

Ralph's Accident Reconstruction Newsletter—Volume 5, Number 1—January 2006



In July of 2005, I attended the Seventh Annual Southeastern Accident Reconstruction Conference held in North Charleston, South Carolina. This conference was jointly sponsored by the South Carolina Association of Reconstruction Specialists (SCARS), the Southeastern Accident Reconstruction Society (SeARS), and the Society of Accident Reconstructionists (SOAR). On the first day of this conference, four staged collisions were conducted. Rusty Haight of Collision Safety Institute drove the bullet vehicle for each collision and provided most of the instrumentation. Cars were furnished by the South Carolina Highway Patrol. The photograph above was taken a few milliseconds after the first collision, which involved a 2000 Chevrolet Camaro driven into the right side of a 1990 Toyota Corolla. The white, pipe-like structure seen between the photographer and the Camaro is part of a trap system used to establish a precise value of speed at impact. It was conducted on the grass to demonstrate several features and factors of the SDM in the Camaro.



The photograph to the left shows the SDM which was standard in the Camaro (to the left) and the IST three-axis accelerometer, which is a very accurate device. The IST accelerometer was securely mounted to the floor of the Camaro, near the SDM. The primary purpose of the accelerometer in the SDM is to monitor large changes in speed to evaluate whether or not the airbags should be deployed, and it monitors (and may record) acceleration in only one plane—the car's longitudinal, or front-to-rear, axis.

Even though the accelerometer in the SDM (Sensing Diagnostic Module) only monitors acceleration in one plane, and it is not a laboratory-grade piece of equipment, numerous tests where an SDM has been present in a car which was instrumented with IST or other very precise accelerometers have shown that it is surprisingly accurate in the longitudinal plane. The SDM is General Motors' name for the Event Data Recorder (EDR) placed in virtually all of its late-model cars and light trucks.

The trap showed that the Camaro was traveling 36.5 mph at impact. The Camaro's delta-v was 15.9 mph in 130 milliseconds of collision with the Corolla. The Corolla's delta-v was 21.6 mph. The SDM in the Camaro reported an impact speed of 35 mph. The SDM also reported a delta-v of 14.5 mph. Numerical evaluation of the post-crash data using momentum principles and reasonable ranges for values not specifically known yielded an impact speed in the range of 34.7 to 37.3 mph.

These and other tests confirm the accuracy and validity of applying conservation of momentum principles to reconstruct an accident, including speed calculations. This test and others also show the general accuracy of the velocity reported by EDRs in motor vehicles and that the reported delta-v values are generally low; in some cases, the reported delta-v values can be significantly low. The good news is that they're not high! A driver can't say, "My EDR reads high!" It doesn't; recorded data have consistently been shown, by this and other staged collisions, to be generally accurate to somewhat low.



The picture above shows the third staged collision sequence. A 1994 Ford Crown Victoria was driven to collide with the rear of a parked 1985 Nissan Maxima, which was propelled by that collision into the rear of a parked 1989 Chrysler Conquest. The delta-v to the Crown Vic was 19.9 mph. The Maxima departed from this collision with an initial speed of 20.7 mph. (It was lighter than the Crown Victoria.) It moved forward from that rear impact to collide with the rear of the parked Conquest. A primary purpose of staging this sequence was to demonstrate that conservation of momentum principles can be applied to both collisions. One of the interesting aspects of attending conferences like this is to watch these staged collisions. All were surprised at the degree to which the front of the Crown Vic rose at impact, only to bounce down hard when the Maxima moved away from it. The speed of the Crown Vic at the instant of impact was 37.8 mph.