Ralph's Crash Reconstruction Newsletter: Volume 14, Number 1—Winter 2015

Happy New Year. I hope everyone had a joyous holiday season. Mine was peaceful and quiet, spent with family and a few friends.

I have received the CDR 500 FlexRay kit. It was supposed to be available in November, but I didn't receive mine until early January. I will need to get a separate Pelican case to hold my inverter, the FlexRay kit, and the Bosch power supply. I will also keep the FOOK-108387 adaptor in the case, since it is only supposed to be used with the Bosch power supply.

Thankfully, Bosch is getting away from the "FOOK" cable designations. When Bosch bought the CDR system from Vetronix, they began labeling all new cables with that prefix. That seemed silly to me; apparently the people at Bosch finally reached the same conclusion.

The Fall 2014 issue of ***Collision*** magazine (www.collisionpublishing.com) had several interesting articles. One was titled, "Low Velocity Piston Isolator Testing of a Ford Crown Victoria." There were ten authors listed; I won't give their names in this newsletter. Many of you may be aware that some bumper systems use piston isolators (similar in nature to shock absorbers in motor vehicle suspensions) to minimize damage from low-speed impacts. The article described a number of experiments conducted using Ford Crown Victorias. For some of the tests, the vehicle was backed into a fixed, rigid barrier at a documented speed; for other tests, the rear of the Ford was struck by another vehicle approaching at a low, documented speed. Seven of these tests featured female occupants who volunteered to be present in the Ford when it experienced the delta-v associated with the incident. (Delta-v refers to the sudden change of speed to a vehicle during the contact phase of a collision.) None of the female volunteers experienced any permanent discomfort from participation in the test. Another conclusion was that, although there was generally good correlation between impact speed and isolator compression, using that process to estimate delta-v may result in a slight underestimation of the actual value.

A second article which I found particularly interesting was titled "Vehicle Dynamics and Resultant Occupant Accelerations Caused by Vehicle Wheel Separation." I have not seen any similar study whose results were published. Among other experiments, a wheel was staged to separate from a vehicle while it was otherwise in normal operation. All tests and experiments were documented. A significant conclusion from these activities was that, in all cases, the accelerations to which occupants were subjected were no greater than those which would be encountered on amusement rides.

A third article of interest, "Determination of Motorcycle Pre-Collision Speed—Part 1 and 2," was of interest. Limited crash testing of motorcycles conducted decades ago revealed a good correlation between barrier impact speed and shortening of the motorcycle's wheelbase. However, modern motorcycles are structurally quite different from the motorcycles involved in those early tests. The authors of the recent article used a number of modern motorcycles which were in staged, documented collisions, then calculated impact speed based on different methods which have been used for that purpose in recent years. The conclusion, based on their relatively extensive testing and analysis, was that impact speed calculations using momentum, energy, and rotational mechanics methods may not be precise. Perhaps a significant factor is the wide variation in the structures of modern motorcycles; although they are radically different from motorcycles made decades ago, there are wide variations in weight, structural design, and materials used in motorcycles which are currently for sale.

The fourth article which I found particularly interesting was written by W. R. "Rusty" Haight. You may remember him as the "human crash dummy." He has been the driver of the bullet vehicle in many staged collisions; that number probably exceeds 1000 crashes by now. He always uses a vehicle with an active airbag system for the bullet vehicle, and some of the bullet vehicles have been traveling at or above 50 mph at impact. So far, the only injuries he has sustained were minor cuts on his arms from contact by the airbag covers upon deployment. He was one of a very few who were involved with Crash Data Retrieval at its onset.

The article was titled, "CDR Report Data from Vehicles Subject to the GM Ignition Switch Recall with the Epsilon ACM." Most of you are probably aware of the GM recall of millions of vehicles with ignition switches which could move from the run position to the accessory position without driver contact. Of course, that change in position causes the engine to stall. On vehicles with power steering, the power assist is lost. On vehicles with power brakes, there will only be one fully power-assisted stop available after the engine stalls. All, or virtually all, of the vehicles involved in this recall were equipped with an Epsilon-category airbag control module. This article was a very extensive treatment of the performance characteristics of the Epsilon ACM when powered down and powered up, as well as addressing certain other aspects of the ignition switch problem and the characteristics of the Epsilon ACMs. Several important conclusions were presented: When powered down, the Epsilon ACM loses the ability to fire airbags almost immediately, but it may still be able to record data if the vehicle is involved in a collision within a period of 2.5 to perhaps as much as 4 seconds after the shutdown. Also, it takes the Epsilon ACM approximately 2.5 seconds after being powered up to be able to monitor vehicle dynamics and deploy airbag(s) as needed. This is obviously not a problem when a parked vehicle has been started, but it may be an issue when a vehicle that is in motion has its ignition switch moved from run to accessory and back to run. The article was an exhaustive treatment of the issues related to the Epsilon ACM and ignition switch functioning.

ASTM International began life as the American Society for Testing and Materials; when other nations accepted ASTM standards and began working with ASTM to develop and refine standards, it became ASTM International. For many years, I have served on several ASTM committees: E7, Vehicle Pavement Systems; E30, Forensic Sciences; E58, Forensic Engineering; and F09, Tires. I have mentioned that as an introduction to a synopsis of an article which appeared in

the most recent edition of the magazine *ASTM Standardization News*. The article was titled "Keeping Cars and Storefronts Apart," and it briefly described two ASTM standards regarding protective barriers to keep motor vehicles and structures apart. These standards were composed and are maintained by committee F12. There are two such standards: F3016, Test Method for Surrogate Testing of Vehicle Impact Protective Devices at Low Speeds (30 mph and less) and F2656, Test Method for Vehicle Crash Testing of Perimeter Barriers. Many of you probably have been involved in cases where a car or light truck has crashed into a store or other building. I honestly didn't even know that there was a standard for verifying the efficacy of barriers to prevent vehicles from crashing into buildings. If any of you want to purchase either one of those standards, or any other ASTM standards, you can visit www.astm.org and search by the designation (as, for example, F3016) of the standard. Their sales number is 877-909-2786.

Airbag recall. Those of you who don't pay much attention to automotive recalls may not be aware of a Takata recall. Takata is a leading manufacturer of airbag control modules and airbags. Takata admitted in 2008 that some of its airbags might deploy too forcefully and spray metal shrapnel into the cabin. Airbags use very tiny explosions (some in two stages) to inflate the airbags. Although the propellant is supposed to be sealed, lack of proper quality control may have caused an unknown number of airbag assemblies to allow the entrance of moisture into the propellant chamber. The presence of moisture in the propellant causes it to create much more pressure when deployed, resulting in excessive force during the airbag deployment. Reportedly, five deaths are attributed to this defect in the airbag propellant. Initially, 7.8 million vehicles in the United States, mostly those used in climates where the humidity is high, were recalled. The National Highway Traffic Safety Administration (NHTSA) has ordered Takata to expand the recall to the entire nation; so far, Takata has refused. The vehicles recalled to date involve model years 2000-2008 from Acura, BMW, Chrysler, Dodge, Ford, Honda, Infiniti, Lexus, Mazda, Mitsubishi, Nissan, Pontiac, Saab, Subaru, and Toyota. This should not in any way be construed as a manufacturing shortcoming or mistake by any of those vehicle manufacturers—they bought the airbags in good faith, not knowing that there was a potential problem with them. If you own a vehicle in that model-year range from one of those manufacturers and are concerned that your vehicle might be affected, you can call the NHTSA Safety Hotline at 888.327.4236 or go to SaferCar.gov to find a list of affected models. Either way, have your vehicle's VIN ready.

Another, unrelated recall involves vehicles manufactured by Fiat-Chrysler, Honda, and Toyota. The first TRW-related recall occurred from 2012 to 2014 and required the installation of filter(s) or wiring harness(s) to protect a critical circuit from damage which would result in an inadvertent airbag deployment. Some of those vehicles were also involved in the Takata recall. Now, it seems, the TRW-related fix was found to be inadequate, so the entire ACM has to be replaced. But parts will not be available until later this year. What a frustrating sequence of events for the owners of those vehicles. Thank the NHTSA for staying on top of these issues.

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