C5 Unique SDM Data Patterns

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After attending this presentation, attendees will learn the different ways a vehicle data recorder can "see" a crash event.

This presentation will impact the forensic community and/or humanity by providing a better understanding of how vehicle computers record data, especially during a crash.

The goal of this presentation is to highlight some unique SDM data storage patterns that may not appear to make sense at first glance. Some of these patterns are alluded to in the SDM Data Limitations paragraphs that print out with the reports generated by the Vetronix CDR. Others are only fully understood after a reconstructionist has completed their accident scene analysis or a complete vehicle inspection is completed. In either case, these examples are meant to shed some light on the special way that a crash recording device can "see" an impact.

A couple of basic terms must be understood regarding SDMs. Pre- crash data in the world of SDMs is points of data taken at approximate time intervals and stored by different vehicle computers in data addresses that are constantly being overwritten until a potential deployment is sensed. At that time, those data points are transferred to the SDM on the vehicle's computer network. That potential deployment sensing time is called algo- rithm enable. It is the point during the beginning of an event at which the computer "wakes up" because a threshold above normal has been reached. This threshold varies from vehicle to vehicle. A non-deployment is an incident where the SDM "wakes up" but determines the event is not deployment-worthy.

One of the SDM Data Limitations is stated as "Some of the pre-crash data, from the deployment file, may be recorded after algorithm enable, if the deployment event has a long crash pulse." In other words, if you have an impact with a long crash pulse, like a T-bone or an embankment, the SDM may record some of the post-impact data as pre-crash data. An example of this will be shown in the data from a 2002 Cadillac Escalade that T-boned a Nissan Altima.

Another interesting example of SDM data occurs when, on first glance, the data recorded by the SDM does not seem possible. In this case, the CDR download of a 2002 Buick Regal SDM showed a pre-crash speed of 106 mph with a constant 95% throttle, but an RPM value that dropped almost in half at the -2 second pre-crash value. All analysis of the SDM hexadecimal data indicated valid pre-crash data points. After the recon-structionist's review of the accident scene and police witness interviews, it was found that the Buick attempted to beat a red light. As the Buick sped through the intersection, it rear-ended a 2001 Ford Windstar and sent it air-borne, killing the Windstar driver.

A third example involved a 2001 GMC Sierra that T-boned a 1997 Chevy Blazer. The Sierra's steering wheel was bent, and the CDR printout contained only a partial near deployment record, including some pre-crash data and the indicator lamp status, which generally indicates some form of a power loss. When the vehicle was inspected, the SDM was found with the larger of two connectors unseated. This discovery created several ques-tions including, "Is this non-deployment record relevant?" and "Was the air bag malfunction indicator lamp (MIL) functioning properly?" Varying analysis found the answer to both of these questions to be "yes." The case settled.

The final case involves a 2001 Suburban. There was approximately 15.1 inches of crush and the steering wheel was deformed. The SDM recorded a near deployment only. A maximum delta V of 14.2 mph was recorded, but the delta V graph contained 0 and 0.44 mph data points. Careful examination of the data revealed that the delta V buffer was in the process of being overwritten. Therefore, only the end of the crash pulse was saved, and the beginning, which would give insight into deployment versus non-deployment claims, was lost through the overwriting of the delta V buffer.

Each of these cases highlights a different type data storage pattern that can, at first, appear confusing, but after careful analysis, is able to con- tribute to the overall understanding of the accident.

SDM, Crash Data, Data Recorders

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