DISPELLING THE MYTHS ABOUT BLACK BOXES

TECHNICAL FEATURE

We have all heard the term "black box recorder," and we usually associate it with airplanes (more specifically, airplane crashes). Officially, the black box is known as a flight data recorder (FDR). Contrary to its name, it is in fact not black, but coated in a heat-resistant bright orange paint to make it highly visible after a collision event. The device collects information from the plane and records all incoming and outgoing communications from the time of taxiing, during the flight and up to the actual crash. This allows aviation authorities to determine what happened during that flight, and more importantly, what went wrong during an in-air mishap.

Similar devices have been utilized by vehicle engineers during crash testing for about two decades, and serve a similar purpose. They record what was happening to the vehicle during the crash test - more specifically, the vehicle speed, airbag deployment, airbag deployment speed, seat belt usage, gear, occupant position, crash dummy sustained injuries and almost anything else the engineers need to study. These devices started by testing modules – generally accelerometers – and eventually moved to in-vehicle equipment.

Vehicle-based electronic data recorders (EDRs) are designed to give automakers feedback on how and when airbags deploy in order to improve the technology, make vehicles safer and essentially lessen occupant injuries. EDR data was instrumental, for example, in the development of the dual-stage or "smart" airbag systems installed in today's vehicles. "Smart" systems determine which component (if any) deploys based on the severity of a collision, vehicle speed, vehicle deceleration, longitudinal and lateral deceleration, occupant position, occupant weight and seat belt usage. These "smart" airbag systems help reduce the number of airbag-related injuries and deaths to adults and children. EDR data can be used to track manufacturing defects and issue recalls. For example, the data provided by EDRs proved to be critical during the federal investigation into the unintended-acceleration controversy that affected (primarily) Toyota vehicles.

In almost every case, black box technology EDRs have had an overall positive effect on automotive safety and may become mandatory on all new vehicles sold in the USA in 2014. Vehicles now equipped with EDRs already have mandated guidelines on recording (starting in September 2012 for the 2013 model year as per Title 49 CFR Part 563). But as with any government regulation/rule/law, not everyone is in favor of EDRs in vehicles. Not surprisingly, some consumer and privacy advocates point out that they aren't only used to improve safety, but also help automakers cover their, well, you know whats. This might be true. The data provided by the EDRs may show evidence to prove the supposed airbag malfunctions or sudden unintended acceleration cannot be supported, and that the root cause was an improper repair or operator error. But what is wrong with the truth?

We have read articles by conspiracy theorists who state they worry that EDRs can and will be used to track drivers' every movements — wherever, whenever. They have mentioned the issues with the federal and state governments being able to track where, when and how fast drivers are going 24/7, every day of the year. Oh boy…how scary, right? STOP IT! Over the past few years, some criminals have been caught by "Big Brother is Watching" technology. Many of those criminals were caught by surveillance cameras or by EZPass. Yes, some idiotic criminals stole a car and used the vehicle's EZPass to pay for tolls. Look, the Boston Marathon bombers were identified by surveillance cameras. Can we tell you right now today that EDRs will not become a Big Brother device? NO, but we feel it will not happen, as there are laws against spying on US citizens. We know what you are thinking: "What about Progressive's Snapshot or OnSTAR service, which keeps an eye on you?" Yes, it does, and it is the owner's choice to install the device or pay for the service. But EDRs DO NOT record the same information as the Snapshot device or OnStar service.

There is a lot of apprehension about mandating that all vehicles have an EDR "black box" device. The idea behind mandating black box data recorders is to gather information that can help investigators determine the causes of accidents and lead to safer vehicles. But privacy advocates say government regulators and automakers are spreading an intrusive technology without first putting in place policies to prevent misuse of the information collected. Data collected by the recorders is increasingly showing up in lawsuits, criminal cases and high-profile accidents. For example, Massachusetts Lieutenant Governor Timothy Murray initially said that he wasn't speeding and was wearing his seat belt when he crashed a government-owned car last year. But the Ford Crown Victoria's data recorder told a different story: It showed the car was traveling more than 100 mph and Murray wasn't belted in. In 2007, then-New Jersey Governor Jon Corzine was seriously injured in the crash of an SUV driven by a state trooper. Corzine was a passenger. The SUV's recorder showed the vehicle was traveling 91 mph on a parkway where the speed limit was 65 mph, and Corzine didn't have his seat belt on.

The recording and sharing of personal information has become a touchy topic in our increasingly connected world. But this is basically due to misinformation and lies by the media. Let's look at some of the issues and separate fact from fiction.

EDRs are Required on All Cars: FICTION. (Or, at least, fiction for now, as mentioned on the previous page). But almost all of the OEMs are in compliance with Title 49 CFR Part 563. For OEMs that claim they do not use EDR "black box" technology, there is a proposed Senate rule pending that would require EDRs in all vehicles. The new law, if passed, would take out the option and require all car manufacturers to install EDRs.

Automakers Have to Declare the Presence of an EDR: FACT. Since 2006, NHTSA has stipulated that automakers that include the device in a vehicle have to disclose to consumers that an EDR is on board. The information is generally found in the owner's manual, which nobody reads, but it is there. NHTSA also mandated that vehicles manufactured after September 1, 2011 that include EDR devices must record data in a standardized format.

An EDR Constantly Records Your Driving Habits: FICTION, LIES and MISINFORMATION! Unlike an FDR (used in planes), an EDR just records certain information about the vehicle operation (see below for a general list). That information is only recorded for a maximum of a few seconds. An automotive EDR only captures information if the vehicle senses and detects a crash is - or may be - evident. This "trigger," referred to as "algorithm wakeup" or "algorithm enable" (for GM cars), is set off when the airbag control module detects enough force (deceleration) to trigger it. This trigger can be set off by different events, such as in a collision or from significant impact after a hard jolt (i.e., a pothole impacted at a rapid speed.) The algorithm that sets off the capturing of EDR data can be triggered without deploying an airbag. On the EDR report of data, there is generally a line that states "Events Recovered;" next to that; it will state either "Deployment Event" or "Non-Deployment Event." "Deployment events" obviously deployed an airbag component, such as an airbag, seat belt pretensioner or some combination. A "non-deployment event" records the same information a deployment event would, without an airbag component deployment occurring.

Black Boxes Can Nail Liars Trying to Blame Their Cars for Bad Driving: FACT *and* FICTION. This would depend on if the EDR recorded a non-deployment event. But the facts are the facts. This is the main reason why people are opposing the EDR mandate for all vehicles.

Black Boxes Can Assist in Insurance Fraud Investigations: FACT *and* FICTION. This also would depend on if the EDR recorded a non-deployment event. But what can EDRs actually record? Here is a general list of what the current EDRs record; eventually, they will be required to record the same information, although they may record more than what is required:

1. **Change in forward crash speed**
2. **Maximum change in forward crash speed**
3. **Time from the beginning of the crash at which the maximum change in forward crash speed occurs**
4. **Speed vehicle was traveling**
5. **Percentage of engine throttle, percentage full (how far the accelerator pedal was pressed)**
6. **Whether or not the brake was applied**
7. **Ignition cycle (number of power cycles applied to the EDR) at the time of the crash**
8. **Ignition cycle (number of power cycles applied to the EDR) when the EDR data were downloaded**
9. **Whether or not driver was using safety belt**
10. **Whether or not the frontal airbag warning lamp was on**
11. **Driver frontal airbag deployment: Time to deploy for a single stage airbag, or time to first stage deployment for a multistage airbag**
12. **Right front passenger frontal airbag deployment: Time to deploy for a single stage airbag, or time to first stage deployment for a multistage airbag**
13. **Number of crash events**
14. **Time between the first two crash events, if applicable**
15. **Whether or not the EDR completed recording**

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www.iihs.org/research/ganda/edr.aspx

Currently, there is a section on the first page of each EDR data report titled "Data Limitations." This section explains how to read and interpret the data. Generally, when a vehicle is involved in a collision event and is equipped with an EDR, if the "jerk" (change in rate of acceleration) is enough to wake the system up or if airbags deploy, inputs from the vehicle's crash sensor(s) send information to the airbag control module (where the EDR is located). The EDR will generally record 200 milliseconds to five seconds of pre-crash data and 300 milliseconds to 10 seconds of post-crash data, depending on the OEM. We hope this article has helped the industry to understand the importance of "black box" technology – as well as separate the facts from the fiction. If you are interested in learning more about EDRs and/or becoming a certified technician, feel free to send us an email.

H&D

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Executive Director's Thoughts

This kind of information is helpful to dispel rumors or misinformation for your customers. This is an article you can use and keep to help explain the functions of a system usually thought to be the "Big Brother" living in their car.

- Jordan Hendler