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# Curriculum Vitae

**Brian Herbst, P.E.**  
Senior Engineer/President



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EXPERIENCE: SENIOR ENGINEER AND PRESIDENT  
SAFE LABORATORIES, LLC  
(2005- PRESENT)

- Design, perform and analyze automotive destructive and non-destructive tests evaluating automotive safety devices, automotive structural components and crashworthiness systems
- Research, design, implement and test alternative automotive safety systems
- Research and author automotive safety technical publications

SENIOR ENGINEER  
SAFETY ANALYSIS & FORENSIC ENGINEERING (SAFE)(1997 - 2004)  
(Formerly LIABILITY RESEARCH GROUP 1994-1997)

- Extensive study and research of real-world rollover accidents with respect to vehicle crashworthiness and occupant protection systems including interior padding, restraint systems and automotive structures
- Conduct three-dimensional occupant kinematic simulations using Articulated Total Body (ATB) and DYNAMAN
- Produce three-dimensional representations of accident reconstructions and occupant kinematics using advanced computer visualization programs
- Conduct three-dimensional photogrammetric analysis
- Inspect and document field accident and exemplar vehicles
- Review and collect field data and accident statistics

ACADEMIC TRAINING:

- Bachelor of Science, Mechanical Engineering, 1994  
University of California, Santa Barbara  
Graduate courses completed in Mechanical Engineering

PROFESSIONAL LICENSES:

- California Registered Professional Engineer, Mechanical #M30424

PROFESSIONAL AFFILIATIONS:

- American Society of Mechanical Engineers
- Society of Automotive Engineers
- National Society of Professional Engineers

PUBLICATIONS AND INVITED LECTURES:

Herbst B, Forrest S, Wang P, Chng D, Friedman D, Friedman K, "The Ability of 3 Point Safety Belts to Restrain Occupants in Rollover Crashes," Paper No. 96-S5-0-12, Fifteenth International Technical Conference on the Enhanced Safety of Vehicles (ESV), May 1996.

Friedman K, Friedman D, Forrest S, Meyer S, Herbst B, Chng D, Wang P, "Restraint Effectiveness During Rollover Motion" 1996 International Conference on the Biomechanics of Impact International Conference on the Biomechanics of Impact (IRCOBI) September 11 - 13, 1996, Ireland.

Meyer SE, Herbst B, "The Effects of Pretensioning on 3-Point Safety Belts on Occupants in Rollover Crashes," NAFE Conference, 1997.

Forrest S, Herbst B, "Comments to Docket No. 94-97; Notice 2, Federal Motor Vehicle Safety Standards (FMVSS); Roof Crush Resistance," April 28, 1997.

Herbst B, Forrest S, Meyer SE, "Strength Improvements to Automotive Roof Components," SAE 980209, SAE International Congress & Exposition, 1998.

Herbst B, Friedman D, "The Relationship Between Vertical Velocity and Roof Crush in Rollover Crashes," SAE 980211, 1998 SAE International Congress & Exposition, February 23-26, 1998.

Herbst B, Forrest S, Chng D, Sances A, "Fidelity of Anthropometric Test Dummy Necks in Rollover Accidents," Paper No. 98-S9-W-20, Sixteenth International Technical Conference on the Enhanced Safety of Vehicles (ESV), June 1998.

Khadilkar A, Sances A, Herbst B, Forrest S, Meyer S, "Head Injury Reduction with Roll Bar Padding," IEEE - Biomedical Engineering Society/Engineering in Medicine and Biology Society, 1st Joint Conference, Atlanta, GA, October 1999.

Sances A, Herbst B, Forrest S, Meyer SE, Khadilkar AV, "Biomechanical Analysis of Padding," Advances in Bioengineering, ASME, BED Volume 43, 1999.

Sances A, Herbst B, Forrest S, Meyer S, "Modeling of Frontal and Rollover Collisions and Restraint Analysis," 12<sup>th</sup> International Conference on Mathematical and Computer Modeling and Scientific Computing, Chicago, IL, 1999.

Meyer SE, Davis M, Chng D, Herbst B, Forrest S, "Three-Point Restraint System Design Considerations for Reducing Vertical Occupant Excursion in Rollover Environments," SAE 2000-01-0605, 2000 SAE International Congress and Exposition, Detroit, MI, 2000.

Meyer SE, Davis M, Forrest S, Chng D, Herbst B, "Accident Reconstruction of Rollovers - A Methodology," SAE 2000-01-0853, 2000 SAE International Congress and Exposition, Detroit, MI, 2000.

Sances A, Carlin FH, Herbst B, Forrest S, Meyer S, Khadilkar A, Friedman K, Bish J, "Vehicular Padding and Head Injury," Seoul, Korea, 2000 FISITA World Automotive Conference; 2000.

Herbst B, Chng D, Meyer SE, Forrest S, "Reinforcing Automotive Roofs with Composite Materials," Paper No. 00SAF008, ISATA 2000, Dublin, Ireland, 2000.

Chng D, Herbst B, Meyer SE, Forrest S, Davis M, "An Analytical Method for Calculating Roof Stiffness Factors From Roof Performance During Dynamic and Quasi-Static Loading Tests," Paper No. 00SAF007, ISATA 2000, Dublin, Ireland, 2000.

Sances A, Carlin FH, Herbst B, Forrest S, Meyer S, Khadilkar A, Friedman K, Bish J, "Studies of Vehicular Padding Materials," 44th Annual Proceedings of the Association for the Advancement of Automotive Medicine, Chicago, Illinois, 2000.

Herbst B, Forrest S, Meyer SE, Chng D, Davis M, "Vehicle Crashworthiness in Vertical Drop Tests," ASME 2000 International Mechanical Engineering Congress & Exposition, Orlando, Florida, 2000.

Meyer SE, Forrest S, Hayden J, Herbst B, "The Effect of Vertical Acceleration on Emergency Locking Seatbelt Retractors," ASME 2000 International Congress & Exposition, Orlando, Florida, 2000.

Forrest S, Meyer SE, Herbst B, "The Relationship of Roof Crush and Head Clearance on Neck Injuries in Rollovers," 10th International Conference on Biomedical Engineering, Singapore, 2000.

Meyer SE, Hock, Forrest S, Herbst B, Sances A, "Failure of Seatbelt Retractors with Vertical Acceleration," 10th International Conference on Biomedical Engineering, Singapore, 2000.

Meyer SE, Forrest S, Hock D, Herbst B, Sances A, "Test Methods for Evaluating Seatbelt Retractor Response in Multiplanar Acceleration Environments," Bioengineering Conference, American Society of Mechanical Engineers (ASME), BED-Vol. 50, 2001.

Herbst B, Meyer SE, Forrest S, "Roof Crush - An Analytical Method of Calculating Equivalent Vehicle Drop Height from Residual Roof Crush," AIRIL 2001 4th International Conference on Accident Investigation, Reconstruction, Interpretation and the Law, Vancouver, British Columbia, 2001.

Hayden J, Meyer SE, Herbst B, Hock D, Forrest S, "Curb Impacts - A Study in Occupant Kinematics and Energy Loss," APRIL 2001 4<sup>th</sup> International Conference on Accident Investigation, Reconstruction, Interpretation and the Law, Vancouver, British Columbia, 2001.

Meyer SE, Hock D, Herbst B, Forrest S, "Dynamic Analysis of ELR Retractor Spool out," SAE 2001 Automotive and Transportation Technology Congress and Exhibition, Barcelona, Spain, October 2001.

Herbst B, Forrest S, Meyer SE, Hock D, "Improving Rollover Crashworthiness Through Inverted Drop Testing," SAE 2001 Automotive and Transportation Technology Congress and Exhibition, Barcelona, Spain October 2001.

Herbst B, Forrest S, Meyer S, Hock D, "Simulated Tests of Large Animal Impacts," International Mechanical Engineering Congress and Exposition American Society of Mechanical Engineers (ASME), IMECE2001/BED-23101, New York, NY, 2001.

Sances A, Herbst B, Forrest S, Meyer S, Kumaresan S, Carlin F, "Biomechanical Modeling of Motor Vehicle Collision and Overview of Belt Restraint Analysis", International Conference on Biomedical Engineering, India, 2001.

Forrest S, Herbst B, Meyer S, Hock D, "Comments to 49 CFR Part 571, Docket No. 1999-5572, Notice 2, Federal Motor Vehicle Safety Standards (FMVSS); Roof Crush Resistance," December 6, 2001.

Meyer, SE, Hayden J, Herbst B, Hock D, Forrest S, "Curb Impacts - A Continuing Study in Energy Loss and Occupant Kinematics," SAE 2002-01-0557, 2002 SAE International Congress and Exposition, Detroit, MI, 2002.

Meyer SE, Herbst B, Forrest S, Syson SR, Sances A, Kumaresan S, "Restraints And Occupant Kinematics In Vehicular Rollovers," 39th Annual Rocky Mountain Bioengineering Symposium, Biomedical Sciences Instrumentation, Volume 38, ISA Volume 419, Copper Mountain, Colorado, April 2002.

Herbst B, Forrest S, Meyer SE, Hock D, "Alternative Roof Crush Resistance Testing with Production and Reinforced Roof Structures," SAE 2002-01-2076, International Body Engineering Conference and Exhibition, (IBEC), Paris, July 9-11, 2002.

Herbst B, Meyer SE, Forrest S, Syson S, Sances A, Kumaresan, "Analysis of Structural Deformation in Vehicular Drop Studies," International Mechanical Engineering Congress & Exposition, American Society of Mechanical Engineers (ASME), IMECE2002-32644, New Orleans, Louisiana 2002.

"Comments to 49 CFR Part 571, Docket #1999-5572 Notice 2 on Roof Crush Resistance", February 25, 2003.

Sances A, Kumaresan S, Clarke R, Renfroe D, Herbst B, Pozzi M, "Biomechanical Analysis of Motor Vehicle Seat Belt Buckles," 40th Annual Rocky Mountain Bioengineering Symposium, Biomedical Sciences Instrumentation, Volume 39, ISA Volume 437, Biloxi, Mississippi, April 2003.

Meyer SE, Hock D, Forrest S, Herbst B, Sances A, Kumaresan S, "Motor Vehicle Seat Belt Restraint System Analysis During Rollover," 40th Annual Rocky Mountain Bioengineering Symposium, Biomedical Sciences Instrumentation, Volume 39, ISA Volume 437, Biloxi, Mississippi, April 2003.

Forrest S, Herbst B, Meyer S, Sances A, Kumaresan S, "Inverted Drop Testing and Neck Injury Potential," 40th Annual Rocky Mountain Bioengineering Symposium, Biomedical Sciences Instrumentation, Volume 39, ISA Volume 437, Biloxi, Mississippi, April 2003.

Sances A, Kumaresan S, Meyer SE, Herbst B, Hock D, "Biomechanical Analysis of Motor Vehicle Seat Belt Restraint Spool Out," 22<sup>nd</sup> Southern Biomedical Engineering Conference, Charlotte, North Carolina, September 26 – 28, 2003.

Forrest SM, Herbst B, Meyer SE, Orton T, "Evaluating 'Real World' Roof Strength Through Inverted Drop Testing," American Society of Mechanical Engineers (ASME), Summer Bioengineering Conference, June 25-29, 2003, Key Biscayne, FL.

Forrest SM, Herbst B, Meyer SE, Orton T, "Factors in Rollover Neck Injury Potential," American Society of Mechanical Engineers (ASME), Summer Bioengineering Conference, June 25-29, 2003, Key Biscayne, FL.

Sances A, Kumaresan K, Herbst B, Meyer S, Hock D, "Biomechanical Analysis of Seatbelt Restraint Deformation," 22<sup>nd</sup> Southern Biomedical Engineering Conference, Charlotte, North Carolina, September 26 – 28, 2003.

Meyer SE, Herbst B, Forrest S, Sances A, Kumaresan S, "Design and Evaluation of a System for Testing and Analysis of Rollovers with Narrow Objects," 2003 ASME International Mechanical Engineering Congress & Exposition, Washington, D.C., November 16 – 21, 2003, IMECE2003-43104

Herbst B, Meyer SE, Forrest S, Sances A, Kumaresan S, "Acceleration Amplification in Safety Belt Buckle Systems," 2003 ASME International Mechanical Engineering Congress & Exposition, Washington, D.C., November 16 – 21, 2003, IMECE2003-43159

Meyer SE, Forrest S, Herbst B, Hayden J, Orton T, Sances A, Kumaresan S, "Testing and Injury Potential Analysis of Rollovers with Narrow Object Impacts," 41st Annual Rocky Mountain Bioengineering Symposium, Biomedical Sciences Instrumentation, Volume 40, ISA Volume 449, Fort Collins, Colorado, April 2004.

Herbst B, Forrest S, Meyer SE, Sances A, Kumaresan S, "Roof Crush Mitigation Techniques to Enhance Occupant Protection," International Symposium on Biomedical Engineering 2004, Bangkok, Thailand, November 16-18, 2004.

Herbst B, Hock D, Meyer SE, Forrest S, Sances A, Kumaresan S, "Epoxy Reinforcing for Rollover Safety," ASME International Mechanical Engineering Congress, Anaheim, California, November 13-19, 2004.

Hock D, Meyer SE, Herbst B, Forrest S, Renfroe DA, Hutchinson B, Canalichio T, Sances A, Kumaresan S, "Evaluation of Motor Vehicle Seatbelt Retractor Locking Devices," ASME International Mechanical Engineering Congress, Anaheim, California, November 13-19, 2004.

Meyer S, Herbst B, Sances, Jr. S, Kumaresan S, Clarke R, "Biomechanical Analysis of Occupant Kinematics in Rollover Motor Vehicle Accidents - Dynamic Spit Test," 2005 ISA Rocky Mountain Bioengineering Symposium, Cooper Mountain, Colorado, April 8 -10, 2005.

Forrest S, Meyer S, Herbst B, Orton T, Sances, Jr. S, Kumaresan S, "The Effect of Roof Strength on Reducing Occupant Injury in Rollovers," 2005 ISA Rocky Mountain Bioengineering Symposium, Cooper Mountain, Colorado, April 8 -10, 2005.

Forrest S, Orton T, Herbst B, Meyer S, Sances, Jr. S, Kumaresan S, "The Influence of Roof Crush on Glazing Retention and Occupant Containment in Rollovers," 2005 Summer Bioengineering Conference, June 22-26, 2005, Vail, CO.

Forrest S, Meyer S, Herbst B, Orton T, Pedder D, Cahill A, "Comments to DOT Docket No. NHTSA-2005-22143 (FMVSS 216: Roof Crush Resistance (NPRM))," November 21, 2005.

Meyer S, Forrest S, Hock D, Herbst B, Oliver A, "Comments to DOT Docket No. NHTSA-2005-22143 (FMVSS 216: Roof Crush Resistance (NPRM))," November 20, 2005.

Forrest S, Meyer S, Herbst B, Orton T, "Additional Comments to DOT Docket No. NHTSA-2005-22143 (FMVSS 216: Roof Crush Resistance) - Potential Roof Rack Issue," April 12, 2006.

Forrest S, Meyer S, Herbst B, Orton T, "90-day follow-up for previously submitted petition for review of Ford Explorer Compliance with FMVSS 216 – Docket No. NHTSA-2005-22904," April 11, 2006.

Forrest F, Orton T, Pedder D, Meyer S, Herbst B, Sances, Jr. A, Kumaresan S, "Investigation of Injury Potential Through Matched Pair Drop Testing." Rocky Mountain Bioengineering Symposium & International ISA Biomedical Sciences Instrumentation Symposium, Terre Haute, Indiana, April 7-9 2006.

"Comments to DOT Docket No. NHTSA-2005-22904: PowerPoint Presentation of Petition for Review of Ford Explorer Compliance with FMVSS 216," January 2006.

"Comments to DOT Docket No. NHTSA-2005-22904: Additional Information Regarding Previous Petition for Review of 1999-2001 Ford Explorer Compliance with FMVSS 216 Submitted to the NHTSA in September 2005," January 2006.

Meyer S, Herbst B, Hock D, "Restraint System Performance and Injury Potential to Belted Occupants in Automobile Rollover Crashes," IMECE2006-16068, Proceedings of IMECE2006, 2006 ASME International Mechanical Engineering Congress and Exposition, November 5-10, 2006, Chicago, Illinois, USA.

Herbst B, Forrest S, Meyer S, Hock D, Ward C, "Assessing Rollover Protection through the Deformable Occupant Compartment Impact Tester (DOCIT)," IMECE2006-16076, Proceedings of IMECE2006, 2006 ASME International Mechanical Engineering Congress and Exposition, November 5-10, 2006, Chicago, Illinois, USA.

Herbst B, Forrest S, Pedder D, Meyer S, "Inverted Drop Testing as a Mechanism to Evaluate Rollover Occupant Injury Potential," presented at Rocky Mountain Bioengineering Symposium & International ISA Biomedical Sciences Instrumentation Symposium 13-15 April 2007, Denver, Colorado.

Herbst B, Forrest S, Cahill A, Meyer S, C "Head And Neck Injury Potential In Inverted Impact Tests", ESV 07-0371-W, 20th International Technical Conference on the Enhanced Safety of Vehicles, June 18-21, 2007, Lyon, France.

Herbst B, Meyer S, Forrest S, "Parametric Analysis Of Rollover Occupant Protection Using A Deformable Occupant Compartment Testing Device", ESV 07-0378-W, 20th International Technical Conference on the Enhanced Safety of Vehicles, June 18-21, 2007, Lyon, France.

Forrest S, Herbst B, Carlson D and Meyer S, "Rollover Roof Strength Improvements Using Epoxy Reinforcement", ICRASH Conference, July 22-25, 2008, Kyoto, Japan.