



**Exponent<sup>®</sup>**

Engineering & Scientific Consulting

**John Zolock, Ph.D., P.E.**

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## Professional Profile

Dr. Zolock's expertise in the field of engineering includes analytical and experimental evaluation of vehicle crashworthiness and occupant protection, vehicle dynamics, and mechanics. He specializes in automobile, bus, pedestrian, heavy truck, and rail vehicle accident investigation and reconstruction.

His experience in photogrammetry, passenger vehicle and heavy truck event data recorder (EDR) download and analysis, full scale rail vehicle testing, physical testing and evaluation of the design and performance of Roll Over Protection Structures (ROPS) for off-highway recreational vehicles, and automobile crash, dolly rollover, handling testing, sled testing, and FMVSS testing enhances his consulting contributions to the reconstruction of accidents.

His work has emphasized study in the areas of materials, applied mechanics, dynamics, vibrations, finite element analysis, vehicle handling and collision simulation, biomechanics and occupant injury modeling, and component and full-scale field-testing.

Prior to joining Exponent, Dr. Zolock held the position of Mechanical Engineer at the Department of Transportation / Research and Innovative Technology Administration / Volpe National Transportation Systems Center in Cambridge, MA, for 9 years. His core work specialized in research and development projects related to railroad vehicle/track interaction, train derailment cause finding and prevention, train make-up and performance, rail vehicle suspension design and performance, rail vehicle crashworthiness, accident injury causation, and rail vehicle occupant safety and protection.

Dr. Zolock is familiar with test and/or analysis protocols used to demonstrate compliance with numerous National Highway Traffic Safety Administration (NHTSA) FMVSS Regulations, Federal Railroad Administration Regulations (FRA), American Public Transportation Association (APTA) recommended practices, and the ANSI/ROHVA standards.

While working at the Volpe Center, Dr. Zolock wrote a Ph.D. dissertation at Tufts University titled, "A Methodology for the Modeling of Forced Dynamical Systems from Time Series Measurements using Time-Delay Neural Networks." The dissertation studies the use of neural networks to predict the wheel/rail force response of rail vehicles to track geometry variation. While at Penn State University, Dr. Zolock wrote a thesis titled, "Experimental Observation and Characterization of Tire Standing Waves." At Penn State, Dr. Zolock focused classroom studies on experimental and analytical dynamics, vibrations, modal analysis, signal analysis, mechanics of materials, and composite materials. Previous work experience at Micro Motion included experimental and analytical modal analysis of coriolis based mass flow meters, high pressure feedthru testing and design, and coriolis mass flow meter design.

## Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Tufts University, 2005

M.S., Engineering Science and Mechanics, Penn State University, 1997

B.S., Mechanical Engineering, Grove City College, 1994

Recipient of 2012 SAE Arch T. Colwell Award for outstanding paper (2010-01-0515) presented at SAE

## Licenses and Certifications

Professional Engineer, Connecticut, #PEN.0028194

Professional Engineer Mechanical, Massachusetts, #48127

Professional Engineer, New York, #88006

Professional Engineer, Pennsylvania, #PE079651

Professional Engineer, Rhode Island, #PE.0009625

## Prior Experience

Senior Mechanical Engineer (Structures and Dynamics Division), U.S. Department of Transportation/Research and Innovative Technology Administration/Volpe National Transportation Systems Center, 1998-2006

Research Assistant, Department of Engineering Science and Mechanics, The Pennsylvania State University, 1995-1997

Teacher Assistant in the Department of Engineering Science and Mechanics, The Pennsylvania State University, 1995

Mechanical Engineering Intern, Micro Motion Incorporated, 1992-1993

## Professional Affiliations

Society of Automotive Engineers (member)

American Society of Mechanical Engineers (member)

National Society of Professional Engineers (PE Status and member)

## Publications

Croteau, J., Toney-Bolger, M., Isaacs, J.L., Shurtz, B. et al., Seatback Strength and Its Effect on In-Position and Out-of-Position ATD Loading in High-Speed Rear Impact Sled Tests, SAE Technical Paper 2022-01-0856, 2022, doi:10.4271/2022-01-0856.

Rapp van Roden, E. and Zolock, J., Using the Instantaneous Center of Rotation to Examine the Influence of Yaw Rate on Occupant Kinematics in Eccentric Planar Collisions, SAE Technical Paper 2022-01-0826, 2022, doi:10.4271/2022-01-0826.

Parenteau C, Croteau J, and Zolock J, The Effect of Crash Severity and Structural Intrusion on ATD

Responses in Rear-End Crashes. SAE Technical Paper 2020-01-1224, 2020, <https://doi.org/10.4271/2020-01-1224>.

Zolock J, Senatore C, Yee R, Larson R et al. The use of stationary object radar sensor data from Advanced Driver Assistance Systems (ADAS) in accident reconstruction. SAE Technical Paper 2016-01-1465, 2016, doi:10.4271/2016-01-1465.

Larson R, Croteau J, Bare C, Zolock J, et al. Steering maneuver with furrow-tripped rollovers of a pickup and passenger car. SAE Technical Paper 2015-01-1477, 2015. doi:10.4271/2015-01-1477.

Heller M, Sharpe S, Newberry W, Dibb A, Zolock J, et al. Occupant kinematics and injury response in steer maneuver-induced furrow tripped rollover testing. SAE International Journal of Transportation Safety 3(2):2015. doi:10.4271/2015-01-1478.

Parker D, Zolock J, Keefer D. A study of vehicle impacts during dolly rollover tests and comparison to frontal and side impact tests. Society of Automotive Engineers, 2014-01-0529, April 2014.

Croteau J, Zolock J, Larson R, Bare C, Peterson D, Parker D. Dynamic response of vehicle roof structure and ATD neck loading during dolly rollover tests. Society of Automotive Engineers, 2010-01-0515, April 2010.

Zolock J, Greif R. A methodology for the modeling of forced dynamical systems from time series measurements using time-delay neural networks. J Vibration Acoustics 2009; 131(1).

Zolock J, Greif R. A methodology for the modeling of rail vehicles from time series measurements using time-delay neural networks. American Society of Mechanical Engineers Rail Transportation Division Fall Technical Conference, RTDF2007-46022, November 2007.

Martinez E, Zolock J, Tyrell D. Crush analyses of multi-level equipment. American Society of Mechanical Engineers, IMECE2006-13214, November 2006.

Martinez E, Zolock J, Tyrell D. Review of severe deformation recommended practice through analysis-comparison of two cab car end frame designs. American Society of Mechanical Engineers, ASME2005-70043, March 2005.

Zolock J, Greif R. Application of time series analysis and neural networks to the modeling and analysis of forced vibrating mechanical systems. American Society of Mechanical Engineers, ASME2003-55519, November 2003.

Zolock JD, Tyrell D.C. Locomotive cab occupant protection. American Society of Mechanical Engineers, ASME2003-44121, November 2003.

Martinez E, Zolock J, Tyrell D. Rail-car impact tests with steel coil: Car crush. American Society of Mechanical Engineers, JRC2003-1656, April 2003.

Tyrell D, Zolock J, VanIngen-Dunn C. Train-to-train impact test: Occupant protection experiments. American Society of Mechanical Engineers, IMECE2002-39611, November 2002.

Tyrell D, Zolock J, VanIngen-Dunn, C. Rail passenger equipment collision tests: Analysis of occupant protection measurements. Rail Transportation, American Society of Mechanical Engineers, RTD-Vol. 19, November 2000.

Chatterjee A, Cusumano JP, Zolock JD. On contact-induced standing waves in rotating tires: Experiment and theory. Journal of Sound and Vibration 1999; 227(5):1049-1081.

Chatterjee A, Cusumano JP, Zolock JD. Standing waves in a simple model of a rotating balloon tire.

ASME Winter Annual Meeting November 1997.

Cusumano JP, Zolock JD. An experimental study of tire standing waves on a small-scale test rig. SAE Aerospace Atlantic Conference, SAE961301, May 1996.

### **Technical Reports**

Tyrell D, Severson K, Zolock J, Perlman A. Passenger rail two-car impact test Volume I: Overview and selected results. U.S. Department of Transportation/Federal Railroad Administration; DOT/FRA/ORD-01/22.1, January 2002.

### **Public Abstracts of Presentations**

Zolock J, Lavoie M, Catastrophic Motor Vehicle Accidents and the Benefits of Early Involvement by Counsel and Experts, Massachusetts Defense Lawyers Association, May 21, 2021.

Zolock J, Use of Computer Simulation to Analyze Auto Accidents, National Association of Subrogation Professionals, June 18, 2019.

Zolock J, Shapiro B, Bracher P, Use of Computer Simulation to Analyze Accidents with Emphasis on Vehicle Handling and Collisions, Claims and Litigation Management 2019 Transportation Webinar Series, February 13, 2019.

Zolock J, Danthurthi S, Use of Computer Simulation in Litigation — with emphasis on Vehicles, Humans, and Structures, Maryland Defense Counsel, May 17, 2018.

Zolock J, Senatore C, Investigation and Reconstruction of Automobile and Heavy Truck Accidents, American Society of Safety Engineers, March 22, 2017.

Zolock J, Loud W, Passenger Car and Heavy Truck Advanced Driver Assistance Systems - How will this technology change accident investigation, Claims and Litigation Management Webinar, February 8, 2017.

Zolock J. Passenger car and heavy truck advanced driver assistance systems: How will technology change accident investigation? Philadelphia Association of Defense Counsel Annual Meeting, June 7, 2016.

Zolock J, Rodowicz K., Accident Reconstruction & Biomechanics in Auto Liability Cases: Testing & the Seat Belt Defense, November 24, 2015.

Zolock J, Seusing C, Loud W, Event data from automobile Electronic Control Modules (ECM's), Claims and Litigation Management 2013 Transportation Committee Mini-Conference, June 14, 2013.

Zolock J, Frank B, Event data from automobile Electronic Control Modules (ECM's), Massachusetts Defense Lawyers Annual Meeting, May 12, 2011.

Zolock JD. Rail passenger equipment outermost end door removable panels. Federal Railroad Administration — Railroad Safety Advisory Committee Passenger Safety Working Group/Emergency Preparedness Task Force Meeting, Boston, MA, April 19 2005.

Zolock JD. Artificial neural network approach to modeling dynamic mechanical systems. University of Rhode Island Seminar Series in Mechanical Engineering, Kingston, RI, April 23, 2004.

Zolock JD, Tsai T. Equalized truck performance modeling and testing. Transportation Research Board 78th Meeting, Washington, D.C, January 10-14 2000.

Zolock JD, Carr G. A case study of commuter rail low speed derailments. ARM-Corporation Wheel/Rail

Interface Seminar, Chicago, IL, May 12-13, 1999.

Zolock JD, Cusumano JP. An experimental study of tire standing waves. 133rd Meeting of the Acoustic Society of America, State College, PA, June 16-19, 1997.

## Additional Education & Training

Introduction to Brake Control Systems: ABS, TCS, and ESC, SAE International 2023

Motorcycle Collision Reconstruction, Lightpoint Learning, March 2023

Bendix Online Air Brake Training Course ABT101, 2023

Satellite Photogrammetry, EZ-pdh.com, 2023

Aerial Photogrammetry, EZ-pdh.com, 2023

Introduction to sUAS for Land Surveyors, EZ-pdh.com, 2023

Airborne Topographic LiDAR, EZ-pdh.com, 2023

Stress and Strain in Soils, EZ-pdh.com, 2023

Engineering Description of Soils and Rocks, EZ-pdh.com, 2023

Accident Reconstruction Digital Summit, SAE International, 2022

HVE Forum, Engineering Dynamics Company LLC, 2022

Forensic Photography Symposium, Eugene Liscio, 2022

Accident Reconstruction, The Autonomous Vehicle and ADAS, SAE International, 2021

HVE Forum Workshop, Engineering Dynamics Company LLC, 2020

Side Impact Occupant Safety and CAE, SAE International, 2019

FAA Part 107 Aeronautical Knowledge Test Preparation Course, Drone Pilot Ground School, 2019

World Reconstruction Exposition, 2016

Accessing and Interpreting Heavy Vehicle Event Data Recorders Seminar, SAE International, 2015

Investigating Motor Vehicle Crashes with Utility Poles and Trees, SSR Training, 2014

Field Inspections: Tips and Techniques, The Practicing Institute of Engineering Inc, 2014

Crash Data Retrieval User Summit, Collision Safety Institute, 2014

Crash Data Retrieval Technician Level I and II, Collision Safety Institute, 2013

Vehicle Frontal Crash Occupant Safety and CAE, SAE International, 2013

HVE Forum Workshop, Engineering Dynamics Company LLC, 2012

Bosch Crash Data Retrieval Data Analyst Course, Collision Safety Institute, 2011

Bosch Crash Data Retrieval Technician Level 1 Course, Collision Safety Institute, 2011

Vehicle Dynamics for Passenger Cars and Light Trucks e-Seminar, SAE International, 2011

Hazardous Waste Operations and Emergency Response Training, 29 CFR 1910.120

Highway-Rail Grade Crossing Safety Course, University of Wisconsin, 2008

Engineering Fundamentals of Rail Transit Passenger Systems: Light Rail, Commuter Rail, and Rapid transit, University of Wisconsin, 2008

Traffic Accident Reconstruction, Northwestern University Center for Public Safety, 2007

Occupant and Vehicle Kinematics in Rollovers, SAE International, 2007

Injuries, Anatomy, Biomechanics, and Federal Regulations Seminar, Society of Automotive Engineers, 2001

Railroad Derailment Cause Finding and Prevention Seminar, Rail Sciences Inc., 1999

Dale Carnegie Leadership Training Course Graduate and Course Assistant, 1993-1994