



## The Engineering Institute Newsletter

January 2012



### Recent Publications

Tire Expert Don Lee, co-authored "*Understanding Why Codes And Standards Fail*"

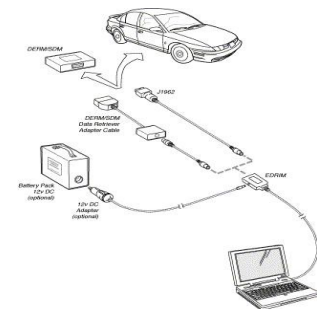
ASME International  
Mechanical Engineering  
Congress, Denver, CO,  
November 11-17, 2011.  
IMECE 2011-62037

### Website Quick Links

[Home Page](#)  
[Accident Reconstruction](#)  
[ATV and UTV](#)  
[Biomechanics & Occupant Motion](#)  
[Design and Development](#)  
[Fire Investigations](#)

### Vehicle electronics: The Black Box

When we think of electronics in our vehicle we most likely think of the devices we can see or touch. However, there are sophisticated electronic devices such as sensors and recording devices that we cannot see. Since the 1970's, automakers have produced vehicles with onboard computer systems known as Engine Control Modules (ECMs). The ECM records information that helps detect problems with the vehicle engine operation. As technology became more advanced other sophisticated sensors were installed on vehicles. Some of these sensors are accelerometers for airbag modules, wheel speed sensors for ABS and traction control, and vehicle yaw rate sensors for stability control. This technology set the path to creating the crash data recorder or "Black Box" which can provide pre-crash data that is helpful in developing safer vehicles, aiding in law enforcement with their investigations, and providing accident reconstructionists with important details related to the crash.



Vetronix Event Data Recovery System. Photo from (NHTSA) website

Utilizing the proper software, interface hardware, and a PC, [The Engineering Institute's](#) Accident Reconstructionists [Stan Andrews](#) and his team are experienced in recovering and downloading information from the event data recorder (EDR), or black box. Depending on the vehicle, the EDR can provide information about the vehicle speed, the engine RPMs, use of accelerator pedal, brakes, and whether seatbelts were in use during the crash. In addition to recovering and downloading information from the event data recorder, The Engineering Institute's Accident Reconstructionist team performs investigations of the vehicle, the

[Restraint Systems](#)  
[Tire Design & Analysis](#)  
[Vehicle Dynamics & Stability](#)  
[Rollover](#)

crash-site, and investigates photographic evidence. From the investigation and mathematical analysis of the vehicle motion, the Accident Reconstructionist can provide an analysis and detailed report of the accident and aspects of interest related to the crash. To read the latest ruling on 49 CFR Part 563 *Event Data Recorders*, click [here](#).

## Seat belt Safety



Dr. David Renfroe

The importance of a seat belt is to protect the occupant from catastrophic injuries and to help prevent fatalities. Moreover, a seat belt was designed to keep the occupant in the seat, which reduces catastrophic injuries, ejection and death. In an automobile accident the occupant absorbs the crash forces of the impact.

Without a seat belt, the occupant is forced from the seat, which causes the occupant to strike the interior parts of the vehicle, other occupants within the vehicle, or are partially or completely ejected from the vehicle. Striking other occupants within the vehicle can cause life threatening injuries or death to both occupants. Striking the interior parts of the vehicle can cause brain trauma, spinal injuries and even death, such as the case during the tragic accident of Princess Diana.

The forced impact from the automobile accident caused her unbelted body to be thrown into the back of the front seat. Using an occupant motion model, [Dr. David Renfroe](#) of The Engineering Institute explains during a [CNN interview](#), how the force of the impact is transferred to the body causing Princess Diana's death. Dr. Renfroe further explains her injuries would have been survivable if she had been wearing a seat belt (Renfroe D., 1997).

Dr. Renfroe has years of experience in cause and effect of seat belt failures. He has authored and co-authored peer-reviewed papers related to seat belts such as "Failure Analysis of Seat-Belt Buckle Inertial Release." [Engineering Failure Analysis Vol. 14. Issue 6 \(2007\): 1135-1143](#). Currently, Dr. Renfroe holds a patent for an Impact Resistant Seat-Belt Buckle.

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The Engineering Institute | 13045 West Highway 62 | Farmington | AR | 72730