
# Comments by the Insurance Institute for Highway Safety at the U.S. House of Representatives Policy Roundtable Series discussion – “The Road Ahead: Developing Policies to Make Connected & Automated Vehicles a Reality”

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Thank you for inviting the Insurance Institute for Highway Safety to participate in this roundtable discussion about safety assurance and policy concerning driving automation technologies. IIHS and its sister organization, the Highway Loss Data Institute, or HLDI, are nonprofit research institutes dedicated to identifying ways to prevent deaths, injuries and property damage that result from motor vehicle crashes. We are wholly supported by voluntary contributions from companies that sell automobile insurance in the U.S. and Canada. We are encouraged by the potential for driving automation technologies to help reduce, if not someday eliminate, crash injuries and deaths, but it will be critical to establish a framework for collecting and sharing information to determine whether the technologies are delivering on this promise.

Using Vehicle Identification Numbers to identify vehicles with optional advanced vehicle technologies, IIHS and HLDI have successfully documented the benefits of some newer crash avoidance features. Some of these, including features that automatically respond to crash hazards, such as electronic stability control and automatic emergency braking, are highly effective in preventing crashes and injuries, while others, such as those designed to help keep the driver in their lane, are preventing fewer crashes. The presence of optional features is not encoded in VINs, and there is no comprehensive database linking VINs to information about vehicle features, so these studies were only possible with the close cooperation of a few automakers. Policies that make vehicle feature information available to the highway safety research community will facilitate and accelerate this type of research, which can accurately evaluate the real-world safety benefits of driving automation technology.

Making information about crashes involving vehicles with driving automation technology publicly available also is important. Police crash reports are used by the highway safety community to monitor crash trends and identify causal factors. In California, companies testing automated vehicles must report all crashes. The Institute and other organizations have used this information to take an early look at the safety of automated vehicles in a testing context relative to conventional vehicles. Standardizing the reporting of information across jurisdictions will be key for continuing and expanding this type of research. The extent that crash details, circumstances, and the role of driving automation technology are reported consistently and reliably will affect the usefulness of police crash reports for assessing safety and guiding policy.

Police crash reports are an imperfect source of information, and some data elements are imprecise or unreliable because they rely on subjective information such as interviews with drivers and witnesses or the judgement of responding law enforcement officers. Police-reported information about automated vehicles may be fraught with similar issues. For this reason, it is important that objective information from driving automation systems be recorded by vehicles' event data recorders, or "black boxes." The Institute has developed a list of data elements we believe can be collected using an event data recorder and are sufficient for understanding the circumstances of a crash and the contribution of driving automation technology without compromising confidential business information. This type of information will help determine whether the human or vehicle was in control at the time of a crash and the actions each entity took prior to it. Insurers need this information in order to assign liability and settle claims. It also can help researchers illuminate the challenges humans face as the driving task becomes increasingly automated.

Finally, we must continue to promote proven countermeasures for reducing the toll of traffic crashes while we wait for the benefits of driving automation to be proven out.  Crashworthiness standards should continue to be strengthened and should apply to all vehicles, including automated ones. Such standards, along with automated enforcement of traffic laws, strict enforcement of seat belt use and impaired-driving laws, and safer road designs, can help reduce crashes, injuries and deaths on our nation's roads right now.

**Suggested variables to include in event-based electronic data recording for vehicles equipped with one or more driving automation systems**

IIHS recommends that the following variables be recorded by an event data recorder or autonomous vehicle data recorder when an autonomous vehicle is involved in a crash. At a minimum, each variable below should be recorded every second during the period beginning 30 seconds before a crash and ending 5 seconds after, or until the vehicle comes to a stop. Some variables are currently recorded by event data recorders in conventional vehicles. It may be appropriate to record some variables more frequently.

Definitions:

- **State** **-** a categorical variable indicating if a vehicle system is off or on, its current setting (e.g., standby mode, low beam, high beam), or if the system is not functioning (e.g., failure mode).
- **Action** **-** a categorical variable indicating when a restraint system, advanced driver assistance system, driver monitoring system, or driving automation system is warning, intervening, deploying, or responding to a safety-critical event.

| **Category** | **Variable** |
|---|---|
| Time and history | Timestamp |
| | Ignition cycle count since being manufactured |
| Location and path | Latitude |
| | Longitude |
| | Elevation |
| | Heading |
| Vehicle state and kinematics | Speed |
| | Steering input (torque or wheel angle) (overall, amount applied by driver, amount applied by automation) |
| | Brake position/input (overall, amount applied by driver, amount applied by automation) |
| | Throttle position/input (overall, amount applied by driver, amount applied by automation) |
| | Lateral acceleration |
| | Longitudinal acceleration |
| | Roll angle |
| | Transmission state (P (park); R (reverse); N (neutral); D,L (forward/drive)) |
| | Windshield wiper state |
| | Exterior lights state |
| | Engine RPM |
| Crash prevention, driver assistance, and restraint systems | Antilock brake system state and action |
| | Electronic stability control state and action |
| | Front crash prevention system (e.g., forward collision warning, automatic emergency braking) state and action |
| | Rear crash prevention system (e.g., parking sensor, rear automatic emergency braking) state and action |
| | Lane change crash prevention (e.g., blind spot warning, blind spot intervention) state and action |

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|---|---|
| | Lane maintenance system (e.g., lane departure warning, lane departure prevention, active lane keeping) state and action |
| | Frontal airbag state and action |
| | Side airbag state and action |
| | Safety belt pretensioner state and action for each occupied seating position |
| | Driver fatigue monitoring system state and action |
| | Hands-on wheel detection state and action |
| | Driver monitoring system (e.g., eyes on or off road) state and action |
| Vehicle occupant state | Occupant presence for each seating position |
| | Safety belt state for each occupied seating position |
| | Occupant size classification for each occupied seating position |
| Automated driving systems (e.g., self-parking, highway autopilot, traffic jam assistant)<br>* these variables are collected for each equipped level 2-5 driving automation system even if the system is not in use for any reason (e.g., outside the operational design domain, driver choice) | OEM defined SAE level of automation for each equipped system |
| | Vehicle within or outside intended or specified operational design domain for each equipped system |
| | State of each equipped system |
| | Transition of control/take-over message action for each equipped system |
| V2V basic safety message data for each message broadcasted and received | Time |
| | Message count |
| | Temporary ID |
| | Position data (latitude, longitude, elevation) |
| | Positional accuracy (semi-major axis accuracy, semi-minor axis accuracy, semi-major axis orientation) |
| | Transmission state |
| | Speed |
| | Heading |
| | Steering wheel angle |
| | Acceleration (longitudinal, lateral, vertical, yaw rate) |
| | Brake system state |
| | Vehicle size (width, length) |
| V2I safety message data for each message broadcasted and received | Signal phase and timing message data |
| | Signal request message data |
| | Signal state message data |
| | Map message data |
| | Emergency vehicle alert message data |
| | Intersection collision avoidance message data |
| | Personal safety message data (vulnerable road user data) |
| | Road side alert message data |
| | Traveler information message data |