Curriculum Vitae for Peter M.W. Dill of Dill Engineering & Associates

Peter M.W. Dill
DILL ENGINEERING and ASSOCIATES

Motor Vehicle Accident Reconstruction
Bio-Mechanical & Human Factors-Motor Vehicle Injury Analysis,
Automobile & Motorcycle Design and Mechanical/Electronic Failure Analysis
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Technical Areas of Specialization

Motor Vehicle Accident Reconstruction, Bio-Mechanical/Motor Vehicle Injury Analysis,
Human Factors, Automobile and Motorcycle Design and Manufacture
Mechanical/Electronic Failure Analysis

EDUCATION:

University of Michigan, Ann Arbor, Michigan, B.S. Engineering (1968-1972).
Western Michigan University, Kalamazoo, Mi. Automotive Engineering (1967).
University of Michigan, Graduate Studies in Mechanical, Human Factors and Bio-Mechanics.

PROFESSIONAL EXPERIENCE:

Thirty five years of Automotive Safety Research and Development, Accident Reconstruction, Concept Vehicle Design and Manufacture as a **Scientist, Project Manager, Senior Project Engineer, Designer, Development, Manufacturing and Test Engineer**. Qualified as a Motor Vehicle Accident Reconstruction and Bio-Mechanical Engineering Expert in Los Angeles, Orange, Riverside, Ventura, Kern, Alameda and San Bernardino Counties, Alaska, Iowa, Tennessee, Florida, Ohio, Idaho, Utah, Nevada, Arizona, Massachusetts and Texas.

I have thirty-five years of Motor Vehicle Accident Reconstruction, Automobile and Motorcycle Product Defect, Forensic and Occupant Injury Analysis, Automotive Safety, Vehicle Design, Development, Manufacturing and Test Engineering and Patent Infringement analysis.

Product Defect: Automobile, Truck, Motorcycle, Jet Ski, ATV, Snow Mobile, Golf Cart, Big Rig Truck cases: involving airbags, seatbelts, seats, fuel system fires, transmission part-to-reverse, brakes, tires, axle failures, roof crush, side impact, roll propensity, vehicle handling dynamics, suspension and chassis, design and manufacturing defects, slip and fall, sports accidents (skiing, racing, basketball, football, horse back riding, injury bio-mechanics).

Accident Reconstruction:

On many occasions Mr. Dill has been an expert witness in Superior Court in the State of California. He has been retained on over 700 cases since March 1992. Fifty five percent of these cases were plaintiff and forty five percent were defense.

He has represented clients in **automotive, motorcycle, jet ski, eighteen wheel truck, fork truck, refuse truck, bicycle and pedestrian** impact type cases. The cases have involved fatalities/injuries from **Air Bags, passive and active belts**, warning labels, fuel system leaks and fires, cruise controls, transmission park-to-reverse, brakes, tires, axle failures, seats, roof crush, side/door impact, roll over, center of gravity and moments of inertia, vehicle handling and dynamics, suspension and chassis design and other design and manufacturing defects.

Vehicle handling and dynamics track and skid pad testing is available for the analysis and evaluation of Roll Over propensity (e.g. sport utility vehicles), Brake Failure evaluation, Vehicle Handling, Ride and Visibility studies.

Congressional Testimony/CBS News, Public Eye, Bryant Gumbal & Fox Nat'l News:

Appeared on CBS evening news program (11-12-97) The Public Eye with Bryant Gumbal. Gave opinions/warnings regarding **fatal risks of air bags** to close proximity occupants (CPO), especially right front seated children and Fox 11 News on 11-3-98 re.A/B Toxicity

Gave testimony to the Congress of the United States in Washington, D.C. of video taped research he conducted for DOT/NHTSA on the development and potential **hazards (death and burns), to children and small adult occupants,** of **air bag** type restraint systems. Appeared as an automotive safety expert on **Walter Cronkite's** (1979) national evening news, in the Detroit Free Press/News, Washington Post newspapers & in the Congressional Record.

Assisted in the successful passage of the (air bag related) Dingell/Broyhill amendment (1979/80) in Washington, D.C. , delaying the introduction of air bags until the technology had a greater chance to mature before making it production available to the unsuspecting public.

Bio-Mechanics R&D:

Performed human cadaver Bio-Mechanics R&D at Wayne State University's Bio-Mechanics lab with General Motors Research Labs. These tests included cadaver knee impact tests to determine the force threshold required to fracture the human knee upon impact with the instrument panel. Head/neck flexion/extension strength (torque) v. hyper extension (angle) tests and thoracic dynamic impact tests to determine injury threshold and human tolerance to blunt trauma impact scenarios. The basis for this cooperative research was to further the design and bio-fidelity of the Hybrid III Crash Test Dummy (Adult 50th% male, 5th% female and child ATD's) used in motor vehicle impact accidents reconstruction/evaluation.

Designed and manufactured Hybrid III crash test surrogates to emulate these cadaver test results. Invented the General Motors Bio-Mechanical Hybrid III Cervical Spine, and was a design and development Project Engineer on the Hybrid II and III anthropomorphic human surrogate (ATD) at General Motor's, Safety Research & Development Lab, Milford, Mi.

The development of the bio-fidelity (human likeness) of the Hybrid III ATD included research into the realism of the ATD head, cervical spine, chest, abdomen, lumbar spine, pelvis and femur load and G load measurements. He conducted NHTSA mandated (Part 572) ATD qualification component tests for the above subsystems. He also designed laboratory experiments, test equipment, transducers/instrumentation (for measurement) and test protocol for these tests. This work included Head Drop, Neck flexion and hyperextension, thoracic ballistic pendulum, sternum deformation, patella/knee and femur load cell ballistic pendulum impact tests/development.

Conducted hundreds of Automobile accident full scale, HYGE sled tests and vehicle subsystem tests, at General Motors' Safety research and Development Laboratory and for National Highway Traffic and Safety Administration in Washington. These tests were designed to evaluate passenger kinematics, injury severity, Bio-Mechanical human response to automotive crashes/survivability, vehicle restraints and crashworthiness.

Developed FMVSS 208 Occupant Injury Criteria for NHTSA automobile crash testing program. Most of this work had to do with the development of the bio-fidelity of the Hybrid III's cervical and thoracic spine, head, and femur/knee. Developed and wrote FMVSS/Part 572 Anthropomorphic Dummy qualification tests and procedures for NHTSA and the DOT in Washington. These test procedures had to do with the concurrent development of the Bio-Mechanical cervical spine for the Hybrid III ATD. He devised the

cervical spine/head flexion and hyperextension test hardware, test protocol and test deceleration time history/profile using aluminum hex cell honey comb as energy management materials.

He conducted, as a student, EMG research of neuropathy and myopathy patients at University of Michigan Hospital. Conducted psycho-motor skill test in underwater environment, (hyperbaric chamber), at University of Michigan.

As a consultant to the Motorcycle Industry he designed a Bio-Mechanical seat for motorcycles to reduce lumbar spine injuries from high vertical G/forces under severe customer service/use. This seat was designed with a polymer based rising rate/stiffness foam seat pan. The foam was specifically chosen to reduce high rise time short duration impact acceleration (G's) related forces from superior/inferior impact/seat slap. These forces heretofore have been the result of poor seat Bio-Mechanics and poor vehicle suspension design technologies. Motorcycle Suspension design, research & development is mentioned below.

Project management:

Project Manager/Systems Engineer working for General Motors, as a consultant from Hughes Aircraft, at Advanced Product Engineering at the GM Technical Center in Warren, Mi. The purpose of which was to assist in the teaching/training of GM **senior engineers, managers and executives** on the **Scientific Methods/concepts of System Engineering** from the Aero Space field and how this discipline can be successfully integrated/applied to the automotive design, manufacturing, testing and project management side of the car business.

Teaching: Publishing Digital/CD Book "Forensic Air Bag Analysis Methods" by McLay, Jacobson, Dill, Wilder & Nagle. **The Iowa Projects:** "**Air Bags: Promises and Problems"** seminar at University of Iowa, (11-2-96). Teaching GM Executive and senior Engineering personnel lecturing included weekly training classes he prepared and presented on such System Engineering concepts as Earned Value financial project management, Configuration Management, Vehicle Validation, Risk Management, Trade Study Methods, Program Controls Process, the Four Phase Process of vehicle design, Work Breakdown Structure, 3-Dimensional Critical Clearance Matrix/documentation, Vehicle Technical Specification, Dynamic Vehicle Subsystem Performance Metrics (such as Digital Signal Processing of transmission shift quality, engine idle quality, engine combustion chamber detonation recognition and suppression and vehicle noise recognition suppression, modulation and warning/service), Engineering Notebook writing and document control, formalized Engineering Design Reviews based on subsystem performance requirements, total vehicle conception, design and manufacture schedule compression through the use of vehicle subsystem and whole body computer software simulations, verification and software tests and validation prior to prototype manufacture, Vehicle Mass Properties Optimization including roll, pitch and yaw inertia dynamics & compilation of System Engineering Tool Kits.

Project Manager of $.4 million air bag **NHTSA** contract for subcompact passenger cars and RSV's. **Tests and published research** include a digital/CD Book "Forensic Air Bag Analysis Methods" by McLay, Jacobson, Dill, Wilder & Nagle, occupant head and thoracic injury analysis for **out of position small adult and child** occupants with passenger side **air bag**. These tests also evaluated the **injurious/fatal effects of Air Bag induced trauma** such as burns, blindness, broken arms and crushed thoracic cavities/fatalities. Developed Passenger Air Bags for CALSPAN's Research Safety Vehicle (RSV) and NHTSA at CALSPAN in Buffalo, New York. Worked on $8.0 million Research Safety Vehicle for NHTSA.

Lectured at the CCF/HSF Winter Conference in San Jose, Ca. January, 1994 on low speed MVA induced cervical/lumbar spine injuries.

Product Design and Manufacturing:

Systems Engineer working on General Motors prototype and production IMPACT Electric Vehicle Program at GM's Tech Center in Warren, Mi. and AeroVironment in Monrovia, Ca. He assisted in the design of the production GM Impact electric car by defining the technology used in the preproduction/prototype Impact vehicle which we designed, manufactured , developed and tested at AeroVironment. His systems engineering design effort included such technologies as the Impact's Motor, Motor Cooling, Batteries and associated crashworthiness, Suspension, Transmission, Brakes, Chassis and related Composite materials, the Air Conditioning system, CHIMSEL (Holographic rear brake lights).

The Impact mass properties/management was also a significant design feature as it directly relates to vehicle range and handling dynamics. The benefit of weight management to the EVP is a systematized, traceable, verifiable and controllable process for the optimization of the vehicle's weight and subsequent improvement in range (for every 38 lbs in vehicle weight saved the vehicle's range is extended by about 1% or 1 mile).

The weight and moments of inertia (measurement of an object's resistance to rotational acceleration) are determined analytically from drawings using formulas or from the mass properties program found in most CAD software or experimentally using mass measurement equipment in the lab with prototype parts. Clearly from a schedule standpoint the analytical approach is preferred.The magnitude of weight and mass properties can be discovered in software prior to engineering drawing release dates or before parts are made.

The advantages of a weight and mass properties program are many. Most importantly, it will reduce the vehicle's weight and improve its range/economy, it will optimize the c.g. location and also reduce the vehicle's role, pitch and yaw inertia, reduce polar moments of inertia and reduce the roll over potential/dependence on chassis fixes that are required after production.

Design Project Manager/Scientist (1989 to 1992) on a future electronic 5-7 speed Automatic Transmissions at the GM Tech Center's Advanced Engineering Staff, in Warren, Michigan. He was a Project Manager and resident X2F Clutch to Clutch 5-7 speed prototype automatic transmission engineer at Advanced Engineering Staff in GM's Tech Center. His job was to instruct/train GM engineers and executives on the project management advantages of systems engineering and how it could be applied the GM's vehicle subsystems. He was the Hughes Aircraft's Steering Committee representative/manager on the X2F transmission program. This project/committee included representatives from Hydramatic Division, GM Research, Advanced Product Engineering, and Advanced Engineering Staff.

Scientist & Section Head in Design, Manufacture & Vehicle Integration of commercial (HS376 type) and DOD Satellites & Space probe vehicles. Line manager of over forty design & vehicle integration satellite engineers & manufacturing technicians. His projects included structural design and manufacture of commercial and military satellites, vehicle subsystem integration project management, vehicle construction & test engineer, and manager of NASA's space shuttle Vehicle Engineers, that is his staff prepared the spacecraft we design & built for insertion into the space shuttle in preparation for launch.

These spacecraft included top secret military vehicles, commercial satellites such as the graphite composite antenna on Aussat, Anik-D and Galileo probe to the planet of Jupiter.
Design and Development Engineer of Ford's fuel systems/Digital Electronic Fuel Injection for Ford Motor Co.'s 5.0L V-8 and 3.8L V-6 engines. He worked at Engine Engineering in Dearborn, Mi. developing, designing and field testing prototype electronic fuel injection fuel systems. These throttle body & direct intake manifold/port injection systems were developed for V-6&8 class engines. Designed hydraulic systems for Ford Diversified Products in Troy, Michigan.

He also designed, in the context of automotive systems engineering, subsystem performance metrics for quantification of vehicle/**transmission shift quality** using real time digital signal processing,

statistical analysis of engine accelerometer and power spectral density data. Transmission shift quality metrics are based on data collected from field testing of GM's 4L60E automatic transmission. Specifically the vehicles (1994 B&D Cars) are instrumented with accelerometers and strain gages to measure and record the vehicle's response to transmission shifts. The acceleration and axle torque time histories are further analyzed by Hughes' advanced signal processing techniques learned from years of experience in Radar detection, e.g. FFT, PSD and Wigner-Ville analysis techniques.

Perturbations on the accelerometer/torque time histories were correlated with specific transmission components and features. The emphasis of analysis techniques and computer dynamic modeling will be to create a prioritized list of transmission components and control variables that correlate to perceptible shift anomalies.

This and other performance metrics, such as engine Idle, adaptive noise monitoring and engine combustion detonation, were used as design performance standards in GM's Vehicle Technical Specification for all cars and truck.

Adaptive Noise Monitoring equipment on GM race cars, e.g. Indy and GTP cars. We (EDSG) developed a data telemetry system (Oscar) for Buick's Indy car effort. The object of the technology would be to monitor the acoustic, temperature and/or vibration signatures, from a prioritized failure mode list, such as wheel bearings, engine bearings and pistons, CV joints, differential gears and brakes. The data would then be telemetered (JASON software) to the pits where it would be real time analyzed. The data compared, real time, to a look up table of go/no-go routines and appropriate warnings of incipient failure/service recommendations made. This technology could be developed and later used in GM Dealership Service Departments throughout the country as a diagnostic aid for customer driven complaints.

Designed a prototype V-8, 5.7 L Mid-Engine concept sports car while at General Motors Proving Ground, Milford, Mi. This design included a mid mounted small block 5.7 L Corvette engine with remote trans axle for Roll, Pitch and vehicle Yaw optimization and vehicle handling/control. The chassis was a unibody sports car design with two seating capacity, 180 degree exhaust headers/pipes, front mounted aluminum radiators and liberal use of composite plastic materials for weight reduction and subsequent performance optimization. The total vehicle weight was scheduled to be 2300 lbs. The car was designed to compete in the Ferrari class vehicle category.

Motor Vehicle Design and Manufacture:

2001 Project Vehicle: Designed, manufactured & raced six cars starting at the age of fourteen. His current 2001 project vehicle is a Scientifically Designed (System Engineered) "Custom Show Car". **Awards:** 1 St. Place VW Jamboree, Irvine Meadows 5-6-01; Best Engineered Import Car, Brea, Ca. 6-10-01, Appears in Hot VW Magazine, Sept. issue pg. 83; Daytona (Dec. issue) and Let's Play VW (Japan) Dec. issue, pg. 8, VW Scene (USA, Germany and Sweden), Wheels Magazine (Sweden) April 04 pgs. 66&67.

The first car (age 14) was an "C" Altered class vehicle designed & scratch built for Drag Racing. The vehicle was based on a Model-A, 1931 Ford five window coupe. The car had a 383 CID Chrysler Wedge engine, with high performance cam, scratch built direct port intake manifold for four carburetors, centrifugal only ignition/distributor, scratch built exhaust headers, a Ford T-Bird 4.11:1 rear axle, boxed steel frame, chopped and channeled body and coilover rear suspension w/ T-Bird brakes. Additional cars included a Chev Camaro Stock Car, Mid Engine V-8 Corvair road racing car and a stock appearing 1932 Ford four door sedan "sleeper" with 394 Oldsmobile Engine and power train.

These designs included engine, transmission, suspension, intake and exhaust system, chassis system, brake design, tire, fuel system and safety fuel tank systems design and fabrication, e.g. aluminum, steel, fiberglass and HDPE (plastic) fuel tanks w/fuel cell foam, flexible fuel cells and bladders. He is

also consultant to the World and International Karting Federation on safe fuel systems, fuel tanks and fuel tank location/crashworthiness for racing cars.

He also has designed Racing Cars, Ice Boats, Tunnel Hull Boats, Super Karts and Motorcycles since high school to present. These designs have included an industry first all carbon graphite fiber motorcycle, gas shock absorber for racing motorcycles, non-linear suspension a torque/chain reduction device for motorcycles, reed valves for two cycle motorcycle engines, and roll, pitch & yaw optimization design goals for motorcycles and cars. Has won over 600 races over thirty year of amateur and professional racing competition.

Designed an industry first method of quantifying measurement error and measuring natural gas flow in major international gas transmission lines. The process used electronic turbine and orifice flow metering in a pulsating (flow and pressure) environment. It also included telephone line data transmission and interrogation from remote sights to the gas companies headquarters in San Francisco, Ca.

Testing:

Work at the GM Proving Grounds included full scale, HyGe sled, static crusher and vehicle components tests using air bags and seat belts. Developed energy absorbing instrument panels and other passive restraints. Defined high energy (HYGE) Sled pulses for surrogate/dummy occupant testing.

Conducted field accident investigations of General Motor's Motors Insurance Corporation (MIC) files & reconstructed these accident configurations in the laboratory using anthropomorphic dummies & full vehicle instrumentation. The purpose of these full scale tests was to evaluate the impact severity of actual field accidents in the laboratory using exemplar cars. By doing so we were able to determine scientifically by measuring electronically the actual speed and relative velocity vectors of the colliding vehicles and measure/evaluate the occupant impact severity in these crash scenarios. This truly scientific real world technique enabled us to to evaluate overall vehicle crashworthiness, fuel system integrity, restraint system performance, vehicle structural robustness and cost of repair estimates, etc. for the accident recreations we researched. These crash test would also be used to further research in the laboratory in the context of FMVSS 208, 216, 301 etc. type crash tests.

Vehicle handling and dynamics track and skid pad testing is available for the analysis and evaluation of Roll Over propensity (e.g. sport utility vehicles), Bake failure evaluation, Vehicle Handling, Ride, Chassis Stifness, Shock and Spring rate evaluations, Fuel Tank and Exhaust system design, fabrication and testing and Visibility studies.

Performed automotive occupant injury/survivability evaluation of frontal, rear end, roll over and lateral full scale vehicle crash/impact tests. Researched the development of advanced technology vehicle, safety devices, such as air bags, seat belts, composite materials and foam materials for crash energy management. These tests included testing of prototype and production Sodium Azide and compressed Nitrogen gas air bags and velocity and G sensitive lap/shoulder and lap belts, friendly interior design to mitigate head, chest, abdominal (submarining) and femur injuries from interior vehicle contact in the above accident scenarios.

Conducted rear impact accident simulation and tests for major LA /county traffic accident/injury cases. Research included HYGE sled and static testing of automotive seat back/head restraint design and seat performance during rear end collisions at Auto Safety Engineering in Los Angeles, Ca.

The purpose of these tests was to document/evaluate the strength and crashworthiness of various manufactures seat and seat track designs as it would relate to dynamic structural failure of these components in a real world vehicle crash. The test results would then be compared to the Federal Motor Vehicle Safety Standards.

Vehicle Performance and Handling Track Testing:

As a former professional driver, since 1974, he has conducted automotive and motorcycle dynamic track testing has included vehicle handling and performance testing, engine, suspension, brake, tire coefficient of friction and tire compound testing at major racing tracks around the country. He has tested at such tracks as Riverside, Willow Springs in Lancaster, Ca., Sears Point in San Francisco, Laguna Seca in Monterey, Ca., Road America in Wisconsin, Gratten Raceway in Michigan, Indianapolis in Indiana, Mid Ohio in Ohio and Road Atlanta in Georgia, Perris in Perris , Ca., Indian Dunes in Ventura, Ca., Saddleback in Orange County, Adams in Riverside, Novatto in Novatto, Ca., Sacramento in Ca., Thunder Hills in Willows, Ca., and Fremont Raceway in Fremont, Ca.

Twenty years experience with 2&4 Stroke engines, consulting, design and modification of motorcycles with Honda, Yamaha, Husqvarna in Sweden & Maico in Germany. Designed a prototype all carbon fiber composite motorcycle for Yamaha in Japan.

Consultant to the **United States Olympic Committee** in Colorado Springs, Colorado on scientific/quantitative athletic performance measurement (cardio vascular, pulmonary and muscle) optimization . Using real time body function data acquisition electronics and high speed whole body video kinematic analysis.

EMPLOYMENT:

Dill Engineering 9/74 to-present; **Motor Vehicle Accident Reconstruction** (since 10-93) & Design, Development & Fabrication of Automobiles, Motorcycles and Race Cars since 9-74.

T. Mitchell and Associates, Upland, Ca. 3/92-10/93; **Bio-Mechanical Engineer & Accident Reconstruction**. **Pro Council:** Consultant re. Accident Reconstruction 1996-present

Scientist: General Motors Hughes Electronics Co., 8/82 - 3/92. Worked for Hughes as a Space Craft Design Engineer & Section Head in El-Segundo, Ca. and at General Motors Advanced Engineering Staff at the Tech Center in Warren, Mi.
Project & Bio-Mechanical Test Engineer: General Motors Safety Research & Development Laboratory, Milford, Mi. 4/72-12/76, FMVSS crash testing & Anthropomorphic Dummy design.

Scientist: at Hughes Air Craft in Fullerton, Ca. & the General Motors Technical Center in Warren, Mi. 1989-1992.

Restraint Systems Project Manager: Minicars, Goleta, Ca., 9/77-3/79 Research, Design, Development and Testing of Air Bags, Passive Restraints and RSV's under government contract with NHTSA/DOT in Washington.

Design and Development Engineer: Ford Motor Company, Engine Engineering Department, Dearborn, Mi., 3/79-4/80, Developed Digital Electronic Fuel Injection, Air Bag R&D/Congress. Ford Diversified Products, Troy, Mi. 1/77-9/77.

Electronic Gas Measurement Engineer: Sr. Engineer Pacific Gas and Electric Co., San Francisco, Ca. 9/80-8/82.

PROFESSIONAL AFFILIATIONS:

Society of Automotive Engineers, since 1973
Top Secret (EBI) Clearance with the Department of Defense
Forensic Expert Witness Association (FEWA)
JurisPro.com

Continuing Education Courses:

2008 ARC/CSI Crash Conference 6-2 to 5-08 Las Vegas, Nevada, SEMA (Specialty Equipment Market Association) Las Vegas, Nevada for the last ten years, Accident Reconstruction Crashworthiness & Bio-Mechanics of Injury Causation, (Air Bag Defect Theories, Occupant Packaging Defects, Seat Belt Defect theories, Air Bag Deployment Characteristics and Vehicle Black Box Data), Highway Accident Reconstruction (NAFE) (Collision Analysis, Air Bag ECU Encoding, Photogrammetry, Signal Light Timing Study, Critical Speed Analysis, Seat Belt Failure Mechanism), Accidental Injury: Bio-Mechanics & Prevention, Society of Automotive Engineers TOPTEC, Passenger Car Rollover Causes and Prevention (Occupant Kinematics in Rollover MVA's, Bio-Mechanics of Neck Injuries, Bio-Mechanics of Head Trauma, Accident Statistics, Rollover Causal Analysis, Rollover Frequency, Roadside Design and Rollover, Vehicle Inertial Loading, Vehicle Roll Propensity, Advanced Rollover Protection, Rollover Sensor Technology, Tire Performance and Rollover), Air Bag Design and Performance 1997 (Air Bags How and Why they work, Regulatory History of AB, Depowered AB, System Designing of AB, Fatalities Associated w/AB, AB crash sensor performance, Head and Thorax Side Impact System, AB Injuries in head on collisions, AB performance in the real world, AB Injury Patterns, Auditory and Visual System Injury Potential w/AB, Performance Advantages of Light Weight AB Material, Smart Restraint Systems, Advanced AB research, Field investigation of AB, seat belt and Interior markings), "The Iowa Projects: Advanced Automotive Restraint Systems", Society of Automotive Engineers, TOPTEC, e.g. (Occupant Kinematics, Bio-Mechanics of Injury from Traffic Collisions, Low Speed Rear Impact, Occupant Kinematics, Bio-mechanical Understanding of Kinetics and Kinematics, Injury Bio-Mechanics of Soft Tissue in the Neck, Rear Impact Crash Characteristics, Low Speed Collisions Injury Coding, Human and ATD Head Kinematics in Low Speed Rear End Collisions, Vehicle Restitution in Low Velocity Collisions, Staged Collisions and the Role of Bumpers and Estimating Impact Impact Severity), Anatomy for Automotive Engineers, Chiropractic and Motor Vehicle Accidents, Accident Bio-Mechanics and Anatomy, Physics and Mathematics of Vehicle Collisions, Occupant Kinematics and Analysis of Restraining Systems, Bio-Mechanics of Low Speed Collisions, Bio-Mechanics of Injury from Traffic Collisions Speed from Skid Marks, What Happens in a Collision/How A Seat Belt Works, Traffic Collision Questionnaire, Vehicle Mechanical Inspection, Vehicle and Person factors in Whiplash Injury, Bio-Mechanics of Neck Injury, Physiology of Pain and Whiplash disorders, Psychology of Pain, New Hypothesis of Whiplash Injury, Bio-Mechanics of Cervical Facet Capsule, Radiological Aspects of Whiplash, Whiplash Injury Mechanisms, Whiplash Injury Bio-Mechanics, MRI of Soft Tissue Injuries, Osteopathic Manipulation, Neck Injury in Low Speed Rear Impacts, Rehabilitation in Whiplash Injury, Composite Plastic Materials, Modal Analysis (SDRC), Sixteenth Stapp Car Crash Conference (Bio-mechanical Quantities in Analytical Neck Models, Improved Neck Simulation for ATD's, Mechanical Necks with Human Response, Injury mechanisms of the Cervical Spine, Injury Mechanism in Roll Over MVA's, Injury Frequency and Head Restraint Effectiveness in Rear End Collisions, Effect of Long Duration Impacts on the Head, Pathological Response to Rotational and Translational Accelerations to the Head, Bio-Mechanics of Seat Belt Design, Safety Performance of Shaped Steering Assembly Airbag, Modeling and Bio-Mechanics, Impact Studies of Facial Bones and Skull, Injury mechanism in Roll Over Collisions, Car Crash Collision types, Parameter Study of Bio-mechanical Quantities in Analytical Neck Models, Rear Seat Inflatable Restraint Systems, Impact tolerance and Resulting Injury Patterns, Dynamic Performance of Child Seating Systems, Effectiveness of Safety Belts under various Directions of Crashes), Carbon/plastic Composite Materials, Strength of Materials, Stapp/SAE (Automotive Accident/Injury Research), Project Management, Line Management, Quality Circles, Leader/Facilitator Training, Group Problem Solving, Adhesives, Non Destructive Testing (NDT, X-Ray and Ultrasound techniques), CSPEC (Department of Defense-project financial project management), Automotive Engines, Chassis/Vehicle Dynamics, ARRA driving school, WERA's K. Code driver school, G. Bailey driving school, Suzuki driving school, SuperKart driving school, PADI SCUBA Diving certification.