

Darrin Richards, P.Eng., P.E.
Principal Engineer

Professional Profile

Mr. Richards is the President of Synaptic Analysis Consulting Group, Inc. Mr. Richards' expertise includes accident reconstruction and injury biomechanics. He specializes in vehicle dynamics, occupant kinematics, and occupant protection. He has analyzed occupant protection and the performance of automotive restraint systems, and has tested seatbelts, pretensioners, front airbags, side airbags, and child restraint systems. He has investigated the effectiveness of motorcycle, bicycle, skiing, and hockey helmets as well as hard hats. Mr. Richards has analyzed hundreds of accidents and accidental injuries involving transportation, the workplace, and sport. This includes the investigation and reconstruction of automobile, bicycle and motorcycle accidents, as well as sporting accidents involving human injury. Mr. Richards has conducted full-scale automotive sled tests and crash tests using anthropomorphic test devices (ATDs) in order to evaluate injury potential.

Mr. Richards has testified on issues involving injury biomechanics, accident reconstruction, snow sports and helmet protection. Mr. Richards has testified in British Columbia, Washington, Arizona, Utah, and California. Prior to joining Synaptic Analysis Consulting Group, Mr. Richards was a consultant with Exponent at the Test and Engineering Center in Phoenix, Arizona.

Education and Awards

M.S., Bioengineering, Arizona State University, 1999

B.Eng., Mechanical Engineering, Technical University of Nova Scotia, 1994

B.Sc., Mathematics, Dalhousie University, 1990

- Society of Automotive Engineering Arch T. Colwell Merit Award for outstanding paper and original contribution to subject matter, 2006
- Sachiko Yahashi Memorial Award for best conference paper at the 16th International Symposium on Skiing Trauma and Safety, 2005

Licenses and Certifications

Registered Professional Engineer, Arizona, #45697

Registered Professional Engineer, British Columbia, #124405

Prior Experience

Managing Engineer, Exponent, Inc., 2007–2009
Senior Engineer, Exponent, Inc., 2004–2007
Adjunct Professor of Mathematics, Birmingham Southern College, 2002–2003
Senior Engineer, Forensic Dynamics, Inc., 2000–2003
Engineer, Biomechanics Research and Consulting, Inc., 1998–2000

Professional Affiliations

- American Society for Testing and Materials—ASTM
 - Committee F27 on Snow Skiing
 - Committee F08 on Sports Equipment and Facilities
- International Society of Biomechanics—ISB
- Society of Automotive Engineers—SAE
- Southwestern Association of Technical Accident Investigators—SATAI

Patents

Patent 6,758,083 B2: Apparatus and Method of Dynamic Inertial Balance for Golf Clubs. 9 pages, 19 claims, 5 figures, awarded July 6, 2004, filed September 11, 2002 (Yamaguchi G, Schwatken B, Richards D).

Selected Publications

Bussone WR, Bove RT, Thomas R, Richards D, Prange MT. Six-Degree-of-Freedom Accelerations: Linear Arrays Compared with Angular Rate Sensors. SAE World Congress, 2010-01-1017, Society of Automotive Engineers, Warrendale, PA, 2010.

Van Arsdell W, Marsden A, Amirault D, Oltman S, Richards D, Prange M. Effect of padding on child restraint performance during side impact collisions. SAE World Congress, 2009-01-1244, Society of Automotive Engineers, Warrendale, PA, 2009.

Bussone W, Moore T, Richards D, Bove R, Scher I, Prange M. Everyday Head Accelerations of a Pediatric Population. SAE World Congress, 2009-01-0383, Society of Automotive Engineers, Warrendale, PA and in SAE Int. J. Passeng. Cars - Mech. Syst. 2009; 2(1):565–586.

Scher I, Harley E, Richards D, Thomas R. Likelihood of Brain Injury in Motorcycle Accidents: A Comparison of Novelty and DOT-Approved Helmets. SAE World Congress, 2009-01-0248, Society of Automotive Engineers, Warrendale, PA, 2009.

Richards D, Carhart M, Scher I, Thomas R, Hurlen N, Head Kinematics During Experimental Snowboard Falls: Implications for Snow Helmet Standards. Journal of ASTM International, Vol. 5, No.6, June 2008 (Paper ID JAI101406).



Scher I, Richards D, Carhart M, Thomas R, Hurlen N, Lam T. Pediatric head and neck injuries in snow sports: Evaluating the Influence of Helmets. *Journal of ASTM International*, Vol 5 No.4, April 2008 (Paper ID JAI101400).

Richards D, Carhart M, Raasch C, Pierce J, Steffey D, Ostarello A. Incidence for thoracic and lumbar spine injuries for restrained occupants in frontal collisions. *Proceedings, 50th Annual Association for the Advancement of Automotive Medicine*, Chicago, IL, October 16–18, 2006.

Scher I, Cargill R, Vijayakumar V, Richards D, Kuzel M. Examining bumper cars as a surrogate for low-speed rear-end and frontal collisions. *5th World Congress of Biomechanics*, Munich, Germany, July 2006.

Scher I, Richards D, Carhart M. Head Injury in snowboarding: Evaluating the protective role of helmets. *Journal of ASTM International*, Vol 3, No. 4, April 2006 (Paper ID JAI14203). Also: *Skiing Trauma and Safety, Sixteenth Volume, ASTM STP 9034*, 2006.

Newberry W, Lai W, Carhart M, Richards D, Brown J, Raasch C. Modeling the effects of seat belt pretensioners on occupant kinematics during rollover. *SAE World Congress, 2006-01-0246*, and *Transactions Journal of Passenger Cars, Society of Automotive Engineers*, Warrendale, PA, 2006.

Yamaguchi G, Ashby B, Lai W, Carhart M, Richards D, Ford Corrigan C. Occupant mechanics in rollover simulations of high and low aspect ratio vehicles. *SAE World Congress, 2006-01-0451*, Society of Automotive Engineers, Warrendale, PA, 2006.

Kuzel M, Werner S, Richards D. The effect of stiffness coefficients on output variables in EDSMAC4 simulations. *SAE World Congress, 2006-01-1396*, Society of Automotive Engineers, Warrendale, PA, 2006.

Scher I, Richards D, Carhart M. Head contact after catching an edge: An examination of snowboarding helmets. *Knee Surgery, Sports Traumatology, Arthroscopy* 2006; 14(1): 97, January.

Richards D, Scher I, Vijayakumar V, Carhart M, Larson R, Taylor S, Ford Corrigan C. Repetitive head loading: Accelerations during cyclic, everyday activities. *Proceedings, XXth Congress of the International Society of Biomechanics*, Cleveland, OH, July 2005.

Scher I, Richards D, Vijayakumar V, Carhart M, Ford Corrigan C, Jaekel D. Coronal head accelerations during vigorous activities of daily living. *Proceedings, Summer Bioengineering Conference, American Society of Mechanical Engineers (ASME)*, Vail, CO, June 2005.

Lai W, Ewers B, Richards D, Carhart M, Newberry W, Ford Corrigan C. Evaluation of human surrogate models for rollover. *SAE World Congress, 2005-01-0941*, Society of Automotive Engineers, Warrendale, PA, 2005.



Yamaguchi G, Carhart M, Larson R, Richards D, Pierce J, Raasch C, Scher I, Ford Corrigan C. Electromyographic activity and posturing of the human neck during rollover tests. SAE World Congress, 2005-01-0302, Society of Automotive Engineers, Warrendale, PA, 2005

Yamaguchi G, Richards D, Larson R, Carhart M, Cargill R, Lai W, Ford Corrigan C. Development of a computational method to predict occupant motions and neck loads during rollovers. SAE World Congress, 2005-01-0300, Society of Automotive Engineers, Warrendale, PA, 2005.

Selected Talks and Presentations

Richards D, Ivarsson J, Scher I, Thomas R. Modern Hockey Equipment and its Relationship to Head Injuries. Fifth Symposium on Safety in Ice Hockey, Denver, CO, May 2008.

Richards D, Scher I. Staying ahead of the game—Design, protection and limitations of recreational sports helmets. Defense Research Institute (DRI) Product Liability Conference, Product Liability in the Global Economy, Phoenix, AZ, February 2008.

Richards D. Guest Faculty, Arizona State Bar Association's College of Trial Advocacy Mock Trials, Phoenix, AZ, July 2007.

Scher I, Richards D, Carhart M. Pediatric head and neck injuries: Evaluating the influence of helmets. 17th International Symposium on Skiing Trauma and Safety, Aviemore, Scotland, May 2007.

Richards D, Carhart M, Scher I. Kinematics of a snowboard fall: Implications for snowboard helmet testing. 17th International Symposium on Skiing Trauma and Safety, Aviemore, Scotland, May 2007.

Richards D. Guest Faculty, Arizona State Bar Association's College of Trial Advocacy Mock Trials, Phoenix, AZ, July 2006.

Richards D. Helmet Safety. IntraWest 2006 Risk Management Conference, Stratton, VT, June 2006.

Richards D, Carhart M, Scher I. A Comprehensive Look At Helmet Safety. National Ski Area Association, Winter Conference, Squaw Valley, CA, March 2006.

Richards D, Scher I, Carhart M. Snow Helmets and Head Injury. ASTM Summer Meeting of Committee F27 on Snow Skiing, July 2005.

Richards D. Guest Faculty, Arizona State Bar Association's College of Trial Advocacy Mock Trials, Phoenix, AZ, July 2005.



Scher I, Richards D, Carhart M. Head contact after catching an edge: An examination of snowboarding helmets. 16th International Symposium on Skiing Trauma and Safety, Arai, Niigata, Japan, April 2005.

Invited Lectures

Richards, D. Head Injury and Helmets, University of British Columbia, Department of Mechanical Engineering, Injury Biomechanics Course (ME 436/536), Vancouver BC, March 2010.

Richards D. Education in Biomechanics and Mechanical Engineering. The University College of the Cariboo, Kamloops, BC, January 2002.

Richards D. Injury Biomechanics and Biomechanics Research. The University College of the Cariboo, Kamloops, BC, February 2001.

