CURRICULUM VITAE - MUKUL K. VERMA. PH.D.

Current Title: *Consultant* (Vehicle Engineering) &
Adjunct Professor of Mechanical Engineering

AREAS OF CONSULTING

- Vehicle Engineering – *Automobile design & testing – for Safety and Structural performance. Passive Safety Systems - airbags, crash sensors, structural components. Active Safety Systems - Pre-crash sensors, Crash Avoidance, Autonomous braking. Electric vehicles – functional safety.*
- Sustainable Transportation Technologies – *Vehicle designs for increased energy efficiency & safety. Mass reduction. Intelligent Tires &Vehicles. Mechatronics systems, Vehicle based sensors.*
- Product Liability and Forensic Engineering – *Automotive Safety; Accident Analysis; Performance Evaluation of vehicle structure, interior components, airbags, sensors, mechanical-electrical systems for safety. Vehicle design factors in pedestrians' safety. Pre-crash safety; accident avoidance. Safety of Electric and Hybrid Vehicles. Post-crash rescue criteria and design.*
- Intellectual Property*: Analysis of Patent infringement claims and patent validity factors in areas of automotive safety systems; airbags; vehicle-based sensors; restraint systems, interior components; Tires and TPMS.*

PARTIAL LIST OF CLIENTS & PROJECTS:

- State government– Department of Transportation – *Investigation of factors in injury to a rider in mass-transit bus and design analysis of the ingress-egress structure.*
- Trucking Company – *Analysis of factors causing rollover of fully-loaded tractor-trailer and injury to its driver.*
- US Department of Transportation; US Environmental Protection Agency – *Peer review of research on design of vehicles for 2025 CAFE standards; Evaluation of crash protection effectiveness of reduced-mass cars and SUVs.*
- Overseas automotive research organization – *Consulted on functional and accident safety of Electric vehicles, Test facility review and plan, Invited speaker - Conference on technology and regulatory scenarios.*
- Individual client – *Investigation of factors in head injury; Evaluation of design of remote-operated trunk-lid on. Analysis of available risk-mitigation technologies*.
- Individual client – *Investigation of windshield damage to a pickup truck and analysis of projectile trajectory.*
- Automotive manufacturer – *Investigation of car-to-SUV crash and factors in driver fatality; Performance analysis of frontal and A-pillar airbags and front structure.*
- Insurance company – *Investigation of factors in injury caused to front-seat passenger by external object; Performance of laminated windshields with pre-existing crack.*

- Two Automotive manufacturers – *Patent infringement and validity analysis of Tire Pressure Monitoring Systems.*
- Manufacturer of Small Car – *Directing the vehicle design to achieve top-level safety performance and regulatory compliance.*
-

RECENT TESTIFYING EXPERIENCE:

- Depositions *(California 2016) – Invalidity report and Rebuttal of infringement claims. Case 2:14-cv-02963-JAK; and Case 8:14-cv-00491-JAK.*
- Deposition (Florida, 2015) – *Analysis of impact risks from remote-operated trunk-lid and evaluation of risk-mitigation technologies.*
- Deposition (Kentucky, 2012) – *Case involving performance of airbag and vehicle structure in car-to-SUV crash.*

ACADEMIC CREDENTIALS

- **Ph.D.**, Mechanical Engineering & Applied Mechanics, University of Michigan.
- **M.S.,** Aerospace Engineering, Indian Institute of Science, Bangalore.

PREVIOUS WORK EXPERIENCE

- Consultant, M. P. Holcomb Engineering Corporation (1/2009- 9/2012)
- General Motors: (8/1978 -11/2008)
  - *Technical Fellow*: Vehicle Safety & Structures, General Motors Product Development Organization (1999-2008).
  - *Principal Engineer/Systems Manager/ Staff Engineer*, General Motors Engineering/ GM Research Laboratories, (1978-1999).
  - *Research Associate,* Highway Safety Research Institute (now UMTRI), University of Michigan (1975-78)

TEACHING EXPERIENCE

- Professor, Mechatronics Engineering (adjunct), Lawrence Technological University, (2009- current): *Intelligent Tires and Vehicles*: Graduate-level course,
- Invited Course at 2014 International Tire Industry Conference (Cologne): *Intelligent Vehicle-&-Tire Systems for Energy Efficiency and Safety.*
- Professor of Mechanical Engineering (adjunct), University of Alabama at Birmingham (2012-current): *Nonlinear Mechanics in Vehicle Engineering & Aerospace Systems*. (2013).
- GMU classes at General Motors for Engineers & Managers: *Design Integration for Automotive Safety (through 2007)*
- *Mechanical Engineering – Dynamics of Mechanical Systems* - Graduate and Professional Development Course, Department of Mechanical Engineering, University of Michigan (Dearborn), 1978-1985.

OTHER EXPERIENCE: AUTOMOTIVE INDUSTRY

- Chairman, Experts' Workgroup for Enhanced Vehicle Compatibility (*2003-2008)*
- US industry representative
  – Traffic safety regulations - *OICA/ Group of Experts on Passive Safety (France) (2007-2008)*
  - *VC COMPAT Final Workshop (Netherlands)* *2006*
  - *International Harmonization Association (Germany*) 2005
- GM representative to USCAR 2007-2008
  - Research projects in hydrogen fuel cell vehicle safety
- Technical Sessions Organizer, Chairperson
  - *FISITA (International Federation of Automotive Engineering Societies)*
  - *SAE Annual Congress* 1985 – current

PUBLICATIONS & PRESENTATIONS

TECHNICAL PUBLICATIONS – INTERNATIONAL JOURNALS & CONFERENCES

1. Article: "Intelligent Systems - Intelligent Tires and Vehicle Systems involving Tire-mounted sensors…", Tire Technology International, July 2014.
2. *Invited Lecture*, "Sustainable Transportation & Intelligent Vehicle and tire Technologies", Tire Technology Conference and Expo, Cologne, Germany**,** February 2013.
3. Verma, M**.**, Vantsevich, V., Keynote Speech "Intelligent Tires – Past, Present and Future**"**, *4th Annual Conference on Intelligent Tire Technology, December 2011.*
4. Verma, M., Goertz, A., **"**Preliminary Evaluations of Pre-crash Safety System Effectiveness**"**, Paper # 2010-01-1042, *SAE Annual Congress, April 2010.*
5. Verma, M., **"**Evaluation of MDB as a Car Surrogate in LTV-to-Car Frontal Compatibility Tests**":** Part II - GM Test Results**"**, *SAE Government - Industry Meeting, Washington DC, 2008*.
6. Verma, M., Lange, R. and McGarry, D., **"**A Study of US Crash Statistics from Automatic Crash Notification Data", Paper 07-0058, *Enhanced Safety of Vehicles Conference, Lyon, France, 2007*.
7. Subramaniam, K., Verma, M., Nagappala, R., Tedesco, R and Carlin, L., **"**Evaluation of Stiffness Matching Concepts for Vehicle Safety Improvement**",** Paper 07-0112, *Enhanced Safety of Vehicles Conference, Lyon, France 2007.*
8. Verma, M., "Enhanced Vehicle Collision Compatibility - Progress Report of US Technical Workgroup for Front-to-Front Compatibility**",** Paper 07-0291, *Enhanced Safety of Vehicles Conference, Lyon, France 2007.*
9. Peddi, S., Subramaniam, K., Sharma, V., Verma, M., Schuyten, H., **"**Development of Mobile Deformable Barrier as a Car Surrogate**",** Paper 2007-01-1179, *SAE Transactions - Journal of Passenger Cars – Mechanical Systems, 2007*.

10. Verma, M., **"**Progress in Vehicle Collision Compatibility Improvements**",** Paper 09, *VC COMPAT Final Workshop, Eindhoven, Netherlands, 2006.*
11. Verma, M., Lavelle, J., Tan, S., and Lange, R.,**"**Injury Patterns and Effective Countermeasures for Vehicle Collision Compatibility**"**, Paper 05-0173, *Enhanced Safety of Vehicles Conference, Washington DC, 2005.*
12. Verma, M., **"**Vehicle to Vehicle Crashes - Steps towards Increased Compatibility", *International Automotive Technical Conference, Dresden, Germany, 2005.*
13. Verma, M. Gupta, G., Sreekanth, M.,**"**Development of an MDB Concept for Crash Compatibility", Paper 2005-01-1374, *SAE Transactions, 2005, vol 114, p1645-1650.*
14. Verma, M., **"**EVC Technical Work Group Status; Chairman's Report**"**, *SAE Government - Industry Meeting, 2005.*
15. Verma, M., Nagappala, R., Murugan, M., Tung, Y., **"**Evaluation of Structural Parameters for vehicle crash compatibility**"**, *International Journal of Crashworthiness, vol. 9, no. 4, 2004.*
16. Verma, M., Nagappala, R., Tung, Y., Zimmerman, M., Murugan, M., Bernstein, M., **"**Significant Factors in Height of Force Measurements for Vehicle Collision Compatibility**"**, Paper 2004-01-1165, *SAE Annual Congress, Detroit, 2004.*
17. Verma, M., Lavelle, J., Lange, R., **"**Perspectives on Vehicle Crash Compatibility and Relationship to Other Safety Parameters**"**, Paper 412, *Enhanced Safety of Vehicles Conference, Nagoya, Japan, 2003.*
18. Verma, M., Lange, R, Lavelle, J., **"**Relationship of Crash Test Procedures to Vehicle Compatibility**"**, Paper 2003-01-0900, *SAE Transactions, 2003, vol112, pp920-928.*
19. Chandra, J., Wawa, C., Verma, M., "Implementation and Validation of a Finite Element Approach to Simulate Occupant Crashes with Airbags: Part 1- Airbag Mode**l",** *American Society of Mechanical Engineers, Applied Mechanics Division, Vol. 169, 1993.*
20. Chandra, J., Wawa, C., Verma, M., ***"***Implementation and Validation of a Finite Element Approach to Simulate Occupant Crashes with Airbags; Part II – Airbag Coupling with Crash Victims***", American Society of Mechanical Engineers, Applied Mechanics Division, Vol. 169, 1993*.
21. Verma, M., Repa, B., **"**Pedestrian Impact Simulation- A Preliminary Study**"**, Paper 831601, *Stapp Car Crash Conference, San Diego, 1983.*
22. Verma, M., "Transient Response Test Procedures for Measuring Vehicle Directional Control", *Vehicle System Dynamics, 1981.*
23. Verma, M., Gillespie, T., **"**Roll Dynamics of Commercial Vehicles**"**, *Vehicle System Dynamics, 1980.*
24. Verma, M., Scott, R., Segel, L., "Effect of Frame Compliance on the Lateral

Dynamics of Motorcycles", *Vehicle System Dynamics, 1980.*

25. Gillespie, T., Verma, M., **"**Analysis of Rollover Dynamics of Double-bottom Tankers", Paper 781065, SAE Annual Congress, 1978**.**
26. Verma, M., **"**Theoretical and Experimental Investigations of Motorcycle Dynamics", PhD Thesis, University of Michigan, 1978.
27. Verma, M., Segel, L., Sayers, M., Winkler, C., Watanabe, Y., **"**A Study of the Free-Control Dynamics of Single-track Vehicles: The Adequacy of Linear Analysis**"**, University of Michigan Research Report, 1977.
28. Verma, M., KrishnaMurthy, A., **"I**nelastic Post-buckling of Columns of Variable Flexural Rigidity**",** *Mechanics Based Designs of Structures & Machines, Vol. 3, 1974.*
29. Verma, M., KrishnaMurthy, A., **"**Nonlinear Vibrations of Nonuniform Beams with Concentrated Masses**",** *Journal of Sound & Vibration, Vol. 33, 1974.*
30. Verma, M., KrishnaMurthy, A., **"**Nonlinear Bending of Beams of Variable Cross-section", International Journal of Mechanical Sciences, 1973.
31. Verma, M., KrishnaMurthy, A**.,** **"**Minimum Mass Design of Beams of Variable Cross-section", American Society of Mechanical Engineers, Journal of Applied Mechanics, 1973**.**

SAMPLE INTERVIEWS AND WEB-PUBLISHED ARTICLES: (www.VEfact.com)

1. *Automobile Seat & Seatback Structure and Occupants' Safety in Crashes*; January 2010.
2. *Airbag Deployment, Occupant Safety and Role of Vehicle Structure*; February 2010.
3. *Pedestrian Impacts with Automobiles*; April 2011.
4. *Summary of Keynote speech on Intelligent Tire Technology*, December 2011.
5. *Trends in Automobile Safety: Analysis of Recent NCAP Front Crash Tests*; January 2012.
6. *When Two Automobiles Collide* – Side Impacts & Vehicle Occupants' Safety; July 2012.