R. Matthew Brach, PhD, PE

Principal, Manager of Illinois Operations

Dr. R. Matthew Brach, Ph.D., P.E. is a Principal with ESI in the Aurora, Illinois office, where he also manages the Illinois office operations. His principal areas of professional activity include vehicle impact analysis, vehicle dynamics, and automotive accident reconstruction. He has a Ph.D. in Mechanical Engineering from Michigan State University, an M.S. in Mechanical Engineering from the University of Illinois at Chicago, and a B.S. in Electrical Engineering from the University of Notre Dame. He served as an adjunct professor of Mechanical Engineering at Lawrence Technological University. He has held engineering positions with the Ford Motor Company, Exponent, and the IIT Research Institute. He is a member of the Society of Automotive Engineers, the American Society of Mechanical Engineers, the National Association of Professional Accident Reconstruction Specialists, and the Institute of Electrical and Electronics Engineers.

Licenses & Certifications

- State of Illinois P.E. LicenseNo.062-68077
- State of Michigan P.E. License No.620-045038
- State of Indiana P.E. License No.10403311

Positions Held

Engineering Systems Inc., Aurora, Illinois

- Principal, 2024 – Present
- Senior Managing Consultant, 2014 - 2023
- Manager of Illinois Operations, 2017 - Present

Brach Engineering, LLC, South Bend, IN

- Engineering Consultant, 2002 - 2014

Exponent, Inc., Farmington Hills, MI

- Managing Engineer, 1998 - 2002

Lawrence Technological University, Southfield, MI

- Adjunct Professor, 1994 - 2000

Ford Motor Company, Dearborn, MI

- Engineer, 1993 - 1998

Michigan State University, East Lansing, MI

- Graduate Student, 1989 - 1993

R. Matthew Brach
Principal, Manager of Illinois Operations

Email: rmbrach@engsys.com
Phone: 630-851-4823

ESi
4215 Campus Dr.
Aurora, IL 60504

Education

PhD, Mechanical Engineering. Michigan State University. 1993

M.S., Mechanical Engineering, University of Illinois at Chicago, IL 1986

BS, Electrical Engineering University of Notre Dame. 1982

Areas of Specialization

Vehicle Impact Analysis

Vehicle Dynamics

Automotive Accident Reconstruction

Railroad Grade Crossing Crash Analysis and Reconstruction

MPC Products Corporation, Skokie, IL

- Engineer, 1987 - 1989

Triodyne, Inc., Niles, IL

- Engineer, 1985 - 1987

IIT Research Institute, Chicago, IL

- Associate Research Engineer, 1982 - 1985

Publications

"Bicycle Pitch-over Reconstruction Analysis",

R. Matthew Brach, Mirielle Kelley, J. Van Poppel, SAE Technical Paper 2025-01-8684, SAE International, Warrendale, PA, 2025

“Addition of Tire Forces into Low-Speed Bumper-to-Bumper Crash Reconstruction Simulation Models”,

R. Matthew Brach, Jacob Stegemann, Emmanuel Jay Manuel, and Nicholas Civitanova, SAE Technical Paper 2024-01-2479, SAE International, Warrendale, PA, 2024.

"Validation of the Han-Brach Vehicle-Pedestrian Impact Mechanics Model",

R. Matthew Brach, David Fortenbaugh and Jon Van Poppel, Collision Magazine, volume 13, issue 2, pgs. 8 - 23, Spring 2020.

"Sensitivity Analysis of Various Vehicle Dynamic Simulation Software Packages Using Design of Experiments (DOE)",

R. Matthew Brach, Shawn Capser, Emmanuel Jay Manuel, Joshua Rogers, Robert Bailey, Paper 2020-01-0639, SAE International, Warrendale, PA, 2020.

"Sensitivity Analysis of Simulated Postimpact Vehicle Motion Using Design of Experiments (DOE)",

R. Matthew Brach and Shawn P. Capser, SAE Technical Paper 2018-011-0526, 2018. Recipient of SAE Oral Presentation Award.

"Nonlinear Optimization in Vehicular Crash Reconstruction,"

(with Raymond M. Brach and Richard A. Mink), SAE Int. J. Trans. Safety 3(1):2015, doi:10.4271/2015-01-1433.

"Analysis of High-Speed Sideswipe Collisions Using Data from Small Overlap Crash Tests,"

(with Raymond M. Brach and Katherine Pongetti), Paper 2014-01-0469, SAE International, Warrendale, PA, 2014.

"Uncertainty of CRASH3 /Δ V and Energy Loss for Frontal Collisions,"
(with Raymond M. Brach and Andrew Louderback), Paper 2012-01-0608, SAE International, Warrendale, PA, 2012.

"The Tire-Force Ellipse (Friction Ellipse) and Tire Characteristics,"
(with Raymond M. Brach), Paper 2011-01-0094, SAE International, Warrendale, PA, 2011.

"Insertion Loss: Train & Light-Vehicle Horns and Railroad-Crossing Sound Levels,"
National Highway-Rail Grade Crossing Safety Training Conference, New Orleans, LA, 2009.

"Tire Models for Vehicle Dynamic Simulation and Accident Reconstruction,"
(with Raymond M. Brach), Paper 2009-01-0120, SAE International, Warrendale, PA, 2009.

"Analysis of Collisions, Conservation of Linear Momentum: Can We Do Better?"
(with Raymond M. Brach), Collision Magazine, Volume 2, Issue 1, Spring 2007.

"Analysis of Collisions Involving Articulated Vehicles,"
(with Raymond M. Brach), Paper 2007-01- 0735, SAE International, Warrendale, PA, 2007.

"Residual Crush Energy Partitioning: Normal and Tangential Energy Losses,"
(with Raymond M. Brach and Kevin Welsh), Paper 2007-01-0737, SAE International, Warrendale, PA, 2007.

"Uncertainty When Reconstructing Accidents," Michigan Defense Quarterly, Vol. 23, No. 3, January 2007,
(with Raymond M. Brach) [reprinted: "Uncertainty When Reconstructing Accidents," Indiana Civil Litigation Review, Vol IV, 2007, with Philip E. Kalamaros].

"Modeling Combined Braking and Steering Forces,"
(with Raymond M. Brach), Paper 2000-01- 0357, SAE International, Warrendale, PA, 2000.

"Crush Energy and Planar Impact Mechanics for Accident Reconstruction,"
(with Raymond M. Brach), Paper 980025, SAE International, Warrendale, PA, 1998.

"Automotive Powerplant Isolation Strategies,"
Paper 971942, SAE International, Warrendale, PA, 1997.

"The Nonlinear Response and Passive Vibration Isolation of Rigid Bodies,"
(with A.G. Haddow), Journal of Machine Vibration, Vol. 5, Number 3, pp. 131-141, 1996.

"Harmonic Response and Passive Vibration Isolation of Rigid Bodies,"

Ph.D. Thesis, Michigan State University, 1995.

"On the Dynamic Response of Hydraulic Engine Mounts,"

(with A.G. Haddow), SAE Paper 931321, presented at SAE Noise and Vibration Conference, Traverse City, MI, May 1993. Recipient of SAE Oral Presentation Award.

"A Review of Impact Models for Vehicle Collision Analysis,"

(with Raymond M. Brach), SAE Paper 870048, Warrendale, PA, 1987.

"Impact Models for Planar Rigid Body Collisions,"

requirement for Master of Science degree, University of Illinois at Chicago, 1986.

Presentations

"Insertion Loss: Train & Light-Vehicle Horns and Railroad-Crossing Sound Levels,"

(with Raymond M. Brach), 158th Meeting, Acoustical Society of America, San Antonio, TX, Proceedings of Meetings on Acoustics, 2009.

"Tire Models Used in Accident Reconstruction Vehicle Motion Simulation,"

(with Raymond M. Brach), XVII Europaischen Vereinigung fur Unfallforschung und Unfallanalyse (EVU) - Conference, Nice, France, 2008.

"Evaluation of the Squeak Produced by Automotive Interior Trim Materials in Contact with Automotive Glass,"

presented at the Automotive and Transportation Interiors Exposition, (with C. Kennedy), May 1996.

"Nonlinear Response of a Class of Engine Mounts,"

presented at the 4th Conference on Nonlinear Vibrations, Stability and Dynamics of Structures and Mechanisms, Virginia Polytechnic Institute and State University, (with A. G. Haddow and T. Önsay), June 1992.

Continuing Education, Short Course Lectures Presented

- **Vehicles Accident Reconstruction Methods** - Invited Lecture at Collision and Injury Dynamics, Torrance, CA, February 2023
- **Pedestrian Throw Models for Frontal Vehicle-Pedestrian Collisions** - Invited Speaker, ARC-CSI Crash Conference, Las Vegas, Nevada, September 2017
- **Vehicle Accident Reconstruction Methods** - SAE Continuing Education Seminar, 2004 - 2016
- **Vehicle Accident Reconstruction Methods** - Two-day seminar at ITAI/EVU Conference, Hinckley, England, September 2009
- **Experimental Program to Study the Tire-Roadway Friction Related to Drag Sleds -** Presentation and testing at F3T2 Conference, Houston, Texas, September 2006

- **Vehicle Accident Reconstruction Methods** - Three-day seminar for TRL, Bramshill, Berkeshire, England, June 2006
- **Tire Forces** - SAE TOPTEC, Phoenix, Arizona, May 2001
- **Invited Lecturer** - SAE Industrial Lectureship Program, 2000 - 2001

Continuing Education, Short Courses Attended

- **Event Data Recorder Update and Analysis**, Ruth Consulting, September 2023
- **Advanced Applications of Heavy Vehicle EDR Data**, SAE International, Appleton, WI, June 2023
- **Bendix Spicer - Advanced Technology Training Curriculum**, Elyria, Ohio, October 2021
- **Traffic Signal Timing Records Interpretation and Analysis**, Traffic Signal Academy, University of Tennessee - Knoxville, Instructor: Airton Kohls, Ph.D., Norcross, GA, October 2020
- **Applying Automotive EDR Data to Traffic Crash Reconstruction**, SAE Continuing Education Seminar, June 2019
- **Applied Vehicle Dynamics Course**, Precision Auto Research, Autobahn Country Club, Joliet, IL, October 2018
- **Accessing and Interpreting Heavy Vehicle Event Data Recorders**, SAE International, Charlotte, NC, May 2016
- **Forklift Operator Safety Training and Certification**, Aurora, IL, December 2015
- **Fundamentals of Heavy Truck Dynamics, SAE International**, Troy, MI, December 2013
- **Commercial Vehicle Braking Systems, SAE International**, Troy, MI, June 2012
- **Tire and Wheels Safety Issues**, SAE International, Troy, MI, May 2012
- **CDR Data Analyst**, Collision Safety Institute, Lansing, MI, July 2011
- **Air Brake Systems Training Program**, Bendix Spicer, Huntington, IN, May 2011
- **Legal Issues for Professional Engineers**, HalfMoon LLC, South Bend, IN, January 2011
- **CDR Technician Certification**, Collision Safety Institute, Elk Grove Village, IL, August 2009
- **Investigation of Gas and Electric Appliance Fires**, Fire Findings, Benton Harbor, MI, 2003
- **Photogrammetry in Accident Reconstruction**, SAE, Troy, MI, 1999
- **Fundamental of Seat Ride Dynamics**, SAE, Dearborn, MI, 1994

Professional Affiliations/Honors

- **Society of Automotive Engineers (SAE)** - Chair of the Body, Chassis, Safety and Structures Activity (2014 - 2017)
- **American Society for Mechanical Engineers (ASME)**
- **Institute of Electrical and Electronics Engineers (IEEE)**
- **National Association of Professional Accident Reconstruction Specialists (NAPARS)**
- **Forest R. McFarland Award** - SAE International, 2010
- **Amoco Foundation Fellowship, Department of Mechanical Engineering** - Michigan State University, 1990 - 1993

Books

- **SAE International's Dictionary of Vehicle Accident Reconstruction and Automotive Safety**, By R. Matthew Brach, PhD PE, Publication R-556, SAE International, 2023.
- **Vehicle Accident Analysis and Reconstruction Methods**, (with Raymond M. Brach and James J. Mason), 3rd Edition, Publication R-516, SAE International, 2022.