasis on possibilities of use of 6 planar-flat wrap-around fins for the stabilizer. A design with planar fins was evolved by ARDE design team, stability and other aeroballistics aspects of which were reviewed by a Design Review committee chaired by Dr VG Sekaran, DG (MSS) of which Prof Ghosh was an important specialist-expert member. It indeed gives me great pleasure to share with you, namely, the outcome of the flight trial that six rockets with this finalized innovative design were test fired and achieved consistently a maximum range of 61km under prevailing meteorological conditions. This is a land mark achievement for ARDE and a Golden Moment for Artillery Rocket Development by ARDE / DRDO.

I, therefore, wish to put on record our appreciation for the most valuable contributions made by Prof Ghosh during the progress of the project, especially, during finalization of stabilizer fin geometries, conduct of all 4 flight trials, rigorous analysis of flight data and guiding ARDE team throughout. I once again whole heartedly thank you for permitting Prof Ghosh to participate and contribute in our developmental activities and I am sure that this association would continue in future also.

With best wishes.

Sincerely Yours


Prof. Indranil Manna
Director
Indian Institute of Technology
KANPUR - 208 016