



Gilles Amirault, P.Eng.

- Vehicle accident reconstruction and mechanical failure consultant
- Investigated and analyzed hundreds of collisions
- Specialized expertise in mechanical testing and computer animations

EDUCATION

- Bachelor of Engineering (Sexton Scholar), Dalhousie University, Halifax **2004**
- co-operative program with cumulative GPA of 3.9/4.3
 - majored in mechanical engineering
- Masters of Engineering, University of Calgary, Alberta **Ongoing**
- started part-time program in January 2010
 - majoring in materials engineering

PROFESSIONAL ASSOCIATIONS & MEMBERSHIPS

- Association of Professional Engineers, Geologists & Geophysicists of Alberta (APEGGA)
- Society of Automotive Engineers (SAE)
- Canadian Association of Technical Accident Investigators & Reconstructionists (CATAIR)
- ASM International (Formerly American Society for Metals)

WORK HISTORY

SAMAC ENGINEERING LTD. (Calgary) **2004 to date**

Collision Reconstruction / Failure analysis engineer. Responsible for analyzing vehicle collisions to determine pre and post impact vehicle speeds, locations, occupant dynamics, seatbelt use and functionality, sightlines, potential to avoid, etc. Also performs computer accident simulations and animations as well as event data recorder analyses. Files investigated and analyzed have included incidents involving automobiles, trucks, motorcycles, bicycles, pedestrians, and tire disablement. Low speed investigations include assessing impact severities, vehicle and occupant dynamics, vehicle damage matches, and vehicle speeds. Approximately 300 high speed and 30 low speed investigations have been performed.

Research & testing activities have included yaw testing of multiple vehicles at high speeds. Design & testing activities have included: non-OEM seat & seatbelt installations and performance testing; vehicle idle speeds, truck cargo net performance, and skid-steer window performance.

Responsible for product liability and industrial failure analyses on commercial and industrial equipment and for investigations involving personal injury.

KUDU INDUSTRIES LTD. (Calgary)**2003-2004**

PCP Pump Clutch Designer

Senior Year University Design project – part of a team that designed a safety clutch system for progressive cavity oil pumps.

Built and tested a successful prototype that incorporated extensive part machining, hydraulics, and circuit programming.

KVAERVER SNC-LAVALIN (Halifax)**2003**

Materials Engineer Co-op (4 months)

Addressed issues including welding, corrosion, cathodic protection, protective painting systems, and sour gas environments for the development of Exxon Mobil offshore production facility.

SIEMENS VDO AUTOMOTIVE (Chatham, Ontario)**2002**

Valve Design Co-op (4 mo.)

Invented and patented two solenoid valves for Siemens by combining personal innovative ideas with knowledge of magnetics and solenoids

Coordinated with the Advanced Engineering department to test the valve designs using magnetic modeling and lab testing

FORD MOTOR COMPANY OF CANADA (Windsor, Ontario)**2002**

Casting Engineer Co-op (4 mo.)

Conducted casting trials on engine blocks to analyze various problems that were present at the Windsor Casting Plant

Tested engine block casting molds using thermal probes to find the areas of extreme temperatures, analyzed the results and offered possible solutions

FISHING VESSELS CARMELLE 6, MYSTIQUE LADY & RONALD M**2001-2004**2nd Mate / Maintenance Engineer (part-time)

Ground fish draggers that fish offshore Nova Scotia a week at a time.

Responsible for equipment operation and maintenance plus fish harvesting.

Extensive exposure to heavy hydraulic and mechanical equipment.

PATENTS

Tatsu C, Amirault G & Zdravkovic D, *Purge Valve Including A Permanent Magnet Linear Actuator*, 2004

Tatsu C, Amirault G, Zdravkovic D, Weldon C, & Modien R, *Purge Valve And Method Of Purging Using An Annular Permanent Magnet Linear Actuator*, 2004

ACADEMIC SCHOLARSHIPS

May 2004	Ranked 2 nd / 70 in cumulative GPA for Mechanical Engineering Awarded to the Dean's List
November 2003	Stora Dalhousie Engineering Scholarship Recipient
November 2002	Bruce and Dorothy Rosetti Engineering Scholarship Recipient

May 2002 Awarded to the Dean's List (Dalhousie Engineering)
September 2001 Scholarship from Dalhousie University for GPA > 3.85

TECHNICAL TRAINING

Commercial Vehicle Braking Systems, Troy, Michigan 2009

A 3 day course detailing the specifics and functionality of commercial vehicle braking systems. Topics covered included air brakes, hydraulic brakes, disc, drum, and wedge brakes, ABS systems, traction control, and stability control. The functionality, advantages, and disadvantages of each system were reviewed. (3 days)

Tire Technology Seminar, Akron, 2008

A comprehensive short course on tire and wheel engineering, regulations, compounding, manufacturing, testing, traction, service issues, and tire/vehicle mechanics. Included examination of ongoing tire testing, hands-on mounting and demounting of tires, and pressure testing of a passenger tire until it failed (exploded). (2½ days)

CDR Operator and Analyst Course, Baltimore, 2008

A 5 day course in downloading and analyzing event data recorders from GM, Ford, and Chrysler vehicles using specialized equipment. Depending on the manufacturer and type of vehicle, available data may include accelerations, speeds, braking, engine speeds, and numerous other sets of data pre and post impact. (5 days)

Pedestrian Collision Investigation Course, Calgary, 2007

A detailed mathematical and practical review of the available methods used to analyze collisions involving pedestrians or bicyclists struck by cars, vans, and trucks. Full scale testing and reconstructions of different types of impacts to validate formulae. (5 days)

Motorcycle Crash Investigation, Calgary, 2007

A course teaching the motorcycle dynamics, handling characteristics, and techniques to analyze collisions involving motorcycles. Topics included motorcycle dynamics, stability, performance, crash testing, and a review of previous testing and research. Full scale testing of motorcycle acceleration, maneuverability, braking effectiveness and sliding coefficients to validate formulae. (5 days)

PC-Crash Advanced Training Workshop, Vancouver, 2006

A workshop on the proper modeling, simulation, and analysis of collisions using PC-Crash 7.3. Topics included co-linear crash simulations using various methods, modeling crush characteristics, simulating rollover collisions, and simulating various vehicle dynamic situations. (2 days)

Vehicle Accident Reconstruction Methods, Detroit, 2006

A course on the analysis of various different collision scenarios and correct procedures to follow in reconstructing vehicle collisions. Topics included energy conservation in collisions, crush analysis, momentum analysis, yaw of vehicles, and reconstructing vehicle rollovers, among others. (2 days)

Tire Retread Plant Operations, Calgary, 2006

Review and analysis of retread plant operations including tire inspection, preparation, retreading, marking and analysis of typical failure modes. (1/2 day)

Commercial Vehicle Collision Reconstruction, Calgary, 2005

A course teaching the techniques to analyze accidents involving tractor-trailers and other large vehicles. Topics included braking capability, analysis of scene markings, vehicle pre and post impact movements, and rollover reconstruction. Full scale brake testing of different vehicle types, including tractor-trailers and buses. (5 days)

CDR Data Analyst Course, Saskatoon, 2005

A 3 day course in downloading and analyzing event data recorders from GM and Ford vehicles using specialized equipment. Depending on the manufacturer and type of vehicle, available data may include accelerations, speeds, braking, engine speeds, and numerous other sets of data pre and post impact. (3 days)

CONFERENCES & MEETINGS

SAE International Congress & Exposition, Detroit, 2006

I attended part of the vehicle accident reconstruction sessions presenting peer reviewed papers on the latest international engineering research. The conference bookstore enables all the several hundred new technical papers published each year to be reviewed. (4 days)

RESEARCH AND TESTING

Torque Variations in Wheel Nuts, 2007 ongoing

A study to determine the relationship between the torque required to back-off wheel lug nuts on a vehicle versus the original torque value used to install the wheel.

High Speed Yaw Research, 2007 & 2008

Research engineer for a series of 21 high speed yaw tests (90 km/h) in partnership with the Calgary Police Service. Three different vehicles were tested with each being equipped with a 5th wheel speed sensor, VC3000 accelerometer, and a DAQ computer. Yaw marks were surveyed and photographed. Data was used for peer reviewed SAE paper on accurate measurement of yaw marks, analysis methodology, and analyzing vehicle speeds and movements during yaw via computer simulation.

Skid-Steer Tree Mulcher Side Window Testing, December 2007

Lead engineer in design analysis and force testing of tree mulcher side windows to conform to WCB of British Columbia standards. Full scale testing of the side window was completed with the use of a hydraulic ram and a designed and fabricated test assembly.

Fire Causation due to Sawdust Ignition, 2006

Full scale testing to determine the likelihood of sawdust igniting after removal from a stained and finished wood floor. A data acquisition system was designed and built to digitally record the entire exemplar event over an 18 hr period using multiple video cameras and temperature sensors.

Cargo Net Testing, 2005 ongoing

Lead engineer in ongoing full scale tests of prototype cargo nets at SAMAC's testing facility. Designed for use in pickups, technical reports are prepared confirming whether nets meet certification requirements and to determine breaking strength of net.

Non-OEM Seat & Seatbelt Installations, 2004 ongoing

Design, test, and certify the installation of non-OEM seats and seatbelts in work vehicles to be in compliance with CMVSS 207(1), 210(7) & (8).

Low Speed Acceleration Testing, 2005 ongoing

Lead engineer for low speed vehicle acceleration tests undertaken at SAMAC. Video analysis of low speed vehicle when the driver's foot is lifted off the brake while the vehicle is stopped in gear.

PUBLICATIONS & PRESENTATIONS

Variability of Yaw Calculations from Field Testing, 2009-01-0103, SAE

Lead author of a peer reviewed paper published by the Society of Automotive Engineers (SAE). Based on two years of high speed vehicle testing, the paper discusses, among others, the accuracy of the yaw formula at higher speeds, the optimal chord length to be used, and use of the centre of gravity method (see Research and Testing).

AREAS OF EXPERTISE

Motor Vehicle Accident Reconstruction

Files worked on include analysis of impact speeds, pre and post impact movements, visibility, potential to avoid, and mechanical failures. Typical types of MVA investigations and analyses undertaken include:

- a) High speed highway collisions where vehicles collide either in a head-on, offset head-on or intersection related impact.
- b) Rollovers, other single vehicle losses of control, and impacts with roadside objects.
- c) Accidents involving pedestrians and bicycles struck by all types of vehicles including cars, vans, pickups and commercial vehicles.
- d) Motorcycle collisions and losses of control, including impacts with trucks, passenger vehicles and motorcycles.
- e) Very large or heavy vehicle collisions involving vehicles such as loaded super B-trains, busses, road maintenance equipment, etc.
- f) Low speed collisions, typically rear-end impacts and side-swipes, which occur on city streets, in alleys and in parking lots.

Data used in an analysis is based on information gathered from personal inspection of vehicles and locations, documented data from SAMAC personnel and others, police scene data, or facts assumed from witness statements. Analysis techniques include computer simulations, computerized calculations, analysis of vehicle event data recorders ("*black boxes*"), preparing scale scene and analysis drawings, night visibility studies, vehicle testing, video re-enactments, Monte Carlo probability studies, animations, photogrammetry, and microscopic examinations. Library resources are used to provide historical research data and to confirm technical methods. The technical analyses provide the basis to form conclusions and opinions regarding how the incident occurred and what technical factors caused or contributed to the accident or the injuries sustained.

Mechanical Failure Analysis

Numerous failures of mechanical equipment in commercial operations have been investigated. Investigations have been carried out on large and small mechanical equipment, vehicles, and buildings. Specific examples include hydraulic motor failures, pipe failure in a high rise building leading to extensive water damage, fire detection and suppression system failures, and plumbing failures in residences.

Specific work performed typically includes some or all of the following:

- Detailed examination and documentation of scenes to determine the origin of the loss and the extent of damage.
- Review of operating & maintenance records, review of construction drawings, and detailed analysis to determine the cause of the loss.
- Testing of exemplar components to determine the cause of the loss.

Seatbelt Use & Effectiveness and Occupant Kinematics

Carrying on from a vehicle accident reconstruction, I am also often requested to address seatbelt use and effectiveness. Issues include intrusion into the occupant compartment, occupant ejections, effect of seatbelts not being available or in use, and other occupants being unrestrained. This type of investigation can include interior inspection of the incident vehicle(s) and use of other documented data to determine remaining survival space for the occupants, whether available seatbelts had been in use, possible ejection paths, and interior occupant impacts. Additionally, vehicle motions during the collision sequence are analyzed, any recorded restraint system data is accessed and, if required, medical data is reviewed documenting the injuries sustained. Exemplar vehicles and occupants can also be used to determine available survival space and limits of occupant motion. Use of these results enable technical opinions to be formed regarding seatbelt use and effectiveness.

Occupant kinematics is the science of analyzing how occupants move in a vehicle and whether they would have struck the interior during the incident whether restrained or not. This enables engineering analyses to be carried out to determine issues such as whether unrestrained occupants in a vehicle could have switched positions during a collision sequence or who was driving when the occupants were ejected.

Vehicle Component Failures

When wheels fall off, brakes fail, tires blowout, or other vehicle mechanical issues arise, I am typically requested, as part of an investigative team, to analyze whether the failure occurred before or after the incident, what caused the failure, if the failure caused or contributed to the accident, whether the driver could have maintained control of the vehicle, and whether the failure could have been prevented.

Personal Injury and Commercial Failure Investigations

Numerous incidents occur where engineering principles can be used to analyze incidents that have led to an injury. Some common situations investigated have included:

- Analysis of bicycle falls and cause of component failure.
- Automatic door testing and analysis.
- Slip and fall type accidents where floor testing is required to determine if the effective coefficient of friction meets manufacturer's standards.

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