

Event Data Recorders' Role in Accident Reconstruction

Billy S. Cox, Jr.

One sunny spring morning, on a rural road just outside of Houston, Texas, Molly Jackson, a vibrant 16-year-old girl with a bright future and a new driver's license, was behind the wheel of her father's brand new Chevrolet C2500 crew cab pickup truck. At the same time, just seven seconds before she would draw her last breath, Rhonda Simmons, a 46-year old divorced mother of two teenagers, was approaching from the opposite direction in her sleek and sporty Pontiac Trans Am.

The freshly paved, two-lane county road with a 55-mph speed limit was so newly resurfaced that fog lines delineating the edge of the pavement had not yet been painted. The center of the road was designated only by small, reflective yellow tabs, spaced 10 feet apart. Neither Simmons nor Jackson could foresee how their lives would change forever in mere seconds — one leaving this earth and the other, living with the burden of another person's death and facing criminal indictment.

What Went Wrong?

Just five seconds before their two worlds collided, the right-side tires of the big Chevy dropped off the pavement and onto the grassy shoulder. At 55 mph, the pickup was a little more than 400 feet from the very point on earth where the two lives would be irreversibly changed, yet Jackson only had five seconds to regain control of the vehicle. Partly because of her inexperience and partly due to the fact that the drop on the right side was much greater than she expected, Jackson struggled to steer the vehicle back onto the paved surface.

As both drivers approached a slight S-curve, Jackson steered hard to the left, putting the Chevy into a yaw from which she would not recover. The big truck popped back up on the pavement, crossed the center point on the road, and struck Simmons' Trans Am with more than 578,000 ft-lbs of kinetic energy. The vehicles engaged in horrific fashion, began to rotate in a clock-wise fashion, and then separated. The Trans Am was no match for the rugged and rigid Chevrolet. It crushed so much that the driver's compartment around Simmons disappeared. Although the airbags deployed, the steering wheel was thrust rearward to the point of almost touching the driver's seat, causing Simmon's torso to absorb the full force of the airbag.

An investigation ensued, but the sheriff's department lacked the equipment or technical expertise to conduct a thorough crash reconstruction. However, they knew enough to be dangerous. One of the investigating officers remembered from a seminar that a yaw mark could be measured and variables plugged into a formula to determine a vehicle's speed. Armed with this knowledge, investigating officers measured what they believed were yaw marks from the Chevrolet and determined that Jackson's vehicle was traveling about 82 mph when she steered it suddenly and created the mark.

Sheriff's investigators failed to recognize that the damage, although extensive, was not to the extent one would expect if a 3-ton pickup struck a passenger car at 82 mph. Even more disturbing, they made no

measurements of the impact point and points of rest, nor did they download impact crash data residing within the event data recorder (EDR) of the airbag control modules of both vehicles.

Technology Yields New Clues

Since 2000, Vetronix Corporation has manufactured a crash data retrieval (CDR) system that is available to law-enforcement, industry, and crash-reconstruction experts. It provides the user with an interface to gain access to the EDR of some Ford, Isuzu, Lincoln-Mercury, and many General Motors and Saturn vehicles. In the case of General Motors and Saturn, some model years as old as 1994 have data stored on the EDR.

With the Vetronix CDR, data retrieval can be accomplished in five-to-10 minutes, assuming the EDR is accessible. The CDR converts hexadecimal codes into useable data and displays it in a decipherable format on a Windows-based PC.

W.R. "Rusty" Haight, founder and director of the Collision Safety Institute in San Diego, Calif., said that EDR technology has improved and has led to improvements in three key areas of traffic safety: engineering, education, and enforcement. Haight believes that this technology has and will continue to save lives. According to him, since the technology became mainstream in 2000, there have been recalls as well as less-significant changes in vehicle design, changes in driver behavior, and a whole gamut of traffic-safety improvements. However, he cautions that the room for error and misinterpretation is greater than ever.

Although the data can be instrumental in reconstructing a crash, it can be misleading or wrong if it is relied upon as a stand-alone data point. Insurance companies can make better claim decisions and reduce claim costs if the data is used as intended — as a tool to be used in combination with a thorough crash reconstruction.

The EDR data should supplement the information documented in photos, damage-repair estimates, scene evidence, law-enforcement reports, and witnesses' accounts in order to determine liability or, in some cases, to help determine whether the collision magnitude was severe enough to cause occupant injury in a low-velocity crash.

"The data ... is what it is, no different than a skid mark is a skid mark," Haight said. "How it can and when it can't be used is a second issue and one that needs to be addressed through understanding, proper training, and proper application of the technology."

Results of the Reconstruction

In the case of Jackson and Simmons, the data harvested from the wreckage of both vehicles told a story that was very different than the results of the sheriff's investigation.

First, the EDR in the Chevrolet pickup stored five seconds of pre-crash data that included vehicle speed, engine RPM, brake-switch position, and percent-of-throttle input. At no time in the five seconds preceding the

crash did the speed of the Chevrolet pickup exceed 65 mph. Yet the sheriff's department erroneously calculated the speed to be 82 mph as the truck began to yaw. In fact, the last recorded speed of the Chevrolet pickup was 58 mph.

The EDR also recorded a maximum change in velocity, or delta-V, of -25.9 mph and indicated that Jackson was wearing her seatbelt. The EDR in the Pontiac Trans Am also recorded some crucial data, although it was not as extensive as the Chevrolet pickup. There was no pre-crash data, but the maximum recorded delta-V was -39.8 mph.

The electrical system on the Pontiac was severely compromised, forcing a more cautious analysis of the stored data. For example, the data summary indicated that Simmons was not wearing her seatbelt at the time of the collision. The inspection of the vehicle during reconstruction revealed, however, that the driver's seatbelt latch plate was still inserted into the buckle and the belt was cut in two places by rescuers who worked to free Simmons from the wreckage. Because of the damage to the electrical system, all of the data could not be written to the EDR and the system interpreted the results for the driver seatbelt as being unbuckled.

Using all of the information collected from both EDRs in conjunction with the crash reconstruction yielded a much different crash scenario than the one the sheriff's investigators had developed. The calculated impact speed of the Chevrolet C2500 was 58 mph, yielding a calculated change in velocity of -24 mph. The calculated impact speed of the Pontiac Trans Am was 55 mph, with a calculated change in velocity of -39.8 mph. The EDR data yielded a change in velocity of -25.29 mph for the Chevrolet pickup and -39.05 mph for the Trans Am. The calculated changes in velocity differed from the stored data by 1.34 mph on the Chevy and a mere .75 mph for the Pontiac.

The crash reconstruction and the data retrieved from the vehicles were in agreement. The calculations performed by the sheriff's department did not consider any of the physical evidence available at the scene, other than the yaw mark. Further, their investigation did not consider the data stored by the EDR in either vehicle. Thus, their hypothesis was inaccurate and their presentation of the criminal case to the district attorney's office was based on erroneous calculations.

Jackson may be found liable in a civil lawsuit, but she was spared from criminal prosecution after a thorough crash reconstruction, partially based upon data retrieved from the EDR of each vehicle, was presented in total to the district attorney's office. The crash was a tragedy for all parties involved, but the tragedy could have been further compounded by a faulty police investigation that did not include readily available crash data.

Future of EDR

As long as safety advances continue to be made, an increase in the use of the technology will continue as well. Down the road, Haight said, we are likely to see other related innovations for both fleet management

and individual applications. Tying in other vehicle systems, including diagnostic tools, is the next logical next step. Haight believes that analytical computer programs already in use will be modified to include data from in-car systems for better, more rounded analyses.

Finally, Haight offered a bold vision for the automotive and insurance industries, who typically find themselves on opposite sides of an argument in the area of design improvements.

“I anticipate insurance companies [will offer] discounts for drivers of cars with accessible systems and while that would require a huge leap forward with the auto manufacturers, it’s a win-win position for both,” he said.

The results of a thorough crash reconstruction, combined with an analysis of the EDR data, will yield a more accurate crash reconstruction. It also demonstrates that while the technology is beneficial, it should be used as a tool in the complete crash reconstruction toolbox and not as a stand-alone data point. As public awareness of the technology grows, other manufacturers likely will follow the lead of General Motors and Ford and make the data more accessible for use in crash reconstruction and other safety-related applications. s