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Dr. Steven Cliff  
Administrator  
National Highway Traffic Safety Administration  
United States Department of Transportation  
1200 New Jersey Ave., SE  
Washington, DC 20590

**RE: SAE International Comments to:  
NPRM – Part 563, Event Data Recorders, Minimum time Capture for Pre-  
Crash Data, U.S. DOT – National Highway Traffic Safety Administration  
[Docket No. NHTSA-2022-0021]**

Dear Dr. Cliff:

The following comments are submitted on behalf of the members of the Event Data Recorder (EDR) Committee of SAE, International. These committee members are a diverse group of subject matter experts from who work for automotive vehicle manufacturers, equipment manufacturers and crash reconstructionists.

Since the inception of Part 563 EDR requirements, the automotive industry has embraced robust standards of EDRs, and has placed in production, systems that have provided valuable information regarding collisions<sup>1</sup>, which in turn has cleared the path for more enhanced vehicle safety systems. The collective experience of the SAE EDR committee members spans multiple decades with members providing insight from a scientific and practical standpoint.

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<sup>1</sup> It is understood that the Fixing America's Surface Transportation Act Section 24303 of the Fixing America's Surface Transportation Act (FAST Act), Pub. L. No. 119-14 (Dec. 4, 2015), requires NHTSA to conduct a study "to determine the amount of time event data recorders installed in passenger motor vehicles should capture and record for retrieval [of] vehicle-related data in conjunction with an event in order to provide sufficient information to investigate the cause of motor vehicle crashes," However, EDRs alone will not determine the cause of a crash. The focus of EDR is to monitor the safety equipment in a vehicle to see how it works. Overall, EDR is a supplement to crash reconstruction.

A vehicle EDR, from its inception, has the intention and capability to provide data, which, in conjunction with crash-site evidence and eye-witness accounts, supports the process of reconstructing a collision. As such, the SAE EDR committee is deeply invested in supporting standards and regulations which enhance this process. Because the SAE EDR committee members are experts in this field as both producers and users utilizing EDR data routinely, it is hoped that NHTSA will value this feedback and exercise prudent judgment in rulemaking, considering the broader implications to the entire automotive system.

As NHTSA considers EDR data requirements and future changes, it should maintain a methodical, structured, and predictable approach that remains understandable for consumers, industry, and other stakeholders. Further, any new requirements, which may burden the automotive industry in its development and production efforts, should be accompanied with a clear recitation of societal benefits of the proposed changes.

Respectfully submitted below, are comments on key areas that we consider priorities for the future changes to EDR:

***1. Developing and implementing safety assessments based on societal benefit***

- **State of the Industry** – NHTSA is congratulated for creating the Partnership for Analytics Research in Traffic Safety (PARTS)<sup>2</sup> whose goal is to gain real-world insights into the safety benefits and opportunities of emerging advanced driver assistance systems and automated driving systems. The partnership between NHTSA and the industry is established to gain a better understanding of collisions and driver behaviors. SAE recognizes and encourages the "PARTS" organization as the arm of NHTSA which is focusing on advanced driver support systems and automated driving. As such, SAE recommends that the EDR function and the advanced systems (ADS) data capture be developed and mandated separately.

While the NPRM proposes to use EDR to assist in the determination of crash causation and the better understanding of driver pre-crash behavior, SAE reiterates that EDR is not intended to determine the cause of collisions or understanding driver behaviors. The current EDR data does assist with collision reconstruction. While no technology is expected to completely address 100% of collisions, the current EDR recording duration and frequency are considered sufficient to support collision reconstruction. The vast majority of impact collisions can be analyzed using existing technology.

- **Rollover Vehicle Accidents** – Rollover accidents are of particular interest to the automotive industry. It is generally cited that this type of accident requires a longer duration EDR record, however, the extended duration of the event

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<sup>2</sup> <https://www.nhtsa.gov/parts-partnership-for-analytics-research-in-traffic-safety>

itself does not justify the added duration of pre-crash data. All of the data elements that support the crash investigation are already present in the 5 seconds of data available. According to the DOT HS 809 438 technical report on “Characteristics of Fatal Rollover Crashes,” EDR data has proven valuable in determining vehicle speed, evasive maneuvers, and passenger status (i.e. seat belt, etc.). An increase in data duration, will, in almost all cases, merely represent static operating conditions.

- **Privacy Rights Infringement:** - When determining the appropriate data duration for the current Part 563 requirement, NHTSA had taken into account the balance of securing data with the individual privacy rights of the vehicle operator. In fact, an initial proposed duration of 8 seconds was reduced to 5 seconds in order to apply prudent judgment on this balance. Because the NPRM is suggesting a 400% increase in data duration, to a new 20 second limit, it is feared that the personal privacy matter is being ignored in favor of an unsubstantiated claim that “more data is better.”

It is incorporated by reference, Docket # NHTSA-2004-18029, in which the “Electronic Privacy Information Center (EPIC)” cautioned NHTSA against an incremental expansion of EDR data records as mandated policy. EPIC goes on to cite several “Fair Information Practices” (FIPs) which limit data collection policy based on purpose-specific principles. In keeping with these principles, NHTSA should demonstrate a clear public benefit of an expanded data duration, contrasted with this balance of personal privacy.

- **Conflict over the Purpose of EDRs** – The value of EDRs lies in their use as a tool to provide insight into collisions, however, the EDR was never intended to be a monitor of driver behavior or a gage of fitness of drivers. The increase in data duration, as proposed in the NPRM, is in violation of this central separation of collision reconstruction from a driver behavioral record.
- **Impetus for the NPRM** – In the 2017 report “Event Data Recorders (EDRs) Duration Study”, (R. Chen, W. Tatem, H. C. Gabler, Virginia Tech, September 2017), the authors claim that 35% of rear-end, intersection and road departure crashes do not capture all braking actions within the 5 second EDR record duration. This result was used to draw a conclusion that a longer duration record would be better. It is the view of this SAE committee, that the timing of the brake actuation outside of the 5 second window of data, is not a significant factor in the reconstruction of an impact event. The question of did the driver apply brakes before impact is the information needed and that is always caught in the 5 seconds of recording. The fact that brakes, steering input and other maneuvers were active during the pre-crash window of 5 seconds, is sufficient to support collision reconstruction in almost all cases. It is further noted that an assumption of the Virginia Tech report is that a data report that includes driver behavior outside the 5 second window, naturally would support a more accurate accident reconstruction process, when there is simply no data to support this claim.

It is incorporated by reference, both Docket # NHTSA-2022-0021-0005 and Docket #NHTSA-2022-0021-0006, in which SAE described the lack of benefit of any increase in duration of EDR records. In its presentation to NHTSA engineering staff, SAE rebutted the claims of the Virginia Tech paper which have been used largely as impetus for the NPRM. Any societal benefit of increasing the EDR data duration is decidedly small compared to the drastic impact on automakers and system developers. SAE fails to understand, based on the NPRM content, the improvement in societal value gleaned from an increase in record duration or sampling rate.

- **Data Duration of 5 Seconds** (current Part 563 mandate.) – At a speed of 35mph, a 5 second window of data contains vehicle and functional operation information for a distance of 214.8 ft prior to the impact time. This span of operation adequately covers all active safety device actuations and relevant driver operation suggesting an accident maneuver or mitigation action. Nearly all system functions produce such a maneuver at less than 200 ft distance prior to impact. It is noteworthy that the proposed record duration of 20 seconds would cover a distance span of 984.75 ft, during which all but the last 5 seconds would be irrelevant to collision reconstruction.
- **Sampling Rate of Data** – SAE has not found any study or report that provides evidence that a driver or vehicular action occurring between the current samples at 2Hz, would have changed or altered a collision reconstruction result. The NPRM at issue does not provide a justification for changing the sampling rate from 2Hz to 10Hz.

Many of the pre-crash data elements are recorded based on sensor inputs from other systems and is conveyed via a communication bus to the EDR for recording. Not all of this data is currently transmitted and/or received at or higher than the proposed 10Hz data rate. This would require redevelopment of the related ECUs and systems to provide the data at this increased frequency. Additionally, the communication network structure will experience additional loading, and would also require redevelopment where the bus becomes overloaded by the additional data. Without a change in specification to related devices, the data would be stored at the rate that it is sent, and the increased sample rate is misleading. Automakers simply cannot redesign other ECU's and the vehicle communication bus to send data at a new rate on existing vehicle architectures. Updates to any future vehicle architecture will have to be studied to determine if the sending module can update the rate to the requested 10 Hz.

- **State of the Industry** – Silicon IC production shortages have crippled the automotive industry in the past several years. Although this condition has improved in recent months, many OEMs continue to struggle with their suppliers to provide adequate supply for production. Complete market stabilization is unpredictable in the near and mid-term, but may take several years, assuming that no new supply chain interruptions are experienced. Any

increase in EDR duration or sampling rate would pose a major conflict in managing supplier delivery of IC components by diverting resources to new IC component development and would further impede efforts to manage the current production crisis.

2. **Establishing an effective program for the U.S. considering shared global assessments**

- **Harmonization opportunities for efficiency** – SAE recommends maintaining a mandated EDR practice that is consistent with other global requirements. It is noted that Korea (KMOVSS 56-2), Japan (J-EDR 2015), China (GB 39732-2020), EU (2022/545) based on UN R160 and Russia (Fed article 26 162-03) provide a consistent direction of a 5 second, 2 Hz data record.
- **Providing value to the U.S. consumer** – At its core, NHTSA policies are a consumer-centric resource tailored to provide insightful and relevant safety information to aid the assessment of vehicle safety, ultimately to the benefit of the consumer. Yet, the NPRM as specified would require a completely new and unique set of hardware and software related to this data capture, which would lose global economies of scale, subsequently penalizing US vehicle buyers.

3. **Hardship to Automotive Manufacturers:**

- **Memory Requirements** – The NPRM states in section D, that the Memory cost increase to accommodate a 20 second and 10Hz EDR would increase by a factor of 2.43. Based on analysis from some OEM suppliers, the increase factor is approximately 8.5. It should be noted however, that the memory costs only represent a small fraction of the total cost of a longer duration EDR. Other, more important factors listed below, include microprocessor computational throughput, peripheral data mapping I/Cs, reserve energy supply and amortized development/testing/validation expense. The NPRM implies that increasing the data duration is a simple matter of adding more memory, which is a substantial oversimplification of the matter.
- **Microprocessor** – The microprocessor of the EDR remains the single most expensive and complex part of the system. It is expected that all OEMs will require a higher capacity, data throughput, microprocessor in order to comply with an increase in data storage capacity. Especially for those OEMs that utilize a continuously-running algorithm, the alignment of data mapping, through the microprocessor will require upgrading in speed and data capacity.

Several of the concepts posed in the NPRM, such as adding external memory or trading memory duration for the number of data elements, are not feasible

for any system. Changing the system configuration will require bottom-to-top redevelopment of the EDR system for each vehicle architecture within an OEM. SAE recognizes the value of the Table II data elements and would prefer not to eliminate Table II data elements in favor of increased recording duration and frequency of Table I data elements.

- **Reserve Power Supply** – The 400% increase in data duration timing will require a substantial reserve power supply. This system provides power to the EDR ECU in the event that battery supply power is interrupted in the process of a collision. This not only affects price, but also packaging location in the vehicle, size, mass, etc. To protect the data recording process when vehicle power is interrupted, a 20X minimum recording capture is expected, impacting the specification and cost considerably.

To provide the reserve energy required, a large capacitor is generally used which, given the current time required to capture and record data to memory, occupies the largest mass of the entire system. The increase in capture time, as proposed in the NPRM, would require a substantial increase in size, weight and cost of this device, which is further complicated by requiring changes to the mounting of the EDR ECU and a physical redesign of the surrounding parts/structures. It should also be noted that larger capacitors pose engineering challenges in terms of lifespan, durability and ability to charge during normal operation, such as within the FMVSS 208 required timeframe. 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.

Large energy resource capacitors, such as those used in EDR applications, pose extreme difficulty in assembly, with special considerations for mounting and supporting the device on the ECU circuit board. An increase in this device size and mass further complicates this already difficult assembly process.

- **Location of EDR ECU** – The location of the EDR ECU is critical for purposes of protection of the device in the event of a collision and also to protect it from tampering or theft. The increase in packaging dimensions of the ECU will require, for some OEMs, a modification of the surrounding parts and attachment scheme.
- **Development of a New EDR ECU** – For automotive-grade ECU purposes, a change in the EDR specification, of the magnitude proposed in the NPRM, would require brand new development. This involves intensive design, testing and validation, impacting resources for the span of approximately 3 to 4 years for the first vehicle application.

- **Validation and Compliance Certification** – Appropriate compliance testing for EDRs is done in a crash test facility. Testing of an EDR record of 20 seconds duration, would require a crash test facility of over 985 ft in length. There does not exist such a test facility (over 3 football fields.)
- **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 of from 3 to 4 years, and would require a phased-in approach, applying to vehicle production only at a major-change vehicle development program.

Due to the individual characteristics of each vehicle in an OEM's portfolio, it has become 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 ECU itself, to multiple vehicle types, and as a result, the deployment of a new system to a vehicle requires intensive and 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 to 4 year development window. Completing all vehicles in an OEM lineup is expected to take roughly 7 years.

When the EDR application is coupled with a safety restraint management system, rigorous validation and verification is needed. Given the arduous nature of this critically important aspect of development, a one-year implementation timing may force some OEMs into managing a tradeoff between optimal restraint system deployment, and the presence of an EDR. OEMs note that the one-year proposal of the NPRM is impossible to achieve without compromising safety restraint functionality.

- **EDR ECU** – Typically, the ECU which contains EDR data applies safety restraint actuation. As such, it is safety-critical that a change to the EDR data management structure be developed with the utmost regard for software integrity. The one-year implementation timing suggested by the NPRM would generate significant risk to the functionality of these vehicle safety functions. SAE recognizes this risk in its proposal Docket-2022-0021-0005 with the proposal to not alter the EDR record duration.
- **New CDR Development** – 49 CFR Part 563 requires a commercially available readout tool for downloading an EDR record. Bosch Automotive Service Solutions has dedicated 22 years of development in creating imaging tools necessary to read EDR data for each OEM and each vehicle. Because of the complicated connection and interface requirements of each OEM, changes to the EDR module would require Bosch to develop all new interfaces and

software which would be further complicated by the longer imaging times for each device.

Given the minimal societal benefit, concerns over privacy rights of the consumer, the hardship to OEMs in accomplishing the data extension, and the general conflict posed by the purpose of the EDR, it is recommended that the duration and sampling rate of the current EDR record remain unchanged.

As a point of reference, the Alliance for Automotive Innovation (AAI), is providing additional insight into the burden v. benefit analysis resulting from the NPRM direction. SAE defers to AAI in providing the financial breakdown of the impact of the EDR development required to meet the terms of the NPRM.

SAE remains committed to providing vehicle standards with safety and reliability at its core. This commitment requires a pairing with the practical aspects of system functionality, usefulness, and cost. SAE urges NHTSA to consider all these factors when developing final rules, and to avoid the pitfalls of requesting more data without a proven value to society of such.

This opportunity to provide comments to the NHTSA is appreciated. We look forward to the agency's response and next steps to update the part 563 requirements. Should you have any questions, please direct inquiries to William Gouse, Director, International Government and Technical Affairs at [s.william.gouse@sae.org](mailto:s.william.gouse@sae.org).

With unanimous consensus of the experts of the SAE Event Data Recorder Committee, SAE respectfully submits these comments for consideration by NHTSA.

Sincerely,

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