

Ralph's Accident Reconstruction Newsletter—Volume 7, Number 2—April 2008

Although I've written and said repeatedly that a data download from an Event Data Recorder (EDR) is no substitute for an accident reconstruction, there are situations where data extraction from an EDR is the best means of establishing certain aspects of a collision sequence. I recently had several such situations. Since these investigations are ongoing, I cannot divulge details, only generalities, but they are prime examples of the usefulness of crash data retrieval (CDR).

The first such example involves a collision between a private passenger vehicle and a motorcycle. These vehicles collided head-on; the passenger vehicle moved forward after impact, and the motorcycle was dislodged backward from its original direction of travel. The motorcyclist did not survive the collision.

There are front stiffness values, based on documented crash testing, available for virtually every common personal road vehicle in use today. Motorcycles, on the other hand, are a different story. There has been limited crash testing of motorcycles, and design features can be radically different from one make to another, and sometimes among different models from the same maker, such that there are no reliable "crush coefficients" for motorcycles. Therefore, any energy-based analysis of a motorcycle crash into a car must be conducted very carefully.

A momentum-based analysis of a collision can be very useful, particularly at a right-angle intersection. In a head-on collision, conservation of momentum alone cannot determine vehicle impact speeds unless the speed of one is known by some independent means. And that's where the usefulness of CDR becomes most apparent: the EDR in many vehicles will record the vehicle's speed in one-second (or other) increments before the collision. Many will also provide a numerical value for delta-v, the sudden change in velocity which occurs while the vehicles are in contact. Either number can be used in a momentum-based analysis to determine the impact speed of each vehicle or of the other vehicle, whichever may apply.

In this particular case, a police agency had removed the EDR from the private passenger vehicle and would not allow an independent download, nor would that agency provide the data download in printed or electronic format. I completed my evaluation based on the best conclusions I could reach, having measured the crush at the front of the passenger vehicle, documented that the collision was essentially head-on, located crush coefficients for the front of the passenger vehicle, and documented the details of the point of impact and post-collision travels of the vehicles. That is what I would have done in the years when there were no EDRs in cars and light trucks. The frustrating aspect is that technology was providing a better, more accurate way to evaluate the collision, but I was denied access to that data.

Unrelated to the topic of CDR aids to reconstruction is the photograph in the upper right side of this sheet of the newsletter, which shows an automotive bulb with a hot-shocked filament. This was one of the experiments conducted in conjunction with the 2007 SCARS/SeARS conference. This bulb had a filament of normal configuration before the staged collision and was incandescent at impact; the filament is now obviously and permanently deformed. This is classic hot shock whose cause was proven during the staged collision.



Another case involving an EDR download pertained to a right-angle collision at a perpendicular intersection. The vehicle with the right of way outweighed the crossing vehicle by an approximate factor of two. Also, the vehicle with the right of way was traveling approximately six times faster than the crossing vehicle, giving the heavier vehicle a twelve-to-one momentum advantage. At impact, these two units stuck together, moving together to their final, comingled position. Penetration of the crossing vehicle was essentially 100 percent, rendering a crush analysis for that vehicle invalid. The heavier vehicle, however, had an EDR contained within the airbag control module (ACM), and that EDR recorded a delta-v. Combining the documented speed loss at impact with a calculated maximum post-impact speed loss for the comingled vehicles, considering which tires remained on the ground, what loads were placed on them, and the surfaces and distances they covered after impact, provided a basis to calculate the maximum speed of the vehicle which had the right of way; it was traveling at the speed limit or a little below at the instant of impact.

As you probably know, access to ACMs in select Chrysler vehicles is now possible with the Bosch CDR Toolkit. Data downloads from each manufacturer are different; some are more different than others. ☺ The ACMs in the Chrysler vehicles do not record accessible data unless the command to fire the airbag(s) was given by the module. When airbags have fired, however, the EDR in the ACM typically provides a large volume of data at increments of one-tenth of a second for the two seconds preceding the crash.