

## **ANINDYA DEB, FNAE, SAE Fellow**

Professor

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### **EDUCATION**

- PhD, State University of New York at Buffalo, Amherst, New York, USA
- ME, Memorial University of Newfoundland, St. John's, Canada
- BE, Jadavpur University, Calcutta, India

### **PROFESSIONAL EXPERIENCE**

Professor, CPDM, Indian Institute of Science, Bangalore, India

Chairman, CPDM, for the period 2009-2014

Founder, CAR (**C**reative **A**utomotive **R**esearch/**C**onceptualize-**A**nalyze-**R**ealize) Laboratory,  
CPDM, IISc

Senior Product Design Engineer, Large Vehicle Center, Ford Motor Company, Dearborn,  
Michigan, USA

Technical Development Engineer, Structural Dynamics Research Corporation (SDRC), Milford,  
Ohio, USA

Manager, Research and Engineering, Caddtech Productivity Inc., Liverpool, New York, USA

Adjunct Lecturer, University of Michigan at Dearborn, Michigan, USA (1997-2001)

Graduate Engineer Trainee (GET), TELCO (currently Tata Motors Ltd.), Jamshedpur, India

### **TEACHING EXPERIENCE**

- *Design of Automotive Systems* (PD 216, IISc, Bangalore)
- *CAE in Product Design* (PD 217, IISc, Bangalore)
- *Design and Society* (PD 239, MDes independent study, IISc, Bangalore)
- *Finite Element Methods* (graduate lecture, ME 510, University of Michigan-Dearborn, USA)
- *Design of Machine Elements* (undergraduate lecture, ME 360, University of Michigan-Dearborn, USA)
- *Computer-Aided Design using MicroStation and I/NFM* (professional lecture, Caddtech Productivity Inc., Liverpool, NY, USA)
- *Finite Element Analysis with Applications* (professional lecture, Caddtech Productivity Inc., Liverpool, NY, USA)
- *Statics and Dynamics* (undergraduate tutorial, Memorial University of Newfoundland, Canada)

- *Engineering Analysis* (undergraduate tutorial, Memorial University of Newfoundland, Canada)
- *Engineering Thermodynamics* (undergraduate tutorial, Memorial University of Newfoundland, Canada)

## **GUIDANCE OF STUDENTS**

Number of IISc PhD students supervised: 13

Number of IISc PhD students under supervision: 7

Number of IISc MSc(Engg) students supervised: 7

Number of IISc MTech(Res) students under supervision: 1

Number of MDes students supervised (for Major Design Projects): 20

Number of MDes students under supervision: 2

## **RESEARCH INTERESTS**

- Vehicle Crashworthiness and Occupant Safety; Pedestrian Safety; Impact Modeling and Testing; Behavior of Lightweight Materials under Impact Loading
- Design of Automotive Systems; Design and Prototyping of Lightweight Electric Vehicles; Practical Multidisciplinary (Vehicle) Design Optimization (MDO) involving NVH, Durability, Vehicle Dynamics, Vehicle Crash Safety, etc.; Integrated Multi-Physics Approach to IC Engine Design; Lumped Parameter Modeling of Vehicle Suspension Systems; Explicit Nonlinear Dynamic Finite Element Modeling of Wheel Bearings
- Computer-Aided Engineering (CAE) in Design; Constitutive Modeling;
- CAE-Driven Design of Medical Implants

## **SELECTED FUNDED PROJECTS (AS PRINCIPAL INVESTIGATOR)**

- Electric vehicle design and prototyping; Sponsor: Hydro Aluminium, Norway
- Side impact safety design methodology; Sponsor: General Motors Corporation, Warren, MI, USA
- Weight optimization of Mahindra Scorpio; Sponsor: Mahindra and Mahindra, Nasik, India
- Adhesively bonded joints – testing and simulation; Sponsor: General Motors Corporation, Warren, MI, USA
- Improvement of crash simulation accuracy; Sponsor: Tata Motors Ltd., Pune, India

- Railway coach crashworthiness; Sponsor: Ministry of Human Resource Development (MHRD), Government of India
- Design and development of an aluminum-intensive electric mailvan; Sponsor: CSIC (Center for Scientific and Industrial Consultancy), IISc, Bangalore, India
- Development of design methodology for fatigue life prediction; Sponsor: John Deere, Pune, India
- FIST Grant for CPDM; Sponsor: Department of Science and Technology (DST), Government of India
- Impact testing of aluminium tubes; Sponsor: Tube Investments of India (TII) Ltd., Chennai, India
- Characterization of jute and jute-hybrid laminates for engineering applications; Sponsor: Tata Steel, Jamshedpur, India

## **PATENTS**

1. US Patent No. 6647594 on vehicle interior head impact protection countermeasure for Grab Handle Assembly (implemented in production Ford vehicles for FMVSS 201 compliance)
2. US Patent No. 6354628 on vehicle interior head impact protection countermeasure for Seat Belt Anchor Assembly (implemented in production Ford vehicles for FMVSS 201 compliance)
3. US Patent No. 6145908 on vehicle interior head impact protection countermeasure in the form of Energy Absorbing Continuously Compliant Swept Arch for Interior Trim (implemented in production Ford vehicles for FMVSS 201 compliance)
4. European Patent No. 0957004 on vehicle interior head impact protection countermeasure for A-pillar (implemented in production Ford vehicles for FMVSS 201 compliance)
5. Indian Design Registration (No. 190762 dated June 30, 2003) on a space-frame body-based car
6. Indian Patent No. 248518 dated 21/07/2011 on "A lightweight car having metal extrusion-based body with welded unique joints in space frame configuration" (under discussion for implementation)

## **PUBLICATIONS**

### ***Journals:***

1. Mittal, A., Deb, A., and Chou, C., "A Study into the Mechanical Behavior of Adhesively-Bonded Jute Fiber-Reinforced Composite," *SAE Int. J. Mater. Manf.* 8(2):2015, doi:10.4271/2015-01-0729.
2. Haorongbam, B., Deb, A., and Chou, C., "A Comparison of the Behaviors of Steel and GFRP Hat-Section Components under Axial Quasi-Static and Impact Loading," *SAE Int. J. Trans. Safety* 3(1):2015, doi:10.4271/2015-01-1482.

3. Gunti R. Srinivas, Malhar N. Kumar, Anindya Deb, Subrata Saha, "CAE-driven Evaluations of Surgical Fixations on Lumbar Spine: An Option for Aiding Ethics in Orthopedics", *Ethics in Biology, Engineering and Medicine: An International Journal*, Vol. 5, Issue 4, 313-322 (2014).
4. N. D. Shivakumar, Anindya Deb, Clifford C. Chou, "A Methodology for Characterization of the Strain Rate-Dependent Behavior of PU Foam", *SAE Int. J. Mater. Manf.* 7(3):2014, doi:10.4271/2014-01-0539.
5. S. Subramanya and A. Deb, "Design of a High Speed Data Acquisition System for a Transient Rotor-Dynamic Test Rig", *Experimental Techniques*, DOI: 10.1111/ext.12089 (2014).
6. Srinivas, G.R., Deb, A., Kumar, M.N., "A study on polyethylene stresses in mobile-bearing and fixed-bearing total knee arthroplasty (TKA) using explicit finite element analysis", *Journal of Long-Term Effects of Medical Implants*, 23 (4), 275-283 (2013).
7. A. Deb, B. Haorongbam, N. K. Gupta, "Thin-Walled Steel Hat Section Components As Protective Countermeasures For Vehicle Impact Safety", *Proceedings of the Indian National Science Academy*, 79(4), Part A, 669-678 (2013).
8. Bisheshwar Haorongbam, Anindya Deb and Clifford Chou, Numerical Prediction of Dynamic Progressive Buckling Behaviors of Single-Hat and Double-Hat Steel Components under Axial Loading, *SAE International Journal of Transportation Safety*, Volume 1, Issue 1 (2013).
9. Venkatesh Gude Subbaraya, Ajay Karmarkar, Anindya Deb, Srinivas Gunti Ranga, and Shivakumar Neerakallu Dasappa, Viscoelastic, Mechanical and DOE-Based Study on PP-Nanocomposites, *Polymer-Plastics Technology and Engineering* Vol. 51 , Iss. 8, 2012.
10. G.S. Venkatesh, A. Deb, Ajay Karmarkar. Characterization and finite element modeling of montmorillonite/polypropylene nanocomposites. *Materials and Design* 2012;35:425-33.
11. G.S. Venkatesh, A. Deb, Ajay Karmarkar, Shakti S. Chauhan. Effect of nanoclay content and compatibilizer on viscoelastic properties of montmorillonite/polypropylene nanocomposites. *Materials and Design* 2012;37:285-291.
12. A. Deb, C. Chou, U. Dutta and S. Gunti, "Practical Versus RSM-Based MDO in Vehicle Body Design," *SAE Int. J. Passeng. Cars - Mech. Syst.* 5(1):110-119, 2012, doi:10.4271/2012-01-0098.
13. Kalyan S. Cheruvu, Anindya Deb (2011). Crashworthiness of aluminium structures: an illustration through scaled model. *International Journal of Aerospace Innovations*. 3(3), 143-152.
14. N. D. Shivakumar, Anindya Deb, Aziz Chaudhary (2011). An Experimental Study on Mechanical Behavior and Microstructures of Polyurethane Foams for Design Applications. *International Journal of Aerospace Innovations*. 3(3), 163-170.

15. Anindya Deb, P. Lakshmanan, Clive Chirwa, SravanthiNowpada (2011). Energy absorption behaviours of CSM-based GFRC plates with hemispherical features. *International Journal of Crashworthiness*, 10.1080/13588265.2011.650533.
16. Raguraman, M., Jagadeesh, G., Deb, A., Barton, D. C. (2010). Experimental and numerical investigation of the behavior of aluminium plates upon ballistic impact. *Experimental Techniques*. 34(6), 49-60.
17. Anindya Deb, Bisheshwar Haorongbam, J.E. Diwakar, Clifford Chou (2010). Efficient Approximate Methods for Predicting Behaviors of Steel Hat Sections Under Axial Impact Loading. *SAE International Journal of Passenger Cars - Mechanical Systems*, August 2010, Vol. 3 No. 1 695-703.
18. Raguraman, M., Deb, A., Gupta, N. K. (2010). Semi-empirical procedures for estimation of residual velocity and ballistic limit for impact on mild steel plates by projectiles. *Latin American Journal of Solids and Structures*. 7(1), 63-76.
19. Raguraman, M., Deb, A., Jagadeesh, G. (2009). A numerical study of projectile impact on thin aluminium plates. *Proceedings of the Institution of Mechanical Engineers Part C - Journal of Mechanical Engineering Science*. 223(11). pp. 2519-2530.
20. Deb, A., Shivakumar, N. D. (2009). An Experimental Study on Energy Absorption Behavior of Polyurethane Foams. *Journal of Reinforced Plastics and Composites*. 28(24). pp. 3021-3026.
21. Raguraman, M., Deb, A., Gupta, N. K. (2009). CAE-based prediction of projectile residual velocity for impact on single and multi-layered metallic armour plates. *Latin American Journal of Solids and Structures*. 6(3). pp. 247-263.
22. Malvade, I., Deb, A., Biswas, P., Kumar, A. (2009). Numerical prediction of load-displacement behaviors of adhesively bonded joints at different extension rates and temperatures. *Computational Materials Science*. 44(4). pp. 1208-1217.
23. A. Deb, "A perspective on traffic-related fatalities in India and scope for new vehicle crash safety tests", *International Journal of Vehicle Safety*, 4(2), 154-171 (2009).
24. M. Raguraman, G. Jagadeesh, and A. Deb, "Development of an experimental facility for impact testing of armour plates", *International Journal of Aerospace Innovations*, 1(1), 45-55 (2009).
25. M. Raguraman, G. Jagadeesh, A. Deb and D. C. Barton, "Experimental and numerical investigation of the behaviour of aluminium plates upon ballistic impact", *Experimental Techniques*, ISSN '1747-1567' (2009).
26. A. Deb, U. Biswas and C.C. Chou, "HIC(d) and Its Relation With Headform Rotational Acceleration in Vehicle Upper Interior Head Impact Safety Assessment", *SAE International Journal of Passenger Cars - Mechanical Systems*, April 2009:142-149.

27. M. Raguraman, A. Deb and N.K. Gupta, "A simulation-driven study of oblique impact of ogival-nosed projectiles on mild steel armour plates", *Latin American Journal of Solids and Structures*, 5, 225-235 (2008).
28. A. Deb, I. Malvade, P. Biswas and J.T. Schroeder, "An experimental and analytical study of the mechanical behaviour of adhesively bonded joints for variable extension rates and temperatures", *International Journal of Adhesion and Adhesives*, 28, 1-15 (2008).
29. A. Deb and K.S. Cheruvu, "Development of a new lumped parameter model for vehicle side impact safety simulation", *Journal of Automobile Engineering Part D*, 222(D10), 1793-1811 (2008).
30. M. Raguraman, A. Deb, N.K. Gupta, D.K. Kharat, "Numerical simulation of projectile impact on mild steel armour plates using LS-DYNA, Part II: Parametric Studies", *Defence Science Journal*, 58(4), 573-581 (2008).
31. A. Deb, M. Raguraman, N.K. Gupta, V. Madhu, "Numerical simulation of projectile impact on mild steel armour plates using LS-DYNA, Part I: Validation", *Defence Science Journal*, 58(3), 422-432 (2008).
32. A. Deb, K.S. Cheruvu, S. Ruan, "A modified rigid barrier for improved assessment of occupant injury in incompatible frontal collisions", *International Journal of Vehicle Safety*, 3(4), 319-337 (2008).
33. M. Raguraman, A. Deb and N.K. Gupta, "A numerical study of projectile impact on mild steel armour plates", *Current Science*, 93(4), 498-507 (2007).
34. A. Deb, K.S. Cheruvu, "Setting initial targets in vehicle side impact safety design using regression-based modelling", *International Journal of Crashworthiness*, 12(4), 401-410 (2007).
35. K. Cheruvu, A. Deb, M.O. Neal and J.T. Wang, "Setting vehicle side impact safety design targets using a regression-based approach", *International Journal of Vehicle Safety*, 2(1/2), 206-220 (2007).
36. A. Deb and C.C. Chou, "Vehicle front impact safety design using a hybrid methodology", *International Journal of Vehicle Safety*, 2(1/2), 44-56 (2007).
37. S.R. Shankapal, A. Deb, R.R. Nath, D.C. Sundaresh, "A CAE-based methodology for designing a customized prosthesis for hemi-pelvis replacement", *Indian Journal of Biomechanics*, 1(2), 159-165 (2007).
38. M. Joshi, A. Deb and S.R. Shankapal, "Ethical issues in pharmacogenomic research", *International Journal of Medical Implants and Devices*, 2(1), 36-37 (2007).
39. A. Deb and C.C. Chou, "Challenges including ethics in human impact injury tolerance", *International Journal of Medical Implants and Devices*, 2(1), 35 (2007).

40. A. Deb and M. Raguraman, "Platform-based vehicle design for agile responses to market demands", *International Journal of Agile Manufacturing*, 9(2), 83-90 (2006).
41. Purohit, R. Pant and A. Deb, "Role of rapid technologies as enablers for agile manufacturing in the automotive industry", *International Journal of Agile Manufacturing*, 9(2), 91-97 (2006).
42. A. Deb, U. Biswas, J. Ruan and N.K. Gupta, "Evaluation of safety of helmets using a featureless Hybrid III headform", *International Journal of Vehicle Safety*, 1(4), 330-347 (2006).
43. A. Deb, A. Naravane and E.C. Chirwa, "An offset rigid barrier-based equivalence of IIHS frontal offset impact safety test", *International Journal of Crashworthiness*, 11(4), 281-290 (2006).
44. A. Deb and A. Naravane, "An improved representation of vehicle incompatibility in frontal NCAP tests using a modified rigid barrier", *International Journal of Crashworthiness*, 11(1), 13-25 (2006).
45. A. Deb, N.K. Gupta, U. Biswas and M.S. Mahendrakumar, "Designing for head impact safety using a combination of lumped parameter and finite element modeling", *International Journal of Crashworthiness*, 10(3), 249-257 (2005).
46. A. Deb, M.S. Mahendrakumar, C. Chavan, J. Karve, D. Blankenburg and S. Storen, "Design of an aluminum-based vehicle platform for front impact safety", *International Journal of Impact Engineering*, 30(8-9), 1055-1079 (2004).
47. A. Deb and T. Ali, "A lumped parameter-based approach for simulation of automotive headform impact with countermeasures", *International Journal of Impact Engineering*, 30, 521-539 (2004).
48. A. Deb, C.C. Chou and S.D. Barbat, "An analytical study on headform impact protection space for a rigid target", *SAE Transactions*, 109(6), pp. 804-812 (2000).
49. A. Deb, "Boundary element analysis of anisotropic bodies under thermo-mechanical body force loadings", *Computers and Structures*, Vol. 58, No. 4, pp. 715-726 (1996).
50. A. Deb and P.K. Banerjee, "A variable stiffness type elastoplastic boundary element formulation for planar anisotropic media", *International Journal of Solids and Structures*, 30(8), 1093-1112 (1993).
51. J.J. Sharp, A. Deb and M.K. Deb, "Application of matrix manipulation in dimensional analysis involving large numbers of variables", *Marine Structures (Design, Construction and Safety)*, 5(4), 333-348 (1992).
52. A. Deb and P.K. Banerjee, "Multi-domain two- and three-dimensional thermoelasticity by BEM", *International Journal for Numerical Methods in Engineering*, 32, 991-1008 (1991).

53. A. Deb, D.P. Henry Jr. and R.B. Wilson, "Alternate boundary element formulations for 2- and 3-D anisotropic thermoelasticity", *International Journal of Solids and Structures*, 27(13), 1721-1738 (1991).
54. A. Deb, M.K. Deb and M. Booton, "Analysis of orthotropically modeled stiffened plates", *International Journal of Solids and Structures*, 27, 647-664 (1991).
55. A. Deb and P.K. Banerjee, "BEM for general 2D anisotropy using particular integrals", *Communications in Applied Numerical Methods*, 6, 111-119 (1990).
56. A. Deb and P.K. Banerjee, "A comparison between isoparametric Lagrangian elements in 2D BEM", *International Journal for Numerical Methods in Engineering*, 28, 1539-1555 (1989).
57. A. Deb and H.C. Wang, "A point concerning quadratic elements in two-dimensional boundary element methods", *Communications in Applied Numerical Methods*, 4, 821-823 (1988).
58. A. Deb and M. Booton, "Finite element models for stiffened plates under transverse loading", *Computers and Structures*, 28(3), 362-372 (1988).
59. M.K. Deb and A. Deb, "The matrix method: a powerful technique in dimensional analysis", *Journal of the Franklin Institute*, 321(4), 233-240 (1986).
60. A. Deb, M.K. Deb and J.J. Sharp, "A comparative study of techniques in dimensional analysis", *Applied Mathematics Notes*, 10(4), 17-34 (1985).

***Refereed SAE (Society of Automotive Engineers) Technical Papers:***

61. Deb, A., Srinivas, G., and Chou, C., "Development Of A Practical Multi-disciplinary Design Optimization (MDO) Algorithm For Vehicle Body Design," SAE Technical Paper 2016-01-1537, 2016, doi:10.4271/2016-01-1537.
62. Deb, A., Chou, C., Srinivas, G., Gowda, S. et al., "Behavior of Adhesively Bonded Steel Double Hat-Section Components under Axial Quasi-Static and Impact Loading," SAE Technical Paper 2016-01-0395, 2016, doi:10.4271/2016-01-0395.
63. Srinivas, G., Deb, A., Chou, C., and Kumar, M., "A Methodology for Prediction of Periprosthetic Injuries in Occupants with TKR Implants in Vehicle Crashes," SAE Technical Paper 2016-01-1529, 2016, doi:10.4271/2016-01-1529.
64. Srinivas, G., Deb, A., and Chou, C., "Lightweighting of an Automotive Front End Structure Considering Frontal NCAP and Pedestrian Lower Leg Impact Safety Requirements," SAE Technical Paper 2016-01-1520, 2016, doi:10.4271/2016-01-1520.
65. Singh, A., Deb, A., Mensi, A., and Gunti, R., "A Unified CAE Framework for Assessing an IC Engine Design," SAE Technical Paper 2015-01-1664, 2015, doi:10.4271/2015-01-1664.

66. Deb, A., Shivakumar, N., and Chou, C., "An Alternative Approach for Formulation of a Crushable PU Foam Considering its Behavior under Compressive Loads," SAE Technical Paper 2015-01-1483, 2015, doi:10.4271/2015-01-1483.
67. Palanimuthu, L., Deb, A., and Mallick, P., "Energy-Absorption Behaviors of Glass Fiber Reinforced Plastic (GFRP) Plates with Hemispherical/Corrugated Force-Multipliers," SAE Technical Paper 2015-01-0560,2015, doi:10.4271/2015-01-0560.
68. Deb, A., Venkatesh, G., and Mache, A., "Performance of Lightweight Materials for Vehicle Interior Trim subject to Monotonic Loading and Low Velocity Impact," SAE Technical Paper 2015-01-0717, 2015, doi:10.4271/2015-01-0717.
69. Mahala, M., Deb, A., and Chou, C., "A Comparative Study of Lumped Parameter Models for Assessing the Performance of Vehicle Suspension Systems," SAE Technical Paper 2015-01-0620, 2015, doi:10.4271/2015-01-0620.
70. Deb, A., Gunti, R., Chou, C., and Dutta, U., "Use of Truncated Finite Element Modeling for Efficient Design Optimization of an Automotive Front End Structure," SAE Technical Paper 2015-01-0496,2015, doi:10.4271/2015-01-0496.
71. S. Subramanya and A. Deb, "Design of a High Speed Data Acquisition System for a Transient Rotor-Dynamic Test Rig", Experimental Techniques, DOI: 10.1111/ext.12089 (2014).
72. Gauri Ranadive, Anindya Deb, Bisheshwar Haorongbam, "An Assessment of Load Cell- and Accelerometer-Based Responses in a Simulated Impact Test", SAE Technical Paper 2014-01-0198, 2014, doi:10.4271/2014-01-0198.
73. Ashok Mache, Anindya Deb, "A Study on Impact Perforation Resistance of Jute - Polyester Composite Laminates", SAE Technical Paper 2014-01-1055, 2014, doi:10.4271/2014-01-1055.
74. B. Haorongbam, A. Deb, C. Chou. "Numerical prediction of dynamic progressive buckling behaviors of single-hat and double-hat steel components under axial loading", SAE Technical Paper 2013-01-0458, April 16-18 2013, Detroit, Michigan, USA.
75. A. Mache, A. Deb. "A Comparative Study on the Axial Impact Performance of Jute and Glass Fiber-Based Composite Tubes", SAE Technical Paper 2013-01-1178, April 16-18 2013, Detroit, Michigan, USA.
76. A. Deb and D. Joshi, "A Study on Ride Comfort Assessment of Multiple Occupants using Lumped Parameter Analysis," SAE Technical Paper 2012-01-0053, doi:10.4271/2012-01-0053.
77. S. Ghosh, A. Deb, M. Mahala, M. Tanbakuchi, M. Makowski, "Active Yaw Control of a Vehicle using a Fuzzy Logic Algorithm," SAE Technical Paper 2012-01-0229, doi:10.4271/2012-01-0229.
78. Mahala, M. and Deb, A., "An Efficient Hybrid Approach for Design of Automotive Wheel Bearings," SAE Technical Paper 2011-01-0091, doi:10.4271/2011-01-0091.

79. Deb, A., Chigullapalli, A., Chou, C., and Dutta, U., "A Practical Approach for Cross-Functional Vehicle Body Weight Optimization," SAE Technical Paper 2011-01-1092, doi:10.4271/2011-01-1092.
80. A. Deb, U. Biswas, C.C. Chou, "HIC(d) Criterion and Headform Rotational Acceleration in Vehicle Upper Interior Head Impact Safety Assessment", SAE 2008-01-0186, 2008 SAE World Congress, Detroit.
81. A. Deb, U. Biswas and C.C. Chou, "HIC(d) and its relation with rotational acceleration in vehicle upper interior head impact safety assessment", SAE 2008 World Congress, April 2008, Detroit, USA.
82. A. Deb, K.S. Cheruvu and M.S. Mahendrakumar, "Energy-based criteria for crashworthiness design of aluminum intensive space frame vehicles", SAE Paper No. 2004-01-1521, March 2004, Detroit, USA.
83. A. Deb, U. Biswas and C.C. Chou, "Effects of unloading and strain rate on headform impact simulation", SAE Paper No. 2004-01-0738, March 2004, Detroit, USA.
84. A. Deb, C.C. Chou and S.D. Barbat, "An analytical study on headform impact protection space for a rigid target", SAE Paper No. 2000-01-0608, March 2000.
85. A. Deb and C. O'Connor, "Prediction of front TTI in NHTSA side impact using a regression-based approach", SAE Paper No. 2000-01-0636, March 2000.

***Other Conference Proceedings:***

86. Shreyas Hegde, Anindya Deb, and Suresh Nagesh, "Simulation of Hemodynamics Phenomenon Using Computational Fluid Dynamics for Enhanced Diagnostics and Prognosis", AMS2015, Ninth Asia International Conference on Mathematical Modelling and Computer Simulation", Kuala Lumpur, Malaysia, 7-9 September 2015.
87. Gunti Ranga Srinivas, Anindya Deb, M.N. Kumar. Weight Optimization of a Total Knee Replacement (TKR) Implant Using Numerical Simulation, 7th World Congress of Biomechanics. Massachusetts, MIT, Boston, USA, 2014.
88. Gunti Ranga Srinivas, Anindya Deb, M.N. Kumar. A study on the effect of malalignment on polyethylene stresses in mobile-bearing and fixed-bearing total knee arthroplasty using explicit finite element analysis. 12th International Symposium on Computer Methods in Biomedical Engineering, Amsterdam, Netherlands, October 13-15, 2015.
89. Gunti Ranga Srinivas, Anindya Deb, M.N. Kumar. Insights into optimality of span of posterior spinal instrumentation for vertebral body fractures. 12th International Symposium on Computer Methods in Biomedical Engineering, Amsterdam, Netherlands, October 13-15, 2015.
90. A. Deb, P. Lakshmanan, N.K. Gupta, D.K. Kharat, "A study on glass fiber-reinforced composites for vehicle impact safety design", 4<sup>th</sup> Indo-Russian Workshop on Topical Problems in Theoretical and Applied Mechanics, November 11-15, 2013, Chennai.

91. Mahesh, C., Deb, A., Kailas, S.V., Shankar, C.U., Kutty, T.R.G., Mahule, K.N., "A study into the behavior of an aluminum foam under compression", Key Engineering Materials, Vol. 535-536, 64-67 (2013).
92. G. S. Venkatesh, Ajay Karmarkar, A. Deb, "No. 251 - Characterization and Modeling of Bamboo-Polypropylene Composites "Euro BioMat 2011 Conference in Jena, Germany held between 13-14, April 2011.
93. A. Deb, G.S. Venkatesh, Ajay Karmarkar and B. Gurumoorthy. Application of a Nanoclay-Polypropylene Composite to Efficient Vehicle Occupant Safety Countermeasure Design. NanoTech 2011. ISBN 978-1-4398-7139-3 Vol. 2-2011.
94. G.S. Venkatesh, A. Deb, Ajay Karmarkar. Prediction of the stiffness of nanoclay-polypropylene composites using a Monte Carlo finite element analysis approach. International Symposium on Engineering under Uncertainty: Safety Assessment and Management. January 4 to 6 2012. Paper No. CNP 067.
95. A. Deb, L. Langeveld (2010). First time right design of an aluminum-intensive spaceframe vehicle. TMCE 2010, Ancona, Italy.
96. Anindya Deb, Manoj Mahala, Narinder K. Gupta. A hybrid methodology for the design of wheel bearings under extreme road loads. Indo-Russian Workshop on Topical Problems in Solid and Fluid Mechanics. St. Petersburg, Russia, July 2-4 2011.
97. A. Deb, B. Haorongbam, N. K. Gupta. Predicting the behaviors of thin-walled steel double-hat sections under axial impact loading. Indo-Russian Workshop on Topical Problems in Solid and Fluid Mechanics. St. Petersburg, Russia, July 2-4 2011.
98. Manoj Mahala, Anindya Deb (2010). A new hybrid approach for simulation of automotive wheel bearings. HTC 2010 (HyperWorks Technology Conference 2010), Bangalore.
99. A. Deb, P. Lakshmanan, D.K. Kharat, S.C. Lakkad (2010). Composite Versus Steel Rails for Vehicle Front Impact Safety. IMPLAST 2010, Providence, Rhode Island, USA.
100. A. Deb, P. Lakshmanan, E.C. Chirwa, S Nowpada (2010). Energy-Absorption Behaviors of CSM-Based GFRC Plates with Hemispherical Force-Multipliers. International Crashworthiness Conference, Leesburg, Virginia, USA.
101. A. Deb, A.K. Chigalapulli, B. Haorongbam, N.K. Gupta (2010). Behaviors of Steel Hat Section Components Under Axial Impact Loading. IMPLAST 2010, Providence, Rhode Island, USA.
102. P. Prabhune, A. Deb, G. Balasubramani (2010). Simulation of crash behavior of a common Indian Railway passenger coach. International Crashworthiness Conference, Leesburg, Virginia, USA.
103. Raguraman Munusamy, Anindya Deb and David C Barton, "Study of impact of projectiles on mild steel armour plates using three different finite element modelling approaches", NAFEMS 2009, Greece.

104. Raguraman Munusamy, Anindya Deb and David C Barton, "CAE-based approaches for designing mild steel armour plates for projectile ballistic impact", DYMAT 2009, Belgium.
105. A. Deb, A.K. Chigullapalli, B. Haorongbam, "Prediction of axial crush performance of steel hat sections using neural networks", Hyperworks Technology Conference (HTC) 2008, Bangalore.
106. KaushalJha, C. Umashankar, TRG Kutty, Vivek Bhasin, KN Mahule, Satish VKailas, and A. Deb. Energy absorbing behaviour of aluminium base foams. IC-ICAME, July 2-5, Bangalore, July 2-5 2008, Bangalore.
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111. A. Deb, M. Raguraman and N.K. Gupta, "Simulation of oblique impact of jacketed hardened-core projectiles on mild steel plates", IMPLAST (International Conference on Impact and Plasticity) 2007, August 2007, Bochum, Germany.
112. M. Raguraman, G. Jagadeesh and A. Deb, "An experimental and numerical study on ballistic impact of thin aluminium plates", EngineeringDesign.in, August 2007, Bangalore, India.
113. N.D. Shivakumar, A. Deb, H.C. Chittappa, E. Suresh and C.R. Prasannakumar, "Modeling and Simulation of Polyurethane Foams for Energy Absorption Application", International Conference & Exhibition on Total Engineering Analysis & Manufacturing Technologies (TEAMTECH 2007), Bangalore, October 2007.
114. N.D. Shivakumar, A. Deb, H.C. Chittappa and C.R. Prasannakumar, "A Study of Automobile Body Shape Using Flow Visualization Technique", International Conference & Exhibition on Total Engineering Analysis & Manufacturing Technologies (TEAMTECH 2007), Bangalore, October 2007.

115. M. Raguraman and A. Deb, "Implementation of agile manufacturing through platform-based vehicle design", National Conference on Automotive Manufacturing , February 2007, Coimbatore, India.
116. D. Ganesh, A. Deb, B. Haorongbam and M. Raguraman, "An insight into performance of tubular components for vehicle crash energy management", National Conference on Automotive Manufacturing , February 2007, Coimbatore, India.
117. I. Malvade and A. Deb, "Effect of constitutive modeling on the simulation of adhesively bonded joint behaviour", EngineeringDesign.in, August 2007, Bangalore, India.
118. H.C. Chittappa, A. Deb, N. Govindaraju, N.D. Shivakumar, C.R. Prasannakumar, "Study of Response of Sandwich Structural Foams for Optimal Energy Absorption", 6<sup>th</sup> International Conference on Materials Processing for Properties and Performance, Institute of Materials (East Asia), Beijing, China, September 2007.
119. A. Deb, "An efficient knowledge-based hybrid methodology for vehicle crash safety design", ICCMS (International Conference on Complex Systems), October 2007, Boston, USA.
120. S.R. Shankapal, D.C. Sundaresh, R.R. Nath and A. Deb, "CAE-driven design of a customized prosthesis for hemi-pelvis replacement", NCB (National Conference on Biomechanics) 2006, Kolkata, India.
121. M. Raguraman and A. Deb, "Robust prediction of residual velocities and ballistic limits of projectiles for impact on thin aluminium plates", Structures Under Shock and Impact IX, 205-214, WIT Transactions on The Built Environment (2006), UK.
122. A. Deb, K.S. Cheruvu and J. Ruan, "A modified rigid barrier for improved assessment of occupant injury in incompatible frontal collisions", NCB (National Conference on Biomechanics) 2006, Kolkata, India.
123. M. Raguraman and A. Deb, "Accurate prediction of projectile residual velocity for impact on single and multi-layered steel and aluminium plates", 9<sup>th</sup> International LS-DYNA Users Conference, June 2006, Detroit, USA.
124. A. Deb and K.S. Cheruvu, "Feasibility of a hybrid methodology for efficient vehicle side impact safety design", ICRASH2006 (International Crashworthiness Conference), July 2006, Athens, Greece.
125. A. Deb, M. Raguraman and N.K. Gupta, "Numerical and semi-analytical prediction of projectile residual velocity for impact on steel armour plates", Indo-Russian Workshop on Problems in Nonlinear Mechanics of Solids with Large Deformation, November 2006, New Delhi, India.
126. A. Deb, U. Biswas and N.K. Gupta, "Simulation-driven design of helmets for head impact protection using an injury-based criterion", International Conference on Lightweight Structures, May 2005, Florianopolis, Brazil.

127. A. Naravane and A. Deb, "Validation of a Hybrid III dummy model and its application in simulation of vehicle frontal NCAP test", Altair CAE Users Conference, August 2005, Bangalore, India.
128. A. Deb and I. Malvade, "Prediction of mechanical behaviors of adhesively bonded joints for a range of loading rates and temperatures", Adhesion '05, Ninth International Conference on the Science and Technology of Adhesion and Adhesives, September 2005, University of Oxford, U.K.
129. A. Deb, A. Naravane, N. D. Shivakumar and H.C. Chittappa, "A comparative study of composite and steel front rails for vehicle front impact safety", Paper No. 2005-26-324, International Mobility Congress and Exposition 2005, October 2005, Chennai, India.
130. A. Deb, A. Naravane and U. Dutta, "An integrated approach for cross-functional vehicle body weight optimization". CAE Applications for Automotive Structures Symposium, November 2005, Troy, MI, USA.
131. A. Deb, "Vehicle design driven by packaging and ergonomics", 2005 HWWE, International Ergonomics Conference, December 2005, Guwahati, India.
132. A. Deb, N.K. Gupta, U. Biswas and M.S. Mahendrakumar, "An Improved Lumped Parameter Model for Vehicle Safety Design Applications", ICrash 2004, San Francisco, USA.
133. A. Deb, K. Subbulakshmi and M.S. Mahendrakumar, "A hybrid approach for vehicle front impact safety design", ICCMS04, Kanpur, India.
134. A. Deb, "Car design driven by exterior styling and crash safety", National Symposium on Mechanisms and Design, July 2003, Bangalore, India.
135. A. Deb and C.C. Chou, "Headform impact safety design through simulation and testing", SAE Paper No. 2003-01-1386, March 2003, Detroit, USA.
136. A. Deb, M.S. Mahendrakumar, C. Chavan, J. Karve, D. Blankenburg and S. Storen, "Design of an aluminum-based vehicle platform for front impact safety", *IMPLAST 2003*, March 2003, New Delhi, India.
137. K.S. Cheruvu, M.S. Mahendrakumar and A. Deb, "Evaluation of side impact safety for a new aluminum-based vehicle platform", 2<sup>nd</sup> Indian LS-DYNA Users Conference, February 2003, Chennai, India.
138. A. Deb and N. Saha, "Setting targets in preliminary vehicle design for side impact safety using a statistical approach", IMECE 2002 (International Mechanical Engineering Congress and Exposition 2002), November 2002, New Orleans, USA.
139. A. Deb, "Transforming a lecture-oriented course in the design of automotive systems into a unique design experience", ICEE 2002, August 18-21, Manchester, UK.
140. A. Deb, T. Ali and S. Arvind, "Designing countermeasures for head impact safety", NordDesign 2002, August 14-16, Trondheim, Norway.

141. A. Deb, S. Calso and N. Saha, "Effectiveness of countermeasures in upper interior head impact", SAE Paper No. 970391, February 1997.
142. A. Deb, S. Calso and N. Saha, "A comparison of countermeasures for upper interior head impact", AMD-Vol. 218, Crashworthiness and Occupant Protection in Transportation Systems, ASME Winter Conference, November 1996.
143. A. Deb, M.K. Deb and J.J. Sharp, "Application of the matrix method in dimensional analysis", Fifteenth IASTED International Conference on Applied Simulation and Modelling, May 1987, Santa Barbara, California.
144. A. Deb and M. Booton, "Analysis of stiffened plates using a Mindlin element", Annual Conference and Specialty Conference on Computer Applications, The Canadian Society for Civil Engineering, May 1986, Toronto, Canada.

**Book Chapters:**

145. A. Deb, "Crashworthiness considerations in vehicle design", Chapter in *Materials, Design and Manufacturing for Lightweight Vehicles* (ed. P.K. Mallick), Woodhead Publishing, UK, March 31, 2010 | ISBN-10: 1439829721 | ISBN-13: 978-1439829721.
146. A. Deb, U. Biswas and N.K. Gupta, "Simulation-driven design of helmets for head impact protection using an injury-based criterion", *WIT Transactions on Engineering Sciences*, 49, 189-204 (2005), ISSN 1743-3533, Eds. M. Alves and N. Jones.
147. M. Raguraman and A. Deb, "Robust prediction of residual velocities and ballistic limits of projectiles for impact on thin aluminium plates", *WIT Transactions on The Built Environment*, 87, 205-214 (2006), ISSN 1743-3509, Eds. N. Jones and C. Brebbia.
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150. S.D. Barbat and A. Deb, "Interior Head Impact FEA", Chapter 6 (pp. 256-289), *Current Safety CAE Methods In Program Applications, A Safety Methods Catalog*, Ford Motor Company, February 1996.

**Manual:**

151. S. Crowell and A. Deb, *Niagara Mohawk CADD Users' Guide*, Caddtech Productivity Inc., 1991.

## **SUPERVISION OF PRODUCT/EQUIPMENT/MATERIAL INNOVATION**

- Aluminium-intensive electric mainvan
- Aluminium-intensive electric car
- Electrically-assisted bicycle
- Low floor bus
- Personal-use three-wheeler
- Campus passenger van
- Three-in-one solar cooker
- Head impact safety countermeasures for Ford vehicles
- Nanocomposite-based head impact safety countermeasure
- Hybrid jute-polymer composite
- Reinforced polyurethane (PU) foam
- Sandwiched jute laminate-PU foam
- Experimental set-ups for drop-weight and ballistic impact tests
- Rotor dynamic test rig
- Electric three-wheeler
- Portable vaccine carrier

## **EDITORIAL BOARD AFFILIATIONS**

- Founding Chief Editor & Member, Editorial Board, International Journal of Vehicle Structures and Systems
- Member, Editorial Board, International Journal of Crashworthiness
- Member, Editorial Board, International Journal of Vehicle Safety
- Associate Editor, SAE International Journal of Materials and Manufacturing
- Member, Editorial Board, Indian Journal of Biomechanics

## **HONORS/AWARDS**

- Elected Fellow of the Indian National Academy of Engineering (INAE), India
- Elected Fellow of the Society of Automotive Engineers (SAE), USA

- Keynote Speaker, INCAM (Indian National Conference on Applied Mechanics) 2015, IIT-Delhi, New Delhi, July 13-15, 2015
- Special Invitee and Keynote Speaker, National Workshop on Cutting Edge Technologies for Automobile Emission Control and Management, Nitte Meenakshi Institute of Technology, Yelahanka, Bangalore, November 30, 2015.
- Chief Guest, TEQIP Workshop on Advanced Simulation and Modeling, University Visvesvaraya College of Engineering, Bangalore, May 7-8, 2015
- Invited Speaker, ICAMET (International Conference on Advanced Materials and Energy Technology) 2014, December 17-19, 2014, IEST, Shibpur, Howrah, West Bengal, India
- Invited Speaker and Co-organizer, Joint Indo-German Workshop on "Strategies for improved bone replacement materials and orthopaedic implants: Design – manufacturing – technologies", Technical University of Dresden, Dresden (Germany), February 19-21, 2014
- Co-organizer, 'Occupant Protection: Safety Test Methodology' Session, SAE 2014 World Congress and Exhibition, Detroit, USA
- Member, Occupant Protection Committee, SAE International, USA
- 3<sup>rd</sup> National Award for Technology Innovation (2013) from the Ministry of Chemicals and Fertilizers, Department of Chemicals and Petrochemicals, Government of India, New Delhi
- Invited Speaker, ICAT Workshop HEV & EV – III, September 5-6, 2013, India Habitat Centre, New Delhi
- Invited Speaker, Seminar on 'Lightweighting of Automobiles Through Aluminium', August 7, 2013, India Habitat Centre, New Delhi (organized by the Aluminium Association of India)
- Co-Organizer, 'Occupant Protection: Safety Test Methodology' Session, SAE 2013 World Congress and Exhibition, Detroit, USA
- Co-Organizer, 'Occupant Protection: Safety Test Methodology' Session, SAE 2012 World Congress and Exhibition, Detroit, USA
- Co-Organizer, 'Occupant Protection: Safety Test Methodology' Session, SAE 2011 World Congress and Exhibition, Detroit, USA
- Co-Organizer, 'Occupant Protection: Safety Test Methodology' Session, SAE 2010 World Congress and Exhibition, Detroit, USA
- Member, Scientific Committee, IMPLAST 2010 (October 12-14, 2010), Providence, Rhode Island, USA
- Invited Speaker (Invitation by the Embassy of the Netherlands, New Delhi) at the "Innovative Technologies for Road Transport and Personal Mobility" Conference (November 6, 2008), Eindhoven, Netherlands

- Session Chairman, SAE India International Mobility Engineering Congress and Exposition (December 13-15, 2009), Chennai, India
- Founding Secretary, SAE (Society of Automotive Engineers) India, Bangalore Section
- Member, Technical Committee, International Mobility Engineering Conference and Exposition 2008, January 2008, New Delhi, India
- Member, International Organizing Committee, IMPLAST 2007 (International Conference on Impact and Plasticity 2007), August 2007, Bochum, Germany
- Member, International Organizing Committee, International Conference on Agile Manufacturing (ICAM 2007), July 2007, Durham, UK
- Keynote Speaker, National Conference on Automotive Manufacturing, February 2007, Coimbatore, India
- Invited Speaker, Indo-Russian Workshop on 'Problems in nonlinear mechanics of solids with large deformation', November 2006, New Delhi, India.
- Chairperson, Safety Test Methodology Session, 2006 SAE World Congress and Exhibition, Detroit, USA
- Member, International Organizing Committee, International Conference on Agile Manufacturing (ICAM 2006), July 2006, Norfolk, Virginia, USA
- Judge, Altair Users Conference, August 2006, Bangalore, India
- Keynote Speaker, NCB (National Conference on Biomechanics) 2006, December 2006, Shibpur, Howrah, India
- Session Chairman, ICRASH2006 (International Crashworthiness Conference), July 2006, Athens, Greece
- Member, Advisory Board, National Conference on Computer Applications in Engineering, May 2006, Bangalore, India
- Invited Speaker, Symposium on Finite Element Analysis, TeamTech 2006, March 2006, Bangalore, India
- Keynote Speaker, Workshop on Welding of Aluminium organized by the Aluminium Association of India, February 2006, Bangalore, India
- Citation from SAE (Society of Automotive Engineers) International, USA for being an organizer of the CAE Applications in Automotive Structures Symposium, Troy, Michigan (2005)

- Keynote Speaker, National Workshop on Finite Element Applications, October 2005, Bengal Engineering and Science University, Shibpur, Howrah, India
- Keynote Speaker, Automobile Safety and Security Systems Seminar, September 2005, Vellore Institute of Technology, Vellore, India
- Organizer and session chairman in the International Mobility Congress and Exposition 2005, Chennai, India
- Session Chairman, ICCMS04 (International Conference on Computational Mechanics and Science 2004), Kanpur, India
- Keynote Speaker, Second National Workshop on Advances in Automotive Technology, August 2004, Coimbatore, India
- Citations from SAE International in recognition of substantial contributions to the SAE 2004 World Congress, Detroit, Michigan, USA
- Received Certificate of Appreciation from SAE AEA Computer Application Committee in recognition of a substantial contribution to the 2003 SAE World Congress, Detroit, Michigan, USA
- Chaired Automotive Crash Safety Design Session at the 2<sup>nd</sup> Indian LS-DYNA Users Conference, February 2003, Chennai, India
- Invited Speaker at the Department of Machine Design and Materials Technology, NTNU (Norwegian University of Science and Technology), Trondheim, Norway in August 2002 on “Design of an Aluminum-Based Vehicle Platform”, and “Vehicle Crashworthiness Design and Occupant Safety”
- Invited Speaker on Vehicle Design at NTTF (Nettur Technical Training Foundation), Bangalore, India
- Ford Patent Usage Award (2000)
- Ford Recognition Award for patent filing (1998)
- 1997 Ford LVC (Large Vehicle Center) Award for Outstanding Achievement
- 1997 Award of Excellence at Ford for Distinguished Achievements toward Customer Satisfaction
- Three Year Service Award (1995) from SDRC (Structural Dynamics Research Corporation), Milford, Ohio
- Achievement Award for Excellence (1994) from SDRC, Milford, Ohio
- Exemplary Action Award (1993) from SDRC, Milford, Ohio

- M.M. Chakraborty Silver Medal from Jadavpur University for securing first rank in the engineering faculty in Intermediate Engineering
- National Scholarship from the Government of India for the entire duration of higher secondary and undergraduate engineering programs