R. Matthew Brach, PhD, PE

Principal, Manager of Illinois Operations

Dr. R. Matthew Brach, PhD, PE, is a Principal with ESI in the Aurora, Illinois, office. He manages the Illinois office operations. His areas of professional activity include vehicle impact analysis, vehicle dynamics, and automotive accident reconstruction.

He has a PhD in Mechanical Engineering from Michigan State University, an MS in Mechanical Engineering from the University of Illinois at Chicago, and a BS 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.

Education

PhD, Mechanical Engineering. Michigan State University. 1993

MS, Mechanical Engineering. University of Illinois Chicago. 1986

BS, Electrical Engineering. University of Notre Dame. 1982

Licenses & Certifications

- State of Illinois P.E. License 062-68077
- State of Indiana P.E. License 10403311
- State of Michigan P.E. License 620-045038

Positions Held

Engineering Systems Inc., Aurora, Illinois

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

Contact Information

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ESi Aurora

4215 Campus Drive
Aurora, IL 60504

Areas of Specialization

- Vehicle Impact Analysis
- Vehicle Dynamics
- Automotive Accident Reconstruction
- Railroad Grade Crossing Crash
- Analysis & Reconstruction

Brach Engineering, LLC, South Bend, Indiana

- Engineering Consultant, 2002–2014

Exponent, Inc., Farmington Hills, Michigan

- Managing Engineer, 1998–2002

Lawrence Technological University, Southfield, Michigan

- Adjunct Professor, 1994–2000

Ford Motor Company, Dearborn, Michigan

- Engineer, 1993–1998

Michigan State University, East Lansing, Michigan

- Graduate Student, 1989–1993

MPC Products Corporation, Skokie, Illinois

- Engineer, 1987–1989

Triodyne, Inc., Niles, Illinois

- Engineer, 1985–1987

IIT Research Institute, Chicago, Illinois

- 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, Berkeshire, England, June 2006
- **Tire Forces** - SAE TOPTEC, Phoenix, Arizona, May 2001
- **Invited Lecturer** - SAE Industrial Lectureship Program, 2000 – 2001

Continuing Education, Short Course Attended

- **Hyundai-Kia & Tesla EDR Tools Technician** - University of North Florida Institute for Police Technology and Management (IPTM), Aurora, IL, 2025
- **Passenger Restraint Safety Systems** - University of North Florida Institute for Police Technology and Management (IPTM), Aurora, IL, 2025
- **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

- Recipient, Oral Presentation Award, 1993 & 2018

- Chair of Body, Chassis, Safety and Structures Activity, 2014–2017
- Recipient, Forest R. McFarland Award, 2010

American Society for Mechanical Engineers

Institute of Electrical and Electronics Engineers

National Association of Professional Accident Reconstruction Specialists

Michigan State University

- Amoco Foundation Fellowship, Department of Mechanical Engineering, 1990–1993

Publications

"Bicycle Pitch-Over Reconstruction Analysis," **R.M. Brach**, M. Kelley, and J. Van Poppel, Paper 2025-01-8684, SAE International, 2025.

"Addition of Tire Forces into Low-Speed Bumper-to-Bumper Crash Reconstruction Simulation Models," **R.M. Brach**, J. Stegemann, E.J. Manuel, and N. Civitanova, Paper 2024-01-2479, SAE International, 2024.

"Validation of the Han-Brach Vehicle-Pedestrian Impact Mechanics Model," **R.M. Brach**, D. Fortenbaugh, and J. Van Poppel, Collision Magazine, Vol. 13, No. 2, pp. 8–23, 2020.

"Sensitivity Analysis of Various Vehicle Dynamic Simulation Software Packages Using Design of Experiments (DOE)," **R.M. Brach**, S. Capser, E.J. Manuel, J. Rogers, and R. Bailey, Paper 2020-01-0639, SAE International, 2020.

"Sensitivity Analysis of Simulated Postimpact Vehicle Motion Using Design of Experiments (DOE)," **R.M. Brach** and S.P. Capser, Paper 2018-011-0526, SAE International, 2018.

"Nonlinear Optimization in Vehicular Crash Reconstruction," **R.M. Brach**, Raymond M. Brach, and R.A. Mink, SAE Int. J. Trans. Safety, Vol. 3, No. 1, doi:10.4271/2015-01-1433, 2015.

"Analysis of High-Speed Sideswipe Collisions Using Data from Small Overlap Crash Tests," **R.M. Brach**, Raymond M. Brach, and K. Pongetti, Paper 2014-01-0469, SAE International, 2014.

"Uncertainty of CRASH3 Δ V and Energy Loss for Frontal Collisions," **R.M. Brach**, Raymond M. Brach, and A. Louderback, Paper 2012-01-0608, SAE International, 2012.

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

"Tire Models for Vehicle Dynamic Simulation and Accident Reconstruction," **R.M. Brach** and Raymond M. Brach, Paper 2009-01-0120, SAE International, 2009.

"Analysis of Collisions, Conservation of Linear Momentum: Can We Do Better?" **R.M. Brach** and Raymond M. Brach, Collision Magazine, Vol. 2, No. 1, 2007.

"Analysis of Collisions Involving Articulated Vehicles," **R.M. Brach** and Raymond M. Brach, Paper 2007-01-0735, SAE International, 2007.

“Residual Crush Energy Partitioning: Normal and Tangential Energy Losses,” **R.M. Brach**, Raymond M. Brach, and K. Welsh, Paper 2007-01-0737, SAE International, 2007.

“Uncertainty When Reconstructing Accidents,” **R.M. Brach** and P.E. Kalamaros, Michigan Defense Quarterly, Vol. 23, No. 3, 2007.

“Uncertainty When Reconstructing Accidents,” **R.M. Brach** and P.E. Kalamaros, Indiana Civil Litigation Review, Vol. 4, 2007.

“Modeling Combined Braking and Steering Forces,” **R.M. Brach** and Raymond M. Brach, Paper 2000-01-0357, SAE International, 2000.

“Crush Energy and Planar Impact Mechanics for Accident Reconstruction,” **R.M. Brach** and Raymond M. Brach, Paper 980025, SAE International, 1998.

“Automotive Powerplant Isolation Strategies,” **R.M. Brach**, Paper 971942, SAE International, 1997.

“The Nonlinear Response and Passive Vibration Isolation of Rigid Bodies,” **R.M. Brach** and A.G. Haddow, Journal of Machine Vibration, Vol. 5, No. 3, pp. 131–141, 1996.

“Harmonic Response and Passive Vibration Isolation of Rigid Bodies,” **R.M. Brach**, Ph.D. Thesis, Michigan State University, 1995.

“On the Dynamic Response of Hydraulic Engine Mounts,” **R.M. Brach** and A.G. Haddow, Paper 931321, SAE International, 1993.

“A Review of Impact Models for Vehicle Collision Analysis,” **R.M. Brach** and Raymond M. Brach, Paper 870048, SAE International, 1987.

“Impact Models for Planar Rigid Body Collisions,” **R.M. Brach**, Master of Science, University of Illinois at Chicago, 1986.

Presentations

“Vehicles Accident Reconstruction Methods,” **R.M. Brach**, Collision and Injury Dynamics, Torrance, CA, February 2023.

“Pedestrian Throw Models for Frontal Vehicle-Pedestrian Collisions,” **R.M. Brach**, ARC-CSI Crash Conference, Las Vegas, NV, September 2017.

“Vehicle Accident Reconstruction Methods,” **R.M. Brach**, SAE Continuing Education Seminar, 2004–2016.

“Vehicle Accident Reconstruction Methods,” **R.M. Brach**, ITAI/EVU Conference, Hinckley, England, September 2009.

“Insertion Loss: Train & Light-Vehicle Horns and Railroad-Crossing Sound Levels,” **R.M. Brach**, National Highway-Rail Grade Crossing Safety Training Conference, New Orleans, LA, 2009.

“Insertion Loss: Train & Light-Vehicle Horns and Railroad-Crossing Sound Levels,” **R.M. Brach** and Raymond M. Brach, 158th Meeting of the Acoustical Society of America, San Antonio, TX, 2009.

"Tire Models Used in Accident Reconstruction Vehicle Motion Simulation," **R.M. Brach** and Raymond M. Brach, XVII Europaischen Vereinigung fur Unfallforschung und Unfallanalyse, Nice, France, 2008.

"Experimental Program to Study the Tire-Roadway Friction Related to Drag Sleds," **R.M. Brach**, F3T2 Conference, Houston, TX, September 2006.

"Vehicle Accident Reconstruction Methods," **R.M. Brach**, TRL, Berkshire, England, June 2006.

"Tire Forces," **R.M. Brach**, SAE TOPTEC, Phoenix, AZ, May 2001.

"Industrial Lectureship Program," **R.M. Brach**, SAE International, 2000–2001.

"Evaluation of the Squeak Produced by Automotive Interior Trim Materials in Contact with Automotive Glass," **R.M. Brach** and C. Kennedy, Automotive and Transportation Interiors Exposition, May 1996.

"On the Dynamic Response of Hydraulic Engine Mounts," **R.M. Brach** and A.G. Haddow, SAE Noise and Vibration Conference, Traverse City, MI, May 1993.

"Nonlinear Response of a Class of Engine Mounts," **R.M. Brach**, A.G. Haddow, and T. Önsay, 4th Conference on Nonlinear Vibrations, Stability and Dynamics of Structures and Mechanisms, Virginia Polytechnic Institute and State University, June 1992.

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.