

CURRICULUM VITAE

Christopher J. Furbish

Biomechanical Engineer / Accident Reconstructionist

Education

- 1999 **Brown University** – Providence, RI
Bachelor of Science, Engineering
Concentration in Biomedical Engineering
Research focused in biomechanics and included investigation and analysis of the emerging practice in tissue engineering of autologous cultured chondrocyte implantation into the knee joint as a treatment for damaged cartilage. Conducted a finite element analysis and visualization of loading on the trapezium and metacarpal bones using CT imaging scans and modeled with the software ABAQUS. Compared and analyzed the effectiveness in preventing injury of differing designs of inline skate wrist guards from impact testing.
- 1998 **University of New South Wales** – Sydney, Australia
Study Abroad

Employment History

- April 2013 - Present **Biomechanical Research & Testing, LLC** – Long Beach, CA
Biomechanical Engineer and Accident Reconstructionist
Responsible for the investigation and analysis of injury-causing events, which includes vehicle and site inspections, accident reconstruction, and necessary biomechanical engineering calculations. Conducts ongoing research to evaluate the biomechanics, human kinematic response, and injury potential of vehicular accidents and other activities. Performs fully instrumented tests utilizing human subjects and/or human surrogates. Data collected and analyzed include accelerations, velocities, displacements, forces, high speed film/video, and vehicle crush and dynamics. Has published research and received training on the retrieval and analysis of data from automobile event data recorders (EDR). Conducts biomechanical and accident reconstruction analyses and provides forensic consultation for automobile accidents and various events for purposes of litigation, including accident reconstruction, occupant kinematics, occupant force exposure, and injury potential.
- Feb. 2011 - April 2013 **Accident & Biomechanical Consulting, LLC** – Phoenix, AZ
Biomechanical Engineer and Accident Reconstructionist
Conducted biomechanical engineering analysis of injury claims and injury-causing accidents. This included performing accident reconstructions, vehicle damage analysis, occupant kinematic evaluation, restraint analysis, site inspections, conducting crash tests, and evaluation of protective gear. Injury mechanism analysis and evaluation of injury potential was investigated on vehicle collisions, pedestrian accidents, helmet analysis, sports and recreation injuries, and restraint effectiveness. Innovative research in these areas was performed.

July 2006 - **Biodynamics Engineering, Inc.** – Phoenix, AZ
Jan. 2011 *Biomechanical Engineer*

Performed biomechanical research and analysis of injury-causing accidents by preparation of written reports and summaries. This included vehicle and scene inspections, restraint and airbag evaluations, and accident reconstruction. Additionally, evaluation was conducted of accident reports, depositions, medical records, and diagnostic tests. Engineering calculations and medical research was conducted to determine causation and mechanics of injury. Biomechanical evaluations of low and high speed vehicle collisions, fall injuries, sports injuries, helmet and restraint effectiveness, and assault incidents were conducted.

June 2001 - **Biomechanics Research & Consulting, Inc.** – Tempe, AZ
July 2006 *Case Engineer and Certified Inspector*

Performed accident reconstruction and/or biomechanical engineering analyses of motor vehicle accidents with injury claims. This included conducting vehicle and scene inspections, accident reconstructions, injury mechanism investigation, and evaluation of medical records. Designed and participated in dynamic impact and quasi-static testing of vehicle bumper systems and components.

Accreditations and Certifications

2015 **Engineering Dynamics Corporation** – Burbank, CA
EDC Simulations Training Course

2012 **Collision Safety Institute, Inc.** – Glendale, AZ
Crash Data Retrieval (CDR) Technician Level I & II
Crash Data Retrieval (CDR) Data Analyst

2012 **EOS Systems, Inc.** – Las Vegas, NV
PhotoModeler Collision Investigation

2011 **Accreditation Commission for Traffic Accident Reconstruction (ACTAR)**
Traffic Accident Reconstructionist – ACTAR #2247

2005 **Collision Safety Institute, Inc.** – San Diego, CA
Crash Data Retrieval (CDR) System Operator Certification

2001 **Vale National** – Fresno, CA
Auto Estimatics 2000 & Star 2000 Certification

Professional Affiliations

National Association of Professional Accident Reconstruction Specialists (NAPARS)

Society of Automotive Engineers (SAE)

Southwestern Association of Technical Accident Investigators (SATAI)

California Association of Accident Reconstruction Specialists (CA²RS)

Publications

Vandiver, W, Anderson, R, Ikram, I, Randles, B and Furbish, C, "*Analysis of Crash Data from a 2012 Kia Soul Data Recorder*," SAE Technical Paper 2015-01-1445, in Occupant Protection: Event Data Recorders (EDR), Society of Automotive Engineers, Inc., Warrendale, PA, April 2015.

Randles, BC, Voss, DP, Ikram, IN, Furbish, CJ, Welcher, JB, and Szabo, TJ, "*Acceleration Testing and Modeling of Vehicle Kinematics Under Idle Conditions*," SAE Paper 2014-01-0484, in Occupant Protection: Accident Reconstruction, Society of Automotive Engineers, Inc., Warrendale, PA, April 2014.

Anderson, RL and Furbish, CJ, "*Forces in Vehicle Side-view Mirror Collisions*," Abstract in Proceedings of the 66th Annual Meeting of the American Academy of Forensic Sciences, Volume 20, 2014.

Furbish CJ, Ivory MA, Hoffman MR, Anderson RD and Anderson RL, "*Steering Column Loads and Upper Extremity Motions During Low Speed Rear-End Collisions*," SAE Paper 2011-01-0275, in Rear Impact, Rollover, and Side Impacts, 2011 (SP-2303), Society of Automotive Engineers, Inc., Warrendale, PA, April 2011.

Ivory MA, Furbish CJ, Hoffman MR, Miller ER, Anderson RL, and Anderson RD, "*Brake Pedal Response and Occupant Kinematics During Low Speed Rear-End Collisions*," SAE Paper 2010-01-0067, in Accident Reconstruction, 2010 (SP-2267), Society of Automotive Engineers, Inc., Warrendale, PA, April 2010.

Furbish CJ, Ward P, and Der Avanessian H, "*Increased Risk of Submarining and Lower Extremity Injuries Associated with Obesity in Frontal Impacts*," Abstract in Proceedings of the 62nd Annual Meeting of the American Academy of Forensic Sciences, Volume 16, 2010.

Furbish CJ, Ward P, and Der Avanessian H, "*Determining Vehicle Speed in a Fatal Pedestrian Impact: A Case of Tampered Evidence*," Abstract in Proceedings of the 61st Annual Meeting of the American Academy of Forensic Sciences, Volume 15, 2009.

Furbish CJ, Ward C, and Der Avanessian H, "*Identifying Fault in a Fatal Pedestrian Impact*," Abstract in Proceedings of the 60th Annual Meeting of the American Academy of Forensic Sciences, Volume 14, 2008.

Furbish CJ, Ward C, and Hoffman MR, "*Airbag Injury Risk to Older Children Occupying the Front Passenger Seat*," Abstract in Proceedings of the 59th Annual Meeting of the American Academy of Forensic Sciences, Volume 13, 2007.

Research and Testing

March 2018 Performed and participated in a series of low speed broadside impacts at various angles between Camrys and a Corolla. Instrumented human volunteers and Hybrid III test dummies were utilized in both the bullet and target vehicles. High-speed video analysis was conducted from multiple angles. Vehicle dynamics, vehicle damage analysis, EDR data, and human/dummy occupant kinematics were documented and analyzed. All tests were performed in Las Vegas, NV.

Jan. 2018 Performed and participated in side-swipe, angled broadside, offset rear-end impacts between a Malibu and a Mustang, child pedestrian and pedcyclist dummy impacts with a Malibu and Tahoe, and Mustang and Malibu to Tahoe trailer hitch impacts with instrumented volunteers. All tests were performed in Glendale, AZ.

Results presented at SATAI Conference, January 26-27, 2016, Glendale, AZ

- Jan. 2018 Performed and participated in instrumented vehicle-to-vehicle impact testing involving front bumper mounted license plates and instrumented human volunteers. License plate bolt marks, bumper damage, and occupant kinematics were investigated. All tests were performed in Mesa, AZ.
- Sept. 2017 Performed and participated in a series of vehicles-to-pedestrian dummy impacts. Various instrumented vehicles and instrumented pedestrian dummy types were utilized. Vehicle damage patterns, pedestrian dummy throw distance and trajectory, and vehicle/dummy accelerations were investigated. Performed and participated in a series of low-speed bumper to trailer hitch impact on an instrumented Toyota Corolla and Nissan Frontier. Vehicle damage and dynamics were investigated. Performed and participated in a high-speed broadside impact with a remote-driven Dodge Dart and a Cadillac SRX, a 3-car impact sequence were a Chevrolet Impala rear-ended a Pontiac Solstice with the Pontiac subsequently broadsided by a Cadillac Deville, a 3-car chain-reaction rear-end impact sequence with a Ford Escape rear-ending a Toyota Corolla which was pushed into the rear of a Ford 500, a high-speed head-on collision between two remote-driven Ford Escapes, and human volunteer kicking of side panels of a Chevrolet Cavalier. All tests were performed at the Las Vegas Motor Speedway, Nevada.
Results presented at ARC-CSI Conference, September 17-21, 2017, Las Vegas, NV
- March 2017 Performed and participated in a series of varying height head drop impacts into a Ford F350 pickup head restraint. An instrumented Hybrid III dummy head was utilized. Head accelerations and HIC were analyzed. All tests were performed in Signal Hill, CA.
- Feb. 2017 Performed and participated in a series of varying severity low-speed head impacts with a glass door. A human volunteer and an instrumented Hybrid III dummy were utilized. Human volunteer kinematics as well as dummy motions, head accelerations, and cervical loads were analyzed. All tests were performed in Los Angeles, CA.
- Feb. 2017 Performed and participated in a series of angled curb impacts with an instrumented Dodge Charger. A human volunteer driver and an instrumented Hybrid III dummy were utilized in each test. Vehicle dynamics as well as dummy motions and loading within the cervical and lumbar spines were analyzed. All tests were performed in Torrance, CA.
- Oct. 2016 Performed and participated in an instrumented remote-driven Toyota Celica high-speed angled frontal impact with an instrumented stationary Ford Ranger, a high-speed human-driven massive moving barrier military vehicle head-on collision (approximate 30 mph) with an instrumented stationary Oldsmobile 98, and a high-speed human-driven massive moving barrier military vehicle head-on collision (approximate 40 mph) with an instrumented stationary Ford Expedition containing two instrumented child dummies in convertible car seats (one forward facing and one rearward facing). All tests were performed in Glendale, Arizona.
Results presented at SATAI Conference, October 6-8, 2016, Glendale, AZ
- Oct. 2016 Performed and participated in a series of increasing severity low-speed rear-end impacts between two instrumented Honda Civic's and the rear of an instrumented Toyota Celica. Both vehicles utilized a human volunteer driver. Documentation and analysis of license plate bolt marks, along with occupant kinematics were conducted. A series of 8 tests were conducted with a non-ABS Toyota Celica to measure dynamic vertical motion of the front and rear bumpers during hard braking. All tests were performed in Mesa, Arizona.
- Sept. 2016 Performed and participated in quasi-static and impact testing of a 2012 Volvo S60 sedan's side mirror. Quasi-static pull testing to determine deflection force was conducted. Impact testing between the side mirror and an instrumented Hybrid III Dummy at increasing speeds were conducted to analyze head accelerations, as well as cervical and lumbar loads and moments. All tests were performed in Signal Hill, California.

- May 2016 Performed and participated in a series of motorcycle to flat barrier and motorcycle to vehicle impacts, a remote-driven VW Passat head-on collision with a remote-driven Ford Crown Victoria, a human-driven Ford Crown Victoria into the side of a reversing Toyota Prius collision, a remote-driven high-speed VW Passat to flat barrier impact, a 3-car chain-reaction rear-end impact sequence with a human-driven Ford Crown Victoria colliding into the rear of a remote-driven VW Passat which then struck a Chevrolet Cavalier, and a high-speed angled remote-driven VW Passat left front to barrier impact. All tests were performed at the Las Vegas Motor Speedway, Nevada.
Results presented at ARC-CSI Conference, May 23-26, 2016, Las Vegas, NV
- May 2016 Performed and participated in a series of low-speed rear-end and head-on frontal impacts between an instrumented Toyota Prius and VW Passat, both with human volunteers and a hybrid III dummy in the VW Passat's right front seat. Two VW Passat front to flat barrier impacts were conducted with a human volunteer driver and a Hybrid III Dummy in the right front seat. All tests were performed at the Las Vegas Motor Speedway, Nevada.
- April 2016 Performed and participated in low-speed rear-end impacts with instrumented human volunteers in a Volvo XC90 into a Mazda Tribute (with and without a trailer hitch), a low-speed rear-end impact with instrumented human volunteers in a Lexus ES300 into a Mazda Tribute, low-speed angled broadside impacts with instrumented human volunteers in a Mazda Tribute to Lexus ES300, and a high-speed instrumented human volunteer broadside of a Lexus ES300 into the passenger side of a stationary Volvo XC90 with Lexus front airbag deployment. All tests were performed in Lafayette, Louisiana.
Results presented at Barczyk Biomechanics Institute Crash Conference, April 22-24, 2016, Lafayette, LA
- Nov. 2015 Performed and participated in instrumented Hybrid III dummy head strikes from a hospital pump. Dummy neck loads and moments, head accelerations and angular velocities, and HIC were analyzed. All tests were performed in Los Angeles, California.
- Nov. 2015 Performed and participated in instrumented Hybrid III dummy headform strikes with a Toyota Sienna head restraint. Dummy head accelerations and angular velocities, and HIC were analyzed. All tests were performed in Signal Hill, California.
- Sept. 2015 Performed and participated in an instrumented human-driven Ford Focus high speed frontal impact with a pedestrian dummy, two instrumented human-driven Ford Crown Victoria with instrumented human front passenger side-swipe impacts to the front wheels of a Ford Focus with an instrumented human driver and instrumented Hybrid III dummy, a human-driven Ford Crown Victoria with instrumented human front passenger offset frontal impact into the open driver's door of a Ford Focus with an instrumented Hybrid III dummy front passenger, a human-driven Dodge pickup with human front passenger high speed frontal impact with a pedestrian dummy, and a human-driven Dodge pickup with human front passenger high speed head-on collision into a Honda Prelude with an instrumented Hybrid III dummy front passenger. All tests were performed in Glendale, Arizona.
Results presented at SATAI Conference, September 10-12, 2015, Glendale, AZ
- Sept. 2015 Performed and participated in a series of increasing severity low-speed rear-end impacts between two instrumented Ford Focus ZX3's and the trailer hitch and trailer hitch receiver of an instrumented Toyota Sequoia. The bullet vehicles utilized a human volunteer driver. The target vehicle utilized an instrumented human volunteer driver and an instrumented Hybrid III dummy. All tests were performed in Mesa, Arizona.

- July 2015 Performed and participated in an instrumented high speed offset frontal impact between a Mazda pickup with an instrumented Hybrid III dummy and a wheel/tire. Dummy neck and lumbar loads and moments, head accelerations and angular velocities, and HIC were analyzed. Testing was performed in Phoenix, Arizona.
- June 2015 Performed and participated in instrumented Hybrid III dummy head strikes from a Toyota Sienna liftgate. Dummy neck loads and moments, head accelerations and angular velocities, and HIC were analyzed. All tests were performed in Signal Hill, California.
- June 2015 Performed and participated in a human-driven Land Rover Discovery II with instrumented Hybrid III dummy high speed broadside impact into a Lincoln MKZ, a remote-driven motorcycle broadside impact into a Dodge Grand Caravan, a remote-driven motorcycle high speed broadside impact into a Ford Crown Victoria containing a human driver, a human-driven Chevrolet Malibu with human front passenger high speed vault off a ramp and then broadside impact into a Mazda3, a human-driven Dodge Grand Caravan with instrumented Hybrid III dummy high speed vault off a ramp and then oblique frontal impact into a Hyundai Elantra, a remote-driven motorcycle high speed broadside impact into a Ford Crown Victoria, a remote-driven Pontiac Grand Prix high speed offset frontal impact with a remote-driven Ford Crown Victoria, a human-driven Mazda3 high speed offset frontal impact with a wheel/tire, and two human-driven Ford Crown Victoria with instrumented Hybrid III dummy narrow overlap head-on impacts into a Dodge Grand Caravan. All tests were performed at the Las Vegas Motor Speedway, Nevada.
Results presented at ARC-CSI Conference, June 1-4, 2015, Las Vegas, NV
- May 2015 Performed and participated in a series of increasing severity low-speed rear-end impacts between an instrumented 2005 Mazda3 and the trailer hitch of a 2001 Land Rover Discovery II. The bullet vehicle utilized an instrumented human volunteer driver and an instrumented Hybrid III dummy in the right front seat. The target vehicle utilized an instrumented human volunteer driver. All tests were performed at the Las Vegas Motor Speedway, Nevada.
- May 2015 Performed and participated in low-speed rear-end impacts between an instrumented 2005 Mazda3 and a 2007 Toyota Yaris. The bullet vehicle utilized an instrumented human volunteer driver and an instrumented Hybrid III dummy in the right front seat. The target vehicle utilized a human volunteer driver. All tests were performed at the Las Vegas Motor Speedway, Nevada.
- May 2015 Performed and participated in instrumented Hybrid III dummy head strikes from a metal weather cap. Dummy neck loads and moments, head accelerations and angular velocities, and HIC were analyzed. All tests were performed in Signal Hill, California.
- May 2015 Performed and participated in idle speed testing of a 2011 Volkswagen Jetta using a Racelogic VBox III to determine velocity versus distance in Signal Hill, California.
- May 2015 Performed and participated in vehicle motion analysis of airport shuttle buses and taxis for unaware drivers in normal driving conditions using a tri-axial accelerometer in Los Angeles, California.
- Oct. 2014 Performed and participated in an amusement park roller coaster testing utilizing an instrumented 50th percentile male Hybrid III anthropomorphic dummy and human volunteers. Roller coaster accelerations, dummy cervical and lumbar loads and moments, as well as dummy head, thorax, and lumbar accelerations were measured and analyzed. A total of 5 tests were conducted in Ontario, California.

- June 2014 Performed and participated in impact drop tests onto a Dodge Caravan head restraint utilizing an instrumented 5th percentile female Hybrid III anthropomorphic dummy head. Tri-axial accelerometers and angular rate sensors were used to analyze the head dynamics. A total of 9 tests were conducted in Signal Hill, California.
- June 2014 Performed and participated in a remote-driven Ford Explorer high speed frontal barrier impact, two Chevrolet Cobalt high speed offset frontal impacts (with remote controlled ignition switch position), a remote-driven Ford Contour high speed impact into a New Flyer city bus containing an instrumented Hybrid III anthropomorphic dummy driver and instrumented human passengers, a high speed head-on collision between two remote-driven Ford Crown Victoria sedans, human-driven Toyota Prius front and rear barrier impacts, human-driven Chevrolet Cobalt front and rear barrier impacts, multiple rear-end and frontal impacts between human driven Toyota Prius and Chevrolet Cobalt, 3-vehicle crash with human-driven Ford Crown Victoria contacting the rear of a Chevrolet Malibu and pushing the Chevrolet Malibu into the right front of an angled Saturn wagon, and human-driven broadside impacts between a Ford Crown Victoria and a Toyota Prius and a Subaru WRX. Testing was conducted at the Las Vegas Motor Speedway, Nevada.
Results presented at ARC-CSI Conference, June 2-5, 2014, Las Vegas, NV
- May 2014 Performed and participated in rear bumper-to-modified barrier impacts with an instrumented Dodge Caravan. The barrier was modified such that the contacting surface modeled a bicycle rack on the front of a bus. Vehicle impact speed, Delta V, and damage were analyzed. Acted as human volunteer in driver's seat for all tests, which were performed in Long Beach, California.
- May 2014 Performed and participated in vehicle maneuver testing on a Kia Soul to measure various vehicle parameters, including steering wheel angle, brake pedal status, vehicle speed, RPMs, and seat belt status. Approximately 30 tests were conducted over two days in Anaheim, California.
- Nov. 2013 Performed and participated in instrumented Hybrid III dummy head strikes from a ceiling door swing/drop. Dummy head accelerations and HIC were analyzed. All tests were performed in Signal Hill, California.
- Aug. 2013 Performed and participated in idle speed testing using a Racelogic VBox III to determine velocity versus distance for a Toyota Corolla, GMC Yukon, Subaru Legacy, Acura MDX, VW Tiguan, Jeep Grand Cherokee, Lexus ES 350, Lexus RX 450h, Subaru Forester, Ford F-150, and Volvo S60 on flat, low and high sloped roadways in Long Beach, California and Signal Hill, California.
- Aug. 2013 Performed and participated in instrumented Hybrid III dummy head strikes from soccer balls launched at various velocities and distances. Dummy neck loads and HIC were analyzed. All tests were performed at LA Galaxy Soccer Center in Torrance, California.
- July 2013 Performed and participated in instrumented Hybrid III dummy straight leg vertical drop tests at various heights to analyze loads in the lower extremities and spine in Signal Hill, California.
- June 2013 Performed and participated in testing of a waterslide utilizing a female human volunteer. Testing analyzed water speed and human volunteer motions. A total of 5 tests were conducted in Chandler, Arizona.

- May 2013 Performed and participated in remote-driven Saturn SL2, Chevrolet Cavalier, and Chevrolet Impala rear-ending and broadsiding a Neoplan city bus containing an instrumented driver, passengers, and a Hybrid III dummy; human driver and remote-driven Toyota Yaris(s) in front-to-barrier impacts; angled head-on collisions between human-driven Ford Crown Victorias and Chevrolet Cavaliers; and a head-on collision between remote-driven Pontiac Grand Ams. All tests performed at the Las Vegas Motor Speedway, Nevada.
Results presented at ARC-CSI Conference, May 13-16, 2013, Las Vegas, NV
- May 2013 Performed and participated in front and rear to barrier impacts using a Toyota Yaris with an instrumented human driver and a Hybrid III dummy passenger; as well as hard braking of a Neoplan city bus and an angled broadside to a Honda Civic with an instrumented human driver, passengers and a Hybrid III dummy at the Las Vegas Motor Speedway, Nevada.
- May 2013 Performed and participated in instrumented Hybrid III dummy head impacts with wet ceiling tiles and an industrial light fixture, as well as an un-instrumented human volunteer light fixture-to-head impact test in Signal Hill, California.
- April 2013 Performed and participated in an amusement park ride using a CRABI (1 year old) dummy with the Los Angeles County District Attorney's Office in Anaheim, California.
- Feb. 2013 Performed and participated in instrumented front and rear to barrier bumper tests with a Toyota Corolla in Phoenix, Arizona.
Results presented at SATAI Conference, March 15-16, 2013, Manhattan Beach, CA
Results presented at ARC-CSI Conference, May 13-16, 2013, Las Vegas, NV
- Jan. 2013 Performed and participated in instrumented front and rear to barrier bumper tests with a Toyota Camry and a Toyota Prius in Phoenix, Arizona.
Results presented at CDR User's Summit, January 21-23, 2013, Houston, TX
Results presented at SATAI Conference, March 15-16, 2013, Manhattan Beach, CA
Results presented at ARC-CSI Conference, May 13-16, 2013, Las Vegas, NV
- Sept. 2012 Performed and participated in instrumented remote-driven Pontiac Grand Prix and Chevrolet Impala broadside and rear-end impacts to the trailer of a Volvo tractor-utility trailer combination and instrumented demonstrations of tractor-trailer acceleration while turning at an intersection in Glendale, Arizona.
Results presented at SATAI Conference, September 28-29, 2012, Glendale, AZ
- Sept. 2012 Performed and participated in instrumented front and rear to barrier bumper tests with a Toyota Sequoia and a Toyota Corolla in Phoenix, Arizona.
Results presented at CDR User's Summit, January 21-23, 2013, Houston, TX
Results presented at SATAI Conference, March 15-16, 2013, Manhattan Beach, CA
Results presented at ARC-CSI Conference, May 13-16, 2013, Las Vegas, NV
- Sept. 2012 Participated in instrumented front and rear to barrier bumper tests and a 31 mph front to barrier crash with a Toyota Yaris in Phoenix, Arizona.
Results presented for instruction at Collision Safety Institute, Inc. CDR Data Analyst Course, October 1-5, 2012, Glendale, AZ
Results presented at ARC-CSI Conference, May 13-16, 2013, Las Vegas, NV
- July 2012 Participated in instrumented in-line braking, steering-braking, and lane change maneuver tests with a 14-foot U-Haul moving truck and a Honda Pilot with and without electronic stability control, pulling loaded 6x12 foot and 5x8 foot U-Haul trailers in Tucson, Arizona.

- June 2012 Participated in rear-end crash tests between a Jeep Grand Cherokee with active head restraints and a Chrysler Town & Country utilizing instrumented human volunteers and anthropomorphic dummies and a remote tire deflator at the Las Vegas Motor Speedway, Nevada.
Results presented at ARC-CSI Conference, June 6, 2012, Las Vegas, NV
Results presented at CDR User's Summit, January 21-23, 2013, Houston, TX
- June 2012 Participated in a broadside crash test between a Ford Contour and a Ford Crown Victoria utilizing instrumented anthropomorphic dummies at the Las Vegas Motor Speedway, Nevada.
- June 2012 Performed and participated in crash tests with instrumented human volunteers and anthropomorphic dummies, including a remote-driven Pontiac Grand Prix striking a Ford E350 Ambulance in an angled broadside, a Chrysler Town & Country with a remote tire deflation striking a Ford Aspire in an offset rear-end and then broadsiding a Toyota Corolla, a Ford Crown Victoria striking a Saturn SL2 in a high speed high angle broadside, a remote-driven Kia Rio striking a Toyota Yaris in an angled head-on, a remote-driven Jeep Grand Cherokee striking a Fiat Bertone in a high speed offset head-on with override and a rollover, a Ford Crown Victoria side-swiping a Kia Sephia and then broadsiding a Ford Escort, and a remote-driven VW Jetta broadsiding a Chrysler Town & Country at the Las Vegas Motor Speedway, Nevada.
Results presented at ARC-CSI Conference, June 4-7, 2012, Las Vegas, NV
Results presented for instruction at Collision Safety Institute, Inc. CDR Data Analyst Course, October 1-5, 2012, Glendale, AZ
- Nov. 2011 Performed and participated in instrumented offset rear-end, over-ride rear-end, angled rear-end, and side-swipe collisions between a Chrysler LeBaron, Kia Sephia, and Ford F-150 in Las Vegas, Nevada.
- Sept. 2011 Performed and participated in an instrumented rollover of a Ford Super Club Wagon (15 passenger) and a high-speed offset head-on impact between a Kia Spectra and an Oldsmobile Cutlass Ciera in Glendale, Arizona. Remote controlled Phantom Drivers were used in all vehicles.
Results presented at SATAI Conference, September 23-24, 2011, Glendale, AZ
- Sept. 2011 Performed and participated in instrumented rear-end impacts with a Kia Spectra striking an Oldsmobile Cutlass Ciera, resulting in Oldsmobile Delta V's between 1 and 5 mph. An instrumented human volunteer was utilized in the Oldsmobile. All tests were conducted in Mesa, Arizona.
- Sept. 2011 Performed and participated in instrumented automotive seat drop and plop demonstrations with a human volunteer in Mesa, Arizona.
- May 2011 Participated in vehicle-to-vehicle low-speed crash tests, with an instrumented human volunteer driver in a Toyota Celica convertible during a frontal and broadside-to-right door impacts with the trailer hitch of a backing Chevrolet Suburban at the Las Vegas Motor Speedway, Nevada.

- May 2011 Performed and participated in crash tests with instrumented human volunteers, including a head-on collision between a Chrysler 300 and a remote driven Pontiac Bonneville, an angled head-on collision between a Ford Crown Victoria and a Hyundai Sonata, multiple rear-end collisions between a Toyota Sienna and first a Ford Probe and then a Dodge Neon, a 3-car chain-reaction collision sequence with an Opel Insignia (Buick Regal) into a Chevrolet Cavalier into an Oldsmobile Alero, and a broadside collision between a Buick LaCrosse and a Ford Aspire. Instrumented remote driven crash tests were performed, with an offset head-on collision between a Chrysler 300 and a Ford Escape, and a broadside collision between a Ford Crown Victoria and a Toyota Sienna at the Las Vegas Motor Speedway, Nevada.
Results presented at ARC-CSI Conference, May 23-26, 2011, Las Vegas, NV
Results published in Collision: The International Compendium for Crash Research, Volume 6, Issue 2, Fall 2011
Results presented for instruction at Collision Safety Institute, Inc. CDR Data Analyst Course, October 1-5, 2012, Glendale, AZ
- Jan. 2011 Performed and participated in barrier impact testing on the front and rear bumpers of an instrumented Ford Explorer in Gilbert, Arizona. Acted as the volunteer driver in both tests.
- July 2010 Performed and participated in an instrumented high-speed glancing broadside demonstration using a Mercury Sable and Pontiac Grand Am with remote vehicle control at Luke AFB, Arizona.
Results presented at SATAI Conference, July 16-17, 2010, Phoenix, AZ
- June 2010 Performed and Participated in instrumented car-to-car rear-end collision testing utilizing instrumented human volunteers in Phoenix, Arizona. Steering column loads and occupant upper extremity kinematics were analyzed. High-speed video of the vehicle, overall occupant motions, and brake pedal response was recorded. Acted as an instrumented volunteer in 5-6 mph rear impacts for both aware and unaware conditions.
Results presented and published at SAE World Congress & Exhibition, Occupant Protection: Rear Impact technical session, April 12-14, 2011, Detroit, MI
- Dec. 2009 Performed and participated in instrumented low-speed rear tire-to-curb impacts. A Nissan Pathfinder, traveling rearward, contacted a curb at speeds of approximately 3 mph. Vehicle delta V, impact duration, and vehicle accelerations were analyzed. All testing was conducted in Phoenix, Arizona.
- Aug. 2009 Performed and participated in instrumented car-to-car rear-end collision testing utilizing instrumented human volunteers in Phoenix, Arizona. Brake pedal response and occupant kinematics were analyzed. High-speed video of the brake pedal and lower extremity response was conducted. Acted as an instrumented volunteer in 5 mph rear impacts for both the aware and unaware conditions.
Results presented and published at SAE World Congress & Exhibition, Occupant Protection: Accident Reconstruction technical session, April 13-15, 2010, Detroit, MI
Results presented at ARC-CSI Conference, May 24-27, 2010, Las Vegas, NV
Results presented at SATAI Conference, March 11-12, 2011, Laughlin, NV
- June 2009 Performed and participated in instrumented car-to-car rear-end collision testing utilizing instrumented human volunteers in Phoenix, Arizona. Brake pedal force and displacement, as well as occupant kinematics in the target vehicle were analyzed.
- May 2007 Performed and participated in low-speed vehicle-to-barrier impact tests. Various impact speeds were studied. Instrumented pickups with rigidly mounted bumpers were used. Relationships between vehicle damage, velocity change, and vehicle stiffness properties were studied. Acted as an instrumented volunteer in a normal seated position for a 5 mph rear impact. Test revealed acceleration time plots and occupant kinematics for the head, chest, and spine. All tests were conducted in Tempe, Arizona.

Presentations

"Steering Column Loads and Upper Extremity Motions During Low Speed Rear-End Collisions," SAE Paper 2011-01-0275, presented in the Occupant Protection: Rear Impact technical session of the 2011 SAE World Congress Conference, Detroit, Michigan, April 12, 2011.

"Increased Risk of Submarining and Lower Extremity Injuries Associated with Obesity in Frontal Impacts," presented at the 62nd Annual Meeting of the American Academy of Forensic Sciences, Seattle, Washington, February 2010.

"Use of MADYMO as a Tool for Reconstructing Pedestrian Impacts," presented at the Annual Meeting of The Society of Forensic Engineers and Scientists, Tempe, Arizona, March 2009.

"Determining Vehicle Speed in a Fatal Pedestrian Impact: A Case of Tampered Evidence," presented at the 61st Annual Meeting of the American Academy of Forensic Sciences, Denver, Colorado, February 2009.

"Identifying Fault in a Fatal Pedestrian Impact," presented at the 60th Annual Meeting of the American Academy of Forensic Sciences, Washington, D.C., February 2008.

"Airbag Injury Risk to Older Children Occupying the Front Passenger Seat," presented at the 59th Annual Meeting of the American Academy of Forensic Sciences, San Antonio, Texas, February 2007.

Continuing Education and Training

- Feb. 2018 *Engineering Dynamics Corporation (EDC) 2018 HVE Forum Workshop – Charleston, SC*
Courses attended: Advanced HVE: Parts I-III, 3D Vehicles. Pt. I: SIMON, DyMESH 3D Collision Model, HVE White Paper Session, 3D Editor: Functionality/Friction/Importing, Simulation Movies: HD Video Output, and Building a Vehicle for HVE & HVE-2D
- Jan. 2018 *Southwestern Association of Technical Accident Investigators (SATAI) – Glendale, AZ*
Topics included: Pedestrian crash reconstruction, traffic signal timing, low speed crash analysis and reconstruction.
- Sept. 2017 *ARC Network & Collision Safety Institute (ARC-CSI) Crash Conference – Las Vegas, NV*
Topics included: reconstruction from body worn cameras, gap acceptance (how far aware must an approaching vehicle be before a driver will pull out?), NTSB highway crash investigations with recent cases and issues, reconstruction and injury analysis in low-speed inline collisions, pedestrian and nighttime recognition, deploying drones, collision scene mapping using UAS technology, unmanned aircraft techniques, quantitative study of passenger vehicle braking performance during emergency application, overheating of heavy duty truck brakes, pedestrian walking speeds, and pedestrian crash reconstruction methodologies.
- Oct. 2016 *Southwestern Association of Technical Accident Investigators (SATAI) – Glendale, AZ*
Topics included: Documentation and reconstruction of night time accidents, drug toxicology, bicycle collision reconstruction and helmet issues.
- May 2016 *ARC Network & Collision Safety Institute (ARC-CSI) Crash Conference – Las Vegas, NV*
Topics included: IIHS small overlap crash tests, photography for crash reconstruction, use of NHTSA NASS crash database in reconstruction, safely working around hybrids/electric vehicles/newer safety systems, motorcycle reconstruction techniques tied to testing, scene and vehicle data analysis to evaluate pre-crash brake application, wheel impact evaluation in a rollover collision – comparison of a simulation and crash test, lateral acceleration through a curve – rear world measurements of normal drivers at the expected higher end, and airbag deployment conditions.

- April 2016 *Barczyk Biomechanics Institute Crash Conference – Lafayette, LA*
Topics included: biomechanics, occupant kinematics, acceleration, Delta V, crash test data, mechanism of injury, role of a biomechanist, EDR data analysis.
- Sept. 2015 *Southwestern Association of Technical Accident Investigators (SATAI) – Glendale, AZ*
Topics included: human factors, compliance crash testing, and 3D laser scanning.
- March 2015 *Southwestern Association of Technical Accident Investigators (SATAI) – Las Vegas, NV*
Topics included: practical evidence interpretation, conservation of linear momentum, vectors & kinematics, and motorcycle collisions.
- Jan. 2015 *California Association of Accident Reconstruction Specialists (CA²RS) – Glendora, CA*
Topics included: low speed impact analysis and using IIHS & CDR data
- Jan. 2015 *Engineering Dynamics Corporation Simulations Training Course – Burbank, CA*
Course goals included: instruction on how to effectively use HVE simulation programs for reconstruction of motor vehicle accidents, how the EDSVS, EDVTS, and EDSMAC programs work, as well as their limitations. Topics included: history and applications of simulations, vehicle dynamics, key design features in all simulation programs, HVE user environment, driver input tables, estimating initial conditions, tire models, collision models, numerical integrations, simulation calculation procedures, use of EDCRASH outputs for EDSMAC inputs, and numerous lab exercises. Successful completion of the course and final examination resulted in an awarded certificate.
- June 2014 *ARC Network & Collision Safety Institute (ARC-CSI) Crash Conference – Las Vegas, NV*
Topics included: accident reconstruction and biomechanics of low and high speed collisions, fatigue and human factors, conspicuity and visibility testing and research with reflective tape, and vehicle wheel speed and CDR reported speed differences.
- April 2014 *California Association of Accident Reconstruction Specialists (CA²RS) – Los Angeles, CA*
Topics included: Reconstruction of red light / green light accidents, including interpretation of signal timing charts, data and diagrams.
- March 2014 *Southwestern Association of Technical Accident Investigators (SATAI) – Laughlin, NV*
Topics included: Reconstructing a nighttime car versus pedestrian crash, and headlight performance in pedestrian strikes.
- Dec. 2013 *FARO Laser Scanner LS Training Course (FARO) – Signal Hill, CA*
FARO trainer provided instruction on theory and exercises which enabled users to operate the Focus 3D Scanner and FARO SCENE software. This training prepares users to setup hardware and software for a scanning project, perform the scan, and then import the scan project into the FARO software for data analysis.
- July 2013 *PC-Crash Essentials Training Course (MEA Forensic) – Online*
PC-Crash 9.2 software theory and application training. PC-Crash is a collision and trajectory simulation tool for analysis of motor vehicle collisions and other incidents, which can produce results as 3D animations, reports, tables, and/or graphs. Instruction was broken into four courses: Introduction to PC-Crash, Vehicle Control, Looking at the Results, and Latest Features.
- June 2013 *Basic Forensic Mapping (CSI Mapping) – Willoughby, OH*
MapScenes Forensic CAD 2010 theory and application training, with course instruction on legal study, technical studies, and skill development.

- May 2013 *ARC Network & Collision Safety Institute (ARC-CSI) Crash Conference – Las Vegas, NV*
Topics included: damage, energy, and computer simulations, as well as accident reconstruction using Crash3 and LS-DYNA
- March 2013 *Southwestern Association of Technical Accident Investigators (SATAI) – Manhattan Beach, CA*
Topics included: consumer GPS, traffic enforcement cameras, surveillance cameras, and force balance in accident reconstruction, Toyota EDR Delta V anomalies, post-collision speedometer readings, and forensic seat belt analysis.
- Oct. 2012 *Washington Association of Technical Accident Investigators (WATAI) – Bellevue, WA*
Topics included: use of the Monte Carlo statistical analysis method when applied to crash reconstruction, and techniques and acceptable methods of quantifying vehicle crush and damage for an energy and momentum analyses.
- Oct. 2012 *CDR Data Analyst Certification Course (CSI) – Glendale, AZ*
Collision Safety Institute, Inc. course topics included: crash data retrieval (CDR) history and evolution as well as interpretation skills enabling the application of a Bosch CDR System report to a situationally complete crash reconstruction, general legal considerations related to CDR data admissibility, types of data collected, reading, interpreting and using the accessible GM, Ford, Chrysler, Honda, Toyota, Mazda, Nissan, and Suzuki CDR reports and understanding, identifying and dealing with anomalous data from vehicle CDR reports.
- Sept. 2012 *Southwestern Association of Technical Accident Investigators (SATAI) – Glendale, AZ*
Topics included commercial motor vehicle air brake systems, and methods and myths of commercial motor vehicle collision investigations.
- June 2012 *CDR Technician Level 1 and Level 2 Certification (CSI) – Tempe, AZ*
Collision Safety Institute, Inc. course topics included: overall operation of the Bosch Crash Data Retrieval (CDR) System, including evaluation of the vehicle being examined for download and application of the software and hardware to that vehicle, access consideration for the Powertrain Control Module (PCM), Airbag Control Module (ACM), and Rollover Sensor modules (ROS) using the Diagnostic Link Connector (DLC), including back-powering methods and direct-to-module connection methods from start-to-finish, and troubleshooting and solving hardware and software issues.
- June 2012 *ARC Network & Collision Safety Institute (ARC-CSI) Crash Conference – Las Vegas, NV*
Topics included: heavy truck crash testing, closing speed and Delta V, CDR and electric, hybrid and other alternative power vehicles, seat belt loading evidence, low speed reconstruction and biomechanics, and tread separation and axle tramp.
- May 2012 *PhotoModeler 2012 Collision Investigation (EOS Systems, Inc.) – Las Vegas, NV*
Training course included: photogrammetric principles and techniques for developing 3D models and solving for inverse cameras to extract scene and vehicle crush measurements from photographs, including camera calibration, evidence markers, referencing, model accuracy, scaling and orientation, and creation of orthographic diagrams.
- March 2012 *Southwestern Association of Technical Accident Investigators (SATAI) – Los Angeles, CA*
Topics included: sudden acceleration incidents, data acquisition systems, transportation engineering, and bicycle collision reconstruction.
- Oct. 2011 *Washington Association of Technical Accident Investigators (WATAI) – Redmond, WA*
Topics included: human factors, as well as vehicle inspections, documentation, impact analysis, collection of evidence from the vehicle, and courtroom testimony.

- Sept. 2011 *Southwestern Association of Technical Accident Investigators (SATAI) – Phoenix, AZ*
Topics included: accident investigation approach to UTV incidents and mechanics of one dimensional and planar collisions. Conference included crash testing and seminars.
- May 2011 *ARC Network & Collision Safety Institute (ARC-CSI) Crash Conference – Las Vegas, NV*
Topics included: human factors of cell phone use when driving, use of computers in highway safety, applications of GPS data in accident reconstruction, accident reconstruction techniques, roadway design and safety devices, and pedestrian collision testing.
- April 2011 *The Society of Automotive Engineers (SAE) 2011 World Congress Conference & Exhibition – Detroit, MI*
Topics included: injury mitigation with head-to-head restraint positioning, use of BioRID in rear impact tests, occupant pocketing and whiplash, whiplash mitigation and seat back stiffness, steering column loads and upper extremity kinematics, Startcraft-type seat performance in rear impacts, thoracic spine fractures in severe rear impacts, rear occupant head protection, side impact occupant protection, curtain airbags, pressure sensors for airbag deployment, occupant ejection mitigation.
- March 2011 *Southwestern Association of Technical Accident Investigators (SATAI) – Laughlin, NV*
Topics included: photogrammetry, injury analysis, rollover reconstruction, restraint performance and effectiveness, low speed accident reconstruction and the NASS database.
- Feb. 2010 *American Academy of Forensic Sciences (AAFS) 62nd Annual Meeting, Engineering Sciences Section – Seattle, WA*
Topics included: occupant kinematics, occupant compartment intrusion, seat back failure, injury mechanics, submarining, restraint performance, laminated glass glazing, automobile and train accident reconstruction, rollovers, night-time visibility, rollover stability of SUV and trailer combinations, and indications of high intensity discharge (HID) use.
- Nov. 2009 *Southwestern Association of Technical Accident Investigators (SATAI) – San Diego, CA*
Topics included: aftermarket vehicle components, event data recorder discrepancies, and vehicle stiffness data and calculations.
- July 2009 *Southwestern Association of Technical Accident Investigators (SATAI) – Phoenix, AZ*
Presentation topics included: biomechanical analysis of rollover accidents, seat belts in rollover accidents, and use of MADYMO in accident reconstruction. Witnessed vehicle rollover test of a van. Conference included crash testing and seminars.
- Feb. 2009 *American Academy of Forensic Sciences (AAFS) 61st Annual Meeting, Engineering Sciences Section – Denver, CO*
Topics included: occupant kinematics, restraint forces and performance in rear-end impact with seat collapse, pedestrian impacts, motorcycle and rider kinematics in low speed impacts, material fracture and failure types, injury analysis, crashworthiness, occupant survivability, fuel system failure, surveillance video analysis.
- Feb. 2008 *American Academy of Forensic Sciences (AAFS) 60th Annual Meeting, Engineering Sciences Section – Washington, D.C.*
Topics included: common analogies in low speed accidents, occupant kinematics and modeling, pedestrian impacts, partial and complete ejection of restrained occupants, rollover testing and injury analysis, crashworthiness, seat back strength, testing and safety, seat belt failure, discomfort glare quantification, and event data recorders.

- Feb. 2007 *American Academy of Forensic Sciences (AAFS) 59th Annual Meeting, Engineering Sciences Section – San Antonio, TX*
Topics included: traumatic brain injury, use of HIC, traumatic causes of loss of consciousness, traumatic amnesia, disc injury, crushing and closed head injuries, pedestrian night time visibility, critical speed formula, car-to-car and car-to-barrier impacts, narrow object impact damage patterns, inertial buckle release, false latch, seat belt forces, evidence of seat belt use, airbag risk to older children, airbag testing and injury assessment reference values.
- Oct. 2002 *Association for the Advancement of Automotive Medicine (AAAM) 46th Annual Scientific Conference – Tempe, AZ*
Topics presented included: airbags and injury, front and rear vehicle impacts, aortic injuries in side impacts, fatal head and neck injuries from motorcycle collisions, elderly drivers, injury mechanisms and restraints for pregnant females, Crash Injury Research and Engineering Network (CIREN), and child passenger safety.
- July 2001 *Southwestern Association of Technical Accident Investigators (SATAI) – Phoenix, AZ*
Conference included crash testing. Witnessed and evaluated rollover crash dynamics.
- Aug. 2001 *Inter-Industry Conference of Automotive Repair (I-CAR) – Phoenix, AZ*
Classwork and evaluation included: fundamentals of collision repairs and damage analysis.