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Dr. Steven Cliff, Administrator
National Highway Traffic Safety Administration (NHTSA) Docket Management Facility
U.S. Department of Transportation
1200 New Jersey Avenue SE
West Building, Ground Floor,
Room W12-140
Washington, DC 20590-0001

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RE: Notice of Proposed Rulemaking, Event Data Recorders, 49 CFR Part 563, Docket No. NHTSA-2022-0021

Thank you for the opportunity to respond to the request for comments regarding the Notice of Proposed Rulemaking (NPRM) on Event Data Recorders (EDRs).¹ The Center for Auto Safety (CAS), founded in 1970, is an independent, member supported, non-profit consumer advocacy organization dedicated to improving vehicle safety, quality, and fuel economy.

CAS agrees with the need to update 49 CFR Part 563 to record additional precrash data, as required by the FAST Act. The current recording time and frequency limitations have long been in need of improvement. However, the proposed update as described in the NPRM will not provide NHTSA with the full scope of data necessary to effectively investigate and respond to critical safety issues. Automotive technology is rapidly advancing, and requirements for EDRs must not only make marginal improvements on historical practices but must also as a minimum reflect current vehicle data storage technology, vehicle data collection practices and capacities. Updated EDR requirements should assure equitable unfettered data accessibility to support crash investigations. The update should also comply with recommendations from the National Transportation Safety Board (NTSB) for data recording based on its independent investigation of automotive crashes, including data records of safety-critical sensor, data processing, and data network status and performance, especially those involving modern vehicles equipped with automated driving assistance technology.

Fundamentally, NHTSA should require EDR collection and recording of data that enables post-crash assessment of safety critical sensor, data processing, control, motion, and vehicle performance data, ultimately assuring that those data are provided to investigators unfettered by the proprietary interests of manufacturers.

¹ Event Data Recorders, 49 CFR Part 563, [Docket No. NHTSA-2022-0021, RIN 2127-AM12, , <https://public-inspection.federalregister.gov/2022-12860.pdf>

Subsequent to its investigation of a series of ADS Level 2 driver assistance enabled vehicle crashes of a Tesla vehicle in Williston, Florida, the NTSB reiterated Safety Recommendation H-17-037 to NHTSA². and again reiterated its recommendation in the NTSB final accident report of a fatal Tesla crash in Mountain View California.³ Recommendation H-17-037 to NHTSA states:

Define the data parameters needed to understand the automated vehicle control systems involved in a crash. The parameters must reflect the vehicle's control status and the frequency and duration of control actions to adequately characterize driver and vehicle performance before and during a crash.

According to the NTSB, NHTSA's response to date is inadequate. The NTSB states:

In recent AV crash investigations, NTSB investigators retrieved data from the EDR, but the data did not address the status of AV activation, engagement, or object detection and classification. As a result, the NTSB coordinated with the manufacturer and operator to use other proprietary data to interpret the automated system's functionality. However, this type of data is not available on many vehicles operating with automated systems. Further, there are currently no commercially available tools for independently retrieving and reviewing non-EDR vehicle data, and many manufacturers maintain tight control and access to post crash proprietary information associated with their vehicles.

As more manufacturers deploy automation systems in their vehicles, it will be necessary to develop detailed information about how the automated systems, and possibly drivers or vehicle operators, perform and respond in a crash. Manufacturers, regulators, and crash investigators all need specific data in the event of a system malfunction, near-crash, or crash. Recorded data can be used to improve the automated systems and to understand situations that may not have been considered in the original design. Further, data are needed to distinguish between automated control and driver action.

After the Williston crash, the NTSB recommended that the DOT define the parameters necessary to understand AV control systems. See Safety Recommendation H-17-37, currently classified "Open—Unacceptable Response." Another recommendation was made to NHTSA to, using the parameters defined by the DOT as necessary to understand AV control systems, define a benchmark for new vehicles equipped with automated vehicle control systems so that they capture data that reflect the vehicle's control status and the frequency and duration of control actions needed to adequately characterize driver and vehicle performance before and during a crash. See Safety Recommendations H-17-39, currently classified "Open—Unacceptable Response."

² NTSB, Project Summary: Highway Investigation - 46 Docket Items - HWY16FH018 , <https://data.nts.gov/Docket?ProjectID=93548>

³ Collision Between a Car Operating with Automated Vehicle Control Systems and a Tractor-Semitrailer Truck Near Williston, Florida, May 7, 2016, <https://www.nts.gov/investigations/AccidentReports/Reports/HAR1702.pdf>
Collision Between a Sport Utility Vehicle Operating With Partial Driving Automation and a Crash Attenuator Mountain View, California, March 23, 2018, <https://www.nts.gov/investigations/AccidentReports/Reports/HAR2001.pdf>

With the increasing number of AVs using different automated technologies being tested and in some cases being sold to the public, standardized data elements, recording, and access to safety event data are essential to the development of a framework for ADS safety. NHTSA needs to advance its efforts to modernize and improve EDR regulations so that they focus on the performance of advanced safety features.⁴

Contrary to the NTSB recommendation, the DOT/NHTSA have not yet defined, or included in the current NPRM, the data parameters needed to understand the performance of advanced vehicle control systems involved in a crash. The NPRM does not acknowledge the relevant NTSB recommendation, and consideration of data parameters needed for satisfaction of the NTSB safety recommendation purpose was not included in the background studies for the NPRM. There is no assurance that the incremental data rate and duration changes proposed in the NPRM are adequate for that purpose. NHTSA does not address either still picture or video files that are available on many vehicles, and certain to be available on even more in the near future, nor the exclusion of readily available graphical data automatically generated by current and future vehicles. Modern vehicles are increasingly collecting operational data, which may contain still images, videos, and a wide array of parameters that could assist crash investigations.⁵

Current EDRs or equivalent on-board memory also include many other parameters that are unique to individual vehicles and are critical to crash investigation. A vehicle's unique physical and logical configurations at the time of a crash are both essential to understanding the reason for the crash, and should be recorded and protected against post-crash modification. A vehicle's physical configuration may have been altered by either intentional changes or by replacement of original parts with after-market parts. The logical configuration of any vehicle may differ from that vehicle's model year baseline because of OEM service-mediated or over-the-air (OTA) updates to vehicle safety-critical control logic that may have been downloaded and installed. A vehicle's unique physical and logical configuration should be reported and locked in its EDR to assure an accurate vehicle representation.

NHTSA should incorporate vehicle control configuration and other current or reasonably anticipated data related to vehicle state at the time of a reportable incident into the EDR. By limiting the NPRM to merely codifying marginally updated but substantially obsolete data requirements NHTSA would regrettably assure that it would be many years behind the state of the art in vehicle operational data management, and additional years before EDRs provide investigator's adequate understanding of the now commonplace and rapidly advancing automatic vehicle control system capacities and their impacts on highway safety.

⁴ NTSB Response to NHTSA NPRM "Framework for Automated Driving System Safety," , Pg 10 ff, <https://www.nts.gov/Advocacy/safety-topics/Documents/2021-Comments-to-NHTSA-Framework-for-ADS-Safety-NPRM.pdf>

⁵<https://data.nts.gov/Docket/Document/docBLOB?ID=8932690&FileExtension=pdf&FileName=Tesla%20Approval%20to%20Release%20Documentation%20-%20Still%20images%20for%20HAB-Rel.pdf> ; Video shows moments before Uber self-driving car hits pedestrian, https://www.youtube.com/watch?v=hthyTh_fopo

NHTSA should ensure that EDR data requirements fully comply with the NTSB Safety Recommendation H-17-037 and includes vehicle control configuration as well as still images, video, and other sensor data that is automatically generated by a vehicle. It is insufficient and unsafe to issue rules that only apply to obsolete vehicle technology bases while ignoring current and emerging technology.

Neither has NHTSA yet addressed the fact that data needed to fully investigate crashes of automated vehicle control systems may be and is collected and stored at much higher rates and with much greater breadth by current vehicles than included or anticipated in the current NPRM's scope. One example is Tesla's data collection, which includes EDR and the Carlog, designed and built to Tesla's own specifications and including a broad range of parametric and graphical data.⁶ Such rich datasets are extremely valuable to post-crash investigations third parties as well as its utility to the manufacturer, and are clearly within the current state of the art. NHTSA is remiss in not requiring comparable scope for all EDRs since the technology is readily available to manufacturers.

Unfortunately, critical vehicle operational data may be and often are stored in proprietary formats. As noted by the NTSB in its investigation of the fatal Mountain View Tesla Crash,

Further, no commercially available tools are currently able to retrieve and review any non-EDR vehicle recorded data, and other manufacturers of vehicles with driving automation systems similarly control access to the postcrash (sic) proprietary information associated with their vehicles.⁷

Data in proprietary formats, such as the data stored in a Tesla vehicle's Carlog, fall outside of the federal EDR requirements and are only accessible to investigators with the cooperation of a vehicle's manufacturer. A manufacturer may refuse to deliver, inhibit access to, or modify such data inhibiting third party crash investigation.⁸ There is no rule requiring that non-EDR operational record data be made accessible by design to investigators without manufacturer intervention. There is a potential for modification of data by manufacturers intervening to provide such data, thus no way of assuring investigation independence or accuracy. There is no way to assure that proprietary data stored outside of the EDR has needed scope and resolution. NHTSA should assure comparably comprehensive scope of vehicle data to be included in the EDR, and prohibit data storage in proprietary formats to assure unfettered beneficial access by crash investigators to raw EDR data independent of the vehicle manufacturer. Vehicle and highway hazards should not be hidden behind a screen of proprietary secrecy.

NHTSA requests comment on the need and practicability of increasing the pre-crash recording duration. Certain data that should be included in the EDR need to be collected over much longer terms than the proposed 20 seconds. For example, sensors, processors, data networks, or

⁶ Tesla EDR: Documents & Support, <https://crashdatagroup.com/pages/tesla-edr-documents-support>

⁷ Collision Between a Sport Utility Vehicle Operating With Partial Driving Automation and a Crash Attenuator Mountain View, California March 23, 2018, NTSB, <https://www.nts.gov/investigations/AccidentReports/Reports/HAR2001.pdf>

⁸ Letter from NTSB Robert L. Sumwalt III to Elon Musk, April 12, 2018, <https://www.nts.gov/investigations/Documents/HWY18FH011-TeslaPartyRemovalNotificationLetter-041218.pdf>

electronic control units (ECUs) may include built-in test or diagnostic capability that reports status and health to the main vehicle processor and EDR. Sensor and ECU, and supporting data connectivity, performance are critical to object event detection and response (OEDR).

Understanding OEDR performance is critical to understanding ADS crash causality, such as the fatal Uber crash in Arizona.⁹ Progressive sensor degradation that requires long-term data records can also be an important factor in vehicle safety and crash root cause analysis. Capability trends for components in the OEDR chain can also identify needed safety recalls. Such component health trends over a period of weeks or months could be included in the EDR and would not impose an unreasonable burden on OEMs or EDR memory requirements. Similarly, the vehicle's history of software, firmware, or parameter updates, potentially automatically downloaded and installed on a vehicle, or owner inability or refusal to accept available updates, may also be an important factor in crash causality. Extended records of such updates could and should be included in an EDR and made available to crash investigators, and would not impose an unreasonable burden on developers. CAS agrees that a 20 second duration of EDR recording is feasible, but does not agree that it is necessarily sufficient or especially desirable as a uniform standard. As discussed, some data should be recorded for much longer periods.

NHTSA requests comments on the need and practicability of increasing the sampling rate. The current EDR standard is stuck in an obsolete paradigm wherein gross vehicle data collected at modest data rates is believed to be sufficient for crash investigation. The standard is not now sufficient, and will not be acceptable for evolving automated driver assistance (ADAS) and full-blown ADS. NHTSA should require update frequency based on the type of data being recorded and not assume a single update rate is adequate or appropriate for all records. For example, the EDR should contain records of the sensor and main vehicle computer health and status such as data network bit error rates and main processor memory capacity margins since they (and other OEDR/data processing parameters) are safety-critical, essential to vehicle as well as vulnerable road user safety, and determine the proper operation of all of the potentially hundreds of vehicle ECUs.

Such data are essential to crash investigation root cause analysis. If NHTSA allows automatic OEDR to impact vehicle operation, then it must also demand records of OEDR processing and the performance of sensor and data processing components contributing to OEDR, and demand that records of contributing component performance be recorded in the EDR for post-crash analysis. NHTSA does not address safety-critical sensor and data processing, of external inputs including cybersecurity, and of internal network performance, health and safety parameters that can change in microseconds, affecting OEDR performance and vehicle control. For such data, the 10hz change may not be adequate to support post-crash investigations. NHTSA should revise and update the EDR requirements to include sensor and data processing performance, health, and trends, built-in sensor/data processing/data network diagnostic results, as well as sensor, imagery, and video data to empower comprehensive crash investigations of modern data processor- and sensor-dependent vehicles.

⁹ Collision Between Vehicle Controlled by Developmental Automated Driving System and Pedestrian, Tempe, Arizona, March 18, 2018, <https://www.nts.gov/investigations/AccidentReports/Reports/HAR1903.pdf>

NHTSA requests comment on its cost estimates. The cost of memory is not a barrier to greatly expanded EDR data storage. The NPRM is based on "... the projection of a drop to .00003 \$/Kb (0.03 ¢/Mb) by 2020." The current retail cost of flash memory is no more than \$.000000125 per Kilobyte.¹⁰ The NPRM memory cost projection overstates the actual current cost at retail of flash memory by a factor of about 250, not including discounts available to OEMs for bulk memory purchases and other high-volume procurement factors. NHTSA EDR requirements, even if expanded as recommended by CAS, should not be proscribed due to the projected cost of memory.

In conclusion, CAS thanks NHTSA for the opportunity to provide comments on the NPRM. The NPRM, while providing slightly more useful data for crash investigators, appears to be unnecessarily constrained by the perception that traditional parameters are sufficient to respond to the needs of modern and evolving ADAS and ADS-equipped vehicle crash investigation and root cause analysis. That approach is not adequate. While CAS agrees that an update of EDR requirements is timely, NHTSA should require EDR collection and recording of data that enables post-crash assessment of safety critical sensor, data processing, OEDR, vehicle control, motion, and gross performance data for the broad scope of technology that is allowed to be used in current and anticipated production vehicles, notably those equipped with ADAS or ADS capabilities, as recommended by the NTSB. NHTSA should require that those EDR data are provided to investigators unfettered by proprietary interests of manufacturers.

¹⁰ Quote from Amazon, https://www.amazon.com/SanDisk-Cruzer-128GB-Flash-SDCZ36-128G-B35/dp/B00TKFCYP0/ref=sr_1_3?crd=2HC0WN6EFPNH1&keywords=flash+memory&nav_sdd=aps&qid=1656509002&refinements=p_n_size_browse-bin%3A10285018011&rnid=1259751011&s=pc&sprefix=flash+memory&sr=1-3