



R. MATTHEW BRACH, Ph.D., P.E.
PRINCIPAL
MANAGER OF ILLINOIS OPERATIONS

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Mr. 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.

Areas of Specialization

Vehicle Impact Analysis
Vehicle Dynamics
Automotive Accident Reconstruction
Railroad Grade Crossing Crash Analysis and Reconstruction

Education

Ph.D., Mechanical Engineering, Michigan State University, East Lansing, MI, 1995
M.S., Mechanical Engineering, University of Illinois at Chicago, Chicago, IL, 1986
B.S., Electrical Engineering, University of Notre Dame, South Bend, IN, 1982

Licensed Professional Engineer (P.E.)

State of Illinois.....License No.062-068077
State of Michigan.....License No.620-1045038
State of IndianaLicense No.PE10403311

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

Positions Held

Engineering Systems Inc., Aurora, IL
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

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

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, Berkshire, 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

Publications/Presentations

"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 / .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,"
(with Raymond M. Brach), 158th Meeting, Acoustical Society of America, San Antonio,
TX, Proceedings of Meetings on Acoustics, 2009.
- "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.
- "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.
- "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,"
Journal of Machine Vibration, Vol. 5, Number 3, pp. 131-141, (with A.G. Haddow), 1996.

"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.

"Harmonic Response and Passive Vibration Isolation of Rigid Bodies,"
Ph.D. Thesis, Michigan State University, 1995.

"On the Dynamic Response of Hydraulic Engine Mounts,"
SAE Paper 931321, presented at SAE Noise and Vibration Conference, (with A.G.
Haddow), Traverse City, MI, May 1993. Recipient of SAE Oral Presentation Award.

"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.

"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.

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.