

**SAE INTERNATIONAL**

**The SAE EDR Committee's Response to  
NHTSA's Report to Congress on  
Event Data Recorders (EDR) Duration  
Study**

07/31/2020



# AGENDA

- SAE EDR Committee
- EDR and the FAST Act Section 24303
- The SAE EDR Committee's Review of the Virginia Tech Study
- SAE EDR Committee Conclusions
- SAE EDR Committee Recommendations
- Open Discussion

# SAE EDR COMMITTEE

## SAE EDR Committee

- Established in 2003
- Roster contains 96 people with expertise in:
  - Vehicle Manufacturing (13 different companies)
  - Airbag Control Module Design (7 different companies)
  - Accident Reconstruction (13 individuals)
  - Research (8 individuals)
  - EDR Tool Manufacturer (1 individual)
  - Liaison (9 individuals)
  - SAE Staff (9 individuals)
- Over half of committee voting members have been participating for 10+ yrs.

## SAE EDR Committee Standards

- SAE J1698 - Event Data Recorder - Updated May 2014
- SAE J1698-1 - EDR - Output Data Definition - Updated May 2018
  - Added data elements relative to Automated Driving Systems
- SAE J1698-2 - EDR - Retrieval Tool Protocol - Reaffirmed March 2018
- SAE J1698-3 - EDR - Compliance Assessment - Revised December 2015
- SAE J3197 - Automated Driving System Data Logger - Published April 2020
  - Governs data element definitions
  - Provides a minimum data element set
  - Specifies a common ADS data logger record format

# EDR and the FAST ACT SECTION 24303

## Event Data Recorders – 49 CFR Part 563 effective Sept 1, 2012

- EDRs are to record valuable data for effective crash investigations and analysis of safety equipment performance
- EDRs record data such as:
  - Vehicle Speed
  - Brake Status
  - Accelerator Pedal Status
  - Engine/Motor RPM
  - Steering Input
  - Seatbelt Status
  - Many Others
- Used in conjunction with traditional crash reconstruction methods
- EDRs provide valuable field input to customers, OEMs, and crash analysts

## **FIXING AMERICA'S SURFACE TRANSPORTATION ACT (2015) SEC. 24303. VEHICLE EVENT DATA RECORDER STUDY**

***(a) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, the Administrator of the National Highway Traffic Safety Administration shall submit to Congress a report that contains the results of a study conducted by the Administrator to determine the amount of time event data recorders installed in passenger motor vehicles should capture and record for retrieval vehicle-related data in conjunction with an event in order to provide sufficient information to investigate the cause of motor vehicle crashes.***

***(b) RULEMAKING.—Not later than 2 years after submitting the report required under subsection (a), the Administrator of the National Highway Traffic Safety Administration shall promulgate regulations to establish the appropriate period during which event data recorders installed in passenger motor vehicles may capture and record for retrieval vehicle-related data to the time necessary to provide accident investigators with vehicle-related information pertinent to crashes involving such motor vehicles.***



## The SAE EDR Committee's Understanding of Response to FAST Act

- NHTSA submitted a Report to Congress detailing the pre-crash timeframe of vehicle-related data that an EDR should capture “***in order to provide sufficient information to investigate the cause of motor vehicle crashes***”.
- The Report to Congress did not reference any other sources or interviews other than the Virginia Tech Study. Hereinafter, the Report to Congress will be referred to as the Virginia Tech Study.
- The Virginia Tech Study recommended a recording duration of 20 seconds, instead of the current 5 seconds, for pre-crash vehicle data but no where did they demonstrate that this would improve the investigation of crash causation.

# THE SAE EDR COMMITTEE'S REVIEW OF THE VIRGINIA TECH STUDY

## Review of the Virginia Tech Study

- The stated goal of the Virginia Tech Study was to determine the EDR recording duration needed to investigate **crash causation**
- However, the Virginia Tech Study was focused on determining the EDR recording duration needed to assess **driver behavior pre-crash**
  - EDR is not a driver behavior recorder
  - EDR is an aid to accident reconstruction where vehicle dynamic parameters are recorded that indicate the driver's reaction to a sudden situational change which occurs within an instant in time

## Five Issues with the data used in the Virginia Tech Study

1. Out of all of the recorded data elements, the study only considered 3 - Speed, Braking, Steering
2. The vehicles analyzed in the study lacked modern safety features
3. The authors made a number of flawed assumptions
4. The authors stated they purposely ignored EDR data recorded more than 5 seconds prior to a crash
5. The recording frequency of the data from the older vehicles used was at a much slower sampling rate

## Five Issues with the data used in the Virginia Tech Study

- 3 data elements

### 1. Out of all of the recorded data elements, the study only considered 3 - Speed, Braking, Steering

These elements were not studied inclusive to each other nor with the other EDR data as crash data should be.

- Vehicle speed data must be used, in conjunction with the service brake status, to determine if the driver was actually applying enough brake pedal pressure to attempt to slow the vehicle.
- Additionally recorded values such as percent throttle, percent accelerator pedal, engine rpm, cruise control, ABS, lateral acceleration, yaw rate, all can be useful when studying crash causation.

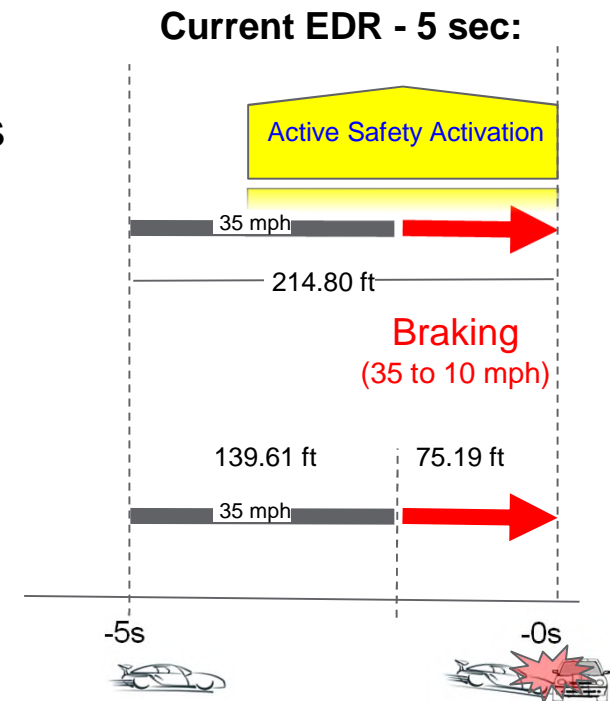
## Five Issues with the data used in the Virginia Tech Study

- Lacked modern safety features

### 2. The vehicles analyzed in the study lacked modern safety features

If vehicles equipped with active safety features such as pre-collision braking and electronic stability control had been used in the study:

- Some of these accidents would have been avoided and therefore not been included in the study
- These features would have initiated well within the current 5 second duration



## Five Issues with the data used in the Virginia Tech Study

### - Flawed assumptions

#### **3. The authors made a number of flawed assumptions (for example):**

- “Service Brake” may not be attributable to brake force applied to slow the vehicle
  - Crash reconstructionists use other vehicle data in conjunction with brake switch information to determine if braking force is actually occurring and to what extent
- Two false assumptions made were relative to the steering input
  - A weighted distribution was used to compensate for the small number of cases with recorded steering input data
  - If there was no steering input change recorded in the EDR, the conclusion was the driver was not moving the steering wheel at all (+/- 16 degrees before change shows)
- No distinction was made between accelerator pedal position data and engine throttle position data. These are two very different data elements.

## Five Issues with the data used in the Virginia Tech Study

### - Ignored data

4. **The authors stated they purposely ignored EDR data recorded more than 5 seconds prior to a crash**
  - If the authors had reviewed all 8 seconds of pre-crash data, where available, they would have been able to:
    - Confirm if Service Brake “on” at -5 seconds, means the brakes have been applied at or prior to -5 seconds
    - Demonstrate that pre-crash data beyond 5 seconds would not change the overall accident reconstruction results, thus no need for additional per-crash recording time



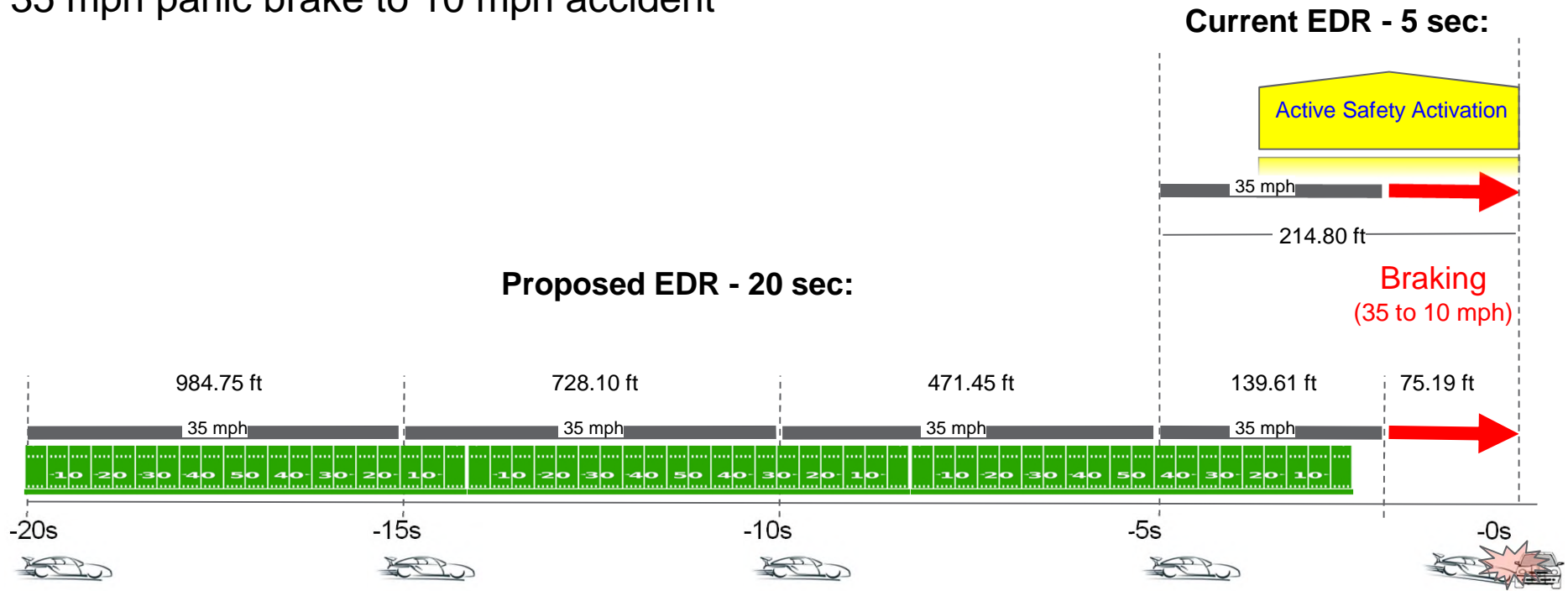
## Five Issues with the data used in the Virginia Tech Study

- Frequency rate

5. **The recording frequency of the data from the older vehicles used was at a much slower sample rate**
  - 1 hertz, versus the 2 hertz frequency of the data stored in Part 563 vehicles
    - Data sampled once per second vs. twice per second
  - Brake pedal application can occur several times within a time span of one second or a half of a second, especially if the driver is pumping the brakes
  - The authors may have missed state changes within the sample window

# Intersection Accident Scenario

35 mph panic brake to 10 mph accident



# SAE EDR COMMITTEE CONCLUSIONS

## Ramifications of 20 sec storage that the Virginia Tech Study did not consider:

1. Increased energy reserve required in the module that stores the EDR
2. Increased memory size of the buffer and non-volatile storage device
3. Microprocessor changes in the module that stores the EDR
4. Increased module size for packaging the aforementioned components
5. Module packaging location(s) constraints
6. Increased module(s) cost
7. Increased validation testing of the EDR and the systems that provide data
8. Increased EDR downloading time requiring an external power supply to power the vehicle

**Overall cost, weight and physical packaging changes have serious ramifications with no tangible benefit to determining crash causation.**

## Summary of the Virginia Tech Study Review

- We agree with the Virginia Tech Study, specifically to their thoughts on ADS vehicles.
  - As ADS technology matures, the subject of function and recording duration will need to be readdressed for SAE Level 3-5 systems.
- The Committee believes the Virginia Tech Study did not show how increased recording durations for pre-crash vehicle data would improve crash reconstruction or provide any benefit to better understand the crash scenario.

## Summary of the Virginia Tech Study Review

- Having 20 seconds of pre-crash data is likely to become a privacy issue as this relates to driver behavior and not accident causation.
- Until real world event data justifies increasing EDR recording duration, we strongly recommend leaving it at its current 5 second duration.
  - Consistent with SAE J1698 and NHTSA Part 563

## Current and Pending Regulations with 5 second recording duration



Shaded countries have existing or proposed regulations that require 5 seconds of pre-crash data.  
Non-shaded countries do not have any existing or proposed EDR regulations.

## Current and Pending Standards and Regulations with 5 second recording duration

- SAE J1698-1 Event Data Recorder – Output Data Definition (May 2018)
- SAE J-3197 Automated Driving System Data Logger (April 2020)
- Korea EDR Regulation KMVSS 56-2 (Dec. 2015)
- Japan EDR Regulation J-EDR (Kokujigi 278/2008/2015)
- China EDR Regulation GB-XXXX (proposed Jan. 2022)
- European Union General Safety Regulation (GSR) ECE EDR Regulation R (EU) No. 2019/xxx (Proposed 2022)
- Russian Federation Automobile Vehicles On-Board Devices Event Registrations - General Technical Requirements and Test Methods first draft as required by Article 26 of Federal Law 162-03 of June 29, 2015.



# SAE EDR COMMITTEE RECOMMENDATIONS

## Recommendations

- Support the US's position in the WP.29 GRVA EDR IWG of recording 5 seconds of pre-crash data
- Encourage NHTSA continue work in the WP.29 to create a single International EDR Global Technical Regulation
- Request that NHTSA use the SAE EDR Committee as a resource for EDR Subject Matter Experts
- Leave the Part 563 pre-crash recording time as is: 5 seconds
  - Given the 20+ years of field experience with EDRs, 5 seconds of pre-crash data is sufficient in nearly every case

# OPEN DISCUSSION