August 22, 2022

Dr. Steven Cliff
Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

RE: Notice of Proposed Rulemaking (NPRM); Event Data Recorders [Docket Number: NHTSA-2022-0021]

Dear Administrator Cliff:

The Alliance for Automotive Innovation ("Auto Innovators")[1] appreciates the opportunity to provide comments in response to the June 22, 2022, National Highway Traffic Safety Administration (NHTSA) ("the Agency") NPRM proposing changes to the Part 563 Event Data Recorder (EDR) requirements. Auto Innovators represents the auto manufacturing sector, including automakers that produce and sell nearly 98% of the new light-duty vehicles in the United States. Our association also includes original equipment suppliers, technology and other automotive-related companies, and trade associations.

Auto Innovators is concerned that the proposed extension of the recording period from 5 seconds to 20 seconds (factor of 4) and the increase in recording frequency from 2 samples/second to 10 samples/second (factor of 5) would significantly impact the cost to consumers, as well as the size, packaging and weight of the airbag control modules, which typically house the current EDR recording functions. Based on our review of the Virginia Tech Transportation Institute (VTTI) research used to support this proposal, including comments and conclusions on the report from the SAE EDR Committee, we are not convinced that there is a real world safety gap that warrants the proposed increase in pre-crash recording period and recording frequency.

Further, given the significant EDR recording unit modifications necessary to accommodate the proposed revision to the pre-crash recording period and recording frequency, coupled with current chip/supply chain problems, a one year lead-time is not practicable.

[1] Auto Innovators is the singular, authoritative, and respected voice of the automotive industry, representing motor vehicle manufacturers responsible for nearly 98 percent of cars and light trucks sold in the U.S., original equipment suppliers, technology companies, and others within the automotive ecosystem.

1. Review of VTTI EDR Report on Recording Duration

Auto Innovators has reviewed and generally agrees with the comments and conclusions of the SAE EDR Committee's review of the NPRM[2] and VTTI Study summarized below.

SAE Analysis of VTTI Report

The SAE EDR Committee,[3] which is comprised of vehicle and equipment manufacturer and accident reconstruction experts, reviewed the VTTI technical report and identified several deficiencies in their analysis that limit the veracity of the report's conclusions[4].

SAE noted that the VTTI study recommended a recording duration of 20 seconds instead of the current 5 seconds for pre-crash data, but nowhere did they demonstrate that this would improve the investigation of crash causation.

SAE observed that the stated goal of the VTTI Study was to determine the EDR recording duration needed to investigate crash causation. Instead, the VTTI study focused on determining the EDR recording duration needed to assess driver behavior. In response, SAE specifically noted that:

- EDR is not, nor is it intended to be, a driver behavior recorder.
- EDR is an aid to accident reconstruction by providing recorded dynamic parameters that indicate the driver's reaction to a sudden situational change.

In its review, SAE identified five significant issues with the data used in the VTTI Study:

1. Out of all of the recorded data elements that are currently available, the study only considered three – Speed, Braking, and Steering.

   These elements were neither 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, and yaw rate all can be useful when studying crash causation.

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 entirely and therefore not included in the study.

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[2] NHTSA-2022-0021-0007

[3] SAE Event Data Recorder Committee has stewardship of the following SAE standards and recommended practices (J1698, J1698/1A, J1698/1, J1698/2, J1698/3, and J3197).

[4] https://www.regulations.gov/document/NHTSA-2022-0021-0005

- These features would have provided intervention well within the current 5 second recording duration (Figure 1).

3. The study included a number of flawed assumptions.
   - For example, VTTI incorrectly assumed that "Service Brake On" indicated driver intent to actively brake the vehicle. In some cases, it could have been recording the driver resting their foot on the brake pedal slightly to disengage cruise control or simply deciding whether to brake. 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 were made relative to steering input. Specifically:
     - The VTTI study summary offered a conclusion that *"The availability of steering angle data, an optional data element, was very limited, reducing its significance in this study."* Despite this cautionary statement, the study authors assigned steering angle data the same importance as the other data elements. The authors erroneously assumed that a weighted distribution would compensate for the small number of cases with steering input. To draw conclusions from such a small sample size is an especially dubious analysis approach that can skew the data. In addition, because the VTTI Study typically used pre-Part 563 vehicles, the driver steering input may have been missed entirely. The data used for steering was not held to the tighter +/- 5 degrees range of Part 563. Actual field-related data from more recent Part 563 compliant vehicles covering a wider range of manufacturers were available and should have been used. Since this study used data from pre-Part 563 compliant EDR's, the analysis should be updated using data from current systems.
     - If there was no steering input recorded in the EDR, the study's conclusion was the driver was not moving the steering wheel at all. However, some pre-Part 563 EDRs reported steering data with an operating range of +/- 16 degrees. Therefore, for the steering input change to be detected and recorded in the EDR, the driver would need to make a steering maneuver beyond +/- 16 degrees. It is possible that active steering maneuvers were not captured by the EDR. Depending on vehicle speed, a change less than the +/- 16 degree resolution could be significant in relation to the dynamics of the vehicle.
   - No distinction was made between accelerator pedal position data and engine throttle position data, which are two very different data elements.

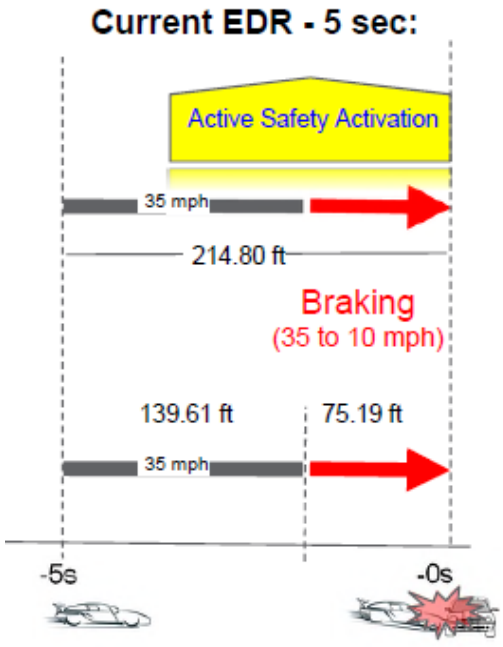

Figure 1: Active safety activation period relative to current 5 second precrash recording period

4. The study 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 were applied at or prior to 5 seconds.
    - Demonstrate whether pre-crash data beyond 5 seconds would change the overall accident reconstruction results, thus whether there was a need for additional pre-crash recording time.

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

It is important to note that the SAE Committee surveyed its expert members and experienced EDR field users which include OEMs, suppliers, crash reconstructionists, and law enforcement. The preponderance of the responses indicated that collecting data outside the 5 second window would not change the conclusions about a specific crash scenario. These responses noted that the analysis of the physical evidence at the crash scene is fundamental to crash reconstruction and allows for appropriate EDR data correlation. Above all, EDR is neither intended to be a naturalist driving study recording device nor to replace the analysis of the physical evidence left by the vehicle at the crash scene. Rather, it is intended as a supplement to crash reconstruction.

SAE concluded that there are no facts to suggest that 20 seconds of pre-crash data would change the outcome of any crash analysis. In a 35 mph crash scenario (as shown in Figure 2), with the 20 seconds of data recommended by the VTTI Study, there would be approximately 770 feet (the length of over 2 ½ football fields) of information that offers no additional value beyond the 5 seconds of data (roughly 2/3 the length of a football field). The current 5 seconds of data can capture any acceleration, braking, and steering maneuvers by the driver which will be relevant to crash reconstruction. In conclusion, until real world event data justifies increasing the recording duration, SAE recommended maintaining the EDR pre-crash vehicle data recording duration at 5 seconds.

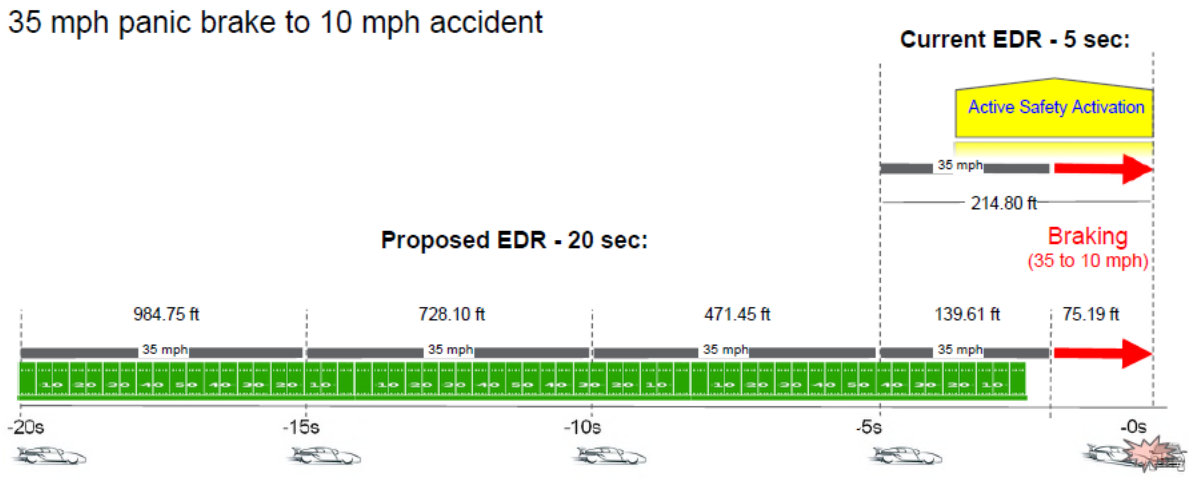

Figure 2: Relationship between proposed pre-crash recording duration and current EDR duration

Innovators Additional Comments on the VTTI Study

Auto Innovators agrees with SAE that EDR data – by itself – will not be able to fully identify specific crash causation factors, such as fatigue, distraction, or alcohol involvement. EDR data must be combined with on-scene information typically captured in police reports and, in certain circumstances, more detailed crash reconstruction. Not only did the VTTI study fail to adequately justify an extension of the recording duration or frequency, it also didn't consider what the relative benefits (if any) might be for more modest increases in recording duration.

For conventionally driven vehicles (non-ADS equipped), 5 seconds of pre-crash EDR recording data should provide enough information to adequately supplement other more detailed sources of crash reconstruction data. Auto Innovators believes that the value of extending the pre-crash recording time past 5 seconds quickly diminishes while the additional memory, reserve power requirements, and resulting cost to consumers quickly increases. While we are certain based on expert consensus that 20 seconds is not the optimum recording duration for non-ADS vehicles, further study is needed to determine what, if any, recording duration increase might be appropriate.

Longer pre-crash recording times may have value for ADS vehicles that can transfer control between human and ADS over a period of time, but these are currently outside the scope of this regulation.

With respect to "long-duration events" such as rollover, virtually all new vehicles sold today are equipped with rollover deploying side curtains which will deploy at or before first tip over. While the vehicles included in the study were generally older vehicles without rollover side curtains (or other advanced crash avoidance technology), for currently produced vehicles the current EDR recording durations will adequately capture the initiation of these events.

2. Impact of Final Rule on Vehicle Design

SAE EDR Committee Analysis of Ramifications Associated with the Proposed Increase in EDR Recording Duration and Frequency

In addition to their review of the VTTI study, the SAE EDR committee also identified the ramifications associated with the increase in recording duration and frequency that the VTTI study did not consider. Specifically, it noted that the following would need to occur to accommodate the proposed duration and frequency:

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

In short, SAE concluded that *"overall cost, weight and physical packaging changes have serious ramifications with no tangible benefit to determining crash causation."*

Auto Innovators agrees with the SAE EDR Committee's evaluation of the ramifications associated with the NPRM. Further, Auto Innovators notes the following:

Increased Energy Reserve – Typically, the EDR function is integrated into the vehicle's air bag control unit (ACU) and includes reserve energy capacity[5] capable of deployment of restraint systems, high voltage shutoffs for electric vehicles, and recording the required amount of EDR data into non-volatile storage in the event that vehicle power is lost early in the crash event. Keeping all other things equal (i.e., not reducing the number of voluntarily recorded data elements), the proposed increased pre-crash recording duration (4 times current - 400% increase) and sampling frequency (5 times current – 500%) would greatly increase the energy reserve needs resulting in larger and costlier ACUs. For instance, it may be necessary to add an additional ASIC (application specific integrated circuit) in order to improve the charging capacity needed to meet the increased energy reserve requirement.

This is further exacerbated by the fact that most EDR's record much more data that the minimum required by Part 563. As a result, increasing the recording duration will likely include recording many of these additional data elements for the proposed 20 second pre-crash duration as well. Thus, the additional time needed to write to the EDR non-volatile memory will be multiplied by the number of data elements with commensurate increases in energy reserve capacity. For many existing units, this may either require reductions/elimination of the

[5] Capacitors are normally used since batteries might not be able to last the lifetime of the vehicle and thus require periodic replacement over the life of the vehicle.

recording of additional, voluntary data elements or redesign of the air bag control/EDR module to accommodate the additional reserve power capacity (among many other modifications).

It should be noted that larger capacitors pose engineering challenges in terms of lifespan, durability, and ability to charge during normal operation. These challenges may require more advanced reserve energy schemes employing multiple new devices, all of which would require lengthy validation and verification procedures, further increasing the cost and development time for a new system.

Increased Memory Size – In section D, the NPRM states that the memory cost increase to accommodate a 20 second and 10Hz EDR would increase by a factor of 2.43. Based on SAE analysis from some OEM suppliers, the cost would increase by a factor of approximately 8.5. It should be noted that the memory costs only represent a *small fraction* of the *total cost* of a longer duration/higher recording frequency EDR. Other important factors include microprocessor computational throughput, peripheral data mapping I/Cs, reserve energy supply, and amortized development/testing/validation expenses. As such, the NPRM assertion that increasing the data duration is a simple matter of adding more memory is a substantial oversimplification.

Since current systems do not have unused excess memory capacity readily available, either the amount of data (e.g., number of data elements recorded) will have to decrease or the memory capacity will have to increase. Auto Innovators is concerned that the combination of insufficient lead-time and significant additional memory and other system resources that are needed to accommodate the proposed increase in pre-crash recording duration and recording frequency may result in some manufacturers being forced to disable the EDR function entirely or shift EDR resources by eliminating valuable table II or ADAS system status data elements.

Unfortunately, current economic and supply chain conditions make the re-specification and procurement of faster and higher capacity microprocessors/chips especially difficult and costly.

Microprocessor Changes – Depending upon the current microprocessor capacity/utilization, the additional data throughput requirements may drive additional energy capacity, speed, and memory increases that will require a new microprocessor and a new circuit board. Such modifications will require a complete redesign of the EDR from both a hardware and software perspective.

Module Size and Packaging – The provision of additional energy capacity into the ACU/EDR will considerably increase the “footprint” of the unit. For current model vehicles, there may no longer be enough physical space in their “optimum” locations (selected for crash sensing and durability). Requirements to relocate either the unit or surrounding components will add complexity and increased cost to consumers.

Vehicle Implementation Phase-In– Applying a new data capture system in the many vehicles for an OEM’s portfolio is a highly complex and sequentially sensitive matter. As vehicles face long lead-times for applying such a new system, the application to secure this EDR practice (20 seconds) would be considered new development and require appropriate lead-time, including potential phase-in provisions.

Due to the individual characteristics of each vehicle in an OEM's portfolio, it is generally necessary to apply a unique set of hardware and software to each application. Because of this, it is not practical to provide a standardized set of components, including the ACU itself, to multiple vehicle types. As a result, the deployment of a new system to a vehicle requires intensive and vehicle platform specific development tasks, further complicating the rollout plan involving a new ruling as proposed in the NPRM. In fact, each vehicle application is considered new development by the automakers. As such, the first vehicle to apply a new EDR schema would require a 3-4 year development window. Completing all vehicles in an OEM lineup is expected to take roughly 7 years.

Development/Validation/Testing – In addition to the specific cost increases for the EDR units themselves (hardware/software), there are associated development and integration costs including validation and testing at component, sub-system, and vehicle levels. These costs and associated lead-times are amplified since the EDR application is coupled with a safety restraint management system that requires rigorous safety system validation and verification.

Cost Estimates – Many of the "examples" noted in the NPRM do not represent the average capabilities/performance of the current fleet. In developing its cost estimates for "flash memory," NHTSA referenced a study by FMCSA on heavy duty/commercial data recorders. There are large differences between light duty EDR's and commercial data loggers which raises questions about the applicability of these cost estimates. In addition, and as detailed above, there are many factors beyond the cost of increased memory that drive the total cost of the proposed recording duration and frequency well beyond the Agency's current estimate.

In order to provide more representative cost information, Innovators members are currently providing cost increase information to outside counsel for aggregation. Once this is completed Innovators will submit this as a supplemental comment.

Supply Chain and Equity Considerations

The cost to consumers and lead-time implications are especially important during these times of supply chain disruption, high inflation, and economic uncertainty. Recently it was reported that GM had approximately 95,000 incomplete vehicles parked awaiting shipments of critical microprocessors (CHIPS)[6] .

Equity issues also need to be considered, given the average new car transaction price has reached ~$48,000[7] with average monthly payments exceeding $700[8] . As a result, during these difficult economic times, we urge the Agency to avoid unnecessary regulatory requirements that add additional cost to consumers with no direct safety benefit to the performance of the vehicle or the consumer.

Lead-time

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[6] https://www.motortrend.com/news/chip-shortage-gm-unfinished-vehicles/
[7] https://mediaroom.kbb.com/2022-08-10-New-Vehicle-Prices-Set-Record-in-July-2022,-According-to-Kelley-Blue-Book,-as-Inventory-Improves-Year-Over-Year-and-Luxury-Share-Remains-Elevated
[8] https://www.jdpower.com/business/press-releases/jd-power-lmc-automotive-forecast-july-2022

As detailed by the SAE committee, there will be significant changes necessary to the EDRs to accommodate the proposed increase in pre-crash recording duration and frequency. In addition, considering the current economic challenges and microprocessor/chip supply issues, 1 year of lead-time is entirely insufficient and would adversely impact vehicle affordability with no commensurate vehicle safety performance increase.

Innovators is concerned that the combination of insufficient lead-time and significant additional memory and other system resources that are needed to accommodate the proposed increase in pre-crash recording duration and recording frequency may have undesirable near-term implications. In some cases, especially for models nearing the end of their run, manufacturers may be forced to disable the EDR function entirely or shift EDR resources to accommodate the proposed increase in recording duration and frequency. For example, manufacturers may reallocate resources to the mandated data elements and elect to not record other high value but non-mandated data elements (e.g., Table II and data elements capturing the status of advanced crash avoidance technologies such as AEB, Lane Keeping, etc.) that many manufacturers voluntarily record.

In NHTSA's 2006 EDR final rule[9], the Agency recognized the burden associated with the modification of EDR recording devices to comply with the proposed data elements and associated formats. The Agency initially provided 3 years and 10 months of lead time (September 1, 2010) that was subsequently extended by an additional two years to September 1, 2012[10]. Given the significant modifications required in a challenging economic and supply chain environment, a similar amount of lead time (~6 years) is necessary for the current proposed rulemaking.

3. Additional Considerations

Impact on NHTSA Defect Identification/Analysis.

In the NPRM, NHTSA suggests that increases in the EDR pre-crash recording time would support the Agency's Defect enforcement and references the Toyota "sudden acceleration" case as an example.

Given the SAE EDR Committee experts' conclusions about the rapidly diminishing value of pre-crash data recorded longer than the current 5 second, Auto Innovators believes that the current 5 second pre-crash EDR recording capability is adequate to determine driver actions (accelerator, brake, steering control application) necessary to inform defect investigations..

In general, adding additional pre-crash recording duration will simply provide information about non-crash related driver inputs and not information critical to the identification of actual vehicle defects. Furthermore, Auto Innovators is unaware of any instances where the lack of the proposed increase of pre-crash recording adversely impacted potential defect investigations

[9] 71 FR 51001
[10] 73 FR 2169

International Harmonization of EDR Specifications

In support of international efforts to develop harmonized performance specifications and regulations to facilitate the deployment of automated vehicle technologies, the UNECE WP.29 has established the EDR/DSSAD Informal Working Group (IWG). The IWG, which is chaired by the US (NHTSA), Japan, and the Netherlands is charged with the development of internationally harmonized performance specification/regulations for EDR functions.

Since its inception in the summer of 2019, the IWG has completed the development of EDR Phase 1 specifications appropriate for self and type certification systems (98 and 58 agreement countries) as well as R160. R160, which has been codified in Europe, is largely harmonized with the current NHTSA Part 563 requirements with the addition of some ADAS system state data elements.

In fact, with the promulgation of the European EDR regulation, all of the nations with EDR requirements currently specify a 5 second pre-crash recording duration (see map in Figure 3). The NPRM proposal will likely require costly US-specific hardware and programming.

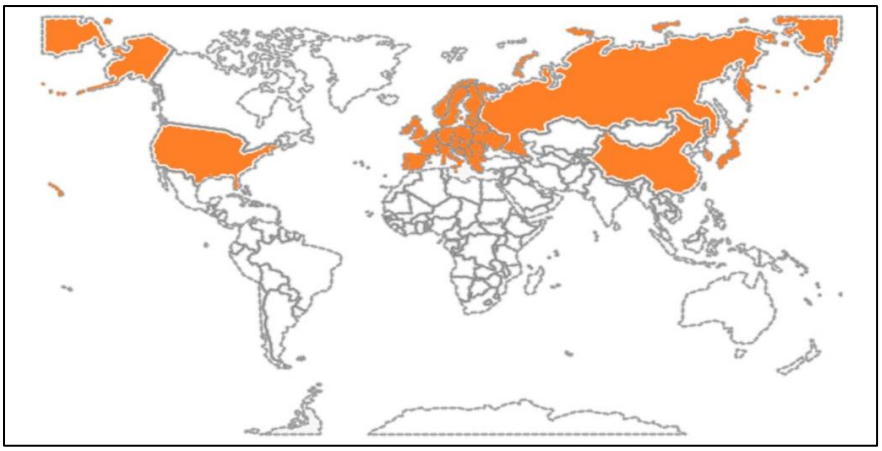

Figure 3: Map of nations with EDR requirements

The IWG is currently working on EDR for Heavy Duty vehicles. Following the completion of these specifications, that group will reexamine light duty vehicle EDRs in a more holistic and comprehensive manner as part of its Phase 2 efforts, likely to start near the end of 2023.

Innovators believes that the goal of improving the data provided by EDRs could be better served by considering additional categories of useful data rather than extending the duration and/or sampling rate of existing Part 563 data retention requirements. Such additional data elements should be considered as part of the upcoming IWG's EDR Phase 2 activity that will develop the specifications that will likely form the basis for a more comprehensive EDR upgrade.

If NHTSA determines that it wants to extend the recording duration, Innovators recommends that the Agency leverage the global technical expertise currently assembled in the IWG and include this as part of the Phase 2 considerations. Once the Phase 2 specifications are completed ~2024, NHTSA could then issue a more comprehensive EDR NPRM that would be internationally harmonized. This would also conform to the recent IIJA Sec.24211 guidance that

specifies that "*The Secretary shall cooperate, to the maximum extent practicable, with foreign governments, nongovernmental stakeholder groups, the motor vehicle industry, and consumer groups with respect to global harmonization of vehicle regulations as a means for improving motor vehicle safety."*

This global approach would also eliminate the unnecessary cost to consumers associated with having to significantly modify EDRs multiple times in a fairly short time period (likely within the 3-4 year lead-time period needed to accommodate the NPRM's proposed revisions).

Privacy

In the preamble to the 2006 EDR final rule, NHTSA details the considerable discussion about how to strike an acceptable balance between the benefits of recording EDR data and privacy concerns with respect to recording driver actions. We contend that the Agency arrived at the optimum balance when it limited the pre-crash recording to the current 5 second pre-crash duration. Expanding the pre-crash recording time to 20 seconds will capture a significant amount of driver behavior, much of which will not have any significant impact on the determination of crash causation factors that can't currently be obtained by other crash reconstruction methods.

4. Conclusion

Based on our assessment of the NPRM, the proposed increase in pre-crash recording duration and frequency for conventional vehicles will not achieve the intended safety goals and will significantly increase both the EDR size (requiring repackaging) and cost to consumers of these units during difficult economic and supply chain constrained conditions, with questionable and unquantified added benefit.

As a result, Auto Innovators recommends that any further consideration of potential EDR revisions, including potential increases in recording duration and frequency, be further considered as part of the UN ECE EDR/DSSAD IWG EDR Phase 2 activities. This will ensure greater international harmonization with minimal to no direct impact on occupant safety while these activities reach their conclusion.

However, if NHTSA is compelled to move forward with the proposed revisions despite the contrary positions expressed herein, we recommend that adequate lead-time similar to that provided with the initial EDR final rule (~6 years) be adopted to help reduce the burden of implementation. Alternatively, 3 years of lead-time followed by a 25%, 50%, 75%, and 100% phase-in would be appropriate.

Please contact me if you have questions on any aspect of these comments.

Sincerely,

Scott Schmidt
Vice President, Safety Policy
Alliance for Automotive Innovation