



Bradley Heinrichs

MSc PEng

Principal, Senior Engineer

contact

✉ brad.heinrichs@meaforensic.com

☎ 778.724.1621

📍 Vancouver

expertise

Collision Reconstruction

areas of specialization

Crash simulation

Vehicle dynamics

Tire friction

Low speed impacts

Electronic crash data

Occupant dynamics

Statistical analysis

Research

A Senior Engineer at MEA Forensic, Brad Heinrichs leads the Collision Reconstruction group in Vancouver. Brad has investigated thousands of crashes involving passenger and commercial vehicles, motorcycles, bicycles, pedestrians, and animals. In addition to determining how cars move and interact during a crash, he has analyzed a variety of specific issues such as speed, collision severity, seat belt use, and avoidance opportunities.

Brad has a Bachelor's degree in Engineering Physics from the University of British Columbia and a Master's degree in Mechanical Engineering from the University of Manitoba. He is a registered professional engineer and has testified in court as an expert witness, a role he sees as "extending the abilities of the court." Judges and juries are called upon to make important decisions, but they can't be expected to know everything. "The court won't necessarily understand the significance of a tire mark," he observes. "That's where we come in." Brad works to draw the story out of the physical evidence left behind after a crash. Ultimately, his role is to provide the court with the facts it needs to come to a just conclusion.

Computer simulation programs have become a basic tool for collision reconstruction engineers. Using physics equations thousands and thousands of times, these programs calculate the movements of a car in response to initial velocity, collisions, road shape, and driver inputs. Brad leads MEA's involvement with PC-Crash, a simulation program that the firm uses and sells. Brad has taught PC-Crash courses to many engineering firms and law enforcement agencies across Canada and the US, and to specialists around the world.

Since Brad joined MEA, forensic engineering has progressed considerably. Brad has contributed by leading research into the



accuracy of crash simulation programs, methods to reconstruct low-speed collisions, and factors that affect tire friction. He adds that “we also have more tools at our disposal— laser scanning, crash data in vehicles and more powerful simulation methods. We can answer more kinds of questions than ever before.”

education

Master of Science, Mechanical Engineering, University of Manitoba, 1996

Bachelor of Applied Science, Engineering Physics (with Honours), University of British Columbia, 1994

professional status

Registered Professional Engineer

Professional Engineers of Ontario, November 2011.

Engineers and Geoscientists BC, January 2000.

professional experience

MEA Forensic Engineers & Scientists

Principal, Senior Engineer, 1997 to present

Conducts technical investigations, primarily in motor vehicle collision reconstruction. Integrally involved in the majority of the research performed at MEA, including occupant dynamics, crash test dummy validation, bumper and bumper component performance in low speed collisions, and tire friction. Qualified as an expert in accident reconstruction and occupant dynamics in the Provincial and Supreme Courts of British Columbia.

Atomic Energy of Canada, Ltd., Pinawa, MB

Research Scientist, January to November 1996

Employed with Atomic Energy of Canada Ltd.'s Reactor Safety Division in Pinawa, Manitoba. Responsible for the design of a novel sensor to determine the distribution of water and steam in high temperature and pressure two-phase flows. Also responsible for the design, execution, and analysis of experimental studies in the characteristics of two-phase flow patterns in CANDU nuclear reactor heat transport system components.

University of Manitoba, Winnipeg, MB

Graduate Researcher, 1994 to 1995

Work consisted of developing control systems to introduce compliance and more intuitive control to large industrial hydraulic robots, with the resulting design being patented.

UBC Cooperative Education Program, Vancouver, BC

Co-op Student, 1991 to 1993

Employed in an engineering capacity for each of the four-month summer periods from 1991 through 1993. In 1991, conducted studies on the effectiveness of conventional pulp screening technology for the Pulp and Paper Research Institute of Canada in Vancouver, BC. In 1992, performed experiments and developed models describing the high-temperature thermal emissivity of CANDU nuclear reactor components with Atomic Energy of Canada Ltd. In 1993, wrote computer programs to assist in the analysis of medical data gathered on magnetic resonance imaging (MRI) scanners at St. Paul's Hospital in Vancouver, BC.

research activities

Lead investigator on a study of sensitivity in computer simulations to initial inputs.

Lead investigator on a study of motor vehicle design and modeling of energy losses in low-speed aligned vehicle collisions.

Co-investigator in a study of the offset of seat belt slack and anchor location on the forward excursion of crash test dummies in frontal collisions.

Co-investigator in a study of rear-impact test dummy response to rear end collisions in 20 common new vehicles, at severities to damage threshold.

Co-investigator in study assessing the accuracy and precision of speeds reported by on-board vehicular data recorders ("black boxes").

Co-investigator in study assessing the accuracy and precision of speed changes recorded by airbag control modules.

Lead author in a parametric study the effect of vehicle speed and tire grade on tire friction in locked-wheel braking. Vehicular speed loss before skid mark deposition was quantified as a function of a remote speed at start of skid.

Co-investigator in a study of the effect of head restraint placement and seat back stiffness on the kinematic and kinetic response of anthropomorphic test dummies in low speed rear end impacts.

Co-investigator in a parametric study on the effect of impact pulse parameters on the kinematic response of anthropomorphic test dummies in low speed rear end impacts.

Performed data analysis for a study of the kinematic and kinetic response of anthropomorphic test dummies in low speed rear end impacts. Neck loads were measured with load cells and calculated from head accelerations and head restraint loading data. The responses of two different dummies was compared with that of human volunteers.

Lead author of a study of the performance of pickup truck bumpers in low speed impacts. Front and rear bumpers of 5 different pickup trucks were tested, using both barrier and vehicle impacts.

Co-investigator in a study to validate a method of using bumper component tests to predict full vehicle behaviour in low-speed collisions. Developed a mathematical model to correlating full vehicle dynamics to individual component dynamics. The model was validated with 1624 tests.

Performed data analysis for a study of tire friction under wet and dry conditions. These 540 tests showed the difference between three grades of tires, and documented the delay between brake application and the start of skidding.

Performed data analysis for a study of occupant kinematics in low speed rear end collisions. Sophisticated statistical analysis determined the set of the most influential of 31 independent factors for each of 27 dependent kinematic parameters.

Co-investigator in a study to validate a method of using bumper component tests to predict full vehicle behaviour in low-speed collisions. Developed a mathematical model to correlating full vehicle dynamics to individual component dynamics. The model was validated with 1624 tests.

Performed data analysis for a study of tire friction under wet and dry conditions. These 540 tests showed the difference between three grades of tires, and documented the delay between brake application and the start of skidding.

Performed data analysis for a study of occupant kinematics in low speed rear end collisions. Sophisticated statistical analysis determined the set of the most influential of 31 independent factors for each of 27 dependent kinematic parameters.

publications

Bias and Repeatability of Measurements from 3D Scans Made Using iOS-Based Lidar

The Effect of Using the Same Tire Friction for Both Vehicles in Impact Speed Reconstructions

Motor vehicle crash reconstruction: Does it relate to the heterogeneity of whiplash recovery?

Low-speed impact testing of pickup truck bumpers

lectures & presentations

Brad has taught PC-Crash reconstruction courses to over 150 engineering and law enforcement specialists.

May 2014 – The Basics of Forensic Engineering. Canadian Defence Lawyers Bootcamp, Vancouver, BC.

July 2012 – Taught PC-Crash Expert topics course, Vancouver, BC.

July 2012 – Taught PC-Crash Essentials course, Vancouver, BC.

April 2012 – Sensitivity of Collision Simulation Results to Initial Assumptions. Presentation of research findings. SAE International Congress and Exposition, Detroit, Michigan.

September 2011 – Taught PC-Crash Expert topics course, Los Angeles, CA.

September 2011 – Taught PC-Crash Essentials course, Los Angeles, CA.

April 2011 – Taught PC-Crash special topics course, Orlando, FL.

August 2010 – Taught PC-Crash Expert topics course, Vancouver, BC.

August 2010 – Taught PC-Crash Essentials course, Vancouver, BC.

May 2010 – Taught PC-Crash to RCMP, Langley, BC.

April 2010 – Taught PC-Crash special topics course, Los Angeles, CA.

November 2009 – Taught PC-Crash Essentials course, Las Vegas, NV.

August 2009 – Taught PC-Crash Essentials and Expert courses, Vancouver, BC.

April 2009 – Taught PC-Crash special topics course, Toronto, ON.

September 2008 – Taught PC-Crash custom course at Sintra Engineering, Edmonton, AB.

August 2008 – Taught PC-Crash Essentials and Expert Animations courses, Vancouver, BC.

April 2008 – Taught PC-Crash Expert course, Las Vegas, NV.

February 2008 – Taught PC-Crash Essentials course, Las Vegas, NV.

August 2007 – Taught PC-Crash Essentials and Advanced courses, Vancouver, BC.

June 2007 – Taught PC-Crash Basic course, Las Vegas, NV.

January 2007 – Taught PC-Crash Advanced course, Las Vegas, NV.

August 2006 – Taught PC-Crash Basic and Advanced courses, Vancouver, BC.

2001 – 2010 – Accident reconstruction presentations, to various Insurance Corporation of British Columbia (ICBC) claim centres. Involved in presentations at many ICBC claim centres, presenting on low speed collision reconstruction and “black box” data recorder technology. Many presentations also involved low speed vehicle collision demonstrations.

March 1999 – Comparison testing of bumper isolators. Presentation of research findings. SAE International Congress and Exposition, Detroit, MI.

training and professional development

June 27-28, 2023 – Cloud Compare training, ai2-3D Forensics, Online.

February 2022 – Photogrammetry: Forensic Applications Using Photomodeler, DCM Technical Services, Online.

March 22–25, 2021 – iNPUT-ACE Video Evidence Symposium 2021, Online.

April 2012 – SAE International Congress and Exposition, Detroit, MI.

June 2010 – The Tire as a Vehicle Component and Tire and Wheel Safety, Dr. Joseph D. Walter, Richmond, BC.

May 2010 – WATAI Expert Witness Seminar, Redmond, WA.

May 2008 – Motorcycle Skills Course, BC Safety Council, Richmond, BC

March 2008 – PC-Crash Easter Seminar, Linz, Austria.

November 2007 – Crash Data Retrieval System Operator, Collision Safety Institute, Seattle, WA.

November 2007 – Crash Data Retrieval System Data Analyst Course, Collision Safety Institute, Seattle, WA.

March 1999 – SAE International Congress and Exposition, Detroit, MI.

February 1999 – Whiplash-Associated Disorders, World Congress, Vancouver, BC.
