

**DEPARTMENT OF TRANSPORTATION**

**National Highway Traffic Safety Administration**

**49 CFR Part 563**

**[Docket No. NHTSA-2006-25666]**

**RIN 2127-AI72**

**Event Data Recorders**

**AGENCY:** National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

**ACTION:** Final Rule.

**SUMMARY:** This final rule specifies uniform requirements for the accuracy, collection, storage, survivability, and retrievability of onboard motor vehicle crash event data in passenger cars and other light vehicles equipped with event data recorders (EDRs). This final rule responds to the growing practice in the motor vehicle industry of voluntarily installing EDRs in an increasing number of light vehicles. This final rule is intended to standardize the data obtained through EDRs so that such data may be put to the most effective future use and to ensure that EDR infrastructure develops in such a way as to speed medical assistance through providing a foundation for automatic crash notification (ACN). This final regulation: requires that the EDRs installed in light vehicles record a minimum set of specified data elements; standardizes the format in which those data are recorded; helps to ensure the crash survivability of an EDR and its data by requiring that the EDR function during and after the front and side vehicle crash tests specified in two Federal motor vehicle safety standards; and requires vehicle

manufacturers to ensure the commercial availability of the tools necessary to enable crash investigators to retrieve data from the EDR. In addition, to ensure public awareness of EDRs, the regulation also requires vehicle manufacturers to include a standardized statement in the owner's manual indicating that the vehicle is equipped with an EDR and describing the functions and capabilities of EDRs.

This final rule for standardization of EDR data will ensure that EDRs record, in a readily usable manner, the data necessary for ACN, effective crash investigations, and analysis of safety equipment performance. Standardization of EDR data will facilitate development of ACN, e-911, and similar systems, which could lead to future safety enhancements. In addition, analysis of EDR data can contribute to safer vehicle designs and a better understanding of the circumstances and causation of crashes and injuries.

**DATES:** Effective Date: This rule is effective **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. The incorporation by reference of a certain publication listed in the regulation is approved by the Director of the Federal Register as of **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

Compliance Dates: Except as provided below, light vehicles manufactured on or after September 1, 2010 that are equipped with an EDR and manufacturers of those vehicles must comply with this rule. However, vehicles that are manufactured in two or more stages or that are altered are not required to comply with the rule until September 1, 2011.

Petitions: If you wish to submit a petition for reconsideration of this rule, your petition must be received by **[INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER.]**

**ADDRESSES**: Petitions for reconsideration should refer to the docket number above and be submitted to: Administrator, Room 5220, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, DC 20590.

**FOR FURTHER INFORMATION CONTACT**: The following persons at the National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, DC 20590.

For technical and policy issues: Ms. Lori Summers, Office of Crashworthiness Standards (Telephone: 202-366-1740) (Fax: 202-493-2739).

For legal issues: Mr. Eric Stas, Office of the Chief Counsel (Telephone: 202-366-2992) (Fax: 202-366-3820).

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#### I. Executive Summary

##### A. Purpose of the Regulation

Event data recorders have been used in recent years in a variety of transportation modes to collect crash information. EDR data will play an increasing role in advancing developing networks for providing emergency medical services. Specifically, EDR data can help the safety community develop ACN, electronic 911 (e-911), and other emergency response systems to improve medical services to crash victims. In addition, EDR data can also provide information to enhance our understanding of crash events and safety system performance, thereby potentially contributing to safer vehicle designs and more effective safety regulations.

EDRs have experienced dramatic changes in the past decade, both in terms of their technical capabilities and fleet penetration. EDRs today demonstrate a range of features, with some systems collecting only vehicle acceleration/deceleration data, but others collecting these data plus a host of complementary data such as driver inputs (*e.g.*, braking and steering) and vehicle system status. The challenge for NHTSA has been to devise an approach that would encourage broad application of EDR technologies in motor vehicles and maximize the usefulness of EDR data for the medical community, researchers, and regulators, without imposing unnecessary burdens or hampering future improvements to EDRs.

In light of the relatively high new vehicle fleet penetration of EDRs (currently estimated at 64%) and present trends, we do not believe that it is necessary to mandate

the installation of EDRs in all new vehicles. Were these trends reversed or slowed, we would consider revisiting this assessment. For now, we believe that standardization of EDR data represents the most important area of opportunity in terms of enhancing the yield of benefits from EDRs. We recognize that the automobile industry has already invested considerable effort and resources into developing effective EDR technologies, so we want to be especially careful not to adopt requirements that would result in unnecessary costs.

Accordingly, this final rule regulates voluntarily-provided EDRs by specifying a minimum core set of required data elements and accompanying range, accuracy, and resolution requirements for those elements. This will help ensure that EDRs provide the types of data most useful for the emergency medical services (EMS) community and crash reconstructionists, and in a manner that promotes the consistency and comparability of these data. We note that by specifying this minimum data set, we are not limiting manufacturers' ability to design EDRs that collect a broader set of data, provided that the required elements are present.

The rule also includes requirements for the survivability of EDR data (so that it is not lost in most crashes) and the retrievability of EDR data (so that it can be obtained by authorized users). In sum, the objectives of our regulation are to get the right data, in sufficient quantity and in a standardized format, and to ensure that the data can survive most crash events and be retrieved by intended users.

By promulgating a uniform national regulation for EDRs, it is our intent to provide one consistent set of minimum requirements for vehicle manufacturers that choose to install EDRs. We believe that this approach will not only enhance the quality

of EDR data, but also facilitate increased numbers of new light vehicles equipped with EDRs. We also believe that this minimum data set provides key elements in a standardized format that will be useful for ACN or other telematic systems.

B. Developments Culminating in the Notice of Proposed Rulemaking

1. Early Agency Efforts on EDRs

NHTSA has been assessing the potential benefits of EDR for over a decade, and in that time, we have witnessed a significant maturation of EDR technology. The agency initially began examining EDRs in 1991 as part of the Special Crash Investigations (SCI) program. In 1997, the National Transportation Safety Board (NTSB) and the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL) recommended that NHTSA consider the possibility of requiring the installation of EDRs in motor vehicles. NTSB made additional recommendations related to EDRs in 1999 (*i.e.*, suggesting that EDRs be installed in school buses and motor coaches). Since 1998, NHTSA has sponsored two Working Groups to examine and report on EDR issues.

As discussed below, the agency received two petitions for rulemaking in the late 1990s asking that light vehicles be equipped with “black boxes” (*i.e.*, EDRs) that would record data during a crash so that it could be read later by crash investigators. However, the agency denied those petitions because the industry was already moving voluntarily in the direction recommended by the petitioners, and because the agency believed that certain outstanding issues would best be addressed in a non-regulatory context.

In 2001, NHTSA received a third petition for rulemaking related to EDRs from Dr. Ricardo Martinez, seeking a requirement for installation of EDRs as well as standardization of EDR data. After considering the Martinez petition and the current

situation vis-à-vis EDRs, we decided to publish a request for comments as to what future role the agency should take related to the continued development and installation of EDRs in motor vehicles. This notice was published on October 11, 2002 (67 FR 63493), and after considering the input from a variety of interested stakeholders and the public, we decided to grant the Martinez petition in part (*i.e.*, the request for standardization and retrievability) and to deny it in part (*i.e.*, the request for an EDR mandate).

## 2. The Notice of Proposed Rulemaking

On June 14, 2004, NHTSA published a notice of proposed rulemaking (NPRM) proposing requirements for EDRs voluntarily installed by light vehicle manufacturers (69 FR 32932).<sup>1</sup> The decision to conduct rulemaking reflected careful deliberation and our belief that EDRs represent a significant technological safety innovation, particularly for the emergency response safety community.<sup>2</sup> Again, the proposal sought to standardize the elements and format of data deemed most appropriate for advancing our goals of enabling ACN and improving crash reconstructions and for ensuring the retrievability of that information. Most of these data elements are already recorded by current EDRs. It was not our intention to require an exhaustive list of non-essential data elements that would significantly increase the cost of EDRs, thereby jeopardizing the current, high rate of installation.

In summary, the NPRM proposed to require light vehicles voluntarily equipped with an EDR to meet uniform, national requirements for the collection, storage, and retrievability of onboard motor vehicle crash event data. The proposal included Table I,

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<sup>1</sup> Docket No. NHTSA-2004-18029-2.

<sup>2</sup> We note that NHTSA has been assessing the potential benefits of EDRs for over a decade, and in that time, we have witnessed a significant maturation of EDR technology. For further information on these agency research and analytical efforts, please consult the NPRM, which discussed this topic extensively (see 69 FR 32932, 32933 (June 14, 2004)).

Data Elements Required for All Vehicles Equipped with an EDR, which included 18 required elements that would have to be recorded during the interval/time and at the sample rate specified in that table. The proposal also included Table II, Data Elements Required for Vehicles Under Specified Conditions, which included 24 elements that would have to be recorded (during the interval/time and at the sample rate specified in that table) if the vehicle is equipped with certain devices or is equipped to measure certain elements. Table III, Recorded Data Element Format, included proposed range, accuracy, precision, and filter class requirements for each data element.

The NPRM also proposed a methodology for data capture under specified conditions and circumstances (*i.e.*, providing a hierarchy for when new EDR data would overwrite existing data already stored in memory). Simply put, EDRs are constantly monitoring a variety of vehicle systems and parameters when the vehicle is in operation, but the devices only have a limited amount of short-term (volatile) memory and long-term (non-volatile) memory available for recording for these purposes. So when vehicle manufacturers develop EDRs, they must make judgments as to which data are the most important to be captured and recorded (*e.g.*, events surrounding the deployment of an air bag are generally regarded as very important). Frequently, data stored in non-volatile memory are over-written (replaced) or deleted. The NPRM's proposed provisions related to data capture were intended to ensure that EDRs not only capture data according to a uniform methodology, but also that the methodology maximizes the generation of data suitable for the agency's safety purposes.

Because data standardization is only beneficial if the data can be retrieved and used, the agency decided to address the issue of data retrievability as part of our

rulemaking. The NPRM also proposed to require vehicle manufacturers to submit sufficient non-proprietary technical information to the public docket as would permit third parties to manufacture a device capable of accessing, interpreting, and converting the data stored in the EDR. Under the proposal, such information would be required to be submitted to the docket not later than 90 days prior to the start of production of the EDR-equipped vehicle makes and models to which the information relates, and vehicle manufacturers would be required to keep that information updated, by providing information not later than 90 days prior to making any changes that would make the previously submitted information no longer valid. However, as discussed in the NPRM, our proposal offered one possible way to handle the data retrievability issue, and we sought comment on alternative approaches.

In addition, the NPRM proposed survivability requirements for EDR data when the vehicle is crash tested under existing testing requirements of Federal Motor Vehicle Safety Standard (FMVSS) Nos. 208, Occupant Crash Protection, 214, Side Impact Protection, and 301, Fuel System Integrity, and it also proposed to require that the data be retrievable by the methodology specified by the vehicle manufacturer for not less than 30 days after the test and without external power.

Finally, the NPRM proposed a specific owner's manual statement related to EDRs that would make members of the public aware when their vehicle is equipped with an EDR and also explain the intended purpose of the EDR and how it operates.

C. Requirements of the Final Rule

After careful consideration of the public comments on the NPRM, we are promulgating this final rule to establish a regulation for voluntarily-installed EDRs in

order to standardize EDR data. The approach of this final rule is generally consistent with that of the NPRM, although we have further tailored the requirements of the regulation to advance the stated purposes of this rulemaking without requiring substantial costs or impeding the technological development of EDRs. We believe that with certain modest modifications, many current EDR systems can meet our goals of facilitating ACN and improving crash reconstructions.

In overview, the final rule specifies uniform, national requirements for light vehicles voluntarily equipped with EDRs, including the collection, storage, and retrievability of onboard motor vehicle crash event data. It also specifies requirements for vehicle manufacturers to make tools and/or methods commercially available so that authorized crash investigators and researchers are able to retrieve data from such EDRs.

Specifically, the regulation applies to passenger cars, multipurpose passenger vehicles, trucks, and buses with a gross vehicle weight rating (GVWR) of 3,855 kg (8,500 pounds) or less and an unloaded vehicle weight of 2,495 kg (5,500 pounds) or less, except for walk-in van-type trucks or vehicles designed to be sold exclusively to the U.S. Postal Service, that are equipped with an event data recorder and to manufacturers of these vehicles. Subject to an exception for final-stage manufacturers and alterers discussed below, compliance with the requirements of the final rule commences for covered vehicles manufactured on or after September 1, 2010. The final rule is intended to be technology-neutral, so as to permit compliance with any available EDR technology that meets the specified performance requirements.

The following points highlight the key provisions of the final rule:

- Each vehicle equipped with an EDR must record all of the data elements listed in Table I, during the interval/time and at the sample rate specified in that table. There are 15 required data elements (see paragraph 563.7(a), Table I). Examples of these data elements are “delta-V, longitudinal,” “maximum delta-V, longitudinal,” “speed, vehicle indicated,” and “safety belt status, driver.”
- Each vehicle equipped with an EDR that records any of the data elements listed in Table II identified as “if recorded” (most elements in that table) must capture and record that information according to the interval/time and at the sample rate specified in that table. Data elements listed in Table II as “if equipped” (*i.e.*, “frontal air bag deployment, time to n<sup>th</sup> stage, driver” and “frontal air bag deployment, time to n<sup>th</sup> stage, right front passenger”) must record the specified information if they are equipped with the relevant item, even if they are not presently doing so.<sup>3</sup> There are 30 data elements included in Table II (see paragraph 563.7(b), Table II). Examples of these data elements are “lateral acceleration,” “longitudinal acceleration,” “frontal air bag suppression switch status, right front passenger (on, off, or auto),” and “safety belt status, right front passenger (buckled, not buckled).”
- The data elements required to be collected by the EDR pursuant to Tables I and II, as applicable, must be recorded in accordance with the range, accuracy, and resolution requirements specified in Table III, Recorded Data Element Format (see paragraph 563.8(a), Table III).

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<sup>3</sup> The “frontal air bag deployment, time to n<sup>th</sup> stage” data elements provide critical timing data for vehicles equipped with multi-stage air bags, which will help in assessing whether an air bag is deploying correctly during a crash (*i.e.*, whether the sensors are functioning properly). In drafting this final rule, we had considered including these two elements as required elements under Table I, but we recognized that not all vehicles are equipped with multi-stage air bags. Thus, by including these elements in Table II and requiring recording of that information if the vehicle is so equipped, we are, in effect, requiring this data from all vehicles equipped with an EDR and multi-stage air bags.

- For EDRs that record acceleration, the longitudinal and lateral acceleration time-history data must be filtered in accordance with the filter class specified in Table III (*i.e.*, Society of Automotive Engineers (SAE) Recommended Practice J211-1, March 1995, “Instrumentation For Impact Test – Part 1 – Electronic Instrumentation” (SAE J211-1, Class 60), which the regulation incorporates by reference (see paragraph 563.8(b)). Such filtering may be done during collection or post-processing.

- The EDR must collect and store data elements for events in accordance with the following conditions and circumstances as specified in paragraph 563.9:

- (1) In an air bag deployment crash, the data recorded from any previous crash must be deleted; the data related to the deployment must be recorded, and the memory must be locked in order to prevent any future overwriting of these data.

- (2) In an air bag non-deployment crash that meets the trigger threshold, all previously recorded data in the EDR’s memory must be deleted from the EDR’s memory, and the current data (up to two events) must be recorded.

- In order to ensure the survivability of EDR data in most crashes, the EDR is tested in conjunction with crash tests already required under FMVSS No. 208, Occupant Crash Protection, and FMVSS No. 214, Side Impact Protection (see paragraph 563.10). Except for elements discussed below, the data elements required under Tables I and II must be recorded in a specified format, must exist at the completion of the crash test, and must be retrievable by a methodology specified by the vehicle manufacturer for not less than 10 days after the test.

The EDR is not required to meet the above survivability requirements for the following data elements: (1) “engine throttle, % full,” (2) “service brake, on/off,” and (3)

“engine RPM.” These elements have been excluded from these requirements because vehicles are crash tested without the engine running for safety reasons, so the EDR would not be able to record the above data elements under those circumstances.

- For vehicles equipped with an EDR, vehicle manufacturers must include a specified statement in the owner’s manual to make the operator aware of the presence, function, and capabilities of the EDR.
- In order to ensure the retrievability of EDR data, each vehicle manufacturer that installs EDRs must ensure by licensing agreement or other means that the necessary tool(s) are commercially available for downloading the required EDR data. The tool must be commercially available not later than 90 days after the first sale of the vehicle for purposes other than resale.

#### D. Lead Time

In order to limit the transition costs associated with the standardization of EDR data, we sought in the NPRM to provide adequate lead time to manufacturers to enable them to incorporate necessary changes as part of their routine production cycles. To that end, the NPRM proposed a compliance date of September 1, 2008 for the EDR regulation. However, vehicle manufacturers commented that the lead time in the proposed rule would be inadequate to allow manufacturers to incorporate the necessary changes as part of their regular production cycle. Those commenters argued that a longer lead time is needed to minimize the costs and burdens associated with the EDR rule, particularly for those manufacturers which have already incorporated EDRs in a large proportion of their fleets.

After carefully considering the public comments on lead time, we have decided to require covered vehicles manufactured on or after September 1, 2010 to comply with the requirements of this final rule, subject to the exception below. Again, it is our intention to limit the costs associated with this final rule for the standardization of EDR data, including implications associated with new definitions, new pre-crash data collection, data download strategies, and data element costs associated with meeting the range and accuracy requirements. We believe that a lead time in excess of four years should prove adequate for all vehicle manufacturers and all vehicle lines, without the need for a phase-in. Vehicle manufacturers may voluntarily comply with these requirements prior to this date.

Consistent with the policy set forth in NHTSA's February 14, 2005 final rule on certification requirements under Federal motor vehicle safety standards for vehicles built in two or more stages and altered vehicles (70 FR 7414), we are providing final-stage manufacturers and alterers that produce vehicles covered by this regulation with an extra year to comply. Accordingly, these manufacturers must meet the requirements of this final rule for vehicles manufactured on or after September 1, 2011. However, final-stage manufacturers and alterers may voluntarily comply with the requirements of the regulation prior to this date.

E. Differences between the Final Rule and the Notice of Proposed Rulemaking

As noted above, NHTSA has decided to issue the present final rule to standardize EDR data in order to further our stated purposes of ensuring that EDRs record the data necessary for effective implementation of ACN, crash investigations, and analysis of

safety equipment performance. In order to achieve these objectives (and to garner the derivative benefits that EDR-generated data may provide in terms of safer vehicle designs), we have largely retained the general approach presented in the NPRM. However, after further study and a careful review of the public comments, we have decided to make a number of modifications as part of the final rule in order to better reflect the current state of EDR technology and the data elements (including form and format) that will meet our research and policy objectives in a manner that is both effective and practicable.

The main differences between the NPRM and the final rule involve a change in the definition of “event data recorder,” selection of data elements (*i.e.*, which elements are required), changes to the range/accuracy/resolution requirements, modification of the test requirements related to EDR survivability, and extension of lead time for implementing the regulation. A number of minor technical modifications are also incorporated in the final rule in response to public comments on the NPRM. All of these changes and their rationale are discussed fully in the balance of this document. However, the following points briefly describe the main differences between the NPRM and this final rule.

- In the NPRM, the term “event data recorder” was defined as “a device or function in a vehicle that records any vehicle or occupant-based data just prior to or during a crash, such that the data can be retrieved after the crash. For purposes of this definition, vehicle or occupant-based data include any of the data elements listed in Table I of this part.” However, several commenters stated that under this definition, virtually all vehicles would be considered to have an EDR, because most vehicles capture freeze-

frame data required for internal processing; therefore, commenters argued that the proposed definition is overly broad (*i.e.*, covering vehicles not equipped with a true EDR) and would create a *de facto* mandate for EDRs, contrary to the agency's expressed intent. Therefore, in this final rule, we have revised the definition of "event data recorder" to read as follows: "a device or function in a vehicle that records the vehicle's dynamic, time-series data during the time period just prior to a crash event (*e.g.*, vehicle speed vs. time) or during a crash event (*e.g.*, delta-V vs. time), intended for retrieval after the crash event. For the purposes of this definition, the event data do not include audio and video data."

- In the final rule, we have decided to make certain modifications to the proposed tables of EDR data elements. Table I, Data Elements Required For All Vehicles Equipped With an EDR, has been amended by deleting five data elements (*i.e.*, (1) longitudinal acceleration (moved to Table II); (2) engine RPM (moved to Table II); (3) frontal air bag deployment level, driver; (4) frontal air bag deployment level, right front passenger, and (5) time from event 2 to 3) and by adding two data elements (*i.e.*, (1) time, maximum delta-V, and (2) delta-V, longitudinal).

Table II, Data Elements Required for Vehicles under Specified Conditions, has been modified in two ways from the NPRM. First, the data elements now listed in Table II as "if recorded" will be required only if the data elements are recorded by the EDR (*i.e.*, stored in non-volatile memory as would permit later retrieval), rather than the NPRM's approach which would have required those elements if the vehicle were equipped to measure those elements. However, for the final rule's data elements listed in

Table II as “if equipped,” a manufacturer’s EDRs must record the specified information, even if its current EDRs are not doing so.

Furthermore, Table II has been amended by adding six data elements (*i.e.*, Table II includes four new elements: (1) lateral delta-V; (2) lateral cumulative maximum delta-V; (3) time to cumulative maximum lateral delta-V, and (4) time to cumulative maximum resultant delta-V. In addition, as indicated above, two items have been moved from Table I to Table II: (1) longitudinal acceleration; and (2) engine RPM.).

- In the NPRM, we proposed a definition for “trigger threshold,” the point at which a recordable event is recognized by the EDR, as “a change in vehicle velocity ... that equals or exceeds 0.8 km/h within a 20 ms interval.” That definition encompassed movement in either a longitudinal or lateral direction.

In the final rule, we decided to change the definition of “trigger threshold” for the longitudinal direction to “a change in vehicle velocity ... that equals or exceeds 8 km/h within a 150 ms interval.” For vehicles whose EDRs measure lateral delta-V or lateral acceleration, we are using the same trigger threshold. In the final rule, we have changed the definition of “time zero” to account for different EDR crash detection strategies (*i.e.*, using a “wake-up” time for EDRs that wake up just as a crash starts, or a change in velocity over a short period for EDRs that are continuously running). We have also added a new definition for “end of event time.” “Time zero” and “end of event time” are defined in a manner consistent with SAE J1698.

- In the final rule, we have changed our approach in terms of the type of data that an EDR may capture to assess crash severity. Specifically, the NPRM proposed to require EDRs to measure vehicle acceleration, but the final rule requires the EDR to

record delta-V. However, if the EDR records acceleration data in non-volatile memory, that information must also be captured and recorded under the final rule.

- As part of the final rule, the agency has decided to reduce the number of events that must be recorded in a multi-event crash from three (as proposed in the NPRM) to two.

- For each of the proposed data elements (when applicable), the NPRM specified a recording interval and sampling rate in order to standardize EDR data across the spectrum of new light vehicles. We have decreased the pre-crash recording interval from 8 seconds prior to the crash, as proposed in the NPRM, to 5 seconds prior to the crash, and we have reduced the amount of time allocated for collecting crash data from 0.5 second, as proposed in the NPRM, to 0.25 second in this final rule.

- The final rule has modified the NPRM's data format requirements, which proposed to require covered data elements to be recorded in accordance with the range, accuracy, precision, and filter class specified in Table III, Recorded Data Element Format, where applicable. The major changes were: (1) to reduce the maximum range for acceleration measurements from 100 G maximum, as proposed in the NPRM, to 50 G maximum, and (2) to reduce the required accuracy of these same devices (and the data generated therefrom) from within  $\pm 1$  percent, as proposed in the NPRM, to within  $\pm 5$  percent.

- After requesting comments on alternate approaches in the NPRM, the agency has adopted a different approach for ensuring that manufacturers make sufficient information available to permit EDR data to be downloaded by potential users. The NPRM proposed to require vehicle manufacturers make publicly available sufficient

information to permit third parties to build a retrieval tool for EDR data by submitting such materials to the NHTSA Docket (and keeping such information updated). However, in the final rule, we have decided, consistent with manufacturers' comments, to require manufacturers to ensure by licensing agreement or other means that retrieval tools for EDR data are commercially available.

- In the NPRM, we proposed to require manufacturers to send detailed information on an ongoing basis to the agency about retrieval tools for EDR data. However, in the final rule, we have decided to require vehicle manufacturers to ensure that EDR retrieval tools are commercially available, something which manufacturers may accomplish either by producing the tools themselves or working directly with their suppliers through licensing agreements. Accordingly, the need for reports to the agency, as contemplated in the NPRM, no longer exists.

- The final rule clarifies that EDR survivability testing will be conducted without the engine running, in order to prevent a potentially hazardous situation for testing personnel and facilities. The final rule specifies that the “engine throttle,” “service brake, on/off,” and (3) “engine RPM” data elements are not required to be recorded as part of survivability testing. While we are retaining the general approach for survivability testing, we are decreasing the number of tests required to demonstrate survivability. Under the NPRM, we proposed using FMVSS Nos. 208 (frontal), 214 (side), and 301 (rear) tests, but in the final rule, we have decided to delete the requirement for the Standard No. 301 test.

- We have decided as part of the final rule to extend the lead time for compliance by covered vehicles by two years, until September 1, 2010. In addition, the final rule sets

the compliance date for final-stage manufacturers and alterers at one year beyond the compliance deadline for other manufacturers (*i.e.*, September 1, 2011).

F. Impacts of the Final Rule

It is difficult for the agency to quantify the benefits expected to result from this final rule for standardization of EDR data. That is because the EDR devices themselves are not designed to be systems for crash avoidance or crashworthiness, but instead they offer an important tool to enable better EMS response and to better understand crashes and crash-related events. However, it is possible to describe the benefits of EDRs in qualitative terms.

To the extent that EDR data are compatible with developing ACN and e-911 systems, emergency medical personnel are likely to arrive at a crash site better informed and thus better prepared to deal with the injuries they encounter. Because expedient and appropriate post-crash medical care is often critical to achieving the best possible outcome for the injured person, we believe that EDR data have the potential to make a positive contribution in this area.

We also believe that EDRs can provide important benefits by giving researchers a relatively inexpensive way of obtaining higher quality data and thus a more accurate and detailed understanding of the circumstances surrounding crashes, including how the vehicles and their safety systems performed. In many cases, such information may be derived from crash reconstructions, but such measurements tend to be reasoned estimates, as compared to the directly measured data provided by the EDR. There is certain information, such as how the air bag deployed (*e.g.*, low level or high level) or when it deployed, that cannot be determined without an EDR. To the extent that EDRs help

researchers and policymakers to better understand the events surrounding crashes, NHTSA and vehicle manufacturers will be better able to develop effective safety countermeasures as reflected in Federal motor vehicle safety standards and new vehicle designs.

In sum, we believe that having a uniform and standardized data set for EDRs will increase the compatibility, comparability, and overall usefulness of EDR data, which will benefit the public directly through the availability of ACN and e-911, and indirectly through improved crash information for research and regulatory efforts.

In terms of costs, we believe that the costs of this final rule should be minimal, averaging up to \$0.17 per vehicle. Several factors contribute to this result. First, we estimate that about 64 percent of new light vehicles in 2005 are already equipped with EDRs, which have been provided by adding the EDR capability to the vehicles' air bag control systems. Thus, EDRs largely capture information that is already being processed by the vehicle, so EDRs are not responsible for the much higher costs of sensing much of the data in the first place. Therefore, the costs of this final rule reflect the incremental costs for vehicles voluntarily equipped with EDRs to comply with the requirements of the regulation.

Second, the agency has sought to limit the number of EDR data elements and associated requirements to the minimum necessary to achieve our stated purposes. We have determined that the industry's current state-of-the-art largely meets our purposes, so we have found it generally unnecessary to specify requirements for additional sensors or other hardware that would increase EDR costs appreciably. (The most significant

technology cost may involve the need to upgrade EDR memory chips.) Furthermore, we expect that administrative costs and compliance costs will be negligible.

In sum, for the 64 percent of new light vehicles already equipped with an EDR, the estimated total cost to comply with the requirements of this final rule (*i.e.*, Table I data elements) will range up to \$1.7 million. If we were to assume that all 15.5 million new light vehicles were equipped with EDRs, the estimated total cost will range up to \$10.9 million.

## II. Background

### A. Overview of EDR Technology

Event data recorders capture vehicle crash information.<sup>4</sup> Basic EDRs capture only vehicle acceleration/deceleration data, while more sophisticated EDRs capture these data plus a host of complementary data, such as driver inputs (*e.g.*, braking and steering) and the status of vehicle safety systems (*e.g.*, seatbelt pretensioners).

The EDR captures crash data by monitoring several of the vehicle's systems, such as brakes, air bags, and seat belts. It continuously captures and overwrites (erases) information on these systems so that a record of the most recent period (up to a few seconds) is always available. If an "event" occurs (*i.e.*, a crash meeting a pre-determined threshold of severity), then the EDR moves captured pre-crash information (up to a few seconds) into its long-term memory. EDRs also record (in long-term memory) data after the start of the crash (up to a few seconds), such as the timing and manner of the deployment of the air bags.

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<sup>4</sup> The term "EDR" can be used to describe many different types of devices. For this final rule, the term EDR means a device or function in a vehicle that captures the vehicle's dynamic, time-series data during the time period just prior to a crash event (*e.g.*, vehicle speed vs. time) or during a crash event (*e.g.*, delta-V vs. time), such that the data can be retrieved after the crash event. For the purposes of this definition, the event data do not include audio and video data.

EDRs have been installed as standard equipment in most light motor vehicles in recent years, particularly vehicles with air bags. We estimate that 64 percent of model year (MY) 2005 passenger cars and other light vehicles have some recording capability, and that more than half record data elements such as crash pulse data. This is based on manufacturer reports regarding their 2005 vehicles and then weighted using 2003 corporate-level vehicle sales figures to determine a fleet average.

#### B. Chronology of Events Relating to NHTSA's Consideration of EDRs

In 1991, NHTSA's Special Crash Investigations program first utilized EDR information in an agency crash investigation. General Motors, the vehicle's manufacturer, cooperated with the program. Throughout the 1990s, NHTSA's SCI team utilized EDRs as one of their investigative tools, and from 1991 through 1997, SCI worked with manufacturers to read approximately 40 EDRs. Starting around 2000, the collection of EDR data was automated, and to date, NHTSA's crash investigation programs have collected information on about 2,700 crashes with EDR files.

The National Transportation Safety Board has also played a role in agency efforts related to event data recorders. The NTSB has been active in data recorders for a long time, first concentrating on aircraft and later on railroads and ships. More recently, NTSB has been active in the area of EDRs for highway vehicles. In 1997, the Safety Board issued its first highway vehicle EDR-related Safety Recommendation, H-97-18,<sup>5</sup> to NHTSA, recommending that the agency "pursue crash information gathering using EDRs." NTSB recommended that the agency "develop and implement, in conjunction with the domestic and international automobile manufacturers, a plan to gather better

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<sup>5</sup> NTSB public forum on air bags and child passenger safety (March 1997). See <http://www.nts.gov/publictn/1997/rp9701.pdf>.

information on crash pulses and other crash parameters in actual crashes, utilizing current or augmented crash sensing and recording devices.” NTSB subsequently closed this recommendation, citing NHTSA’s actions as acceptable. Also in that year, the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL), in a study conducted for NHTSA about advanced air bag technology, recommended that the agency “study the feasibility of installing and obtaining crash data for safety analyses from crash recorders on vehicles.”

In early 1998, NHTSA’s Office of Vehicle Safety Research formed an EDR Working Group comprised of members from industry, academia, and other government organizations. The working group was formed in response to NHTSA’s growing interest in EDRs, the NTSB’s recommendation, and interest from vehicle manufacturers. The group’s objective was to facilitate the collection and utilization of collision avoidance and crashworthiness data from on-board EDRs. The NHTSA-sponsored EDR Working Group published a final report on the results of its deliberations in August 2001.<sup>6</sup> The working group found that EDRs have the potential to greatly improve highway safety, for example, by improving occupant protection systems and improving the accuracy of crash reconstruction.

In 1999, NTSB issued a second set of recommendations to NHTSA related to EDRs (H-99-53 and H-99-54<sup>7</sup>) recommending that the agency require standardized EDRs to be installed on school buses and motor coaches. In 2000, NHTSA responded to these NTSB recommendations by sponsoring a second working group related to EDRs—

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<sup>6</sup> Event Data Recorders, Summary of Findings by the NHTSA EDR Working Group, August 2001, Final Report (Docket No. NHTSA-99-5218-9).

<sup>7</sup> Bus Crashworthiness Issues, Highway Special Investigation Report (NTSB/SIR-99/04) (Washington, D.C. (1999)). See <http://www.nts.gov/publictn/1999/sir9904.pdf>.

the NHTSA Truck & Bus EDR Working Group. This Working Group collected facts related to use of EDRs in trucks, school buses, and motor coaches—a natural follow-up activity from the first working group that concentrated on light vehicles. The final report of the NHTSA Truck and Bus EDR Working Group was published in May 2002.<sup>8</sup>

In 2004, NTSB issued EDR recommendations to NHTSA for a third time. This set of recommendations was prompted by a crash that occurred at a farmers' market in Santa Monica, CA, which resulted in multiple deaths. In examining that crash, the Safety Board found that they could not determine exactly what occurred with respect to the driver controls and indicated that EDRs should be installed on all new vehicles. Recommendation H-04-26<sup>9</sup> reads: "Once standards for event data recorders are developed, require their installation in all newly manufactured light-duty vehicles." In 2005, NHTSA sent a letter to the Safety Board asking them to reconsider their recommendation, indicating that many new cars and light trucks are already equipped with EDRs and that standardization of installed EDRs is the main issue, which is being addressed by this final rule.

For further information, NHTSA has developed a website about highway-based EDRs located at the following address: <http://www-nrd.nhtsa.dot.gov/edr-site/index.html>.

### C. Petitions for Rulemaking

#### 1. **Petitions from Mr. Price T. Bingham and Ms. Marie E. Birnbaum**

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<sup>8</sup> Event Data Recorders, Summary of Findings by the NHTSA EDR Working Group, May 2002, Final Report, Volume II, Supplemental Findings for Trucks, Motor Coaches, and School Buses. (Docket No. NHTSA-2000-7699-6).

<sup>9</sup> Rear-End Collision and Subsequent Vehicle Intrusion into Pedestrian Space at Certified Farmers' Market Santa Monica, California (July 16, 2003). See <http://www.nts.gov/publictn/2004/har0404.pdf>.

In the late 1990s, the agency denied two petitions for rulemaking asking us to require the installation of EDRs in new motor vehicles (see 63 FR 60270 (Nov. 9, 1998) and 64 FR 29616 (June 2, 1999)).

The first petition, submitted by Mr. Price T. Bingham,<sup>10</sup> a private individual, asked the agency to initiate rulemaking to require air bag sensors to record data during a crash so that it could later be read by crash investigators. The petitioner cited a concern about air bag deployments that might be “spontaneous,” but he did not limit the petition to that issue.

The second petition, submitted by Ms. Marie E. Birnbaum,<sup>11</sup> also a private individual, asked us to initiate rulemaking to require passenger cars and light trucks to be equipped with “black boxes” (*i.e.*, EDRs) analogous to those found on commercial aircraft.

In responding to these petitions, NHTSA acknowledged that EDRs could provide valuable information useful for analyzing crashes and improving motor vehicle safety. However, the agency decided to deny the petitions because the motor vehicle industry was already voluntarily moving in the direction recommended by the petitioners, and because the agency believed “this area presents some issues that are, at least for the present time, best addressed in a non-regulatory context.”<sup>12</sup>

## 2. **Petition from Dr. Ricardo Martinez**

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<sup>10</sup> Docket No. NHTSA-1998-4368-1.

<sup>11</sup> Docket No. NHTSA-1998-4367-22.

<sup>12</sup> 63 FR 60270, 60270 (Nov. 9, 1998) (Docket No. NHTSA-1998-4672-1); 64 FR 29616, 29616 (June 2, 1999) (Docket No. NHTSA-1999-5737-1).

In October 2001, the agency received a petition<sup>13</sup> from Dr. Ricardo Martinez, President of Safety Intelligence Systems Corporation and former Administrator of NHTSA, asking us to “mandate the collection and storage of onboard vehicle crash event data, in a standardized data and content format and in a way that is retrievable from the vehicle after the crash.”

In his petition for rulemaking, Dr. Martinez argued that understanding what happens in a crash is essential to preventing injuries and deaths, and that EDRs would improve crash reconstruction analysis. The petitioner also stated that current crash reconstruction analysis is costly, time consuming, laborious, and often inaccurate. According to Dr. Martinez, the increasing sophistication and decreasing costs of information technology have created the opportunity to now mandate the capture, storage, and retrieval of onboard crash data, and a NHTSA rulemaking could greatly accelerate the development of ACN.

The petition from Dr. Martinez was submitted shortly after the NHTSA EDR Working Group had published its final report. As discussed in more detail in the next section of this document, in October 2002, after the second working group had completed its work, we decided to request public comments on what future role the agency should take related to the continued development and installation of EDRs in motor vehicles. We decided to respond to Dr. Martinez’s petition after considering those comments.

#### D. October 2002 Request for Comments

On October 11, 2002, NHTSA published a request for comments concerning EDRs in the **Federal Register** (67 FR 63493).<sup>14</sup> In that document, the agency discussed

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<sup>13</sup> Docket No. NHTSA-2002-13546-3.

<sup>14</sup> Docket No. NHTSA-2002-13546-1.

its prior involvement concerning EDRs, and it requested comments on what future role NHTSA should take related to the continued development and installation of EDRs in motor vehicles. The request for comments discussed a range of issues, including safety benefits, technical issues, privacy issues, and the role of the agency, and it also posed several questions.

In response to this request, we received comments from light and heavy vehicle manufacturers, equipment manufacturers, vehicle users, the medical community, advocacy organizations, safety research organizations, crash investigators, insurance companies, academics, and government agencies. We also received comments from a number of private individuals.

To summarize, these comments raised issues concerning the safety benefits of EDRs (with most commenters suggesting EDRs will improve vehicle safety), technical issues surrounding a potential rulemaking on EDRs (such as the types of data elements to be collected, amount of data to be recorded, and crash survivability of EDR data), potential privacy issues associated with EDRs, NHTSA's role in the future of EDRs, and public perception of EDRs.

After considering the comments and other information NHTSA had gathered on EDRs, NHTSA decided to grant the Martinez petition in part and commenced rulemaking.

### III. **Notice of Proposed Rulemaking**

#### A. Summary of the NPRM

On June 14, 2004, NHTSA published a NPRM in the **Federal Register** (69 FR 32932)<sup>15</sup> proposing to: (1) require that EDRs voluntarily installed in light vehicles record a minimum set of specified data elements useful for crash investigations, analysis of safety equipment performance, and automatic collision notification systems; (2) specify requirements for data format; (3) increase the survivability of the EDRs and their data by requiring that the EDRs function during and after the front, side, and rear vehicle crash tests specified in several Federal motor vehicle safety standards; (4) require vehicle manufacturers to make publicly available information for a download tool that would enable crash investigators to retrieve data from the EDR; and (5) require vehicle manufacturers to include a brief standardized statement in the owner's manual indicating that the vehicle is equipped with an EDR and describing purposes of that device.

NHTSA tentatively concluded that the proposed requirements would help ensure that EDRs record, in a readily usable manner, the data necessary for effective crash investigations, analysis of safety equipment performance, and automatic crash notification systems. NHTSA stated its belief that its proposal would help provide a better understanding of the circumstances under which crashes and injuries occur and would lead to derivative benefits, such as safer vehicle designs.

In the NPRM, NHTSA responded to the Martinez petition<sup>16</sup> for rulemaking, which asked the agency to “mandate the collection and storage of onboard vehicle crash event data, in a standardized data and content format and in a way that is retrievable from the vehicle after the crash.” The agency granted the petition in part, to the extent that it

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<sup>15</sup> Docket No. NHTSA-2004-18029-2.

<sup>16</sup> Docket No. NHTSA-2002-13546-3.

proposed a regulation to specify standardized data content and format for EDRs in a manner that is retrievable from a vehicle after a crash.

However, NHTSA denied the petition to the extent that the agency did not propose to mandate EDRs. In the NPRM, the agency stated its belief that a mandatory EDR rule was not the best approach at this time, and we noted that the industry is continuing to move in the direction of installing EDRs in an increasing percentage of new vehicles. Further, the industry trend is toward designing EDRs to include greater amounts of crash data. Given this trend, we did not deem it necessary for us to propose to require the installation of EDRs, but remained open to considering this in the future.

The NPRM also discussed other key issues including data elements to be recorded, data standardization, data retrieval, crash survivability, privacy, and lead time. The NPRM provided detailed tables of the data elements to be recorded under the proposal and the relationship of the data elements to the stated purposes of the rulemaking. While the NPRM did propose specific technical requirements and specifications, NHTSA requested comments on the proposed data elements, including whether the list sufficiently covers technology that is likely to be in vehicles in the next five to ten years.

In terms of data standardization, the NPRM proposed a standardized format for each data element, specifying the corresponding recording intervals/times, units of measurement, sampling rates, data range/accuracy/precision requirements, and where appropriate, filter class. However, the NPRM noted that there was currently not an industry standard for EDR format.

The NPRM also solicited comments on EDR data retrieval. Specifically, NHTSA sought alternative approaches to the data retrieval requirements proposed in the NPRM, which would have required vehicle manufacturers to submit specifications for accessing and retrieving the stored EDR data and information in sufficient detail to permit companies that manufacture diagnostic tools to develop and build devices for accessing and retrieving the EDR's stored data.

Regarding the functioning of EDRs and crash survivability, the NPRM proposed requirements for the EDR trigger threshold, EDR recording in multi-event crashes, capture of EDR data, and the performance of EDRs in crash tests.

The NPRM discussed privacy issues related to EDRs, but it also noted that most privacy issues involve Federal and State laws separate from NHTSA's primary statutory authority.

Finally, the NPRM discussed lead time for the regulation's proposed compliance date. The NPRM proposed a compliance date of September 1, 2008, to permit manufacturers to make EDR-related design changes as a part of their regular production cycle in order to minimize costs.

#### B. Summary of Public Comments to the NPRM

NHTSA received over 100 comments on the NPRM from automobile manufacturers,<sup>17</sup> motor vehicle equipment suppliers and businesses,<sup>18</sup> trade

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<sup>17</sup> Comments were received from the following vehicle manufacturers: (1) American Honda Motor Company (Honda); (2) DaimlerChrysler, VSO (DaimlerChrysler); (3) Ford Motor Company (Ford); (4) General Motors Corporation (GM); (5) Hyundai America Technical Center, Inc. (Hyundai and Kia); (6) Mitsubishi Motors R & D of America, Inc. (Mitsubishi); (7) Nissan North American, Inc. (Nissan); (8) Porsche Cars North American, Inc. (Porsche); (9) Subaru of America, Inc. (Subaru); and (10) Toyota Motor North America, Inc. (Toyota).

<sup>18</sup> Comments were received from the following motor vehicle equipment suppliers and other businesses: (1) Bendix Commercial Vehicle Systems, L.L.C. (Bendix); (2) Delphi; (3) Gelco Corporation d/b/a GE Fleet Services (Gelco); (4) Kast, GmbH (Kast); (5) Injury Sciences, L.L.C. (Injury Sciences); (6) Racing

associations,<sup>19</sup> advocacy and special interest groups,<sup>20</sup> and individuals. (All of the comments on the NPRM can be reviewed in Docket No. NHTSA-2004-18029.)

Commenters expressed a wide range of views, with vehicle manufacturers, motor vehicle equipment suppliers, and trade associations generally supporting the NPRM in concept, while raising a number of significant issues and recommending modifications. Special interest groups advocating highway safety generally called for a more extensive regulation; for example, these commenters asked NHTSA to require EDRs in all vehicles, to require more data elements to be recorded, and/or to require uniform EDR data retrieval so that first responders and other emergency personnel may easily access EDR data. A number of individuals who commented on the NPRM raised potential privacy concerns.

The following overview of the public comments reflects the key issues raised by the commenters, including whether the EDR rule should be mandatory, the number and type of data elements to be recorded, EDR data standardization requirements, EDR data retrieval and whether to require a standardized data retrieval tool/universal interface, and EDR crash survivability. Other commenters addressed the proposed owner's manual disclosure statement, potential privacy concerns, lead time, and costs. A more in-depth

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Information Systems; (7) Safety Intelligence Systems Corporation (SISC); (8) Siemens VDO Automotive, AG (Siemens); (9) TRW Automotive (TRW); and (10) Wyle Laboratories, Inc. (Wyle Laboratories).

<sup>19</sup> Comments were received from the following trade associations: (1) Alliance of Automobile Manufacturers (Alliance); (2) American Trucking Association (ATA); (3) Association of International Automobile Manufacturers, Inc. – Technical Affairs Committee (AIAM); (4) National Automobile Dealers Association (NADA); (5) Property Casualty Insurers Association of America (PCIAA); and (6) Specialty Equipment Market Association (SEMA).

<sup>20</sup> Comments were received from the following advocacy (and other) groups: (1) Advocates for Highway and Auto Safety (Advocates); (2) Albemarle County Police Department; (3) American Automobile Association (AAA); (4) Canada Safety Council; (5) Children's Hospital of Philadelphia; (6) Electronic Privacy Information Center (EPIC); (7) European Commission; (8) Garthe Associates (Garthe); (9) Institute of Electrical and Electronics Engineers Vehicular Technology Society (IEEE-VTS); (10) Insurance Institute for Highway Safety (IIHS); (11) National Motorist Association; (12) National Transportation Safety Board (NTSB); (13) Public Citizen; and (14) Society of Automotive Engineers (SAE).

analysis of comments along with the agency's response follows in section IV.B of this document.

#### Whether NHTSA Should Require EDRs

In their comments, most automobile manufacturers supported the EDR standardization requirements for voluntarily-installed EDRs. However, GM, Ford, some industry associations, and most advocacy and special interest groups, urged NHTSA to require EDRs to be installed in all new vehicles. Commenters as diverse as GM and Public Citizen urged mandatory installation of EDRs. Arguments for why installation should be mandatory varied, but included concerns that manufacturers will opt out under a voluntary installation approach, that standardization requirements for voluntary-installed EDRs will discourage EDR installation, and that voluntary installation would take many years to build up sufficient information for useful study.

#### Number and Types of Required Data Elements

The NPRM separated EDR data elements into two categories. The first category consisted of a set of data elements that must be recorded if an automobile manufacturer currently uses an EDR for any one data element (*i.e.*, "required" data elements). The second category consisted of data elements that must be recorded only if the vehicle is equipped with a specified system or sensing capability (*i.e.*, "if equipped" data elements). The NPRM listed 18 required data elements and an additional 24 "if equipped" data elements.

Overall, automobile manufacturers, and other commenters connected to the automotive industry, stated their belief that the number of proposed required data elements is excessive in light of NHTSA's stated purposes. However, manufacturers

differed in their assessment as to which of the data elements should be required to be recorded and their rationale why. The manufacturers agreed that the number of data elements should be reduced due to: (1) the estimated (excessive) cost of the EDR proposal; (2) limitations in memory and microprocessing capability of EDRs; (3) the potential to inhibit collection of more useful data; and (4) the desire to avoid complete electrical redesigns.

In contrast, highway safety advocacy groups, such as Public Citizen and Advocates, suggested that the number of required elements is insufficient. This group of commenters generally argued that more data elements should be recorded in order to: (1) provide additional data contribution for a more definitive crash causation evaluation; (2) address equipment likely to be used in the future; and/or (3) encourage uniformity. Some commenters, including Injury Sciences and Public Citizen, suggested adding the Vehicle Identification Number (VIN) as a recorded data element. Still others commented that certain data elements in the “if equipped” category should be moved to the “required” category or vice versa.

#### EDR Data Standardization

The NPRM proposed specific technical specifications for each data element, including sampling rates and recording intervals, data standardization requirements, and data retrieval requirements. The commenters on this issue, mostly from the automobile industry, raised concerns about the proposed recording frequency and sampling rates, especially regarding the amount of microprocessing and memory required to process and store the proposed EDR data. According to the manufacturers, the increase in microprocessing and memory capabilities that would be required to comply with the

proposed rule would be more costly than the agency anticipated. Therefore, manufacturers recommended alternative sampling rates and recording intervals that they believe would be less expensive. Automotive industry commenters also recommended other technical adjustments to the proposed recording requirements. They also generally disagreed with the proposed multiple-event recording requirement, with most stating that it is unnecessary and not current industry practice.

Automobile manufacturers generally commented that the range, accuracy, and precision specifications contained in the NPRM should not be included in the final rule because the proposed parameters are beyond what is currently utilized in the state-of-the-art EDRs and the provisions are not necessary to achieve the agency's goals. Other commenters agreed with the concept of standardization, but suggested that it be accomplished in another manner, such as leaving it to the discretion of the manufacturers for optimal restraint system performance or applying SAE J1698.

Highway safety advocates commented that sampling rates and recording intervals should be of sufficient duration to record the full crash event, especially for "rollover" crashes.

#### EDR Data Retrieval and Whether to Require a Standardized Data Retrieval Tool

With regard to data retrieval requirements, most manufacturers objected to furnishing non-proprietary technical specifications to NHTSA and offered alternative approaches for retrieving EDR data, such as through licensing agreements or making retrieval tools available to the public at a reasonable price. Highway safety advocacy groups argued that NHTSA should require standardization of data retrieval methods, that

first responders should have access to EDR data, and that NHTSA should require a uniform architecture for data retrieval with a standardized interface location.

#### EDR Survivability and Crash Test Performance Requirements

The NPRM proposed that EDR data must exist upon completion of each crash test and be retrievable by a methodology specified by the vehicle manufacturer for not less than 30 days after the test and without external power. Several automobile manufacturers commented that the proposed crash test requirement is impracticable because they believe it would require tests to be performed with engines running and various vehicle systems activated, which would cause a danger to test personnel. As an alternative, commenters suggested a simulated laboratory test. Automobile manufacturers commented that the proposed rule would greatly increase testing costs. There were also comments on whether an alternative power source would be required to meet the 30-day provision in Sec. 563.10(d). Other commenters, including NTSB and Public Citizen commented that NHTSA should require that EDR data survive fire, fluid immersion, and severe crashes.

#### Other Issues

The NPRM proposed a compliance date of September 1, 2008, for the EDR regulation. Nearly all commenters, especially automobile manufacturers, believed that the agency underestimated the amount of time needed to meet the requirements of the proposed rule. Several manufacturers suggested that, as part of the final rule, the agency should provide a phase-in (*e.g.*, a four-year phase-in beginning in 2008).

In order to educate the public about EDRs and to gain public acceptance for use in passenger vehicles, the NPRM proposed that vehicles equipped with an EDR must also

include a specified statement in the owner's manual. This statement would inform the vehicle owner about the presence of the EDR and its purposes. Most commenters, including automobile manufacturers and privacy advocates, expressed support for a disclosure statement. However, several commenters (including automobile manufacturers, EPIC, and individuals) suggested alternative language. Comments concerning the disclosure statement ranged from concerns about privacy and ownership of the EDR data to preemption and State disclosure requirements.

Commenters, especially individuals, raised concerns about privacy. In the NPRM, we addressed privacy issues, stating our position that NHTSA's use of the data collected from EDRs would not raise privacy concerns. NHTSA obtains the owner's consent for collecting and using EDR data and carefully protects any information that could potentially be used to identify an individual. In the context of EDRs, the information in question that may be linked to an individual is the vehicle identification number (VIN), which is collected at the time EDR information is downloaded. The following discussion explains why it is necessary for the agency to collect VIN information in connection with EDRs, how such information is used by the agency, and the safeguards the agency takes related to the release of such information.

VIN information (*e.g.*, relevant to the make/model in question) is necessary to download and process the EDR data, because the commercial EDR download tool requires the VIN to be inputted into the program in order to link the EDR file with data to ensure proper engineering output. Without VIN input, similar data may mean different things depending on the vehicle from which it comes.

This final rule does not require EDRs to record VIN information. However, the full VIN of a vehicle must be inputted into current EDR extraction tools as a key to ensure proper conversion of the electronic EDR data to a usable format. The full VIN is needed in order to account for running changes that may occur during a particular model year, thereby rendering it infeasible to use a shortened VIN. We note that such VIN information is normally available through other means during the course of crash reconstruction (*i.e.*, through reading the VIN label on the vehicle itself). Further, other parties, such as law enforcement, could combine the EDR data with the type of personally identifying data routinely acquired during a crash investigation.

In terms of the use of EDR data, the agency takes the EDR-generated information that it collects and incorporates the information into large crash-related databases in order to gain a more comprehensive understanding of certain crash events; the information contained in these databases is not retrieved or retrievable by name or other individual identifier.

The agency's rationale for protection of the VIN information contained in EDRs is as follows. By way of background, the VIN data identify the vehicle itself and do not specifically provide name, address, or other personal identifier information on an individual. Furthermore, EDR data alone cannot confirm exactly who was driving the vehicle at any given time (*e.g.*, vehicle owner or other individuals (either with or without permission)). However, even though VIN information is not a "record"<sup>21</sup> or part of a

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<sup>21</sup> The Privacy Act of 1974 defines "record" as "any item, collection, or grouping of information about an individual that is maintained by an agency, including but not limited to, his education, financial transactions, medical history, and criminal or employment history and that contains his name, or the identifying number, symbol, or other identifying particular assigned to the individual, such as a finger or voice print or a photograph." 5 U.S.C. §552(a)(4).

“system of records”<sup>22</sup> as those terms are defined under the Privacy Act, NHTSA has nevertheless taken steps to prevent the release of VIN information, because VIN information can be used in various commercially-available programs to determine the identity of the current owner of a vehicle.

As a practical matter, information contained in these records that has the potential indirectly to identify individuals is not made public, except as specifically required by law. Furthermore, prior to the release of information from databases containing EDR data (usually aggregated reports), the agency strips out the last six characters of the VIN (*i.e.*, the portion that would allow identification of a specific vehicle and, potentially by indirect means, the identity of the vehicle’s current owner). In light of the above, we believe that the agency has taken adequate steps to ensure individual privacy vis-à-vis its use of EDR data.

However, we recognized that there may be privacy issues associated with EDRs related to the use of EDR data by entities other than NHTSA, such as law enforcement and EMS personnel, other government entities, and the automotive industry. Notwithstanding our extensive treatment of the privacy issue, we still received comments from individuals who believe that EDRs are an intrusion of their privacy because EDRs might record aspects of their driving behavior (e.g., whether they are speeding or not wearing a safety belt) that they do not want to be known. Automobile manufacturers and highway safety groups commented that the potential benefits of EDRs outweigh any privacy concerns.

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<sup>22</sup> The Privacy Act defines “system of records” as “a group of any records under the control of any agency from which information is retrieved by the name of the individual or by some identifying number, symbol, or other identifying particular assigned to the individual.” 5 U.S.C. §552(a)(5).

In addition to lead time, privacy, and owner's manual disclosure statement issues, commenters raised additional substantive issues including cost, preemption, and inclusion of ACN as a goal of the EDR rule.

Many commenters, mostly automobile manufacturers, believed that NHTSA's cost estimates were significantly understated. According to these commenters, the proposed requirements outlined in the NPRM would contribute to higher costs because of the additional microprocessors and memory needed to handle larger amounts of saved data. These commenters also argued that the dynamic testing requirements would increase costs along with the requirements of accuracy, range, and precision, which they argued are in excess of current industry practice.

Commenters requested that NHTSA specifically preempt inconsistent State and local regulations related to EDRs. Automobile manufacturers were concerned about the possibility of having to comply with inconsistent State regulations, especially concerning owner's manual disclosure statements and technical specifications of EDRs.

With respect to ACN as a stated goal of the EDR rule, commenters associated with the automotive industry argued that this goal should be removed, since the proposed rule would not require ACN or specifically state that the rule will not limit the ability of manufacturers to offer ACN.

Other, more specific and technical issues were raised by commenters. These issues will be treated and addressed in section IV.B of this notice.

#### **IV. The Final Rule and Response to Public Comments**

##### **A. The Final Rule**

##### **1. Summary of the Requirements**

After careful consideration of the public comments on the NPRM, we are promulgating this final rule to establish a regulation for voluntarily-installed EDRs in order to standardize EDR data. The requirements of this regulation are tailored to advance the stated purposes of this rulemaking without imposing unnecessary burdens or unduly impeding the future technological development of EDRs. In overview, the final rule specifies uniform, national requirements for EDR-equipped vehicles covered by the regulation, including the collection, storage, and retrievability of onboard motor vehicle crash event data. It also specifies requirements for vehicle manufacturers to make retrieval tools and/or methods commercially available so that crash investigators and researchers are able to retrieve data from EDRs.

Specifically, the regulation applies to passenger cars, multipurpose passenger vehicles, trucks, and buses with a GVWR of 3,855 kg (8,500 pounds) or less and an unloaded vehicle weight of 2,495 kg (5,500 pounds) or less, except for walk-in van-type trucks or vehicles designed to be sold exclusively to the U.S. Postal Service, that are equipped with an event data recorder and to manufacturers of these vehicles.<sup>23</sup> Subject to an exception for final-stage manufacturers and alterers discussed below, compliance with the requirements of the final rule commences for covered vehicles manufactured on or after September 1, 2010. The final rule is intended to be technology-neutral, so as to permit compliance with any available EDR technology that meets the specified performance requirements.

The following points highlight the key provisions of the final rule:

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<sup>23</sup> These are the same applicability limits set for the air bag requirements in frontal crashes in Federal Motor Vehicle Safety Standard No. 208.

- Term “event data recorder” is defined as “a device or function in a vehicle that captures the vehicle’s dynamic, time-series data during the time period just prior to a crash event (*e.g.*, vehicle speed vs. time) or during a crash event (*e.g.*, delta-V vs. time), such that the data can be retrieved after the crash event. For the purposes of this definition, the event data do not include audio and video data.”

- Each vehicle equipped with an EDR must record all of the data elements listed in Table I, during the interval/time and at the sample rate specified in that table. There are 15 required data elements (see paragraph 563.7(a), Table I). Examples of these data elements are “delta-V, longitudinal,” “maximum delta-V, longitudinal,” “speed, vehicle indicated,” and “safety belt status, driver.”

- Each vehicle equipped with an EDR that records any of the data elements listed in Table II identified as “if recorded” (most elements in that table) must capture and record that information according to the interval/time and at the sample rate specified in that table. Data elements listed in Table II as “if equipped” (*i.e.*, “frontal air bag deployment, time to n<sup>th</sup> stage, driver” and “frontal air bag deployment, time to n<sup>th</sup> stage, right front passenger”) must record the specified information, even if they are not presently doing so. (The “frontal air bag deployment, time to n<sup>th</sup> stage” data elements provide critical timing data for vehicles equipped with multi-stage air bags, which will help in assessing whether an air bag is deploying correctly during a crash (*i.e.*, whether the sensors are functioning properly). In drafting this final rule, we had considered including these two elements as required elements under Table I, but we recognized that not all vehicles are equipped with multi-stage air bags. Thus, by including these elements in Table II and requiring recording of that information if the vehicle is so equipped, we

are, in effect, requiring this data from all vehicles equipped with an EDR and multi-stage air bags.)

There are 30 data elements included in Table II (see paragraph 563.7(b), Table II). Examples of these data elements are “lateral acceleration,” “longitudinal acceleration,” “frontal air bag suppression switch status, right front passenger (on, off, or auto),” “frontal air bag deployment, time to n<sup>th</sup> stage, driver,” and “safety belt status, right front passenger (buckled, not buckled).”

- The data elements required to be collected by the EDR pursuant to Tables I and II, as applicable, must be recorded in accordance with the range, accuracy, and resolution requirements specified in Table III, Recorded Data Element Format (see paragraph 563.8(a), Table III).

- For EDRs that record acceleration, the longitudinal, lateral, and normal acceleration time-history data must be filtered in accordance with the filter class specified in Table III (*i.e.*, SAE J211-1, Class 60) (see paragraph 563.8(b)). Such filtering may be done during collection or post-processing.

- The EDR must collect and store data elements for events in accordance with the following conditions and circumstances as specified in paragraph 563.9:

- (1) In an air bag deployment crash, the data recorded from any previous crash must be deleted; the data related to the deployment must be recorded, and the memory must be locked in order to prevent any future overwriting of these data.

- (2) In an air bag non-deployment crash that meets the trigger threshold, all previously recorded data in the EDR’s memory must be deleted from the EDR’s memory, and the current data (up to two events) must be recorded.

- In order to ensure that survivability of EDR data in most crashes, the EDR is tested in conjunction with crash tests already required under FMVSS No. 208, Occupant Crash Protection, and FMVSS No. 214, Side Impact Protection (see paragraph 563.10). Except for the elements discussed below, the data elements required under paragraph 563.7 must be recorded in the format specified by paragraph 563.8, must exist at the completion of the crash test, and must be retrievable by the methodology specified by the vehicle manufacturer (as required under paragraph 563.12) for not less than 10 days after the test. The “complete file recorded (yes, no)” data element must read “yes” after the test.

The EDR need not meet the above survivability requirements for the following data elements: (1) “engine throttle, % full,” (2) “service brake, on/off,” and (3) “engine RPM.” These elements have been excluded from these requirements because vehicles are crash tested without the engine running for safety reasons, so the EDR would not be able to record the above data elements under those circumstances.

- For vehicles equipped with an EDR, vehicle manufacturers must include a specified statement in the owner’s manual to make the operator aware of the presence, function, and capabilities of the EDR (see paragraph 563.11).

- In order to ensure the retrievability of EDR data, each vehicle manufacturer that installs EDRs must ensure by licensing agreement or other means that retrieval tool(s) are commercially available for downloading the required EDR data. The retrieval tool must be commercially available not later than 90 days after the first sale of the vehicle for purposes other than resale.

## 2. Lead Time

In order to minimize the costs associated with the standardization of EDR data, we have stated our intention to provide adequate lead time to manufacturers to enable them to incorporate necessary changes as part of their routine production cycles. In the NPRM, we had proposed a compliance date of September 1, 2008. However, in their comments on our proposal, some manufacturers had argued that a longer lead time is needed to make the necessary design and production changes. Others requested a phase-in of the EDR requirements, which was characterized as particularly important for manufacturers that already have a significant portion of their fleet equipped with EDRs.

In light of the fact that installation of EDRs remains voluntary on the part of vehicle manufacturers and our concomitant desire to minimize costs, we have decided to adopt the recommendations of commenters to provide vehicle manufacturers with additional lead time. Accordingly, subject to the exception below, we have decided to require covered vehicles manufactured on or after September 1, 2010 to comply with the requirements of this final rule. We believe that lead time in excess of four years, particularly given the revised technical requirements, should prove adequate for all vehicle manufacturers and all vehicle lines, without the need for a phase-in. Vehicle manufacturers may voluntarily comply with these requirements prior to this date.

Beyond the suggestions of the automobile manufacturers to increase the lead time associated with this rule, NHTSA conducted its own analysis of the technical changes needed to meet the standardization requirements and specifications of this final rule. As discussed below, we determined that the final rule will necessitate a number of design and technical changes to current EDRs.

For example, current EDR systems have been designed independently by the vehicle manufacturers, thereby resulting in differences in data definitions. Thus, in implementing this final rule, manufacturers will need to make technical changes to their systems to reflect standardization in the data elements.

Further, we have added new definitions related to EDR operation that will necessitate changes to EDRs. The “trigger threshold” required by this final rule is different than that which any vehicle manufacturer currently utilizes. Generally, vehicle manufacturers use wake-up levels to start collecting data, based upon vehicle deceleration. However, our final rule specifies that data collection be triggered by using change-in-velocity (delta-V) over a specified time period, which will require algorithm development and possibly additional non-volatile memory buffers to capture and analyze these vehicle data. The two-event capture and recording requirement in the final rule is also different from that which any vehicle manufacturer currently uses. While some current EDRs do capture and record two events, the data are not captured with standardized logic, as is specified in the final rule (*e.g.*, standardization of the calculation of time between events). Another new requirement is that the EDR must lock the file if an air bag deploys during an event; this requirement is one that will need to be newly implemented by most of vehicle manufacturers.

Another requirement in the final rule that is likely to necessitate changes in EDRs is the requirement for the capture and recording of pre-crash data. With the exception of GM and Toyota, no other vehicle manufacturer captures and records pre-crash data that can be downloaded using a commercially available tool. Ford is developing a pre-crash data recording capability, but Ford is collecting those data in the engine control module.

All other vehicle manufacturers will need to update their systems to achieve pre-crash data collection, which will necessitate algorithm development and possibly additional non-volatile memory to continuously capture and hold these data until an event occurs. Further, the sampling of the pre-crash data will need to be standardized to two samples per second, in order to meet the requirements of the final rule. To our knowledge, no vehicle manufacturer currently collects pre-crash data at this sample rate (*e.g.*, most GM and Toyota vehicles capture data at one sample per second during the interval specified in the final rule). Again, updating these systems in this fashion will require additional algorithm development and possible additional non-volatile memory.

In addition, we anticipate that development of a turnkey operation for downloading EDR data will take significant time to accomplish. Vehicle manufacturers will need time to develop their licensed partner relationships for production of download tools.

Finally, we note that the latest version of GM's EDR (*e.g.*, ones used in the 2004 Malibu) does not capture and record delta-V data within the accuracy requirement specified in the final rule. In two tests performed by IIHS, which shared results with NHTSA for use in a paper for presentation at an International Technical Conference on the Enhanced Safety of Vehicles (ESV), the delta-Vs recorded by the EDR were at or outside the accuracy specifications of the final rule.<sup>24</sup> Additionally, we note that GM has previously reported that the current generation of EDRs have data resolution and accuracy outside the levels specified in the final rule.<sup>25</sup> In sum, sufficient lead time will

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<sup>24</sup> Niehoff, Peter, *et al*, Evaluation of Event Data Recorders in Full Systems Crash Tests, ESV Paper No. 05-0271 (2005).

<sup>25</sup> "Recording Automotive Crash Event Data," Chidester, Hinch, Mercer & Schultz, NTSB (1999). See [http://www.nts.gov/events/symp\\_rec/proceedings/authors/chidester.pdf](http://www.nts.gov/events/symp_rec/proceedings/authors/chidester.pdf).

be required for vehicle manufacturers to make the changes necessitated by the final rule without incurring significant additional costs.

Consistent with the policy set forth in NHTSA's February 14, 2005 final rule on certification requirements under Federal motor vehicle safety standards for vehicles built in two or more stages and altered vehicles (70 FR 7414), final-stage manufacturers and alterers of covered vehicles must comply with the requirements of this final rule for vehicles manufactured on or after September 1, 2011. However, final-stage manufacturers and alterers may voluntarily comply with the requirements of the regulation prior to this date.

B. Response to Public Comments

1. **Whether NHTSA Should Require EDRs**

We expressly stated in the NPRM that we were not proposing to require all light vehicles to be equipped with EDRs. Under the proposed rule, vehicle manufacturers retained discretion regarding the decision of whether to install EDRs. However, if a vehicle were equipped with an EDR, the vehicle would be required to comply with the requirements of the proposed Part 563. We stated that we did not believe it was necessary to mandate installation of EDRs at this time, noting that the industry has substantially progressed in the development and installation of EDRs without the agency's requiring them. We estimated that at least 64 percent of model year 2004 passenger cars and other light vehicles have some recording capability, and more than half record elements such as crash pulse data. We noted also that industry was expected to install EDRs in an increasing percentage of new vehicles.

The agency received several comments on the issue of whether we should require manufacturers to install EDRs in all new vehicles. GM commented that NHTSA should adopt a FMVSS that would mandate installation of EDRs on all passenger cars and light trucks with a GVWR up to 3,855 kg (8,500 pounds). GM stated that a mandatory EDR requirement would maximize safety benefits by ensuring that all covered vehicles capture and record key crash data. According to GM, an EDR mandate would also eliminate incentives for manufacturers to remove existing EDRs or to delay their introduction. In addition, GM argued that the standard should prohibit switches that would permit EDR disablement.

Public Citizen, Advocates, NADA, and NTSB urged NHTSA to require the installation of EDRs. Public Citizen stated that NHTSA should require EDRs because these devices can provide valuable safety benefits, including: (1) better understanding of crash causation and injury sources; (2) enhanced commercial vehicle safety; (3) better data on defect trends; (4) safer highway designs; and (5) improved emergency response to crashes. Advocates argued that unless the agency requires EDRs, data collection would take many years to gather sufficient information for useful study. Mr. Fink, a crash reconstructionist, stated that the rule should require EDRs in all vehicles sold in the U.S. Four individuals commented that they supported the NPRM, one of which indicated that EDRs should be mandatory.

Several commenters argued that NHTSA's proposal to apply the rule to only those vehicles equipped with EDRs would either act as an incentive for manufacturers to remove EDRs from product lines currently equipped with EDRs or would discourage manufacturers from installing EDRs in new product lines. Ford argued the agency would

need to issue a rule that requires installation of EDRs to accomplish the objectives set forth in the agency's proposal. Ford stated that it has been unable to develop a workable definition of an EDR that would uniformly create a truly voluntary requirement for all vehicle manufacturers and that avoids incentives for removal of existing recording capability or the deferred introduction of such capabilities.

IIHS, Public Citizen, PCIAA, and Children's Hospital of Philadelphia joined Ford and GM in arguing that not requiring manufacturers to install EDRs would act as an incentive for vehicle manufacturers to remove EDRs from vehicles and/or would discourage installation of EDRs in new product lines. According to these commenters, the net result would be a reduction in the number of vehicles equipped with EDRs. While Ford expressed support for modifying language to create a truly voluntary requirement that would at the same time address these concerns, IIHS, Public Citizen, PCIAA, GM, and Children's Hospital argued for a mandatory rule (with PCIAA noting that the industry needs ample lead time to comply), which would eliminate the incentive to remove EDRs and/or the discretion not to install EDRs in new product lines.

SISC supported the proposal's position that EDRs should include minimum standards for capturing crash data. SISC stated that current EDRs are focused on capturing data to evaluate the performance of safety systems; however, they do not adequately address the needs of capturing data for crash investigations. SISC stated that without mandatory minimum standards for capturing crash data, EDRs would not provide the type of information needed for safety research.

On the other hand, DaimlerChrysler and Toyota supported a voluntary approach to EDR installation. DaimlerChrysler also commented that the definition of EDR should

be modified to ensure that EDRs are voluntary. In explaining its request for modification, DaimlerChrysler stated that the NPRM's definition of EDR references the deployable restraint control module for the purpose of determining whether a vehicle is equipped with an EDR. DaimlerChrysler argued that all light vehicles are equipped with such control modules; therefore, the adoption of a definition making such a reference would effectively mandate EDRs for all applicable vehicles, contrary to the agency's stated intent.

Porsche also argued that the NPRM's definition of EDR would effectively require manufacturers to install EDRs. Porsche argued that a vehicle might be capable of recording and storing a few pieces of static freeze frame data in the air bag control unit (*i.e.*, an isolated observation or snapshot of a set of data such as the seat belt status, frontal air bag warning lamp status, etc., triggered by an impact exceeding a defined trigger threshold). Although such systems fall outside the common understanding of EDRs, Porsche argued that this type of recorded data would fall within the proposed EDR definition. Porsche stated that storage of freeze frame data should not, by itself, be a sufficient basis for determining that a vehicle is equipped with an EDR, particularly since such data do not provide information on pre-crash events. Siemens VDO Automotive AG characterized the rule as "semi-compulsory."

We have carefully considered the arguments presented by the commenters for requiring the installation of EDRs in all subject vehicles.

We are not yet persuaded that it is necessary or appropriate to mandate the installation of EDRs. We believe that the industry's voluntary development and installation of EDRs, combined with the standardization requirements in this rule, will be

sufficient to meet the agency's and public's near term needs. Standardized EDR data from the growing population of vehicles with EDRs, collected and compositely analyzed, will enable the agency to investigate crashes more effectively and to analyze safety equipment performance, resulting in improved agency understanding of crash and injury causation. These data will also lay a foundation for advanced crash notification systems.

Further, insofar as achieving those near term goals is concerned, adopting a rule mandating EDR installation would result in an unnecessary cost for automobile manufacturers and consumers. To operate, EDRs need a databus.<sup>26</sup> Since less expensive vehicles are not equipped with a databus, a rule mandating EDR installation would require manufacturers to install a databus in those vehicles. While we are not presently compelling the installation of EDRs, it is our intention that their use continue to expand.

As for the agency's longer terms goals related to EDRs, we expect the extent of installation in new vehicles to continue increasing and to reach approximately 85 percent by model year 2010. Based on currently available information, such as that obtained in connection with our NCAP program, the new vehicles lacking an EDR in that model year will be primarily those manufactured either in Germany or Korea. As Korea has expressed interest in the development of an EDR standard under the International Standards Organization, it appears that Korean built vehicles also might eventually be voluntarily equipped with EDRs.

Further, we believe that allowing the current voluntary, gradualist approach to increased installation of EDRs to continue is more appropriate for meeting those longer term goals than mandating an acceleration of further increases in the extent of

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<sup>26</sup> The bus (connections between and within the central processing unit, memory, and peripherals) is used to carry data.

installation. We are aware that some consumers are concerned about the ownership and use of EDR data. The voluntary approach provides additional time for implementing measures concerning those concerns.

We have considered the comments of Advocates and SISC, asking us to mandate EDRs so that it is possible to gather additional data for safety research. The agency seeks to gather EDR information in a readily usable manner to analyze crashes and the performance of safety equipment as composite information (*i.e.*, to discover statistically significant trends). We believe that the current level of EDR installation, combined with our standardization requirement, will yield data of statistical significance. The expected further increases in the extent of installation will improve the quality of our data still further. In light of our expected ability to meet these near term goals, we do not see the need to mandate EDR installation at this time.

We will monitor future increases in the extent of installation of EDRs and revisit this issue if appropriate.

We do not agree with the comments that our decision to adopt data standardization requirements without also mandating the installation of EDRs will induce manufacturers to remove EDRs from the vehicles in which they are currently installed or to drop plans for installing them in additional vehicles. The fact that approximately two-thirds of new vehicles are already equipped with EDRs is strong evidence of a significant incentive to install these devices. Further, as noted below, the data standardization requirements we are adopting in this final rule are less extensive and thus less costly than the ones we proposed in the NPRM. More specifically, we lowered the number of events and elements to be recorded. Based on our cost estimates (discussed below), we do not

believe that adoption of our revised data standardization requirements will increase costs sufficiently to create a countervailing incentive for manufacturers to remove EDRs. We also note that consumer products, such as OnStar®, incorporate EDRs into their services. The consumer appeal of these consumer products strengthens the existing incentive for manufacturers to install EDRs in their vehicles.<sup>27</sup> In sum, we conclude that there are major benefits from the use of EDRs, but the marketplace appears to be adopting EDRs and we do not currently see a need to mandate their installation. The agency will monitor further progress in this area, and will be prepared to consider this question further if needed.

We have also considered GM’s comment urging us to ban EDR “on/off switches” and the comments of other commenters asking that we require them. This final rule concerns the standardization of EDR data elements and ensuring that downloaded EDR data are available to intended users. We did not propose either requiring or precluding on/off switches in the NPRM. We note, however that on/off switches could limit the benefits provided by EDRs. As with the issue of mandating installation of EDRs, we think it premature to compel action on this issue, and will continue to monitor and assess whether action is warranted in the future.

## **2. EDR Data Elements**

### **a. Number and Types of Required Data Elements**

The NPRM provided a list of required data elements (a minimum set of elements required to be recorded if a vehicle is equipped with an EDR, regardless of whether those elements are presently recorded by the vehicle’s EDR) and a list of “if equipped”

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<sup>27</sup> In response to the concerns that the breadth of our proposed EDR definition could have the effect of requiring the installation of EDRs, we note that we have revised the definition of EDR, as discussed below, to exclude static freeze-frame data elements.

elements (elements that would be required to be recorded only if the vehicle is equipped with the relevant safety system or sensing capability).

NHTSA received several comments on the proposal's number of required data elements. Several manufacturers commented that the proposal's required number of data elements was excessive; however, manufacturers' comments differed as to which of the data elements should be deleted. Commenters representing highway safety advocacy groups suggested that the number of required elements is insufficient to meet NHTSA's stated goals of improving data compatibility, crash investigation, and safety. Some commenters suggested adding the VIN as a required data element.

GM, DaimlerChrysler, IIHS, and Mitsubishi argued that the NPRM proposed an excessive number of data elements. GM provided a critique of each of the data elements and recommended a different list of required data elements. GM's position was that the NPRM's data elements go beyond the minimum set of data elements needed by safety researchers and crash reconstructionists. GM argued that the number of required elements in the NPRM could compromise the ability of the vehicle's control modules to perform their primary function of deploying restraint systems. The number of required elements could also inhibit manufacturers from collecting other, more potentially useful data, to the extent that the required elements consume available processing capacity.<sup>28</sup>

IIHS made a similar comment, stating that the number of proposed data elements increases the burden on manufacturers and the incentive for manufacturers to delay or

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<sup>28</sup> Accordingly, GM, Daimler Chrysler, Ford, and Toyota recommended deletion of the following "required" data elements: (1) Engine RPM; (2) Longitudinal Acceleration (x-direction); (3) Multi-event Crash; and (4) Frontal Air Bag Deployment Level. The four automakers also recommended deletion of the following "if equipped" data elements: (1) ABS Activity; (2) Lateral Acceleration (y-direction); (3) Normal Acceleration (z-direction); (4) Occupant Size Classification; (5) Seat Position; (6) Steering Wheel Angle; (7) Stability Control; (8) Frontal Air Bag Suppression Switch Status; (9) Vehicle Roll Angle; (10) Disposal (second stage of a frontal air bag).

eliminate safety features. Mitsubishi commented that NHTSA should only require those data elements that are needed to capture crash data that would truly be useful in improving motor vehicle safety.

Hyundai and Kia offered several comments regarding NHTSA's proposed data elements. First, they requested that, "data capture be limited to events that trigger air bag deployment." Second, they commented that "engine RPM" and "engine throttle" data serve the same purpose and requested that only one of those data elements be required. Third, Hyundai and Kia commented that the data elements "Ignition cycle, crash" and "Ignition cycle, download" should not be required; Hyundai's and Kia's position is that these data elements do not provide data about the crash event, and that these elements would require additional programming and memory. According to these companies, requiring these data elements would increase costs and necessary lead time.

Delphi recommended that NHTSA limit "the content of event records to those data that are of significant value to crash investigation and safety system performance analysis" in order to reduce the amount of memory that will be required. Delphi stated that each required parameter would consume memory for six instances of that parameter because of the need to hold and compare up to three events in temporary and permanent memory.

Subaru and AIAM argued that the NPRM contained too many data elements, and each provided a recommendation for which data elements the final rule should require. Subaru recommended that NHTSA should re-select and prioritize data elements in order to increase the feasibility of compliance with a final regulation. Specifically, Subaru recommended that NHTSA "omit acceleration direction, tolerance range, and accuracy of

G sensors from the requirement or allow significant additional lead time on a phase-in schedule.” AIAM commented that to reduce the number of systems that would require a complete redesign of vehicle electrical architecture, the minimum data set should include only the following data elements: (1) driver and front passenger belt use; (2) throttle position; (3) brakes on/off; (4) ABS engaged/not engaged; (5) vehicle speed; (6) longitudinal and lateral vehicle acceleration; (7) delta-V; and (8) time of air bag deployment.

In contrast to the commenters who suggested that the NPRM contains too many required data elements, Public Citizen and PCIAA encouraged NHTSA to require additional data elements. Public Citizen stated that to maximize the benefits of the EDR rule, NHTSA should standardize (*i.e.*, require) a far more extensive list of EDR data elements. Public Citizen pointed to the Institute of Electrical and Electronics Engineers (IEEE) Project 1616 (“Motor Vehicle Event Data Recorders”), which includes 80 EDR data elements used by different groups. Public Citizen commented that NHTSA did not propose to require many of the “top ten” data elements listed by the NHTSA-sponsored EDR Working Group.<sup>29</sup> Public Citizen argued that standardizing EDR data elements would ensure compatibility of EDR data.

PCIAA commented that the proposed rule focuses too much on restraint systems and not enough on systems to help the driver avoid collisions. PCIAA suggested that NHTSA should require data elements that would track driver inputs and the performance of the steering, suspension, or braking systems. According to PCIAA, the rule should include other equipment such as vehicle lighting or “intelligent vehicle” systems and

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<sup>29</sup> We note that this group was a fact-finding group, and the findings were those of the group and not NHTSA’s findings.

should address equipment that is likely to be in used in the future, such as stability control systems, radar, cameras, and similar technology to monitor the driving environment.

Nissan, Mr. Fink, Mr. Kast,<sup>30</sup> Bendix, and AAA all suggested specific data elements they believe should be required. Several data elements that the commenters suggested we require were not proposed in the NPRM. Nissan suggested that the following elements be required: (1) delta-V direction (lateral, longitudinal, vertical); (2) roll rate (roll acceleration); (3) yaw rate; (4) gear position; (5) traction control system status; (6) number of downloads after event; and (7) passenger air bag disable indicator status. Mr. Fink stated that the rule should require a standard data set, including “vehicle speed, brake switch status, accelerator status, engine rpm, seat belt switch status and air bag deployment/belt pre-tensioner status.” Mr. Kast commented that, based on his studies of EDR data, the following elements are necessary to evaluate the cause of a crash: (1) status of dimmed headlights; (2) status of high beam; (3) status of indicator left; (4) status of indicator right; (5) status of any special signals; and (6) yaw angle or yaw angle velocity. Mr. Kast’s rationale is that the status of the lighting equipment and turn signals are important for the evaluation of crashes that occur in the dark. Mr. Kast also emphasized the importance of knowing the yaw angle or yaw angle velocity in order to calculate the trajectory of the vehicle.

Bendix Commercial Vehicle Systems, L.L.C. commented that the following data elements should be included in the minimum requirements: (1) transmission status (gear selection on automatic transmissions); (2) brake switch status; (3) accelerator (%); (4)

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<sup>30</sup> Mr. Kast’s comments were submitted independently and by Siemens VDO Automotive, AG. According to Mr. Kast, he is an “independent expert in the field of accident investigation and accident data recorders.”

engine speed (RPM); (5) date & time; (6) engine hours; (7) odometer reading; (8) headlights on/off; (9) turn signal status; (10) cruise control (on/off); (11) ABS fault status; and (12) tire pressure (axle or each wheel or as regulated by NHTSA).

AAA commented that rear seat air bags are being installed with increasing frequency and stated that NHTSA should consider requiring the recording of data elements associated with rear seat air bags in vehicles so equipped (*e.g.*, rear seat occupant presence, size, seating position, and restraint use).

SISC, Children's Hospital of Philadelphia, Delphi, and Public Citizen commented on the NPRM's categorization of data elements as "required for all vehicles equipped with an EDR" (Table I) or "required for vehicles under specified conditions" (Table II) and suggested that we change the categorization of certain data elements. SISC stated that NHTSA should mandate lateral acceleration as part of the required set of data elements. According to SISC, multi-axis accelerometers are becoming less expensive, and both longitudinal and lateral acceleration are essential to determining the true delta-V and the principal direction of force, which are critical elements of general crash investigation, biomechanics research, and the understanding of injury causation. Children's Hospital of Philadelphia made a similar comment, stating lateral acceleration should be a mandatory data element.

Delphi suggested that data elements not normally part of the restraint control system should be moved from the table of data elements required if the vehicle is equipped with an EDR to the table (NPRM's Table II) of elements required under specific conditions (*e.g.*, vehicle indicated speed, engine RPM, engine throttle, service

brake status). According to Delphi, this would lower the cost of implementation for many manufacturers.

On the other hand, Public Citizen argued for re-categorizing several data elements that the NPRM proposed to be recorded only under specified conditions (Table II) and instead require them (*i.e.*, place them in Table I). Public Citizen believes that the final rule should require these data elements to be recorded (*e.g.*, seat belt status for the front passenger). Public Citizen's rationale is that many of these elements only require additional sensing capabilities, which are fairly inexpensive in most cases.

NTSB expressed concern that Table I and Table II will result in different data being available from different EDRs. It stated that the rule should require the same information from all EDRs to encourage uniformity of data and standardization of EDR usage. NTSB encouraged NHTSA to develop a comprehensive standardized list of data elements that would apply to all highway vehicles, including heavy vehicles.

Several commenters, including Mr. Kast, Injury Sciences, Public Citizen, and EPIC, recommended requiring some type of date/time stamp and/or VIN information. Mr. Kast and Injury Sciences commented that a date/time stamp should be added to the required elements in order to correlate the recorded data with a crash event. Mr. Kast explained that the linkage is particularly important since low intensity accidents may be recorded. If this information is not required, Injury Sciences urged NHTSA to consider alternatives for linking data to a particular vehicle and accident. Public Citizen stated that a VIN data element would significantly increase the usefulness of EDR data by permitting crosschecks across various NHTSA databases. EPIC commented that the EDR should record the first eleven digits of the VIN, although "the unique serial number

portion of the VIN – a personal identifier—should not be collected.” EPIC’s rationale is that make, model, and manufacturing origin are important data for crash analysis.

GM and Delphi raised cost issues pertaining to the data elements. GM requested that the final rule expressly state that the specified list of data elements is not intended to limit manufacturers’ ability to voluntarily collect and record additional data elements.

Delphi suggested that the condition for an element to be required (Table II of the NPRM) be changed from “vehicle is equipped,” to “data is available to the recording device.” According to Delphi, this would lower the cost of implementation for many manufacturers.

Siemens VDO Automotive AG and Bendix commented on the state of technology and our EDR proposal. Siemens VDO Automotive AG commented that the NPRM definitions for data elements should be modified (*i.e.*, made more stringent) to reflect the state of technology already available and in use. Siemens predicted that the changes would not result in significantly higher costs because the standardization and adoption by all manufacturers would lower the costs of production. Bendix suggested that solid state digital storage media and non-volatile storage devices could be used in conjunction with emerging technologies in the area of high-speed data links, which combine data, voice, and video data on a single communications link to record additional types of data.

Nissan and Honda requested clarification on specific technical aspects of our proposal. Nissan stated that instead of recording the engine throttle, we should require recording the accelerator pedal operation. Additionally, Nissan suggested that the rule should permit two alternatives for determining the beginning of an event, as provided in SAE J1698, Vehicle Event Data Interface – Vehicular Output Data Definition. Nissan

also sought clarification about the “complete file recorded” data element. Nissan questioned whether the “Yes” value indicates that the EDR functioned the whole time or whether the data set is complete (*i.e.*, the EDR received good data from all systems). Honda sought clarification related to the data element for “frontal air bag deployment level.” Honda sought to confirm its understanding that this term means the percentage of maximum inflator output used for occupant restraint (*i.e.*, inflator output excluding the output of the deployment for disposal, regardless of the delay timing of the second (disposal) stage deployment).-

TRW Automotive commented that the status of the anti-lock braking system (ABS) is not adequately indicated by the “ABS Activity” data element. TRW suggested that “ABS Warning Lamp (On/Off)” would provide a better indication of the status of the ABS system at the time a crash occurred. TRW Automotive commented that the data attributes for stability control systems should be modified because they do not clearly indicate the status. According to TRW, “off” should indicate that the driver has turned off the system, and an attribute “Not Available” should be added to indicate that the system is in a “not available” state.

We indicated in the NPRM that it was not our intention to require manufacturers to install expensive technological hardware or software to meet our EDR standardization proposal. In the NPRM, we emphasized that vehicle manufactures have voluntarily made significant investments in EDRs and are already recording several data elements that suit our goals. The NPRM explained that our proposal sought to build upon the automotive industry’s EDR accomplishments by standardizing the way data elements are captured and recorded. In other words, we considered our proposal to record the most important

data elements relevant to crash reconstruction, the analysis of safety equipment performance, and ACN in light of the data already being processed by vehicles.

We envisioned and it was our intent that the proposed EDR standardization requirements could be implemented by vehicle manufacturers at a minimal cost, since vehicle manufacturers had made EDR capability an additional function of a vehicle's air bag control system. We did not intend to require vehicle manufacturers to install equipment, such as additional accelerometers, to comply with the rule. (We estimated, for example, that an additional accelerometer could cost \$20 per vehicle.)

Our approach of standardizing the most important data elements at a minimal cost remains the same. However, after carefully considering the comments, we have re-evaluated the number and types of data elements that manufacturers should be required to standardize. We learned from the comments that the frequency, range, accuracy, and precision requirements (discussed subsequently) for many of the data elements we proposed would require an upgrade in sensors, microprocessors, and memory capability that would substantially add to the cost of complying with this rule. This was not our intention. We also learned that it is not current industry practice to record some of the data elements we proposed. In order to remain consistent with our approach of standardizing data at a minimal cost, we have revised the number of required data elements to reduce implementation cost and better reflect current industry practice.

In revising the number and types of data elements to be recorded if a vehicle is equipped with an EDR (*i.e.*, Table I), we deleted five items that we had proposed in the NPRM: "longitudinal acceleration," "engine RPM," "frontal air bag deployment level,

driver,” “frontal air bag deployment level, right front passenger,” and “time from event 2 to 3.” We added two items: “time, maximum delta-V” and “delta-V, longitudinal.”<sup>31</sup>

We deleted the “engine RPM” from Table I but added it to Table II. “Engine RPM” is somewhat related to “accelerator pedal position.” Accelerator pedal position reflects the driver’s input to the engine. Engine RPM indicates the engine’s response to that input. We believe that the two data elements are closely related, although distinct. We have reviewed many of GM’s EDR crash data sets, and see little value in requiring “engine RPM” at this time. Moving this data element to Table II will reduce memory costs and the amount of data manipulation during pre-crash.

After carefully considering the comments, we have also decided to remove “frontal air bag deployment level, driver” and “frontal air bag deployment level, right front passenger” from the list of required data elements (Table I). These elements would have indicated the deployment level of the driver’s and right front seat passenger’s air bag system. After further consideration, we believe that the same information we anticipated gathering from these deleted data elements can be ascertained using other data elements: “frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, driver” (and the right front passenger equivalent) from Table I and “frontal air bag deployment time to  $n^{\text{th}}$  stage, driver” (and the right front passenger equivalent) from Table II.

In revising the number and types of data elements to be recorded under specified conditions (Table II), we added four items that did not appear in the NPRM: “delta-v, lateral,” “maximum delta-V, lateral,” “time to maximum delta-V, lateral,” and “time to

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<sup>31</sup> A discussion of our changes relating to the acceleration and delta-V data elements occurs in the next subsection, titled “The Acceleration and Delta-V Data Elements.”

maximum, delta-V, resultant.”<sup>32</sup> Commenters had requested changes in the data elements for longitudinal acceleration and delta-V, and as noted elsewhere in this document, the agency has adopted a number of those changes as part of this final rule. However, in order to fully implement those changes for the longitudinal direction, we believe it is necessary to also adopt data elements that constitute the lateral counterpart of the requested changes. This was done to provide standardized data elements that are consistent with those in Table I for longitudinal acceleration and delta-V. However, we have incorporated these additional data elements in Table II, rather than Table I.

After considering the comments, we have decided to retain a number of the data elements that some manufacturers recommended that we delete, including “occupant size classification” and “frontal air bag suppression switch status.” Occupant size classification is important in determining whether the advanced restraint systems are working properly by drawing a comparison between the occupant and the safety system’s classification. We believe that this is vital to that purpose of obtaining EDR data for the analysis of safety equipment performance. Frontal air bag on/off switch status is important in cases where the right front passenger air bag does not deploy. There is a possibility in some vehicles with no back seats that the air bag was turned-off at the time of the crash. It is critical that the EDR capture this evidence to enable an evaluation of whether advanced restraint systems functioned properly.

We have also decided to retain “ignition cycle, crash” and “ignition cycle, download.” These two data elements provide a method to identify whether the data stored in the EDR is related to a crash under investigation or to a previous crash.

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<sup>32</sup> A discussion of the data elements related to acceleration and delta-V follows below in section titled “The Acceleration and Delta-V Data Elements.”

As indicated above, several commenters recommended recording other data elements that we did not propose to record (*e.g.*, roll rate, yaw rate, gear position, number of downloads after event, passenger air bag disable indicator status, status of lamps and signals, engine hours, odometer reading, cruise control, ABS fault status, “intelligent vehicle systems,” steering input, and tire pressure). We have carefully considered these recommendations. We emphasize this final rule standardizes and requires (Table I) the most important data elements that are essential to crash reconstruction, the analysis of safety equipment performance, and ACN. We have decided not to require the recording of these additional data elements. We believe that recording these additional data elements, which are currently of lesser value for our stated purposes, would not only result in significantly higher costs but would also risk overburdening the microprocessing and memory capabilities of EDRs and increase potential record times. This increases the risk of system failure. We may revisit the distribution of data elements between Table I and Table II as technology advances, costs decrease, and the ability to record these data elements become less risky. We may also consider expanding Table II in the future as manufacturers expand the capability of EDRs and add additional sensors to motor vehicles that could be beneficial to motor vehicle safety.

We have carefully considered comments from Mr. Kast, Injury Sciences, Public Citizen, and EPIC that we should include crash location, date/time stamp and VIN as data elements. We believe that the data elements related to crash location, date, time, and VIN are not essential to meet our goals of crash investigation and safety equipment performance. As we have stated earlier, we are currently standardizing only data elements that are important for composite analysis. We have a need to gather information

about specific crashes only as it is related to general trends that we may discover with the information we gather. Therefore, we presently find it unnecessary to require manufacturers to collect or to standardize this type of data.

After considering Public Citizen's comments, we disagree with the argument that the final rule must include all elements listed in the IEEE 1616 MVEDR Standard report and the "top ten" items presented in the NHTSA-sponsored EDR working group report. The IEEE 1616 report, which lists 80 data elements, is a compilation of the data elements that are available/recordable at present, or expected to be in the future, for various vehicles. In other words, the data elements listed in the IEEE 1616 report are a compilation of all available data elements (*i.e.*, a "data dictionary"), and not a recommended set of data elements. We do not believe it would be appropriate at this time to require automobile manufacturers to record all of the data elements contained in the IEEE 1616 report. Doing so would substantially extend the number of standardized data elements, resulting in redundancy and the standardization of many data elements that are presently unrelated to the purposes of this rulemaking.

Public Citizen also contends that we have not included many of the data elements listed in the "top ten" list found in the NHTSA-sponsored EDR working group report. As we stated above, this group was sponsored by NHTSA; however, we have never adopted its findings as our own. However, we note that the final rule does include standardization protocols for many of the same data elements that are listed in the "top ten" list, including longitudinal/lateral acceleration, seat belt status, pre-crash data (*e.g.*, steering wheel angle, brake use, vehicle speed), vehicle roll angle, ABS, stability control, and air bag data.

We have considered Delphi's recommendation that data elements not pertinent to restraint control and/or crash reconstruction should be moved to Table II. Our NPRM was based on this premise; that is, Table I contains the data elements critical to crash reconstruction, advanced restraint operation, and enabling ACN. We continue to support our approach for Table I data elements. However, we have modified Table I slightly by: (1) moving the "engine RPM" data element to Table II, because it can generally be inferred from accelerator pedal position; (2) substituting delta-V-related crash severity measurements for acceleration measurements to reduce complication and cost of EDRs, and (3) dropping those data elements related to a third event, because we believe two events will capture most crashes with multiple, non-trivial events.

NTSB expressed its desire for recording accelerator/brake pedal positions in certain special crashes. The revised Table I retains both of these data elements.

We have also considered Public Citizen's arguments that several data elements currently listed in Table II could be moved to Table I (required) for minimal to no cost (*e.g.*, safety belt status, front passenger). The costs associated with placing particular data elements in Table I is not the sole factor in determining whether to include that data element in the core set listed in Table I. To minimize the risk of data loss, we must also consider the current capabilities of microprocessors to process the information and the availability of memory storage capacity. The longer or larger the data file, the more complicated it is to record it successfully during a crash. We believe our Table I required list and our Table II (standard formats for data elements recorded by manufacturers) provide a reasonable balance of these concerns and priorities. We may reevaluate the number and types of data elements in the future as EDRs, memory, and microprocessing

continue to develop. In the meantime, we believe that it is appropriate to keep “safety belt status, right front passenger” and other similar data elements in Table II. We emphasize that our final rule requires a minimum set of data, and manufacturers may and most likely will exceed this minimum data set, incorporating data elements listed in Table II and event data elements we have not listed in this final rule.

We note that the data elements in Table II must be standardized if recorded. Therefore, we believe that manufacturers that are currently recording these data elements will be able to standardize at a minimal cost.

We have considered NTSB’s comment encouraging uniformity in the number and types of data elements recorded for all EDRs. As noted above, we believe this final rule standardizes a core set of data elements that will be useful for crash reconstruction, the analysis of safety equipment performance, and the development of ACN. Table I does standardize a core set of data elements among all vehicles equipped with an EDR. However, we recognize that vehicle manufacturers are in different stages of technological development with their EDRs. Some manufacturers have made greater strides in the development of EDRs and the number of recorded data elements while others have been slower to evolve. We developed Table II to standardize data elements that are currently recorded by some manufacturers, but not others.

NTSB commented that they were concerned that our approach of a minimum data set (Table I) combined with an optional data set (Table II) would result in different vehicles recording different data elements. This regulation establishes a minimum data set for vehicles that are equipped with an EDR. Manufacturers are permitted to record other additional data elements, as they believe fit the needs of their vehicles and

equipment installed on their vehicles. We have taken an approach that will: (1) ensure that all vehicles equipped with an EDR will have a minimum set of data, (2) provide standardization for additional priority data elements, and (3) allow manufacturers to obtain other additional data as they deem appropriate to meet their needs. As EDRs evolve, NHTSA may reevaluate this approach in future rulemakings.

We also want to provide manufacturers with the flexibility to improve their EDR designs and record a diverse group of data elements so that we may continue to study the usefulness of various data elements in terms of safety. We view EDRs as a new technology that has not seen much maturation outside of its initial inception as part of the air bag module. This rulemaking, we believe, is a positive step toward guiding the development of EDR technology for vehicle safety purposes by both requiring a standardized set of data elements that we believe will be useful while at the same time providing manufacturers with the ability to continue to evolve the EDR.

Likewise, we do not agree with IIHS that the number of data elements we have chosen to standardize will provide incentive for manufacturers to delay or eliminate safety features. Our cost estimates indicate that our standardization requirements, as revised in this final rule, will not result in significant costs to manufacturers. As stated above, we have narrowed the recording requirements for EDRs. Also, we believe that our decision to standardize a core set of data elements and requiring standardization of data elements “if recorded” will allow flexibility for manufacturers to research and develop EDRs.

We have considered Hyundai’s and Kia’s argument that we should limit the recording of data to events that trigger air bag deployment. We do not believe that

limiting our data to events that trigger air bag deployment would be sufficient for our purposes. We want to know about events that should have deployed air bags, but did not do so, indicating the possible existence of a defect. Further, we seek to gather data not only to analyze the performance of air bags, but also to analyze the performance of other safety equipment, such as seat belts. We also seek to gather data helpful for crash reconstruction. We believe that this data can be standardized and recorded without significant cost. Further, we anticipate that development of e-911 and ACN systems may lead vehicle manufacturers to incorporate additional elements besides air bag deployment; such elements may provide information to EMS regarding other crash modes, such as side impact and rollover, as sensor technologies advance and their costs decline.

We do not agree with AIAM that our final rule will require a complete redesign of vehicle electrical architecture if we do not reduce the minimum data set to the eight elements it proposes. As discussed in the costs section, we anticipate negligible redesign to the electrical architecture of vehicles as a result of our final rule. Additionally, we note that our new Table II is similar to AIAM's recommendation. Our Table II includes ABS engaged/not engaged and right front passenger belt use.

Nissan requested clarification about the "complete file recorded" data element, asking whether the "yes" value indicates that the EDR functioned the whole time or whether the data set is complete. A complete record is a record that ends normally, regardless of the amount of data. An incomplete record is one that ends abnormally. For example, a complete value with "yes" indication would include a scenario where all data elements were captured successfully and recorded to memory or where some elements

were not captured because of device failure but the full record was recorded to memory. Examples of when there is an incomplete record is where all data was captured successfully, but the record function interrupted and the file is incomplete, or in the case of a power or system failure, there is no data captured, so there is no value.

TRW commented that the data element “ABS Activity” does not adequately indicate the status of the ABS system. In the NPRM, we intended the word “status” to mean that the ABS was actively controlling the brake forces, not whether the system status was operational. We would expect “on” to mean that the vehicle’s ABS was actively controlling the vehicle brakes. Conversely, we would expect “off” to be used at all other times. For example, if a person is stopping and presses the brakes moderately in normal driving conditions, then we would expect the service brake operation to indicate “on.” If driver uses hard braking, activating the ABS, then the ABS activity would indicate “on” for that time period. The “service brake” data element would continue to read “on” during periods of ABS activity.

TRW also commented that the data attributes for stability control systems should be modified because they do not clearly indicate the status. We proposed three states for stability control: “on,” “off,” and “engaged.” “On” and “off” are intended to be status of the vehicle’s stability control on/off switch. We intend “engaged” to be used when the stability control is actively controlling the vehicle. Some vehicles do not have on/off switches for stability control, and the systems remains “on.” In such a case, the indicator would read, depending on the circumstances, either “yes” or “engaged.”

We also made a modification to the “condition or requirement” provision for most of the data elements in Table II. In the NPRM, we used the phrase “if equipped.” We

proposed the phrase “if equipped” because we envisioned requiring manufacturers to record the data elements in Table II if the vehicle is equipped with the relevant safety system or sensing capability. In the final rule, the condition or requirement for most data elements in Table II will be “if recorded.” By using “if recorded” we mean that manufacturers are required to comply with Table II if the data element is recorded in non-volatile memory for the purpose of subsequent downloading. We made this modification so that the final rule better reflects current industry practices. Some data elements may only be recorded in volatile memory (for applications such as air bag deployment) and not non-volatile memory for the purpose of subsequent downloading. Our proposal would have required manufacturers to record in non-volatile memory certain data elements, such as acceleration.

We also believe that the change effectuates our goal of providing standardization for the data elements listed in Table II without substantial cost or risking EDR malfunction. We agree with the commenters that recording these data elements, such as acceleration, at the frequency and intervals we proposed, would require additional memory—adding to the cost of implementation. Recording these data elements in non-volatile memory would have also increased the risk of not capturing a complete crash record. A more complete discussion of the risks associated with recording large crash records is discussed below.

b. The “Acceleration” and “Delta-V” Data Elements

In the NPRM, we proposed that Table I (the minimum data set) include the crash severity data elements “longitudinal acceleration” and “maximum delta-V.” We selected longitudinal acceleration to provide crash severity information. Longitudinal acceleration

is a common data element collected in engineering studies and crash tests to determine crash severity and the shape of the crash pulse in frontal and rear crashes. It also provides information regarding the maximum acceleration level. Therefore, we believed that it was appropriate to standardize longitudinal acceleration.

We also proposed to include maximum delta-V in the minimum data set. We proposed to include maximum delta-V in the minimum data set because it quantifies the severity of the crash in the vehicle's memory. We had proposed that the absolute value of maximum delta-V be used, if the vehicle experienced a second crash, to determine whether the data in the EDR's memory should be replaced with the subsequent (or second) crash information. We proposed that only subsequent crashes with higher maximum delta-V must be recorded in the vehicle's memory.

GM, Daimler Chrysler, Ford, Honda, and Toyota specifically requested that we replace the longitudinal acceleration and lateral acceleration data elements, as proposed in the NPRM, with longitudinal/lateral delta-V elements. All suggested that delta-V is a better indicator of crash severity than acceleration. They stated that while longitudinal/lateral acceleration is currently recorded by some manufacturers, acceleration data is not currently used or needed for safety-related crash analysis and reconstruction purposes. The data is intended for internal use, specifically to understand deployment algorithms. DaimlerChrysler explained that because of this very specific use of acceleration data, the time duration recorded was never intended to capture a complete crash and is usually too volatile for use in crash investigation. GM made a similar comment, stating that delta-V is preferred over acceleration in analyzing crash

reconstruction because acceleration data, even after filtering, is typically too sporadic.<sup>33</sup> Accordingly, the manufacturers stated that accident reconstructionists usually use delta-V instead of acceleration data.

Honda also recommended replacing the proposed elements for longitudinal, lateral, and normal accelerations with delta-V, coupled with the angle or direction of delta-V, to improve the overall understanding of a crash event.<sup>34</sup>

Hyundai and Kia suggested that the “lateral acceleration” and “normal acceleration” data elements should not be required even if the vehicle is equipped with sensors. Hyundai and Kia stated that their tests have shown that the data acquired may be misleading due to external noise transmitted from body structure damage.

After reviewing the comments, we have decided to adopt modified requirements for the collection and standardization of data associated with the acceleration and delta-V data elements. In the final rule, the acceleration data elements (longitudinal, lateral, and normal) will appear in Table II. In other words, the final rule will standardize acceleration data elements if manufacturers are recording the acceleration data elements. In lieu of longitudinal acceleration, the final rule focuses on recording delta-V as the crash severity measure.

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<sup>33</sup> Recording intervals were suggested for the proposed delta-V recording element and are discussed below.

<sup>34</sup> Specifically, Honda recommended changing the definition of delta-V, replacing it with the following language:

Delta-V means, for vehicles with only longitudinal acceleration measurement capability, the change in velocity of the vehicle along the longitudinal axis, and for vehicles with longitudinal, lateral and/or normal acceleration measurement capability, the magnitude and direction of the change in velocity of the resultant of the longitudinal, lateral and/or normal vehicle velocity time-histories, within the time interval starting from the time zero and ending 500 ms after time zero.

We have modified data elements relating to delta-V. In the final rule, Table I includes the data element “delta-V, longitudinal,” “maximum delta-V, longitudinal,” and “time, maximum delta-V.” Delta-V longitudinal will provide for the tracking of longitudinal delta-V time series data, replacing our proposal to record the longitudinal acceleration time series. We are also adding a new data element to track the time associated with the maximum longitudinal delta-V.<sup>35</sup> We are focusing on delta-V, modifying the final rule to enhance the standardization of delta-V data elements while also providing for the standardization of acceleration data if manufacturers record acceleration (now in Table II). We believe that delta-V will be sufficient to meet our purposes of analyzing safety equipment performance, aiding in crash reconstruction, and enabling ACN, while remaining sensitive to costs, the risk of data loss associated with writing large amounts of data to memory, and the problems associated with external noise transmitted from body structure damage.

We believe that delta-V is sufficient for our objectives. NHTSA has used delta-V as a measure of crash severity for many years. Delta-V is considered an essential part of crash investigation. For several decades, NHTSA’s crash investigation teams have gathered information to estimate delta-V using computer programs. The EDR data will assist these researchers because they will be able to obtain a direct measure of delta-V.

There are significant cost differences between delta-V and acceleration, notwithstanding that both of these time series measurements are typically based on accelerometer measurements. In current practice, acceleration time series data are collected every 2 milliseconds for some EDRs while delta-V time series data are

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<sup>35</sup> Our decision to record delta-V instead of acceleration resulted in the addition of five new definitions in the regulatory text: (1) delta-V longitudinal, (2) maximum delta-V, longitudinal, (3) delta-V, lateral, (4) maximum delta-V lateral, and (5) time, maximum delta-V, lateral.

collected every 10 milliseconds in others. Therefore, comparing these two practices, accelerometer data generates 5 times the volume of data. If we were to require, as proposed, longitudinal acceleration, it would be necessary to capture and record these data, increasing the cost. This increased cost is due to the increased size in the microprocessor, random access memory (RAM) and electrically erasable read only memory (EEROM) that would be needed to capture and record the volume of data produced by the longitudinal acceleration data element.

In addition to cost, we have considered the comments that address the risk of data loss associated with recording a larger file (*i.e.*, more data elements or data elements producing larger volumes of data, such as longitudinal acceleration). In explaining the risk of data loss, we first explain how the EDR records data. An EDR must continuously capture pre-crash data, and it must also capture crash data to determine if the trigger threshold has been met. If we required acceleration data, EDRs would be required to capture up to 150 milliseconds of data, which equates to 76 data points. However, if we required delta-V data, EDRs would only need to collect about 26 data points, which would correspondingly reduce the amount of data to capture this element. Once the threshold has been met or exceeded, the remainder of the data set must be captured and then recorded. The actual recording operation takes place after the crash event. Severe crashes often interrupt (or destroy) the normal operation of the vehicle's electrical system. Interruption of the vehicle's electrical system may compromise the ability of the EDR to complete capturing and then record data. In the state of current technology, there is a much better chance of capturing and recording a complete file that is smaller rather than larger. Accordingly, we believe it is desirable to keep the file size (*i.e.*, data

elements/volume of data) to a minimum. As the state of technology improves and the cost of microprocessing and memory declines, we foresee the risk of data loss to pose less of a concern.

In deciding to include delta-V in the minimum data set (Table I), we also considered the location of accelerometers. If the accelerometer is located in an area that has some small local movements (often called ringing) as a result of the crash, its acceleration profile will not match that of a rigidly attached accelerometer, producing different maximum deceleration measurements that would not be usable to make assessments for a vehicle's frontal crash stiffness—one of the measurements we were considering when we proposed acceleration as a required element. Our research indicates that, while acceleration profiles are not in good agreement between the EDR's accelerometer and a reference accelerometer, the delta-V measurements in such conditions are reliable.<sup>36</sup>

We have considered the comments asking us to include all directions of acceleration (x, y, and z) in our minimum data set. We believe that such information would be informative; however, we must balance our need against the cost and increased complications with expanding the minimum data set, as discussed above.

The final rule does provide standardization protocols for the acceleration data elements if the manufacturer records them (Table II). Our decision to move longitudinal acceleration from Table I to Table II, as discussed above, rests on our belief that delta-V is sufficient for our present purposes, especially in light of the costs and risk of data loss that we face if we were to require the recording of longitudinal acceleration. We decided

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<sup>36</sup> "Performance of Selected Event Data Recorders," Alope Prasad, NHTSA 2001, available at <http://www-nrd.nhtsa.dot.gov/pdf/nrd-10/EDR/EDR-round-robin-Report.pdf>.

to retain lateral acceleration as a data element to be standardized if recorded in recognition that it is a data element that can provide useful information for crash reconstruction. We also expect lateral acceleration to become more useful as our proposed upgrade to FMVSS No. 214 evolves. Moreover, costs and the risk of data loss pose less of a concern on those manufacturers that have invested in their EDR programs to the point where they are recording longitudinal and lateral acceleration. We expect costs associated with merely standardizing the format of this data already recorded to be minimal.

c. Multiple-event Crashes and the “Multiple-Event” Data Element

In the NPRM, we proposed that the number of crash events be recorded as a data element, which is listed in Table 1 of the NPRM as “Multi-event, number of events (1, 2, 3).” The proposed data element records the number of crash events (up to three events), with a maximum of 5 seconds as the proposed gap between connected events of a crash. Industry commenters disagreed with the NPRM’s requirement to record up to three events—mostly because they believe such a requirement is technologically complex.

According to GM, NHTSA’s proposal did not provide a comprehensive and objective regulatory requirement with respect to multiple-events. GM stated that the final rule should not require EDRs to record data for multiple-impact crashes, but instead should only focus on single-impact events. GM also argued that a regulatory requirement that focuses on recording single events would achieve NHTSA’s regulatory objectives because most crashes involve single events. GM stated its belief that the multiple-event recording requirement is excessive in part because of the amount of buffering and data

processing required to meet a regulatory requirement to record multiple-events could compromise the primary purpose of the module to properly deploy restraint systems and prevent crash injuries. GM urged modification of the NPRM's definition of "event" to reflect this change.

Honda commented that the final rule should clarify an inconsistency in the NPRM related to recording of events in multi-event crashes where the air bag deploys. Honda stated that the NPRM provides that in a situation where the time after a "trigger threshold event" is less than 500 ms, subsequent "event" data would not be captured and recorded in a multi-event crash, even if there is air bag deployment (see definitions in Sec. 563.5). According to Honda, this conflicts with the intent of the data capture provisions in Sec. 563.9(d) of the NPRM. Therefore, Honda recommended that the final rule require, regardless of the time and/or recording status of any "trigger event" as defined in Sec. 563.5, that when air bags deploy, the "event" data should be recorded. Honda's rationale is that such a requirement will help ensure that EDR data will provide a better understanding of the circumstances of crashes that are severe enough to deploy an air bag.

Nissan commented that the three-event requirement is unnecessary and would be expensive and technologically complex to implement. Nissan suggested that the elements related to the three-event requirement be dropped. However, if that requirement is retained, Nissan stated that NHTSA would need to clarify what constitutes a separate event and what combinations of events need to be recorded.

AIAM commented that the recording of three events in a multi-event crash is not current industry practice. Instead that organization suggested that all recording stop after

an event resulting in an air bag deployment. According to AIAM, recording three events, as specified in the NPRM, would be “a major task” and would require additional memory and development of new software algorithms.

Hyundai and Kia expressed concern that the accuracy of acceleration data captured after the first event is uncertain (if a multi-event crash involves two or more events in the same direction) because of the technical limitations of acceleration sensors currently available in the market for air bag systems. Based on this uncertainty, Hyundai and Kia recommended that we not require accurate acceleration data from an event that occurs after the air bag is deployed if this event occurs in the same direction as the previous event. Additionally, Hyundai and Kia suggested that “recording time of longitudinal acceleration . . . be reduced from ‘-0.1 to 0.5 seconds’ to ‘-0.1 to 0.3’ seconds,” arguing that this change would prevent recording overlap with other events and would reduce the implementation cost and time.

Advocates supported the NPRM’s proposal to record multi-event crashes, capturing up to three events, because of the high percentage of multiple-event crashes. However, Advocates asked us to reconsider whether a five second interval from the first triggering event would be sufficient to capture all or most of multi-event crashes.

In light of the comments submitted on the multiple-event recording data element, we have decided to reduce the number of events to be recorded in a crash from three to two. We also decided to change the logic for capturing up to 2 events by limiting the capture to a single event in the event of a crash where an inflatable restraint is deployed. As a result, we have modified the data element to reflect up to 2 events in a crash,

dropped the data element that recorded the time associated with event 3, and retained the data element that records the time between event 1 and event 2.

We believe that reducing the multiple-event recording requirement to two events is appropriate considering the number of crashes that occur with two events or less. We believe the revision will also alleviate the additional cost and complications associated with recording up to 3 events. The following discussion explains our approach and rationale in further detail.

Because we have, in effect, redefined an “event” as a change in delta-V that equals or exceeds 8 km/h (5 mph) in a 150 ms period, we needed to update our analysis in terms of what events are considered to be non-trivial, as would justify capture and recording by the EDR (*i.e.*, events meeting the trigger threshold). In the NPRM, we proposed that EDRs must be capable of recording up to three events. In light of these changes, the agency re-examined the issue of multi-event recording in developing this final rule.

NHTSA conducted an analysis using 2002 and 2003 National Automotive Sampling System/Crashworthiness Data System (NASS/CDS) data to determine the distribution of vehicles in multi-event crashes. This analysis provides a weighted annual estimate of the number of vehicles in crashes involving multiple events. The data from these two years reveal that approximately 3.2 million light vehicles in the United States were towed each year. Of these vehicles, about 2.25 million are involved in single-event crashes, and 0.85 million are involved in multi-event crashes. (The remaining 0.1 million had no event, suffered damage resulting strictly from rollover, or experienced some other non-collision event.)

Our analysis revealed that delta-V data are missing for at least one event for many of the 0.85 million vehicles involved in multi-event crashes. To avoid underestimating the frequency of vehicles involved in multi-event crashes, the analysis accounted for unknown delta-V data by adjusting the raw weighted estimate by the ratio of the number of relevant crashes to the number of crashes without any missing delta-V data. We assumed that the vehicles in multi-event crashes with unknown delta-V event data have crash severities similar to those in known delta-V crash events. Of the 0.85 million vehicles in multi-event crashes annually, 175,000 vehicles have delta-V data for all events, while the remaining 684,000 vehicles have at least one event with missing delta-V data. The total annual estimate of vehicles in multi-event crashes where at least two of the events have non-trivial delta-Vs is 587,000. The other 2.61 million vehicles were involved in crashes that had no more than one non-trivial impact.

We have further estimated the distribution of vehicles experiencing exactly two non-trivial events, as compared to those experiencing three or more non-trivial events. (Again, this analysis uses the distributions established from the vehicles with known delta-V data to forecast the annual estimate.) Our analysis indicates that approximately 580,000 vehicles per year are involved in multi-event crashes with exactly two non-trivial events. The annual estimate of vehicles involved in crashes with three or more events is 6,000.

In the final rule, we have also made a change in the data capture and recording strategy, and further allowed an exception to the multiple-event requirement. For each crash that has an event that exceeds the trigger threshold, the EDR records data, replacing data from the previously recorded event(s), up to two events. Typically, up to two events

will be recorded. In those crashes where an air bag is deployed during one of the two events of the crash, only the event associated with the air bag deployment must be recorded. This exception is intended to ensure that a vehicle's microprocessors do not become overburdened during the critical period when the vehicle is deciding whether to deploy the air bag. (We note that while not required to do so, an EDR may capture multi-event data during a crash that involves an air bag deployment.)

This exception in the capture/recording strategy may reduce the number of multi-event recordings (*i.e.*, by the number associated with air bag deployments). Our analysis indicates that about 58 percent of the time when a vehicle is involved in exactly two non-trivial events, the air bags are not involved. (The ratio is about the same for vehicles experiencing one non-trivial event, and it is somewhat lower for vehicles experiencing three or more non-trivial events.) This estimate is based on frontal air bag deployment data. Factoring in these vehicles, the annual estimate of vehicles involved in crashes with two or more non-trivial events for which the EDR would need to capture and record data is reduced under the final rule, taking into account the air bag deployment crashes. We estimate that annually, about 340,000 vehicles would be involved in recordable non-air bag-deployment crashes with two or more non-trivial events.

For these reasons, NHTSA has decided to maintain the multi-event recording requirement in the final rule, but to reduce the number of events from three to two.

Our modification from recording three events to two events will significantly reduce the amount of memory required, thereby addressing commenters concerns about memory and the multiple-event recording requirement. With regard to Hyundai's and Kia's concerns about the accuracy of acceleration and recording time, we believe that this

issue is no longer relevant since we are no longer including acceleration in the minimum set of required data elements.

In response to the comments asking us to clarify the multiple-event requirements, we will briefly discuss multiple-event recording. An event is defined as an impact or other physical occurrence that meets the trigger threshold—5 mph (8 kph) delta-V within a 0.150-second period. When this occurs, the pre-crash data are frozen and the crash data are collected from time zero to 0.3 seconds.

If the first event is the deployment of an inflatable restraint, these data are recorded to memory and the file is locked. No further analyses (*i.e.*, looking for subsequent triggers) or recording occurs. If there is no inflatable restraint deployment during the first event, the data are captured and stored in a similar manner. There are several possibilities that could occur after this event

First, no subsequent event occurs. In this case, the first event ends at 300 ms after time zero.

Second, a subsequent event occurs without an air bag deployment. In this case, the first event ends at 300 ms and within 5 seconds of time zero (event 1) another event is detected. These data are then captured and recorded in a separate file, resulting in a two-event recording.

Third, a subsequent event occurs where the second trigger is detected during the first event, that is, during the 300 ms data collection period of the first event. It is possible that a second impact in a multi-impact crash could occur while the first event is still being captured and recorded. In this case, the time between events could be less than 300 ms. This could occur in cases where the first event triggered quickly, such that the

delta-V threshold (5 mph) was exceeded in just a few milliseconds, but it is also possible that it could occur anytime a subsequent time zero is detected before the end of the first event. In these cases, the second event would start the detection of the second trigger. It is the agency's intent that, in these cases, the EDR capture separate events and not different portions of a single event. Therefore, a method is needed to establish the end of the first event, so the agency has turned to SAE J1698-1, Vehicle Event Data Interface – Output Data Definition (March 2005), in resolving this issue. SAE 1698-1 defines the end of an event as the moment at which the cumulative delta-V within a 20 ms time period drops to 0.8 km/h (0.5 mph) or less. Thus, in this special case, the EDR would not start looking for a new trigger threshold until the first event has ended. The pre-crash data could be the same for both events.

Fourth, a subsequent event occurs with air bag deployment in cases where there is a pre-event (meets trigger threshold of delta-V greater than 5 mph) without an air bag deployment. The file associated with the air bag must be recorded and locked. The pre-air bag event may be recorded, but it is not necessary. We do not want the pre-crash event to affect the decision-making of the microprocessor, which has the primary function of analyzing the crash and properly deploying the air bags.

d. Sampling Rates and Recording Intervals for Required Data Elements

The NPRM specified sampling rates and recording intervals for data elements in order to standardize EDR data across the entire spectrum of new makes and models of light vehicles. NHTSA received comments ranging from general concerns about the

frequency of the rates and intervals to detailed comments concerning sampling rates and recording intervals.

GM, Ford, DaimlerChrysler, and Toyota commented that the sampling rates and durations proposed in the NPRM are excessive in that the large number of data elements and prolonged recording time at a very high frequency rate will require memory storage capacity 5-10 times greater than the current memory capacity provided by manufacturers that have installed EDRs. These manufacturers further commented that recording data in the manner specified in the NPRM will increase the workload for the processor, which would most likely require an upgrade for the microprocessor. These system upgrades would add to the cost of complying with the data requirements.<sup>37</sup>

To address the memory storage capacity and microprocessor issues, GM, Ford, DaimlerChrysler, and Toyota recommended deleting several elements, as mentioned above, and provided alternative recording intervals/times and sample rates for specific data elements. In some instances, the alternative recording intervals/times and sample rates were suggested because their field experience shows no benefit to an accident reconstructionist for the additional recording time.<sup>38</sup>

Other commenters suggested technical changes to the recording times/intervals and sample rates for other reasons. Hyundai and Kia requested that NHTSA perform a cost/benefit analysis for the data elements with recording intervals from 150 ms to 500 ms after an event. They see little degradation in the quality of data captured with the

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<sup>37</sup> The commenters did not provide a specific cost estimate.

<sup>38</sup> These elements include "speed, vehicle indicated," "engine throttle, % full," and "service brake". For these elements, Ford, DaimlerChrysler, and Toyota recommended reducing the recording interval/time by three seconds from "(-)8 to 0 sec" (as proposed in the NPRM) to "(-)5 to 0 sec." GM proposed "-2.5 to 0.5 sec." All four commenters recommended reducing the sample rate per second from "2" (as proposed in the NPRM) to "1" for these data elements.

shorter time period while the costs of implementation would be considerably higher with the 500 ms requirement.

Delphi recommended that NHTSA change the recording period for all acceleration data from 500 ms after an event to only 200 ms after an event. Delphi recommended that NHTSA make the other related changes necessary to reflect this change in recording period (*e.g.*, allowing the recorder to retrigger after 200 ms instead of after 500 ms).

Honda recommended changing the “vehicle roll angle” measurement time interval from “-1.0 to 6.0 sec” to “-1.0 to 0.5 sec.” Honda’s rationale is that because the proposed 563.9(a) specified that the EDR must collect data for an event starting at time zero and ending 500 ms later, the interval for vehicle roll angle must be adjusted to the required measurement time of 0.5 sec of a multi-crash event. Honda also stated that the time of air bag deployment should be recorded during 0 to 500 ms to adjust to the acceleration measurement time. Honda commented that an air bag deployment event cannot be recorded separately while the acceleration after a trigger event is being recorded.

While many automakers advocated for reducing the period of post-crash recording, some advocacy groups, including Public Citizen, suggested the opposite. Public Citizen stated that NHTSA should require a longer period of post-crash recording once the trigger threshold is met. Public Citizen’s rationale is that the NPRM’s current time limit (0.5 second) would not record most data from rollover crashes (which typically last several seconds) or important post-crash information for non-rollover crashes. That organization also urged NHTSA to modify the “safety belt status” data element to record

from one second prior to an event to one second after an event. Public Citizen reasoned that this timing would allow crash investigators to determine whether the belt failed during a crash or whether the occupant intentionally unbuckled it after a crash.

Advocates offered no specific technical comments for the EDR recording times and sampling rates. However, Advocates commented that the time durations must be sufficient to record the full event and provide adequate data, especially in rollover crashes. Advocates did acknowledge that there may be technological impediments or prohibitive costs to capturing data for the entire duration of full crash events. On the other hand, IIHS indicated manufacturers may choose to forego or delay installing EDR features because of the significant costs that may be involved in recording extensive information on rollover angle, antilock brake activity, and stability control status. IIHS, for example, questioned the value of recording vehicle roll angle every 100 ms for one second before a crash.

After carefully considering the comments, we have modified the recording intervals for a number of data elements. We made three basic modifications: (1) for the delta-V and acceleration data elements, we have changed the recording time from -0.1 to 500 ms, as proposed, to 0 to 250 ms; (2) we changed the recording time from -8.0 to 0 sec, as proposed, to -5.0 to 0 sec for the following data elements: “speed, vehicle indicated,” “engine throttle, % full,” “service brake, on/off,” “engine, rpm,” “ABS activity,” “stability control,” and “steering input”; (3) we changed the recording time for “vehicle roll angle” from -1.0 to 6 sec, as proposed, to -1.0 to 0.5 sec. Data sample rates in the final rule are unchanged from our proposal.

Regarding the first modification, we changed the recording time for the delta-V and acceleration elements based on the comments. We agree with the commenters that recording these data elements for 500 ms challenges the microprocessing system, raising the risk of losing a complete crash record. We also believe that a lesser recording time would still be sufficient for our purposes. Further research conducted after our proposal indicates that the maximum delta-V will be reported 95% percent of the time with a recording time of 250 ms.<sup>39</sup> Our research also reveals that a 150 ms recording duration would not be sufficient.<sup>40</sup> Based upon this information, we believe that a 250 ms recording time is sufficient for our purposes and also reduces the risk of losing EDR data because of a system malfunction.

We also reduced the recording time for several data elements from –8.0 to 0 seconds to –5.0 to 0 seconds. We believe that this modification will further lessen the amount of data written to memory by the EDR and reduce the workload for the microprocessor. We do not believe that, for our purposes, the quality of data will significantly be reduced by changing the recording time.

We have considered the comments concerning the recording interval for “vehicle roll angle.” In the NPRM, we proposed a recording interval from –1.0 to 6.0 seconds to allow for sufficient time to monitor the vehicle’s roll angle after the crash event. We reasoned that recording up to 6 seconds after the crash event could be necessary because in cases where a frontal crash occurs, the vehicle might continue along some path for a second or more before it veers off the road and possibly overturns. We also considered SAE J1698-1, which classifies vehicle roll angle to be a high frequency data type with a

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<sup>39</sup> Niehoff, Peter, *et al*, Evaluation of Event Data Recorders in Full Systems Crash Tests, ESV Paper No. 05-0271 (2005).

<sup>40</sup> *Id.*

recording interval from –300 ms up to 750 ms, and IEEE P1616, which specifies that “roll rate” and “rollover” data elements should be collected between –8 to 5 seconds.

After carefully considering the comments concerning “vehicle roll angle,” we have modified the final rule by removing the specified recording interval for “vehicle roll angle.” We encourage vehicle manufacturers to use SAE J1698-1 and IEEE P1616 as a guideline for recording this data element. However, we have not included a specific recording interval in the final rule. We are providing flexibility to the automobile manufacturers that choose to record this data element. If we required a longer recording interval, it is possible that the costs would discourage automobile manufacturers from recording the data element. On the other hand, if we specified a shorter recording interval, we may not be provided with sufficient data for many crashes with subsequent overturns.

### 3. EDR Data Standardization (Format) Requirements

The NPRM included a proposed section 563.8, which would require that the data elements listed in Tables I and II of the NPRM, be recorded in “accordance with the range, accuracy, precision<sup>41</sup>, and filter class specified in Table III.” GM, DaimlerChrysler, Ford, and Toyota submitted comments stating that these specifications (*i.e.*, Table III of the NPRM) should not be included in the final rule. Other commenters suggested that the final rule should require data standardization and provided suggestions. Finally, GM, Ford, DaimlerChrysler, Toyota, Honda, and Delphi also made specific comments regarding the range, accuracy, and precision of acceleration data.

GM believes that these parameters are beyond what is currently utilized in state-of-the-art EDRs to detect crashes, make deployment decisions, and record crash severity

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<sup>41</sup> This term was changed to “resolution” in the final rule. This change is technical, not substantive.

data, and GM argued that such provisions are not necessary to achieve the rule's safety benefits. DaimlerChrysler, Ford and Toyota provided different reasoning to reach the same conclusion as GM. They stated that NHTSA intended to use present design and performance capabilities of existing sensors, rather than to set new design and performance requirements. However, the current specification in paragraph 563.8 would run counter to that intent. Thus, DaimlerChrysler, Ford, and Toyota recommended that the range, accuracy, precision, and filter class be determined by the manufacturer for optimal restraint system performance, rather than EDR performance.

Nissan, Mitsubishi, and ATA suggested that the final rule use the SAE J1698 resolution attribute instead of requiring specific levels of accuracy and precision. Nissan submitted a comment similar to other automakers, stating that the accuracy and precision standards do not correspond with current industry practice. If these accuracy and precision standards are retained, Nissan suggested that NHTSA should revise these standards to reflect present sensor performance specifications of each system feeding the EDR. In addition to Nissan, Mitsubishi requested that NHTSA consider SAE J1698 for the common output format for event data. Mitsubishi stated that many automobile manufacturers participated in creation of this standard to specify optimal standard output formats. Similarly, the ATA commented that it supports the use of standards developed by the SAE. As for filtering, Nissan questioned the rationale for requiring data to be filtered in accordance with SAE J211-1 before recording, instead of permitting filtering after data retrieval.

Mr. Kast commented that, based on his studies of EDR data, some of the data elements are not recorded at the necessary resolution, accuracy, or duration to be of use

(*i.e.*, brake lights, acceleration, change of speed (computed delta-V), speed-vehicle indicated). He included a technical discussion of each element and the parameters necessary to acquire useful data.

The ATA commented that data reliability must be assured. Specifically, ATA is concerned that inaccurate or erroneous data could result in incorrect assessments of the causes of accidents and of liability. ATA indicated that NHTSA should validate the technological ability to meet the requirements as defined in Table III prior to any rulemaking. ATA questioned whether the data elements would be part of a certification process for a specified useful life or warranty period and whether service schedules would include the EDR.

Several automobile manufacturers stated that the NPRM's required range and precision for accelerometers exceeds industry standards and are not currently commercially available. GM stated that the NPRM's requirements would have the effect of doubling the range and that increasing the accuracy would add significant costs not comprehended in the agency's cost estimates. GM currently utilizes +/- 50 G accelerometers with an 8% accuracy. Ford, DaimlerChrysler, and Toyota also stated that accelerometers, as proposed, are not the industry norm, are not commercially available, and would increase the cost of compliance.

Honda stated that the accuracy of mass-produced accelerometers used in motor vehicles can be near +/-10%. Honda requested that the final rule permit use of current G-sensors, which have ranges of 30 G to 50 G instead of 100 G. Honda argued that the NPRM had suggested these types of added costs were to be avoided. Honda also sought clarification as to whether “. . . it is correct to say that the accuracy in Table III means

only the recording error between the output value of each sensor to the recording unit and the input value to the retrieval tools?”

Delphi made similar comments, stating that the NPRM’s range and precision parameters for the longitudinal and lateral acceleration data elements are “substantially different than [those] typically chosen for most crash sensing systems today.” It stated that it would require manufacturers to change existing systems, potentially resulting in “sub-optimized system performance,” to add separate sensors, resulting in increased costs, or require manufacturers to choose not to install an EDR. Delphi recommended that the normal acceleration element should not have fixed parameters for range, accuracy, precision, and sample rate. Instead, Delphi suggested that the value of those parameters should be reported as elements of the data record.

Delphi commented that the accuracy requirements for accelerometers should allow a margin for sources of error attributable to other factors other than the accelerometers (*e.g.*, alignment tolerances between the axes of the accelerometer and the vehicle). Delphi recommended that the accuracy requirement for longitudinal and lateral acceleration should be no less than +/- 6 percent. Delphi recommended minimum limits of +/- 50 G and 1 G be placed on the range and precision parameters for the longitudinal and lateral acceleration data elements, respectively and that the available range and precision of the sensors be reported as data elements.

After carefully considering the comments, we have made a number of modifications to the range and accuracy requirements for the acceleration data elements. For these data elements, we proposed a range of -100 G to +100 G and an accuracy of +/- 1 G. In the final rule, the range and accuracy for the acceleration data elements is -50 G

to +50 G with an accuracy of +/- 5 percent. Based on our research<sup>42</sup> and the comments, we believe that the new range and accuracy requirements are more realistic based upon what we now understand to be commercially available for vehicle production. Our research also leads us to believe that EDRs with accelerometers designed to meet these requirements will be sufficient to analyze safety equipment performance, a primary objective of this final rule.

We have considered the recommendation off Mitsubishi and ATA that the final rule should use the SAE J1698 resolution attribute instead of requiring specific levels of accuracy and precision. After evaluating SAE J1698, we have concluded that the values in our proposal are nearly identical to or are less stringent than those found in SAE J1698. Thus, if an original equipment manufacturer were to use the SAE J1698 data resolution guidelines, they would be in compliance with the requirements of Table III.

#### **4. EDR Data Retrieval and Whether to Require a Standardized Data Retrieval Tool/Universal Interface**

In the NPRM, we proposed requirements for EDR data retrieval (*i.e.*, post-crash access to stored data). Under the NPRM's regulatory text (Sec. 563.12), the manufacturer of a motor vehicle equipped with an EDR would be required to furnish non-proprietary technical specifications at a level of detail sufficient to permit companies that manufacture diagnostic tools to develop and build a device capable of accessing, retrieving, interpreting, and converting the data stored in the EDR. The language would have required a manufacturer to submit the non-proprietary technical specifications to NHTSA. We also requested comments on alternative approaches.

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<sup>42</sup> Niehoff, Peter, et al, Evaluation of Event Data Recorders in Full Systems Crash Tests, ESV Paper No. 05-0271 (2005).

Some commenters asked NHTSA to require standardization of data retrieval methods, arguing that a standardized data retrieval protocol will assist first responders and/or reduce cost. Other commenters suggested that we consider another approach, other than furnishing non-proprietary technical specifications to NHTSA, to achieve the goal of making EDR retrieval tools available to crash investigators.

SISC, ATA, SEMA, Advocates, and AAA recommended standardized retrieval methods so that emergency and first responder personnel can have quick and easy access to EDR data. SISC requested a standardized interface. SISC also believes that that retrieval of crash data in rural areas would be facilitated by the lower costs and easier access resulting from a single interface. For example, SISC suggested the U.S. Environmental Protection Agency (EPA) standards for onboard diagnostics of emission system performance. SEMA argued for a standardized retrieval method but indicated that the data should not be vehicle-specific.

AAA encouraged first responder access to data, but through ACN. AAA commented that transferal of accurate location coordinates, speed estimates, air bag deployment and other medically relevant information to EMTs should be encouraged through ACN. To that end, AAA commented that it supports NHTSA's proposal requiring manufacturers "to provide sufficient technical detail to companies that manufacture commercial crash data retrieval systems."

Commenters offered other arguments for standardizing EDR data retrieval, including minimizing the "tool-up" costs and the inconvenience of having different types of data retrieval methods for each automaker. Three commenters referenced the On-

Board Diagnostics (OBD) systems, requesting or opposing similar protocols for the EDR rule.

PCIAA stated that the regulatory objective should be to avoid making EDR information access/retrieval more expensive and inconvenient than necessary. PCIAA commented that the failure to require standardization of the data retrieval method may preclude or diminish the opportunity for broader applications of the technology by the public and private sector. PCIAA further commented that NHTSA should adopt a standard in its final rule that minimizes new tool-up and licensing costs for the service and repair sectors. Because dealership service centers and independent automotive repair businesses have made significant investments in recent years in scanner equipment to download or read data from the OBD electronic interface point, PCIAA urged NHTSA to consider requiring data retrieval through the OBD.

NADA and SEMA made similar comments, asking NHTSA to consider setting standards for data retrieval communications protocols, connectors, and tools, similar to those of OBD systems. Additionally, SEMA argued that data access must include all data stored in the EDR, not just NHTSA-mandated data. That organization argued that the vehicle owner should be able to access all data stored in the EDR.

On the other hand, Injury Sciences is opposed to relying on OBD protocols. Injury Sciences is opposed to relying on the connector as a means of retrieval because it asserts that data collection via the OBD works only if the electrical systems are intact. It argues that NHTSA should articulate retrieval requirements in the numerous instances when electrical systems are compromised and the extraction of data can only be accomplished from connecting directly to the device storing the information.

Simplifying retrieval methods and minimizing costs were two common reasons suggested by commenters for standardizing EDR data retrieval, with some commenters providing technical suggestions for EDR data standardization. Public Citizen stated that NHTSA should standardize extraction protocols, technology, and interface location to ensure that data can be easily and quickly retrieved. Public Citizen believes that these steps would reduce overall costs. Advocates commented that the rule should require a uniform architecture for data retrieval. Advocates supported standardizing the retrieval method, citing higher costs for those retrieving data.

Garthe Associates commented that the rule should require a uniform, non-contact retrieval method to rapidly and reliably download data. Garthe Associates suggested the use of radio frequency identification (RFID) or infrared (IR) for data retrieval. Garthe Associates also suggested specifications for the retrieval technology. Garthe Associates indicated numerous benefits of these technologies, including rapid access to crash data by EMS personnel. According to Garthe Associates, the estimated cost would be about \$1/car.

Mr. Fink stated that the rule should require standard software for downloading EDR data. He also commented that the same software and hardware should be able to access data from vehicle EDRs and commercial vehicle engine control modules. EPIC commented that the rule should address real-time data collection, which will become widely prevalent well before the proposed effective date for the rule.

GM asked NHTSA to alter its proposal for data retrieval. In the NPRM, NHTSA proposed that each vehicle manufacturer must furnish non-proprietary technical specifications at a level of detail sufficient to permit companies that manufacture

diagnostic tools to develop and build a device capable of accessing, retrieving, interpreting, and converting the data stored in the EDR. GM recommended that we instead allow manufacturers to enter into a licensing agreement or provide other means for the tool(s) required for retrieving the EDR data. GM argued that aspects of EDR designs are often refined up to, and sometimes after, the start of vehicle production. GM argues that the provision would (1) potentially facilitate tampering with EDR data, (2) be impractical to accomplish at 90 days before the start of production, (3) result in a significant paperwork burden, (4) be unnecessary to satisfy a limited market for EDR download devices, and (5) require manufacturers to disclose proprietary information.

Comments provided by DaimlerChrysler, Ford and Toyota were nearly identical to those of GM, except that they recommended that each manufacturer be required to certify to NHTSA that it has licensed the development of a download tool for each applicable vehicle. This is in contrast to GM, which was also open to other means of ensuring that a retrieval tool is available.

SEMA commented that NHTSA should require manufacturers to provide information necessary for third parties to design and develop data access tools and should require the manufacturer to make the tools available to the public for a reasonable price and in a timely fashion.

Ford stated that NHTSA should promulgate requirements that effectively prohibit tampering with EDRs and EDR data, because the value of EDRs is predicated upon the integrity of the data they contain.

Honda commented that the NPRM's proposal to require the submission of data retrieval information no later than 90 days prior to the start of production of EDR-

equipped vehicles is problematic. Honda argues that the modification or addition of information may become necessary near the start of production due to the detection of an inaccuracy or technical issue. Honda argued that under NHTSA's current proposal, a manufacturer would have to provide NHTSA with updated information and wait 90 days before it could start production with the modified EDR. Honda would like to be able to change the EDR specifications as soon as possible, and to produce vehicles equipped with the modified EDR as soon as possible. Therefore, Honda recommended that the final rule permit the submission of updated retrieval information as soon as it can be provided and for production of vehicles with the modified EDR to occur as soon as possible thereafter.

ATA commented that specifications for the EDR interface should be provided to NHTSA but should not be part of the public domain. The ATA commented that a mandated, standard interface would threaten privacy rights. However, retrieval of data should be brief and should not impede the continued utilization, maintenance or repair of the subject vehicle.

More than one commenter recommended changing the phrase in the "scope" section of the regulatory text from "it [the NPRM] also specifies requirements for vehicle manufacturers to make publicly available information that would enable crash investigators and researchers to retrieve data from EDRs" to "it also specifies requirements for vehicle manufacturers to make commercially available tools and/or methods that enable crash investigators and researchers to retrieve data from EDRs." This change refers to the above comments that automobile manufacturers should be only required to make retrieval tools commercially available instead of having to furnish non-

proprietary technical specifications of the retrieval tools to the agency, as proposed in the NPRM.

We have carefully considered the comments and recommended alternatives on this issue, and determined that an alternative approach will better meet the goal of ensuring that crash investigators are able to retrieve data from EDRs. We believe that requiring manufacturers to ensure by licensing agreement or other means that retrieval tools are commercially available will be sufficient for the purposes of this final rule. We believe that this revised approach will resolve concerns about the release of proprietary information. It will also result in less paperwork costs for the manufacturers.

Under our revised approach, we are no longer following the NPRM's proposed requirement for vehicle manufacturers to submit information to the public docket to allow third parties to manufacture a retrieval tool for EDR data. Instead, the final rule requires manufacturers and/or their licensees to make these tools commercially available. We expect that these retrieval tools will be accessible (*i.e.*, for sale) for a reasonable period of time. That is, we anticipate that: (1) retrieval tools will be available for several years after the vehicle whose EDR data it is designed to read has been sold, or (2) the capability to read EDR data for such vehicles will be integrated into a newer version of the tool, thereby making the new retrieval tool "backward-compatible." (We note that current download tools designed for reading vehicle emissions-related data or engine-control data have been designed to be backward-compatible, as has the Vetronix Crash Data Retrieval (CDR) tool for reading EDR data.) We anticipate that the movement toward backward-compatibility will continue and that there will be no issues associated with downloading

EDR data from older vehicles covered by the EDR regulation set forth in this final rule. If this trend does not continue, the agency will consider appropriate action, as necessary.

We are requiring the tool(s) to be commercially available not later than 90 days after the first sale of the motor vehicle for purposes other than resale. This addresses the timing concerns raised by commenters. Given that the retrieval tools will be commercially available, we do not believe it will be difficult to obtain information about how to obtain them.

We have considered the comments asking us to require a standardized retrieval tool (or standardized retrieval software and hardware). In consideration of this issue, we assessed the comments concerning whether we should require a retrieval system similar to or utilizing the EPA/OBD protocols (68 FR 38427, June 27, 2003). However, such a requirement is beyond the scope of this rulemaking, since we did not propose to require a uniform retrieval tool in the NPRM. We do not believe that a uniform retrieval tool is necessary to achieve the purposes of this rulemaking. We believe that intended users will be able to access EDR data by our requiring manufacturers to ensure that retrieval tools are commercially available.

We recognize, however, that there are potential benefits to standardizing the means of downloading EDR data. This could facilitate the future use of EDRs by first responders and possibly result in lower costs. This is an area that could potentially be addressed by voluntary organizations such as SAE and IEEE.

We have considered NADA's and SEMA's comments that we should require access to all data stored in the EDR. However, we believe that it would not be appropriate to mandate the processing and storage for data that we currently have

determined are not necessary for our goals of analyzing the performance of safety equipment, improving crash reconstruction, and enabling ACN.

Additionally, we did not propose to require that vehicle owners have the ability of directly accessing EDR data. However, the requirement that vehicle manufacturers ensure that retrieval tools are commercially available should make it easier for vehicle owners to indirectly access stored EDR data.

We considered the comments by Garthe and Siemens regarding a standardized, non-contact retrieval method. However, we did not propose the implementation of such technology in the NPRM, and will not include it in this final rule. Requiring automobile manufacturers to install a non-contact retrieval method is not necessary to achieve our stated purposes for this rulemaking.

We have considered ATA's comments regarding access to EDR data, and we address this issue in our section on "Privacy Issues." With regard to ATA's comments on mandating for brief retrieval we presently have not gathered sufficient information to mandate the brevity with which EDR data can be retrieved.

We have considered the comments recommending that we address potential tampering with EDRs. We currently do not have information that leads us to believe that tampering with EDRs is a problem that necessitates us to develop requirements in this area. We may revisit this issue if we find that EDR tampering becomes a problem. However, we do believe one aspect of EDR design will discourage tampering. We are requiring that the captured file be locked for crashes that involve air bags. The locked file will be preserved and the file cannot be overwritten.

## 5. **EDR Survivability and Crash Test Performance Requirements**

In the NPRM, we stated that if EDRs are to provide useful information, they must function properly during a crash, and that data must survive the crash. Accordingly, we proposed to require that EDRs meet specified requirements during and after the crash tests in FMVSS Nos. 208, 214, and 301. We also proposed that the data must be retrievable for not less than 30 days after the test and without external power. We chose not to propose more extensive survivability requirements, such as requiring EDRs to survive extreme crashes, fire, or fluid immersion.

GM, DaimlerChrysler, Ford, Toyota, Nissan, and AIAM argued that in order to test for EDR survivability, as proposed in the NPRM, vehicles would have to be tested with engines running and various vehicle systems activated, presenting a danger to test personnel. Such tests also risk damaging test facilities, instrumentation, and photographic equipment resulting from fuel, oil, and/or battery fluid spillage.

To solve this perceived problem, GM, DaimlerChrysler, Ford, and Toyota proposed an alternative approach to EDR crash survivability (*i.e.*, a simulated laboratory test to verify EDR recording function and certification by engineering analysis to ensure sufficient energy reserve).<sup>43</sup> According to the four commenters, the NPRM's current

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<sup>43</sup> Specifically, GM recommended replacing the proposed language in paragraph 563.10, Crash Test Performance and Survivability, with the following language:

The data elements required by sec. 563.7 must be recorded so that they can be downloaded in the format specified by sec. 563.8; exist at the completion of the simulated test, and be retrievable by the methodology specified by the vehicle manufacturer under sec. 563.12 for not less than 30 days after the simulated test, and the "complete data recorded" element must read "yes" after the test. A simulated test for the purposes of this subsection consists of laboratory methods to provide data bus input representative of FMVSS [Nos.] 208 and 214 crash tests to the vehicle data bus, so that the EDR recording function can be verified. For those data elements not specified by FMVSS [Nos.] 208 and 214 (*i.e.*, throttle angle, braking input, etc.), manufacturers will furnish simulated signals. In addition, manufacturers must certify through engineering analysis or other means that sufficient energy reserve exists in the subject module to ensure that all design-intended functions, including the deployment of restraint system components and the complete recording of EDR data elements as specified by

dynamic testing requirements for EDRs would greatly increase testing costs. GM, DaimlerChrysler, Ford, and Toyota also argued that the crash test provisions would not fulfill their intended purpose and that the provisions are unnecessary since the EDR function is typically co-located in the restraint control module.

Nissan stated that the NPRM's proposed regulatory text needs to be amended to reflect that engine RPM and throttle information will not be available in crash tests, which are performed without fuel. AIAM recommended clarifying the rule to indicate that EDR performance does not require the engine to be running and that, as a result, some data elements may not be recorded.

GM, DaimlerChrysler, Ford, Toyota commented that storing crashed vehicles for 30 days following a test to ensure retrievability of data is impractical and unnecessary. These commenters stated that it is unreasonable to require data to be retrievable without external battery supply for 30 days, because current EDRs use external battery supplies to retrieve post-crash data. According to the commenters, the NPRM's requirements would necessitate adding a battery to the module, which would add significant cost and risk damage to the module circuitry due to electrolyte leakage. They also argued that this requirement for 30-day retrievability is unnecessary to meet the safety purposes of furnishing additional data to aid in crash investigations.

AIAM commented that the proposed regulatory text is not clear as to whether data must be retrievable without external power for up to 30 days. AIAM suggested that the

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this regulation, are fully supported in the event of power loss to the module from the vehicle's battery supply at any point following time zero, as defined by this regulation.

final rule should be clarified to require the EDR to store data without external power for up to 30 days but to permit an external power source for data retrieval.

Nissan sought clarification for two issues related to survivability: (1) whether an alternate power source would be required to ensure that the EDR is able to record up to 11 seconds of post-crash data; and (2) whether sensors would be expected to survive crashes to ensure delivery of data to the EDR. Mitsubishi stated that the final rule should not require data survivability in cases where there is a cut-off in the power supply or destruction of the electronic control unit. Mitsubishi argued that it is not technically feasible to require data recording if power is no longer directly supplied to the ECU.

EPIC and the ATA made general comments regarding the survivability of EDRs. EPIC commented that EDR reliability is essential, ensuring that proper functioning of EDR systems becomes more critical as third parties (*e.g.*, insurance companies and prosecutors) are provided access to EDR data. EPIC expressed concern that the level of survivability called for in the NPRM may not be sufficient to ensure reliable data. EPIC suggested text for the owner's manual encouraging owners to have the EDR inspected after a crash. ATA commented that EDRs must function properly during and after the specified crash tests.

Several commenters gave specific suggestions for crash survivability. NADA commented that the rule should take into account EDR reparability and restoration. Advocates commented that the rule should require the EDR to be located in the passenger compartment in order to increase survivability. Hyundai and Kia commented that the rule should not require repositioning air bag control units to achieve crash survivability unless the repositioning would not adversely affect performance of the systems.

Public Citizen and NTSB commented that the NPRM does not include requirements to ensure that the EDR will survive fire, fluid immersion, and severe crashes. To remedy this perceived deficiency, Public Citizen suggested that EDRs should be subjected to a rollover crash test or that they should meet survivability tests similar to those for airliner and locomotive “black boxes.” Public Citizen stated it is important that EDR data from severe crashes not be lost since such crashes may result in fatalities.

We have carefully considered the comments regarding our testing requirements, and the commenters’ position that requiring dynamic testing, as proposed, would be impracticable. After reviewing the comments from the manufacturers, we disagree that it is impracticable to require basic EDR crash survivability. However, we agree that certain proposed data elements cannot be recorded unless the crash tests are conducted with the engine running and vehicle systems activated. Those data elements are: “Engine RPM” and “Engine Throttle % Full.” At present, FMVSS Nos. 208 and 214 tests are not conducted with the engine running; compliance crash tests are only conducted with battery connected and vehicle systems activated. It was not our intention to propose any testing requirements beyond FMVSS Nos. 208, 214, and 301. Testing with the engine running could create hazardous conditions for the test engineers. Therefore, we agree that “Engine RPM” and “Engine Throttle % Full” cannot be recorded in current crash tests. We have modified the final rule to account for these concerns.

As a result of our analysis of this issue, we have also realized that the braking input data element “service brake on/off” is not specified in FMVSS crash tests. Accordingly, there is no practical way to require manufacturers to test the survivability of

this data element in the FMVSS Nos. 208 and 214 tests. Because there is no current way to test for these there elements, we have modified the final rule accordingly.

After reviewing the comments, we believe that our proposal to require that data elements be retrievable for not less than 30 days after the test and without external power confused some commenters. We intended the proposed requirement that data be retrievable within 30 days without external power to simply mean that the EDR data must be stored and saved in the system for at least 30 days without external power. This was not intended to mean that 30 days after the date of the crash, a crash investigator must be able to download the stored data with a download tool without an external power supply. We have modified the rule to clarify our original intentions.

The final rule also modifies the number of days we will require EDR data to be retrievable after the crash test. Manufacturers have indicated that it usually takes three to seven days to complete the task of crash test data analysis and validation. Based upon this information, we believe that requiring that EDR data be retrievable up to 10 days better reflects the manufacturer's time frame of crash testing. We agree with manufacturers, based on this information, that a 30-day requirement would require additional vehicle storage. Accordingly, we have modified the final rule.

We have also considered the comments regarding EDR survivability in severe crashes or crashes involving fire or fluid immersion; however, we have not changed our position on requiring EDR survivability in these extreme cases. In the NPRM, we stated that EDR data from such crashes would be useful, but we do not have sufficient information to propose survivability requirements that would address such crashes. We also stated that countermeasures that would ensure the survivability of EDR data in fires

might be costly. We have not engaged in research to promulgate survivability requirements for EDR data in these extreme cases. Moreover, we reiterate that the most important benefits of EDR data comes from enabling ACN and composite analysis, and we believe that this final rule will allow researchers to gather sufficient EDR data of statistical significance. We believe that we can meet the objectives of this rulemaking without requiring EDR survivability in extreme crashes.

The comments of Ford, GM, Daimler Chrysler, and Toyota on EDR survivability also recommended deleting subsections (a)-(c) of the proposed regulatory text in Sec. 563.10. These commenters proposed an alternative testing protocol, as discussed above. The manufacturers recommended that a simulated test for data bus input of FMVSS Nos. 208 and 214 be performed at room temperature and that the EDR data be stored at room temperature for 30 days after the tests. We believe that testing requirements, as proposed by the manufacturers, would not be sufficient to meet our basic survivability requirements. These basic survivability requirements in the final rule, which will include the crash tests in FMVSS Nos. 208 and 214, are critical to verifying the performance and accuracy of EDRs because they reflect a controlled crash environment. The simulated tests recommended by the manufacturers for EDR crash survivability do not expose the EDR to a real crash environment. After carefully considering the comments, we believe that ensuring basic EDR survivability by requiring that EDRs meet specified requirements in accordance with FMVSS Nos. 208 and 214 tests remains the best approach to ensure EDR survivability.

We have, however, modified our crash test requirements in light of the comments we have received and in consideration of further information we have obtained. We have

deleted the test associated with FMVSS No. 301. We believe that since most EDRs and other vehicle electrical systems are located in the front part of the vehicle, there is little chance that crash forces to the rear of the vehicle will affect EDR operation. Also, in the FMVSS No. 301 test, no air bags are deployed, so elements related to air bag deployment, that make up the vast majority the data collected by the EDR, are not collected.

Also, we have decided not to require EDRs to meet requirements during crash tests listed under S13 of § 571.208, as we proposed in the NPRM. The tests specified in S13 of § 571.208 are currently subject to be gradually phased-out. After further consideration, we believe that the tests in FMVSS Nos. 208 and 214 will be sufficient to determine EDR survivability.

The agency notes that in some FMVSS No. 214 tests (*i.e.*, for vehicles equipped with only longitudinal delta-V sensors), the longitudinal trigger threshold may not be met because there may not be sufficient delta-V in that direction. For tests conducted pursuant to FMVSS No. 214, we would not expect the vehicle's EDR to record data unless the manufacturer records delta-V, lateral or any air bag (frontal, side, other) deploys.

Our final rule represents tests that we believe will be sufficient to ensure basic EDR survivability. Furthermore, we would like to emphasize that this rule is not requiring any additional crash tests than what is currently required by existing FMVSSs. Tests for EDR crash survivability simply piggyback on test requirements for existing FMVSSs.

## **6. Compliance Date**

In the NPRM, we proposed an effective date of September 1, 2008 for the EDR regulation. We proposed this date with the intention of providing manufacturers adequate lead time to make design changes to their EDRs as part of their regular production cycle, minimizing costs. Almost all of the commenters on this issue believed that the proposed lead time was insufficient and/or would result in unnecessarily high costs, with most suggesting a phase-in beginning in 2008.

GM, Ford, DaimlerChrysler, and Toyota stated if NHTSA issued a final rule for EDRs by September 1, 2005, that is consistent with their recommendations, they could support a four year phase-in beginning September 1, 2008 (10% of vehicle production at year 1, 25% at year 2, 60% at year 3, and 100% at year 4). GM added that if the rule is appreciably different from its recommendations, it might need additional lead time to achieve compliance. GM reasoned that its recommended four-year phase-in would be an “aggressive” schedule because manufacturers would need to redesign, revalidate, and retool virtually every restraint control module, add greater power capability to those modules, and, in many cases, redesign the entire electrical architecture of the vehicle. Ford, DaimlerChrysler, and Toyota commented that their vehicle electrical/electronic architecture designs, which influence EDR feasibility, are presently being committed and cannot be readily changed for vehicles in model years before 2008. Hyundai and Kia commented that a four year phase-in period after the September 1, 2008 start date will be necessary to implement the design changes needed to meet the rule as proposed.

Honda and Mitsubishi recommended that the effective date of the regulation should be no sooner than September 1<sup>st</sup> of the third year after publication of a final rule, with a phase-in period starting on that date. Honda’s rationale is that it would be very

difficult for all manufacturers to simultaneously develop and install compliant EDRs on all models by September 1, 2008.

Subaru commented that the NPRM underestimates the time necessary for implementation. Because Subaru would have to acquire new memory devices, develop backup power sources, and possibly redesign its air bag system, Subaru requested additional lead time and a phase-in schedule for recording certain data elements. Subaru commented that its most state-of-the-art EDR technology is still not mature enough to meet all the proposed requirements. For example, its current air bag sensors do not meet the range and accuracy requirements. Subaru stated that it would probably remove all data recording rather than risk noncompliance if the rule were implemented as proposed.

NADA commented that the rule should adopt a phased-in approach with multiple effective dates requiring that certain data recording capabilities be implemented in the near term, with additional data collection capabilities considered for the longer term. AIAM also commented that additional lead time would be necessary to meet the accuracy and precision requirements as proposed in the NPRM, due to the complexity of the required changes. AIAM suggested that the regulation should take effect with a pared down data set no sooner than the September 1<sup>st</sup>, three years after publication of the final rule and that the regulation should allow for a substantial phase-in period. If the final rule includes the complete set of proposed data elements, a longer lead time would be necessary. SISC commented we should provide sufficient lead time so that manufacturers can transition to multi-axis accelerometers (to ensure collection of lateral acceleration).

We have considered the comments regarding our proposed effective date. Based upon the comments, we have decided to require covered vehicles manufactured on or after September 1, 2010 to comply with the requirements of this final rule. We believe that a lead time in excess of four years, particularly given the revised technical requirements, should prove adequate for all vehicle manufacturers and all vehicle lines, without the need for a phase-in. Vehicle manufacturers may voluntarily comply with the final rule prior to this date.

## **7. Privacy Issues**

The NPRM acknowledged that the recording of information by EDRs raises a number of potential privacy issues. These include the question of who owns the information that has been recorded, the circumstances under which other persons may obtain that information, and the purposes for which those other persons may use that information.

In the NPRM, we stated that our rulemaking would not create any privacy problems. We explained that NHTSA would first obtain permission from the vehicle's owner before using the data. Furthermore, we believe that our objectives can be met by using a very brief snapshot of EDR data surrounding a crash. A broader use of EDR data is not necessary for us to gather information or use EDR data.

Many issues raised by commenters concerning privacy arise from the misconception that EDRs record data for prolonged intervals and personal information to study driver behavior. We noted in the NPRM that we were not proposing to require personal or location identification information. We also explained that we were proposing to standardize EDR data recording for an extremely short duration (*i.e.*, a few

seconds immediately before and after a crash). We did not propose to require data for prolonged recording intervals (*i.e.*, several minutes) or audio/visual data that the public may associate with event data recorders in other modes of transportation, such as flight data recorders or locomotive event recorders. However, we note that another DOT agency, the Federal Motor Carrier Safety Administration (FMCSA), is currently engaged in rulemaking that would facilitate the use a different type of device, known as electronic on-board recorders (EOBRs), for documenting the hours of service of commercial drivers.

In the NPRM, we expressed our sensitivity to privacy concerns, especially in relation to how we handle EDR data. We explained that NHTSA would first obtain a verbal release from the vehicle owner before using the data and fully comply with federal privacy law in its use of the information. Access to EDR data would not be affected by this rulemaking and would continue to be provided in limited situations. Furthermore, the design would most likely preclude public access to the EDR data because the interfaces will likely be located in the vehicle's passenger compartment.

Some commenters argued that public safety outweighs any potential privacy issue or argued that privacy concerns were adequately addressed in the NPRM. Several individuals commented that the government and others will use EDRs to invade privacy. Still others identified privacy issues, but took differing positions on how to and who should address privacy concerns.

GM, Ford, DaimlerChrysler, and Toyota commented that a FMVSS requiring EDR installation would permit the life-saving benefits of EDRs to be properly balanced, at the national level, with societal interests involving privacy and disclosure. These four

commenters argued that unless there is Federal leadership, individual States will continue to regulate in the area of EDR privacy (*e.g.*, through disclosure requirements). According to these automakers, unless this issue is dealt with comprehensively at the Federal level, the result could be a patchwork of State laws that would leave manufacturers in the untenable position of providing unique EDR systems and complying with disclosure language provisions on a State-by-State basis.

EPIC commented that the NPRM inadequately protects the privacy of vehicle owners. According to EPIC, NHTSA has the responsibility to provide basic privacy protections and to clearly communicate to the public how EDR technology will be used. EPIC predicted that failure to do this would expose the rule to legal and political challenges. EPIC suggested that the rule should explicitly recognize the vehicle owner as the owner of EDR data. Moreover, EPIC expressed concern that many EDR systems currently record the complete VIN, including the serial number portion that can be used as a personal identifier.

Several individuals commented on privacy and EDRs. Mr. Crutchfield, whose comments were representative of such commenters, expressed concern regarding the collection and use of EDR data. He argued that EDRs have no safety purpose and will be used to increase government revenues from fines, to increase rates or deny coverage by insurance companies, to justify seizure of private property, and to discriminate against individuals based on race, gender, age, regional origin, and socio-economic status.

Mr. Leggett, an individual, commented on the collection and use of EDR data. He suggested that EDRs should be designed so that vehicle owners can remove them and that there should be no legal penalty for doing so. He also requested that the rule prohibit

the use of EDR data in criminal and civil actions or by insurance companies. Mr. Leggett stated that the rule should specifically state that insurance companies may not require the use of EDRs, to ensure that the use of EDRs remains voluntary.

Mr. King, an individual, commented that the rule should either provide protections for the vehicle owner (the presumptive data owner) or should be delayed until the passage of legislation addressing the issue. Mr. Lashway, along with fifty-two other individuals, commented that EDRs will be used to intrude into the privacy of individuals.

Several commenters indicated that the ability to turn off or disable recording would resolve their concerns. Several also indicated that requiring written consent to acquire the data would be an acceptable solution. Some individuals commented that the EDR data are not reliable enough, thereby creating a danger to individuals confronted with countering the data in court. Commenters also suggested that vehicle purchasers should be provided with adequate notice about EDRs and EDR data at the time of first sale.

SEMA commented that NHTSA should recognize that EDR data is the sole property of the vehicle owner. According to SEMA, a court order or consent of the vehicle owner should be required before EDR data may be released to insurance companies or before vehicle-specific data could be released to law enforcement. SEMA stated that an owner's consent could be provided prospectively via a form at the time of purchase (similar to current contracts for OnStar® subscriptions).

Gelco commented that EDR data may contain personal information and may be easily accessible in the passenger compartment. Therefore, Gelco requested that the final rule explicitly or implicitly limit the access of the owner, lessor, or lessee to the data.

The ATA commented that NHTSA should address privacy issues or coordinate with other appropriate Federal agencies to ensure that such issues are addressed. The ATA stated that it supports the practice of obtaining consent from the vehicle owner and commented that the data should be exempt from the Freedom of Information Act (FOIA). The ATA also expressed concern that a standard interface would make access to EDR data too easily accessible.

Canada Safety Council commented that ownership of EDR data is unclear and that the issue needs to be resolved by legislators in the near future. The Council also commented that under the NPRM, emergency medical service personnel would not have easy access to crash severity data.

Wyle Laboratories commented that NHTSA should consider certification of independent laboratories for EDR data management. Wyle's rationale is that such certification would facilitate data retrieval, validation, and distribution and would help protect the rights of each party with an interest in the data (*e.g.*, manufacturer, owner, insurance carrier, regulator, and law enforcement agency).

The ATA commented that, in contrast to what the NPRM states, much of the data is proprietary to the motor carrier or commercial vehicle operator. The ATA predicted that the volume of data that will be produced would: (1) increase the likelihood that unskilled or untrained personnel would be involved in data analysis; (2) result in a misunderstanding or incorrect interpretation of data; (3) result in a use of erroneous data; and (4) lead to obtaining and using data for purposes other than to improve vehicle, driver, and highway safety. Accordingly, the ATA suggested an appropriate level of

training should be required to access, collect, and protect EDR data, especially considering the types and numbers of events that might warrant event data collection.

AAA commented that law enforcement should have access to the data where a crash results in serious injury or fatality. AAA also commented that rules or laws need to be adopted to prohibit access to EDR data without a court order or permission from the owner. However, AAA did comment that EDR data that cannot be tied to a specific vehicle should be generally available for research purposes.

National Motorists Association commented that it is inappropriate for EDR data to be used for criminal prosecutions and by insurance companies. The Association also expressed concern that EDR data is unreliable, which exacerbates the danger of its use for those purposes.

Advocates commented that resolution of privacy issues should be left to the courts.

Injury Sciences and Public Citizen did not view privacy concerns as an impediment to the EDR rule. Injury Sciences stated that it believes the NPRM provides adequate consideration and protection for the privacy of the individual. While acknowledging the importance of ensuring privacy, Public Citizen also did not see the EDR rule as raising a significant privacy concern. Public Citizen's comments suggested that "public health" data provided by EDRs outweighs these privacy concerns. Public Citizen's rationale is that NHTSA already collects and uses EDR data, so the rule does not raise new privacy issues. Furthermore, Public Citizen stated that the NPRM addresses some existing privacy concerns by requiring a statement in the owner's manual to inform consumers as to the presence and role of the EDR in their vehicle.

We have reviewed all of the comments regarding privacy and EDRs. As to comments concerning our planned use of EDR data, we hope that our continued efforts to educate and inform the public will help to correct any public misconceptions about the type of data that EDRs record and how that information is used.

We stated in the NPRM that we are careful to protect privacy in our own use of EDR data. We obtain consent from the vehicle owner to gain access to EDR data. Furthermore, we assure the owner that all personally identifiable information will be held confidential. In handling this information, the agency does not make public any information contained in these records which has the potential to either directly or indirectly identify individuals, except as specifically required by law. Furthermore, prior to the release of information from databases containing EDR data (usually aggregated reports), the agency strips out the last six characters of the VIN (*i.e.*, the portion that would allow identification of a specific vehicle and, potentially by indirect means, the identity of the vehicle's current owner). Therefore, we believe that the agency has taken adequate steps to ensure individual privacy vis-à-vis its use of EDR data.

We understand that EDRs can generate concerns related to how EDR data are currently used or will be used by entities other than NHTSA. As we stated in the NPRM, our role in protecting privacy is a limited one. While we remain sensitive to the public debate about EDRs and the use of EDR data, we do not have statutory authority to address many privacy issues, which are generally matters of State and Federal law that we do not administer. These privacy issues were not created by this rulemaking (*e.g.*, whether the vehicle owner owns the EDR data, how EDR data can be used/discovered in criminal/civil litigation, whether EDR data may be obtained by the police). EDRs have

existed since the 1970s, and our rulemaking on EDRs standardizes technology that has existed, in some cases, for decades.

Other issues beyond the scope of this rulemaking include access to EDR data (including by law enforcement) and training of individuals to handle EDR data. As to Wylie Lab's comments, we did not propose certifying independent labs to handle downloaded EDR data for NHTSA, and we do not have a present need for such analysis.

As noted earlier, we are not requiring or prohibiting on/off switches. Given that we are not requiring EDRs, we do not believe it would be appropriate to prohibit on/off switches. However, such switches could reduce the benefits from EDRs. Therefore, we believe it would be inappropriate to require such switches.

We considered Mr. Leggett's comment concerning the reliability of EDRs in trials and other adjudicatory proceedings; however, we note that disputes about these issues are most appropriately resolved in individualized adjudications as needed.<sup>44</sup> We are presently concerned with the reliability of EDR data only as it relates to our stated purposes of the analysis of safety equipment performance, reconstructing crashes, and fostering the development of ACN. We believe that the range, resolution, and accuracy standardization requirements are representative of current industry standards that are generally accepted in the industry, which we discussed in further detail above.

EDR technology continues to evolve, and public discussion about EDRs will continue. We hope to help address these concerns and foster continued acceptance of EDRs by requiring manufacturers of vehicles equipped with EDRs to include a standardized statement in the owner's manual, as discussed below. We also hope to

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<sup>44</sup> See, e.g., Bachman v. General Motors Corp., 776 N.E.2d 262 (Ill. App. Ct. 2002); Matos v. State, No. 4D03-2043 (Fla. Cir. Ct., Mar. 30, 2005); People v. Hopkins, No. 2004-0338 (N.Y. Co. Ct., Aug. 30, 2004); Kevin Schlosser, "Black Box" Evidence, 231 N.Y. L. J. (Jan. 25, 2005).

establish an internet public education program to correct perceived public misunderstanding related to EDRs.

## **8. Owner's Manual Disclosure Statement**

In the NPRM, we proposed to require the following disclosure statement to be included in the owner's manual of vehicles that have an EDR:

This vehicle is equipped with an event data recorder. In the event of a crash, this device records data related to vehicle dynamics and safety systems for a short period of time, typically 30 seconds or less. These data can help provide a better understanding of the circumstances in which crashes and injuries occur and lead to the designing of safer vehicles. This device does not collect or store personal information.

We proposed this disclosure statement in an effort to educate the public about EDRs, *i.e.*, to inform consumers about the circumstances under which EDRs record data and the reasons why EDR data is collected.

All commenters on this issue generally supported our proposal to require an EDR disclosure statement for consumers. We received several suggestions regarding the text and placement of that disclosure statement. Some thought that the language in the NPRM needed augmentation (or a complete rewrite) to address issues such as privacy, preemption, and ownership of and access to EDR data. We also received comments with proposed text to address telematic features, such as ACN, and specifically OnStar®.

GM expressed support for requiring a standardized EDR disclosure statement in the owner's manual. However, GM recommended expanding the statement to more fully inform consumers (*e.g.*, by providing examples of the type of information recorded, explanation that no recording occurs under normal driving conditions, and an explanation

of download protocols) and to respond to issues currently being addressed at the State level (*e.g.*, access to EDR data). In light of the above, GM also suggested that the disclosure statement should inform consumers if their vehicle is equipped with a telematic system that may collect personal and/or vehicle information. GM recommended the following disclosure statement:

This vehicle is equipped with an event data recorder (EDR). The main purpose of an EDR is to record, in certain crash or near crash-like situations, such as an air bag deployment or hard braking, data that will assist in understanding how a vehicle's systems performed. The EDR is designed to record data related to vehicle dynamics and safety systems for a short period of time, typically 30 seconds or less. The EDR in this vehicle is designed to record such data as:

- How various systems in your vehicle were operating;
- Whether or not the driver and passenger safety belts were buckled/fastened;
- How far (if at all) the driver was depressing the accelerator and/or brake pedal; and,
- How fast the vehicle was traveling.

These data can help provide a better understanding of the circumstances in which crashes and injuries occur. NOTE: EDR data are recorded by your vehicle only if a crash or near crash situation occurs; no data are recorded by the EDR under normal driving conditions.

To read data recorded by an EDR, special equipment is required and access to the vehicle or the EDR is required. In addition to the vehicle manufacturer, other parties, such as law enforcement, that have the special equipment, can read the information if they have access to the vehicle or the EDR.

[If the vehicle is equipped with telematic system(s), the following statement must also be included in the owner's manual.]

Your vehicle may be equipped with onboard telematics that provide safety and convenience services such as GPS-based navigation or cellular wireless connectivity, and your vehicle may collect personal or vehicle information to provide such services. Please check the service's subscription agreement or manual for information about its data collection.

According to GM, the NPRM's owner's manual language may not be sufficient to obviate or to preempt current or future State disclosure requirements. GM's recommended disclosure statement also omits reference to "personal information," as we proposed in the NPRM, because GM believes that phrase is potentially ambiguous.

Comments from DaimlerChrysler, Ford, and Toyota were similar to GM's comments, although they differed in two areas. Each recommended that the EDR rule permit vehicle manufacturers to supplement the required language with additional information that the manufacturers deem appropriate for their respective vehicle designs. Each also omitted the language GM included related to telematic systems.

SEMA, Advocates, and Mr. Bruce Funderberg commented that customers should be notified if a vehicle is equipped with an EDR prior to purchasing the vehicle. SEMA stated that vehicle dealers should be required to notify consumers about EDRs, consistent with State and local laws and that subscription services (*e.g.*, OnStar®) should be required to notify purchasers of the types of EDR information that may be transmitted and to whom the data would be provided.<sup>45</sup> According to Advocates, NHTSA should

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<sup>45</sup> SEMA suggested the following disclosure language:

This recorded data may not be retrieved or downloaded by anyone other than the owner of the vehicle except in certain specific circumstances: (1) with the consent of the owner; (2) by court order; (3) by an authorized person for purposes related to improving vehicle safety provided the identity of the registered owner or driver is not disclosed and the information is of a non-vehicle specific nature; or (4) the data is retrieved for the purpose of determining the need or facilitation of emergency medical response.

require dealers to provide a copy of the statement to purchasers at the time of sale along with a brochure written in both English and Spanish. Advocates also supported the use of additional methods to educate the public about EDRs, such as public service announcements, agency publications, and NHTSA's website. Mr. Funderburg, an individual, commented on vehicle owners' lack of knowledge about EDRs, suggesting that manufacturers need to provide better notice to purchasers about EDRs. He also recommended that the EDR should be optional equipment that purchasers may decline.

EPIC commented that the notice to owners should be more specific about the ownership of and access to EDR data. EPIC also commented that ACN systems present unique privacy issues, stating "for EDRs that use communications systems – such as OnStar®, which uses wireless phone networks – the EDR should not initiate communication unless an accident is detected or if the driver uses a manual feature to initiate communications for purposes of transmitting driving data."<sup>46</sup> EPIC commented:

Consent of the vehicle owner should be required for the disclosure of EDR driving data to the NHTSA or any other government or commercial organization, including automotive insurance companies. Such consent should be fully consensual, meaning for example that automotive insurance contracts should not be conditioned upon access to EDR data.<sup>47</sup>

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In cases where vehicles are equipped with a recording device as part of a subscription service, the fact that information may be recorded or transmitted must be disclosed in the subscription service agreement.

<sup>46</sup> EPIC proposed the following additional text for the statement in the owner's manual for vehicles that contain ACN or an EDR connected to a communications network:

The event data recorder is connected to a communication system capable of automatically contacting emergency services when it detects an accident. The event data recorder will only initiate communication in the event of an accident or if the driver uses the manual feature to initiate communication with either emergency services or the communications provider (e.g., for a service that provides driving directions from an operator).

<sup>47</sup> EPIC proposed the following additional text for the statement in the owner's manual for vehicles that contain ACN or EDR connected to a communications network:

In addition, EPIC commented that the vehicle owner should be instructed to have the EDR inspected if the vehicle has been involved in an accident, flooding, or fire.<sup>48</sup>

The National Motorists Association, Advocates, AAA, and ATA all made comments that the proposed disclosure statement is inadequate to address an array of consumer concerns, and some suggested alternative language. PCIAA commented that the required, specific disclosure statement proposed in the NPRM is inadequate because the statement could become obsolete quickly and because vehicle owners rarely refer to or use their owner's manual. Advocates commented that the required statement in the owner's manual is necessary but not sufficient to educate the public about EDRs and address privacy concerns. AAA commented that there is insufficient consumer notification about access to EDR data, stating that manufacturers should disclose in the owner's manual whether any outside parties that have access to the data and under what circumstances the data are shared. ATA commented that the statement in the owner's manual should disclose that an EDR is present and that the EDR does not collect or store

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Your consent is required for the data to be disclosed to the National Highway Traffic Safety Administration – a federal agency that gathers information about traffic accidents to improve vehicle and road safety – or any other government or private organization, including automotive insurance companies.

EPIC also commented that if a partial VIN is included in EDR, the following text should be added to the owner's manual:

Only the part of your vehicle identification number (VIN) that includes information about the make and model of your vehicle will be collected by the event data recorder. The unique serial number portion of the VIN will not be collected.

<sup>48</sup> EPIC proposed the following additional text for the statement in the owner's manual:

If your vehicle has been involved in a serious accident or has been subject to flooding or fire, your event data recorder may have been damaged. If it was involved in one of these situations, please have your event data recorder inspected by an authorized dealer.

personal information. The ATA also stated that additional public information would be desirable.

After considering the public comments, we have decided to adopt a more detailed disclosure statement, along the lines recommended by GM, DaimlerChrysler, Ford, and Toyota. We believe that the more detailed statement will provide consumers with a fuller understanding of the EDR installed in their vehicles.

However, we are not adopting the recommended language in GM's comments related to telematic systems, because such systems are not directly the subject of this rulemaking. We note that the comments of DaimlerChrysler, Ford, and Toyota did not include language related to telematic systems, although the balance of their recommended disclosure statements were virtually identical to that of GM. The capabilities of telematic systems and the level of integration between such systems and the EDR may also vary depending upon the given technology. For these reasons, we have decided not to require language in the specified disclosure statement on telematic systems. However, vehicle manufacturers may include a discussion of applicable telematic systems in the vehicle owner's manual, if they choose to do so.

In addition, we note that we are permitting vehicle manufacturers to supplement the required owner's manual statement on EDRs with additional information, if they choose to do so. Vehicle manufacturers will have specific knowledge about their EDRs, and in some situations, vehicle owners may benefit from such additional information.

In response to SEMA's comment that vehicle dealers should also be required to notify consumers about EDRs and Advocates comment requesting an additional

brochure, we believe that such requirements would be largely redundant of the information required in the owner's manual, and hence unnecessary.

In addition, we have decided not to adopt SEMA's recommendation for a requirement for subscription services, such as OnStar®, to disclose information about the types of data that may be transmitted and to whom they may be transmitted, for the following reasons. First, the regulation of such services is outside the scope of this rulemaking, and second, consumers are generally made aware of such services up-front, particularly where they must pay a fee for the continuation of service. To the extent that consumers are concerned about the data gathered or reported by these services, they are free to pose such questions to the provider.

Regarding Mr. Funderburg's comments that EDRs should be optional equipment that purchasers may decline, we note that making EDRs an option could add unnecessary production costs. Moreover, there are no benefits associated with not having an EDR. Furthermore, taking such a position would run counter to our safety goals of securing more and better EDR data and enabling ACN.

For the reasons discussed more fully under section IV.B.7 of this document, we do not believe that EDRs raise meritorious privacy concerns, because they do not collect individual identifier information. We believe that the disclosure statement we have adopted provides a clear picture of the types of data collected by EDRs and the intended uses of that data.

We have decided not to adopt EPIC's recommended language warning the consumer to have the EDR inspected after the vehicle is in a crash or is subject to fire or flooding. We do not believe that such language is necessary, because in such cases, the

vehicle owner will normally have the vehicle examined by both an insurance adjuster and an automotive repair expert, professionals who will diagnose resulting problems with all vehicle systems, including the EDR.

In response to commenters who argued that our proposed owner's manual disclosure statement is inadequate because it is too limited, we note that under the final rule, we are requiring an expanded disclosure statement. We believe that our specified owner's manual disclosure statement provides adequate notice as to the presence and function of the EDR.

We have considered the comments arguing that our proposed owner's manual statement could become quickly obsolete. NHTSA intends to closely follow the development of EDR technology. If we determine that these devices have evolved in such a way as to render our disclosure statement inadequate, we would consider how to amend the required language. In addition, as stated above, we are permitting vehicle manufacturers to augment the required disclosure statement with additional information based upon the specifics of the EDRs installed on the vehicle. For these reasons, we believe that the EDR-related information provided to consumers will be sufficient for most consumers.

## **9. Preemption**

GM, DaimlerChrysler, Ford, Toyota, AIAM, and NADA recommend that the final rule for EDRs should explicitly state that it preempts inconsistent State and local regulations. GM is concerned that without a clear statement of the preemptive effect of the final rule, manufacturers could be faced with a patchwork of State and local requirements. AIAM expressed concern that the failure to preempt inconsistent State and

local regulations could result in manufacturers being required to provide limited, circumscribed, or deactivated EDR systems and inconsistent disclosure/owner's manual language on a State-by-State basis. AIAM argued that the consistency across the nation would aid in the public acceptance of EDRs and would help keep costs down. NADA commented that the rule should expressly reference the degree to which inconsistent State or local regulations are preempted.

We have considered the comments concerning the preemption of conflicting State regulations and agree that a patchwork of State laws is not desirable. We expect that general principles of preemption law would operate so as to displace any conflicting State law or regulations.

It is our view that any State laws or regulations that would require or prohibit the types of EDRs addressed by our regulation, or that would affect their design or operation, would create a conflict and therefore be preempted. Specifically, this would include State EDR technical requirements, such as ones requiring EDRs in motor vehicles (except for State-owned vehicles), requiring that EDRs record specific data elements, and/or requiring EDRs to meet specific technical performance or survivability requirements.

Further, it is our view that any State laws or regulations that imposed, for the types of EDRs addressed by our regulation, additional disclosure requirements on vehicle manufacturers or dealers would likewise create a conflict and therefore be preempted. We have devised an appropriate statement for the owner's manual to make the operator aware of the presence, function, and capabilities of the EDR. Inconsistent or additional State disclosure requirements would frustrate the purposes of our regulation by

potentially creating confusion or information overload, thereby reducing the benefit of the required statement. The need to meet different disclosure requirements for different States would also increase costs, making it less likely that manufacturers would provide EDRs.

It is our intent to provide one consistent set of requirements, including a specified statement in the owner's manual, for vehicle manufacturers that choose to install EDRs. We believe that this approach will enhance the quality of EDR data by standardizing the content, format, and accuracy of such data, thereby increasing its comparability and overall usefulness; we further believe that the standardized data will be of greater benefit for safety equipment analysis and crash reconstruction. We also believe that this minimum data set provides key elements in a standardized format that will foster the development of ACN and other telematic systems.

We believe that State laws inconsistent with this final rule would frustrate the final rule's purposes. For example, additional State requirements would increase the costs of EDRs and make it less likely that manufacturers would voluntarily provide them. Additional State requirements could also hamper the development of future EDRs by pushing their development in ways that are not optimal for safety. Among other things, given limitations in data processing capabilities, requirements for additional data elements could make EDRs less effective in real world crashes in recording the data elements NHTSA has determined to be most important. (As discussed in section IV.B.2 of this notice, we believe that recording of additional data elements, which are currently of lesser value for our stated purposes, would not only result in significantly higher costs but would also risk overburdening the microprocessing and memory capabilities of

EDRs. This could increase data recording times, and it could also increase the risk of system failure, potentially resulting in the loss of all EDR data.)

In addressing the issue of preemption, we note that the effective date for our EDR regulation is 60 days after publication of this rule, and that the compliance date is September 1, 2010. It is our view that our regulation has preemptive effect between the effective date and September 1, 2010, as well as after that latter date. In New Jersey State Chamber of Commerce v. State of New Jersey,<sup>49</sup> the Court held that a delay in the start-up date of certain provisions of the Occupational Safety and Health Administration's (OSHA's) Revised Asbestos Standards did not affect the effective date of preemption, in that case upon publication in the Federal Register (*holding* that preemption arises before the regulation becomes operative, in cases where an agency provides additional time for regulated entities to take steps to prepare for compliance). The same principle applies here, and we have a substantive reason for structuring the effective date and compliance date in the manner we have done. Once the EDR regulation is effective, a conflict with an inconsistent State law would arise immediately and impact achievement of our ultimate objectives for compliance in 2010.

Specifically, we selected this compliance date to provide sufficient lead time to enable manufacturers to incorporate necessary changes as part of their routine production schedules. Thus, we expect that, in order to meet the requirements of our regulation, between now and September 1, 2010, vehicle manufacturers will be gradually redesigning their EDRs, modifying vehicle systems and components that feed into EDRs, and integrating EDRs into numerous models of vehicles. Furthermore, a vehicle manufacturer may begin complying with the EDR regulation once it becomes effective.

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<sup>49</sup> 653 F.Supp. 1453, 1462 (D. N.J. 1987).

Thus, any State laws or regulations that would require or prohibit the types of EDRs addressed by our regulation, or that would affect their design, or that would establish a compliance date earlier than September 1, 2010, would conflict with and frustrate the purposes of our regulation. Among other things, such laws or regulations would interfere with the process of manufacturers gradually redesigning their EDRs, modifying related vehicle systems and components, and integrating EDRs into vehicles in order to meet our requirements during that timeframe.

The agency is aware of ten States that have passed laws relating to EDRs in the fields preempted by this final rule.<sup>50</sup> Most of these States require that the vehicle purchaser be notified that the motor vehicle is equipped with an EDR. Three States, Arkansas, Colorado, and North Dakota, require additional information. Of those three States, Arkansas and North Dakota have the broadest disclosure requirements. Arkansas requires disclosure of the presence of the EDR, the type of EDR, and the type of data that is recorded, stored, or transmitted.<sup>51</sup> North Dakota requires disclosure of the presence, capacity, and capabilities of the EDR.<sup>52</sup>

We believe that the statements meeting our disclosure requirement in the final rule would satisfy even the broadest of the existing State disclosure requirements. Further, it does not appear that any of the existing State requirements regarding disclosure would conflict with the final rule.

This rule does not address certain other issues generally within the realm of State law, such as whether the vehicle owner owns the EDR data, how EDR data can be

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<sup>50</sup> Arkansas, California, Colorado, Maine, New Hampshire, New York, Nevada, North Dakota, Texas, and Virginia.

<sup>51</sup> Arkansas Code, Title 27, Chapter 37, Subchapter 1, Section 103.

<sup>52</sup> North Dakota Century Code, Title 51 Sales and Exchanges, 51-07-28.

used/discovered in civil litigation, how EDR data may be used in criminal proceedings, whether EDR data may be obtained by the police without a warrant, whether EDR data may be developed into a driver-monitoring tool, and the nature and extent that private parties (including insurance companies, car rental companies, and automobile manufacturers) will have or may contract for access to EDR data. These issues are instead being addressed by State legislatures.

#### **10. Applicability of the EDR Rule to Multi-Stage Vehicles**

In the NPRM, we stated that our proposed EDR rule would apply to the same vehicles that are required by statute and by FMVSS No. 208 to be equipped with frontal air bags (*i.e.*, passenger cars, multipurpose passenger vehicles, trucks, and buses with a GVWR of 3,855 kg or less and an unloaded vehicle weight of 2,495 kg or less, except for walk-in van-type trucks or vehicles designed to be sold exclusively to the U.S. Postal Service). This covers most light vehicles, including multi-stage vehicles. We believe applying this rule to all vehicles that are currently subject to FMVSS No. 208 is appropriate since most EDRs are closely associated with frontal air bags and all of these vehicles must meet the advanced air bag requirements of FMVSS No. 208, which will be completely phased in by manufacturers before compliance with this final rule is required.

Several commenters suggested changing our proposal to provide an exception for multi-stage vehicles and incomplete, intermediate, and final stage manufacturers. GM, DaimlerChrysler, Ford, and Toyota expressed support for either excluding incomplete, intermediate, and final stage manufacturers from the requirements of the rule by specifically excluding these manufacturers in the regulatory text or by requiring those manufacturers to certify compliance one year after the last applicable date for

manufacturer certification of compliance provided under the final rule. GM's point is that the proposed EDR rule would result in a significant burden on incomplete, intermediate, and final stage manufacturers. GM argues that the integration of EDR functions into a vehicle is a complex task requiring advanced communications and data processing technologies that may be beyond the capabilities of many small businesses.

ATA asserted NHTSA has not involved final stage vehicle manufacturers or accessory installers in an appropriate dialog. ATA encouraged NHTSA to conclude that there is no possibility that EDR performance could be affected during any type of completion or conversion or accessory installation. On the issue of the effect of the EDR requirements on altered vehicles, NADA commented that NHTSA should "consider the complexities that may be involved for light-duty vehicles manufactured in two or more stages or which are altered prior to first sale."

We have considered the comments that we provide an exception or otherwise delay the effective date of this rulemaking for incomplete, intermediate, and final stage manufacturers (*i.e.*, multi-stage vehicles). Since the NPRM was published, NHTSA has issued a final rule pertaining to certification requirements for vehicles built in two or more stages and altered vehicles (see 70 FR 7414 (Feb. 14, 2005)). The amendments made in that final rule become effective September 1, 2006. In relevant part, the multi-stage certification final rule amended 49 CFR 571.8, Effective Date, and it added a new subparagraph (b) providing as follows:

(b) Vehicles built in two or more stages vehicles and altered vehicles. Unless Congress directs or the agency expressly determines that this paragraph does not apply, the date for manufacturer certification of compliance with any standard, or amendment to a standard, that is issued on or after September 1, 2006 is, insofar as its application to

intermediate and final-stage manufacturers and alterers is concerned, one year after the last applicable date for manufacturer certification of compliance. Nothing in this provision shall be construed as prohibiting earlier compliance with the standard or amendment or as precluding NHTSA from extending a compliance effective date for intermediate and final-stage manufacturers and alterers by more than one year.

In light of the agency's policy on multi-stage manufacturer certification, as expressed in the February 14, 2005 final rule, we have decided to apply that principle to the compliance date for final-stage manufacturers and alterers. Thus, final-stage manufacturers and alterers must comply with this rule for vehicles manufactured on or after September 1, 2011. However, final-stage manufacturers and alterers may voluntarily certify compliance with the standard prior to this date.

#### **11. Applicability of the EDR Rule to Heavy Vehicles and Buses**

In addition to multi-stage vehicles, Public Citizen and Advocates commented that NHTSA should extend the rule's applicability to include other vehicles, such as heavier trucks and 15-passenger vans. Public Citizen commented that all new vehicles, including large trucks, should be required to be equipped with EDRs, and the organization encouraged NHTSA to undertake a separate rulemaking to require EDRs in large trucks. Public Citizen stated that the benefit realized by EDRs is directly proportional to the number of vehicles equipped with these devices and that full fleet penetration is critical to the accuracy and utility of EDR data. Public Citizen further commented that an EDR requirement for large trucks could help improve industry practices and driver behavior. Similarly, Advocates commented that the rule should include 15 passenger vans and heavier light trucks because those vehicles have relatively high rollover rates, high risk of

injury to multiple occupants, and are exempt from other safety regulations (*e.g.*, side impact and roof crush resistance).

While EDR requirements for heavier vehicles are outside the scope of this rulemaking, we note that many 15-passenger vans are within the applicable weight range for this final rule, and thus, are required to comply with the EDR regulation. Further, we note that some original equipment manufacturers, such as GM, are installing EDRs in their medium trucks equipped with air bags.

As noted in the NPRM, we are not addressing in this document what future role the agency may take related to the continued development and installation of EDRs in heavy vehicles. We will consider that topic separately, after consultation with the Federal Motor Carrier Safety Administration. As noted previously, FMCSA is currently engaged in rulemaking that would facilitate the use of Electronic On-Board Recorders for recording and documenting the hours of service of commercial drivers.

We believe that deferring consideration of requirements for EDRs installed on heavy trucks is appropriate for the following reasons.

First, it would provide the agency with time to build experience in terms of standardization of EDR data in light vehicles. This experience could then be applied to our consideration of heavy trucks.

Second, because the relevant data to be gathered by EDRs installed in heavy trucks are not identical to that of light vehicles, we believe any such requirements should come in a separate regulation.

Third, because EDRs in light vehicles rely heavily upon sensors and diagnostic equipment associated with the vehicle's air bag system, the agency must carefully assess

the costs, benefits, and lead time necessary for EDR requirements for heavy trucks, which may not have systems with all the necessary hardware. We understand that heavy truck manufacturers, suppliers, and others are engaged in EDR-related efforts with SAE, which will result in recommended practices for these devices. NHTSA is closely monitoring these efforts by the SAE working group. NHTSA is also closely following activities in other governmental agencies, including FMCSA and NTSB.

Finally, separate consideration of EDR requirements for heavy trucks will expedite promulgation of this final rule for EDRs in light vehicles, thereby encouraging further positive developments based upon standardized EDR data.

## **12. Automatic Crash Notification and E-911**

The NPRM stated that the purpose of this rulemaking is to help ensure that EDRs record, in a readily usable manner, data necessary for effective crash investigations, analysis of safety equipment performance, and automatic crash notification systems. It is NHTSA's position that this data will help provide a better understanding of the circumstances in which crashes and injuries occur and will lead to the designing of safer vehicles.

Including ACN as a stated purpose of the EDR rule drew comments. Commenters recommended additional clarifying language or deleting relevant portions of the proposed regulatory text so that the rule cannot be construed as a limitation on manufacturers' ability to offer telematics features, such as ACN. GM, Ford, and Toyota recommended that the final rule expressly state that it does not limit manufacturers' ability to offer ACN and other telematics features. Likewise, PCIAA commented the rule

should not “preclude EDRs and similar vehicle technology (*i.e.*, intelligent vehicle systems-telematics) from being fully leveraged by the public and private sectors.”

GM argued that because ACN is not being proposed in this rulemaking, the language referencing ACN should be dropped from the regulatory text. GM further argued that the proposed EDR rule makes no provision for the software, hardware, and infrastructure required to make use of ACN-related data. DaimlerChrysler made a similar comment, adding that ACN infrastructure was last estimated to cover only 25% of the United States, principally in urban areas. DaimlerChrysler stated that benefits of ACN, other than those related to better crash data, are speculative and out-of-scope.

We acknowledge that this final rule does not regulate or require ACN systems. Nonetheless, we are retaining ACN as a stated reason to require EDR data standardization because we believe that the final rule would have ancillary benefits, such as facilitating ACN development. However, our other stated purposes fully justify the rule. We emphasize that this final rule does not limit the ability of manufacturers to offer ACN or other telematics devices.

To reiterate our earlier reasoning, we note that the NPRM provides a detailed explanation of the relationship between EDRs and ACN systems. In addition, the ENHANCE 9-1-1 Act of 2004 requires the Department of Transportation to help coordinate and to speed the deployment of Wireless Enhanced 9-1-1. ACN has the potential for interfacing with nation-wide Wireless Enhanced 9-1-1 deployment by providing immediate and accurate crash location information to Public Safety Answering Points. This will expedite the dispatch of emergency services to the crash scene, help ensure that EMS personnel can locate the crash, and speed the provision of lifesaving

emergency medical services to traffic crash victims. The prompt provision of emergency medical care to traffic crash victims will reduce morbidity and mortality.

We believe ACN systems have great potential for reducing deaths and injuries caused by motor vehicle accidents. This potential arises from the ability of the EDR and ACN, working in tandem, to determine (prior to responding to the accident scene) the likely nature and severity of the injuries, the proper allocation of resources to respond to those injuries, and the location of the crash. We fully expect ACN systems to evolve, and our rulemaking today, which standardizes EDR data, will play a role in realizing the safety benefits of ACN.

### **13. Definitions**

#### **a. “Trigger Threshold”**

“Trigger threshold” indicates the point at which a recordable event is recognized by the EDR as suitable for further analysis. Our proposal defined “trigger threshold” as “a change in vehicle velocity, in the longitudinal direction for vehicles with only longitudinal acceleration measurements or in the horizontal plane for vehicles with both longitudinal and lateral measurements, that equals or exceeds 0.8 km/h within a 20 ms interval.” In proposing a value for the EDR trigger threshold, we turned to SAE J1698 for guidance.

GM commented that, as proposed, the trigger threshold for EDR recording was set too low and would result in an excessive number of recordings and re-recordings. GM argued that the defined threshold would create a risk of memory degradation in the electronic control module over the life of the vehicle. Accordingly, GM, along with DaimlerChrysler, Ford, and Toyota, recommended revising the definition of “trigger

threshold” to read: “equals or exceeds 5 mph (8 km/h) within a 0.15 second interval.”

GM stated that its recommended value is consistent with the FMVSS bumper standard threshold.

Similarly, Hyundai, Kia, and Delphi stated that the trigger threshold specified in the NPRM is set too low and would result in data being rewritten many times as a result of potholes and curb hits. According to the commenters, this frequent overwriting of the EDR data could result in computer memory failure, thereby leaving the EDR unavailable in the event of an actual crash. Delphi recommended that the trigger threshold “corresponds to an average acceleration in excess of 1.5 G with a total velocity change of at least 5 km/hr.”

As an alternative to the proposed language, TRW Automotive suggested that the trigger threshold should be determined by the air bag system, which would notify the other systems to begin recording. TRW argued that, currently, each individual system records its own data so minimal changes would be needed to implement the rule. TRW’s rationale is that implementation of the rule would be less expensive and less complex if the rule permitted each system to record its own data.

TRW Automotive also commented that there should be “an acceptable tolerance of plus or minus ‘one data sample period’ for the data points corresponding to ‘trigger threshold’ detection, and a sampling rate tolerance of plus or minus three percent for data before and after the point of ‘trigger threshold’ detection.”

Advocates stated that it had no opinion on the exact specification for the trigger threshold but expressed concern about setting the trigger at a level where recording would occur only in the event of a crash. Advocates suggested that NHTSA should

consider the collection of near-miss data in a future EDR rulemaking. Advocates also questioned whether an electrical or engine fire would be a triggering event and suggested that NHTSA should revise the rule to require the EDR to be sensitive to fire-based events.

After considering these comments, we have decided to modify the trigger threshold value to 8 km/h within a 150 ms interval, as requested by the commenters, such that the final rule's definition of "trigger threshold" reads: "a change in velocity, in the longitudinal direction, that equals or exceeds 8 km/h within a 150 ms interval. For vehicles that record "delta-V, lateral," trigger threshold means a change in vehicle velocity, in either the longitudinal or lateral direction that equals or exceeds 8 km/h within a 150 ms interval." We believe that this change is appropriate for the following reasons.

While we agree that the threshold proposed in the NPRM routinely could be exceeded by strong bumper-to-bumper contact in a parking lot or minor impact with a road obstacle, we only required the data to be recorded if the cumulative delta-V of the current event/crash exceeded the delta-V of the previously-recorded data. We do not agree that the non-volatile memory would have been over-burdened, because the delta-V of the event in non-volatile memory would have rapidly reached a sufficient magnitude to disregard minor impacts, such as bumper-to-bumper events. We believe that the revised criterion effectively addresses the concerns raised by the commenters and reduces the complications of decisionmaking regarding EDR data recording, while maintaining the ability to obtain data from most significant crashes (*i.e.*, those that are non-trivial).

We have decided not to adopt TRW's recommendation to tie the trigger threshold to air bag deployment. We are interested in collecting data on high delta-V crashes that do not deploy the air bag systems. While air bag systems may be operating properly in these cases, we are nonetheless interested in these situations, and EDR data captured in these situations would be helpful for safety equipment analysis. We are also interested in collecting data in non-air bag deployment crashes. Finally, one of our stated reasons for this rulemaking is to standardize EDRs. We believe that using a set delta-V will better facilitate this purpose, whereas using air bag triggers could result in different thresholds, depending on manufacturer deployment strategies and vehicle platforms. For these reasons, we have decided not to narrow our definition of "trigger threshold" by tying it to air bag deployment.

Regarding Advocates' comments recommending capture of near-miss data, we have decided that this rulemaking should target crash event data. While the agency believes valuable information for crash avoidance can be obtained from studying near-miss data, we do not believe that current EDRs are best suited for this function. Typically, near-miss data are not associated with a strong physical occurrence, hence increasing the difficulty of defining a trigger threshold to key recording. If the trigger threshold were set very low, it would cause the generation of a large volume of files that would need to be captured and recorded, or alternatively, it would force EDRs to continuously record information. Either of these data logging processes would make EDRs much more expensive. At this time, the agency believes these issues can be addressed best through our research programs, such as the recently completed 100-car

study, in which naturalistic driving characteristics were captured.<sup>53</sup> Furthermore, near-miss situations are not expected to generate data applicable to the data elements selected as non-trivial events in this final rule (*e.g.* no delta-V or safety restraint data).

As with near-miss data, NHTSA does not believe that a trigger related to fire would be a cost-effective or practicable approach. Non-crash fires are typically associated with fuel leaks, and as with the near-miss data, current event-driven EDRs would not capture much data, even if the EDR were triggered.

b. “Event”

In addition to “trigger threshold,” the definition of “event” is important to understanding what constitutes a recordable event for an EDR. In the NPRM, we defined “event” as “a crash or other physical occurrence that causes the trigger threshold to be met or exceeded after the end of the 500 ms period for recording data regarding the immediately previous event.”

GM urged modification of the NPRM’s definition of “event,” arguing that the proposed sampling rates and durations are excessive. In order to address these concerns, GM provided a revised definition of “event” and suggested a new definition of “crash event,” which also sought to clarify the distinction between an event that triggers data capture in volatile memory and an event that triggers the recording of data in non-volatile memory. DaimlerChrysler, Ford and Toyota offered nearly identical comments to those of GM, except that in their definition of “crash event,” the longitudinal or lateral trigger threshold was 5 mph delta-V in 150 ms, as opposed to 5 mph delta-V in 250 ms for GM.

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<sup>53</sup> Naturalistic Driving Study; Virginia Tech Transportation Institute (VTTI); [see http://www-nrd.nhtsa.dot.gov/departments/nrd-13/driver-distraction/PDF/100CarMain.pdf](http://www-nrd.nhtsa.dot.gov/departments/nrd-13/driver-distraction/PDF/100CarMain.pdf).

Nissan suggested that the rule should permit two alternatives for determining the beginning of an event, as provided in SAE J1698. SAE J1698 and SAE J1698-1 include two methods of establishing time zero. One method calculates time zero as the occurrence of a delta-V of over 0.8 km/h (0.5 mph) in 20 ms. The other method of calculating delta-V is to define time zero as the point at which the EDR algorithm is activated, also known as “wake-up.” The first method was the basis for our proposal in this area. GM, Ford, DaimlerChrysler, and Toyota commented that we should first define an “event” and then define “time zero” as the beginning of the event, recommending a definition of “event” as a delta-V of over 8 km/h (5 mph) or more within 150 ms, instead delta-V of over 0.8 km/h (0.5 mph) in 20 ms.

After considering the comments we received on this definition, we have slightly modified the definition of “event” in the final rule to read as: “a crash or other physical occurrence that causes the trigger threshold to be met or exceeded.” We believe this change is consistent with vehicle manufacturers’ comments. Under the new trigger threshold definition, an event is a physical occurrence that produces sufficient delta-V to exceed the trigger threshold. Those occurrences that do not meet the threshold are not classified as “events.”

As discussed below, we have modified the way in which the start of an event and end of an event are determined, consistent with SAE J1698.

c. “Event Data Recorder”

The NPRM defined “event data recorder” as “a device or function in a vehicle that records any vehicle or occupant-based data just prior to or during a crash, such that

the data can be retrieved after the crash. For purposes of this definition, vehicle or occupant-based data include any of the data elements listed in Table I of this part.”

GM, Ford and Toyota recommended revising the NPRM’s definition of “event data recorder” in order to narrow the definition and make it more precise.<sup>54</sup> GM argued that its recommended definition of “event recorder” would prevent confusion and possible misinterpretation. DaimlerChrysler recommended a similar definition for “event data recorder,” except that DaimlerChrysler’s comments omitted the specific time references indicated by GM.

Injury Sciences suggested expanding the definition of EDR to include vehicles that record and store any form of speed or collision information, without regard to the storage location or purpose. According to Injury Sciences, this would prevent manufacturers from circumventing the rule by not storing or using the data in their air bag modules.

Gelco commented that the definition of “event data recorder” in the “Supplementary Information” section of the NPRM is narrower than the definition in Sec. 563.5 of the proposed regulatory text. Gelco argued that the definition in Sec. 563.5 would include devices that are designed to capture data at lower resolution on an ongoing basis (as distinguished from devices that capture detailed data at the time of a crash event.) Gelco stated that such devices have valid purposes for both owners and users of vehicles, and that encompassing these devices within the definition of EDR would

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<sup>54</sup> GM offered the following definition of “event data recorder”:

Event data recorder (EDR) means a device or function in a vehicle that captures the data elements identified in Table I of this standard for up to 5 seconds before time zero and up to 250 ms after time zero, and that records the data when it has been determined that a crash event has occurred so that it can be retrieved after the crash.

unnecessarily restrain their development. Gelco recommended narrowing the scope of the rule by adopting a definition for “event data recorder” that differentiates between devices that capture data on an ongoing basis and EDRs.<sup>55</sup>

AAM stated that the definition of “event data recorder” is too broad in that it includes components that are not designed primarily for recording crash data. For example, some current recording systems only record restraint system deployment decisions and timing data. As a result, AAM argued that the rule acts as a mandate forcing manufacturers to record a great deal more data than their systems are currently designed to record. On the same issue, the Alliance offered to help NHTSA draft a specification that more clearly delineates the devices that they believe should fall within the ambit of the final rule.

After carefully consideration of the comments, we have decided to revise the definition of “event data recorder” in order to avoid possible misinterpretation. As proposed in the NPRM, the definition would have covered all devices that record static freeze-frame air bag data elements (*e.g.*, “frontal air bag warning lamp-on/off”), which commenters argued would have inadvertently resulted in a mandatory rule. Therefore, we have revised the definition to exclude static freeze-frame data elements, and by doing

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<sup>55</sup> Gelco recommended the following definition of event data recorder, in order to clarify the scope of existing recorders covered by the rule:

Event data recorder (EDR) means a device or function installed in a vehicle as part of its original equipment that records any vehicle or occupant-based data just prior to or during a crash, such that the data can be retrieved after the crash. For purposes of this definition, vehicle or occupant-based data include any of the data elements listed in Table I of this part. For purposes of this definition, devices or functions which may record one or more of the data elements listed in Table I of this part just prior to or during a crash but which are not designed for the purpose of collecting and storing motor vehicle crash event data or to record vehicle or occupant-based data at the recording intervals/times listed in Table I of this part shall not be event data recorders.

so, we avoid a mandatory rule. However, our revised definition retains critical data elements necessary for restraint performance evaluation, crash reconstruction, and better delta-V estimation.

The final rule defines “event data recorder” as “a device or function in a vehicle that records the vehicle’s dynamic, time-series data during the time period just prior to a crash event (*e.g.*, vehicle speed vs. time) or during a crash event (*e.g.*, delta-V vs. time), intended for retrieval after the crash event. For the purposes of this definition, the event data do not include audio and video data.”

#### **14. Utilization of SAE and IEEE Standards**

Under Section 563.4, the NPRM proposed to incorporate by reference SAE Recommended Practice J211-1, March 1995, “Instrumentation for Impact Test—Part 1—Electronic Instrumentation” (SAE J211-1). GM commented that the proposed section which would have incorporated SAE J211-1 should be deleted, arguing that high-speed acceleration data is not needed for accident reconstruction purposes (delta-V is sufficient) and that manufacturers should have the flexibility to work with their suppliers to match data acquisition hardware and software for their systems. On the other hand, IEEE-VTS commented that NHTSA should include in Section 563.4 several provisions of its consensus Motor Vehicle Electronic Data Recorder (MVEDR) standard on a broad range of topics.<sup>56</sup>

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<sup>56</sup> IEEE-VTS requested incorporation of the following sections of their consensus MVEDR, IEEE 1616 standards: Data Privacy and Security Recommendations (Clause 1.3), Definitions (Clause 3.1), International Use of MVEDR Data (Clause 4.2), Emergency Response Community (*i.e.* Data Accessibility & Extraction)(Clause 4.3.4), Electronic Equipment Operating Environment (Clause 4.6.1), Battery/Reserve Power (Clause 4.6.2), Crashworthiness (Clause 4.7), Vehicle Crash Modes (Clause 5.1), Minimum Outputs (Clause 6.1), Ability to Access Nonvolatile Memory (Clause 6.6.), Use of Proprietary Connectors (Clause 6.8), MVEDR Telltake (Clause 6.12), Data Capture (Clause 7.7), MVEDR Data Dictionary (Clause 8), and Recommended Data Elements for Light Vehicles Under 4,500 kg (Clause 8.2).

We have considered GM's comment that Section 563.4 should be deleted, which is premised upon replacement of the proposed acceleration data element with a delta-V data element. As indicated above, manufacturers who prefer to record acceleration may continue to do so under this final rule. However, for those manufacturers that prefer to record acceleration data instead of delta-V, the acceleration data must be filtered and converted to delta-V either during the recording period or in the data downloading process. Accordingly, the incorporation by reference provision, as it appeared in the NPRM, remains relevant, and we see no reason to remove it. We note that the incorporated SAE standard is not relevant to manufacturers that decide to record delta-V instead of acceleration.

We have also considered IEEE-VTS's request to incorporate its IEEE 1616 standard. We note that although incorporation by reference is a common practice in our rulemaking, we only utilize it when we believe the standards are appropriate and the standards are too complex and onerous to be copied into the regulation. In the present case, we believe that the provisions of the IEEE standard that do not already appear in our proposed EDR rulemaking are not necessary for data standardization. For many of the other IEEE provisions that do appear in the EDR regulatory text, we do not believe that these standards are too complex and onerous to be copied into the regulation. We believe that many of the definitions that we have provided in the regulatory text are easy to understand and follow. In fact, we believe that it would be easier for the reader to understand if all the items were articulated in the regulation itself, rather than by incorporation. Accordingly, we have we have decided not to incorporate by reference the IEEE 1616 standard, as recommended by IEEE-VTS.

## 15. Costs

The NPRM estimated that the added cost to manufacturers for implementing the requirements of the EDR proposal would be \$0.50 per vehicle. Several commenters (GM, DaimlerChrysler, Ford, Toyota, Nissan, Subaru, ATA, and AIAM) argued that the NPRM's cost estimate is understated. These commenters argued that implementation of the proposal would result in significantly higher costs related to microprocessing and memory upgrades, computer reprogramming, the proposed range, accuracy, and precision requirements, the dynamic testing requirements, and air bag sensor upgrades. Several commenters provided suggestions on ways to reduce costs, while others discussed the effect of costs on installation of EDRs.

GM commented that additional memory and processing capacity required to meet the requirements outlined in the NPRM would greatly increase the cost of complying with the proposed rule. According to GM, memory storage capacity would need to be expanded beyond that provided for current EDRs, and memory cannot be added incrementally, as implied in NHTSA's cost estimates (*i.e.*, computer memory is normally available in blocks, so the next step up from 64K may be 128K). GM further stated that microprocessors available to handle larger amounts of memory are usually packaged with other system capabilities (*e.g.*, increased input/output/pins) that would further increase system costs. According to GM, this is true for both volatile and non-volatile memory.

We infer from GM's comments that it believes that, if adopted, our proposal would entail unavoidable increases in processor costs. Specifically, unless the processor has sufficient memory capacity, the ability of the restraint system modules to perform their primary task (*i.e.*, deploying the air bags in a timely and appropriate manner) could

be compromised. GM stated that two microprocessors may be necessary to perform these two functions.

DaimlerChrysler, Ford, and Toyota provided nearly identical comments to those of GM on the cost issues associated with memory capacity and microprocessing. However, they estimated that the NPRM's proposed requirements would necessitate EDR storage capacity 5-10 times greater than that found in current EDRs and that the overall cost per vehicle would be 2-3 orders of magnitude greater than the NPRM's current estimate (*i.e.*, \$50-\$500). DaimlerChrysler and Toyota also argued that costs for RAM memory are typically more expensive than ROM memory.

DaimlerChrysler, Ford, and Toyota commented that the Preliminary Regulatory Evaluation's projection of \$10,000 per manufacturer for software algorithm reprogramming costs is an underestimate, although no alternative figure was provided. These manufacturers asserted that such efforts would require engineering-level specification development, algorithm development, and algorithm validation for each vehicle development program.

GM and AIAM commented that the proposed range, accuracy, and precision requirements in Table III of the NPRM underestimate certain hardware costs. For example, GM stated that it currently uses  $\pm 50$  G accelerometers with an 8% accuracy. According to GM, doubling the range to  $\pm 100$  G and increasing the accuracy of those accelerometers would add significant costs, which are not reflected in the NPRM's cost estimates. GM added that in some cases, the new requirements are beyond the state-of-the-art and may not be feasible. AIAM commented that the NPRM specifies range, accuracy and precision standards in excess of current industry practice. According to

these commenters, significant increases in cost would be required to modify systems to meet these proposed requirements.

Another cost issue, raised by GM, Ford, and Toyota, related to the proposed dynamic testing requirements for EDRs, which the commenters asserted would greatly increase testing costs. For example, GM argued that the NPRM would require storage of crashed vehicles for 30 days following a test to ensure retrievability of data. GM commented that such a requirement is impractical and unnecessary. Ford and Toyota challenged the Preliminary Regulatory Evaluation's assumption that the NPRM's proposed functionality and survivability requirements would not add any costs because existing EDRs are already capable of meeting the proposed standard. Ford stated that NHTSA has not fully accounted for the crash test performance and survivability provisions, so additional costs would be expected.

As discussed earlier, GM, DaimlerChrysler, and Ford all argued that the proposal would significantly increase testing costs, because they perceived that the testing would need to be conducted with running vehicles and activated systems. According to GM, the NPRM does not account for a significant additional cost for reserve or backup batteries, which it argued would be necessary to comply with the proposed requirement that EDR data be retrievable without external power for up to 30 days.

To remedy the above cost issues, GM recommended reducing the number of data elements to only those necessary to obtain safety-related data suitable for crash reconstruction purposes, which would presumably allow current EDRs to handle these tasks with minimal modifications and cost increases.

Nissan argued that the broad definition of an “event data recorder,” as proposed, encompasses many current air bag systems that do not record the types of information included in Table I. According to Nissan’s calculations, the NPRM underestimates the cost of implementation by a factor of 10. Nissan argued that its air bag systems would need major architectural changes to meet the proposed requirements. Subaru made a similar comment, arguing that the NPRM underestimates the costs of implementation because Subaru might be forced to develop an entirely new air bag electronic control unit. AIAM commented that some EDR systems that currently only record air bag information may need a complete redesign.

DaimlerChrysler, Ford and Toyota stated that sensors that could meet the requirements of the NPRM are currently considered “laboratory grade,” which raises issues related both to cost and availability.

Delphi and Mr. Funderburg expressed concern that the cost of implementation would deter manufacturers from installing EDRs or take away resources from NHTSA’s other projects. Delphi commented that the cost of implementation might vary significantly depending on the existing system architecture and that because of potentially high costs, many manufacturers may choose to freeze their level of EDR fleet penetration or even remove EDRs from certain models. Commenters argued that manufacturers of vehicles with components that are not sufficiently interconnected either would remove (or not implement) EDRs or would be required to make significant changes to the existing electrical architecture. Mr. Funderburg expressed concern regarding the costs of data analysis and the potential for diverting NHTSA’s resources away from more important projects.

AAA recommended adoption of a smaller data set to help reduce the costs of implementation. In contrast, Public Citizen asserted that requiring installation of EDRs with an appropriately large number of data elements would be more cost-effective for both manufacturers and consumers. Public Citizen stated that mandated safety features costs consumers as little as a quarter of the cost of such features in the absence of an agency requirement. However, Public Citizen did not provide any data to substantiate this point.

We have considered the comments on costs, and we have addressed the concerns of the commenters in the Final Regulatory Evaluation (FRE), which may be found under the same docket number as this final rule. However, the following summarizes the conclusions presented in the FEA.

The total cost for the estimated 9.8 million vehicles that already have an EDR function to comply with the regulation will range up to \$1.7 million. If manufacturers were to provide EDRs in all 15.5 million light vehicles, the estimated total cost will range up to \$10.9 million. These potential costs include technology costs, administrative costs, and compliance costs (although the latter two sets of costs are expected to be negligible).

## **16. Other Issues**

### **a. Scope and Purpose**

The NPRM's regulatory text defined the purpose and scope of this rulemaking as specifying uniform, national requirements for vehicles equipped with EDRs. Proposed section 563.1 also required vehicle manufacturers to make sufficient information publicly available to enable crash investigators and researchers to retrieve data from EDRs.

Two vehicle manufacturers commented on the proposed scope provision. GM commented that the NPRM's statement of scope is overly broad and somewhat ambiguous. GM argued that the current text of Sec. 563.1 should be revised to clarify the intended scope of the regulation, and GM further argued that NHTSA should mandate installation of EDRs. Toyota also commented that the scope of the rule is overly broad and ambiguous and recommended language nearly identical to GM's, but without advocating a mandatory EDR requirement.

PCIAA commented that the proposed rule focuses too much on restraint systems and not enough on systems to help the driver avoid collisions.

We have carefully considered the comments pertaining to the scope provision. We disagree with the commenters who stated that our scope provision is overbroad and ambiguous. To reiterate our earlier explanation, we intend to collect EDR data in order to gather information related to crash reconstruction, to the analysis of safety equipment performance, and which may be useful for ACN. We believe that the regulatory text, when read in its totality (including sections on scope, purpose, and definitions), provides the public with a clear understanding of the objectives of our final rule.

We also disagree with commenters' recommendations to change the scope of the final rule to adopt a mandatory EDR requirement. As noted above, we did not propose a mandatory requirement for vehicle manufacturers to install EDRs, and for the reasons previously discussed, we have decided not to adopt such an approach at this time. We will continue to monitor EDR installation, and may reconsider this issue in the future if circumstances warrant. We agree that it is desirable for EDRs to gain wider usage and acceptance.

We have considered PCIAA's comment that the rulemaking should acknowledge other uses of EDR data (other than those specified in the NPRM) so that data elements offer sufficient flexibility and the correct incentives to avoid discouraging innovations that go beyond the goals of research and vehicle safety. However, we do not believe that this rule will deter EDR innovations beyond NHTSA's stated purposes, nor inhibit the ability to use EDRs for other purposes. Furthermore, we do not believe it is appropriate to incorporate into this rule other uses of EDR data that we currently have no reason to standardize, and doing so would require the agency to significantly alter the scope and purpose of this rule.

We have, however, revised the regulatory text of the scope provision to make it consistent with the revisions made to the data retrieval section. As stated above, in the final rule we have revised the portion of our proposal that would have required manufacturers make publicly available through the NHTSA docket such non-proprietary information that would permit companies that manufacture diagnostic tools to develop and build a device capable of accessing, retrieving, interpreting, and converting data stored in the EDR. Consistent with our new approach arising out of public comments, the scope provision now indicates that manufacturers are required under this final rule to make such information commercially available.

DaimlerChrysler recommended adding a time element to the "purpose" section of the regulatory text, stating that EDR recording will include "five seconds of specified pre-crash data elements and 250 milliseconds of specified crash data elements . . . ." We have considered DaimlerChrysler's recommendation; however, we generally do not provide such specific language in the purpose section. Instead, we believe that such time

element is sufficiently and clearly addressed in the regulatory text under the “data capture” section.

b. Technical Changes to Definitions and New Definitions

In response to recommendations provided in the comments, we have decided to modify several definitions in the regulatory text. These modifications to the regulatory text provide clarification and address technical or minor issues.

“Capture”

The NPRM defined “capture” as “the process of saving recorded data.” GM, DaimlerChrysler, and Ford commented that this definition should be clarified. According to GM, the industry defines “capture” as the process of buffering data in a temporary, volatile storage medium where it is continuously updated. GM stated that data captured in volatile memory is unstable, insofar as it is continuously overwritten with new data as long as power is supplied to the module and is lost the moment power is discontinued. We have revised the definition of “capture” in light of these comments. Accordingly, the final rule defines “capture” as “the process of buffering EDR data in a temporary, volatile storage medium where it is continuously updated at regular time intervals.” We believe that, as modified, the definition of “capture” better reflects the industry’s understanding and uses of that term.

“Record”

The NPRM defined “record” as “the process of storing data into volatile memory for later use.” GM, DaimlerChrysler, Ford, and Toyota recommended changing the definition of “record” to “the process of saving captured EDR data into a non-volatile memory storage device for subsequent retrieval.” GM stated that the industry generally

uses the term “record” to mean saving captured data into a non-volatile memory storage device that is permanent and stable, even if power is lost to the storage module. We agree with these comments and have modified the definition of the term “record” accordingly. The definition of “record” now reads: “the process of saving captured EDR data into a non-volatile device for subsequent retrieval.”

“Engine Throttle, Percent Full” and “Service Brake, On and Off”

The NPRM defined “engine throttle, percent full” as “for vehicles powered by internal combustion engines, the percent of the engine throttle opening compared to the full open position of the engine throttle opening, and for vehicles not powered by internal combustion engines, the percent of vehicle accelerator depression compared to the fully depressed position.” The NPRM defined “service brake, on, off” as “the vehicle’s service brake is being applied or not being applied.”

GM, DaimlerChrysler, Ford, Toyota, and AIAM recommended revising the definition of “engine throttle, percent full” to clarify that it is the driver input that is recorded, rather than the electrical or mechanical output that resulted. The commenters recommended the same type of change for the definition of “service brake, on, off.” GM’s rationale is that, while the input and output signals will generally correspond, the former is more relevant for safety-related crash analyses. AIAM commented that the “engine throttle, percent full” data element should be redefined to allow the recording of the throttle pedal input angle as an alternative means of capturing driver behavior.

After consideration of these comments, we have determined that both definitions should be clarified, as suggested, to reflect that it is the driver input that is to be recorded. As stated above in our discussion regarding the “engine RPM” data element, we believe

that driver input is more useful for studying crash reconstruction. Therefore, the definition of “engine throttle, percent full” has been clarified and now reads: “the driver requested acceleration as measured by the throttle position sensor on the accelerator pedal compared to the fully depressed position.”

In the final rule, we have also applied this rationale to the definition of “service brake, on/off” as suggested by the public comments, clarifying that it is the driver input that is recorded. The new definition reads, “the status of the device that is installed in, or connected to, the brake pedal system to detect whether the pedal was pressed. The device can include the brake pedal switch or other driver-operated service brake control.” We believe that this definition is more suitable for the stated purposes of this rulemaking.

#### “Frontal Air Bag”

The NPRM defined “frontal air bag” as “the primary inflatable occupant restraint device that is designed to deploy in a frontal crash to protect the front seat occupants.” GM, DaimlerChrysler, Ford, and Toyota recommended revising the NPRM’s definition of “frontal air bag” to make it more closely align to the language of FMVSS No. 208.<sup>57</sup> We agree with the commenters and have made this modification in the final rule.

#### “Ignition Cycle, Crash” and “Ignition Cycle, Download”

In defining the terms “ignition cycle, crash” and “ignition cycle, download,” the NPRM used the phrase “ignition key applications.” GM, DaimlerChrysler, Ford, and Toyota recommended revising these definitions to reflect that in the future, technological changes may obviate the need for a conventional ignition key.

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<sup>57</sup> Specifically, GM recommended the following definition:

Frontal air bag means any inflatable restraint system that requires no action by vehicle occupants and is used to meet the applicable frontal crash protection requirements of S5.1.2(b) of FMVSS No. 208.

Based upon these comments, we have modified the relevant definitions in the final rule as follows: “ignition cycle, crash” means “the number of power cycles applied to the recording device up to and including the time when the crash event occurred since the first use of the EDR.” “Ignition cycle, download” means “the number of power cycles applied to the recording device at the time when the data was downloaded since the first use of the EDR.”

“Normal Acceleration”

The NPRM defined “normal acceleration” as “the component of the vector acceleration of a point in the vehicle in the z-direction. The normal acceleration is positive in a downward direction.” Delphi recommended that NHTSA provide greater specificity in the definition of 0 G normal acceleration, because the term 0 G is used inconsistently within the industry (*e.g.*, 0 G is sometimes normalized for the –1 G bias due to gravity). We agree with Delphi’s comments and have revised the definition. Since the acceleration data are used to compute velocity and motion relative to the other vehicle/barrier in our laboratory tests, 0 G vertical is defined with the gravity term not removed, hence 0 G vertical would be observed when the vertical accelerometer is at rest.

“Pretensioner”

The NPRM defined “pretensioner” as “a device that is activated by a vehicle’s crash sensing system and removes slack from a vehicle belt system.” GM, DaimlerChrysler, Ford, and Toyota requested a minor change in the definition of the term “pretensioner” to clarify that vehicle belt system means vehicle safety belt system. We

agree that the addition of the word “safety” provides clarity, and we have revised the term.

“Safety Belt Status”

The NPRM defined “safety belt status” as “an occupant’s safety belt is buckled or not buckled.” GM, DaimlerChrysler, Ford, and Toyota recommended modifying the term to read: “safety belt status means the feedback, as recorded by the EDR function, from the safety system that is used to determine that the safety belt is fastened.” The commenters’ rationale is that some safety belt technologies provide safety belt status feedback without evaluation of the buckle status. We agree and have modified the definition in accordance with the recommendations. The definitions for both driver and right front passenger “safety belt status” now read: “the feedback from the safety system that is used to determine that an occupant’s safety belt is fastened or not fastened.”

“Side Air Bag” and “Side Curtain/Tube Air Bag”

The NPRM defined “side air bag” as “any inflatable occupant restraint device that is mounted to the seat or side structure of the vehicle interior at or below the window sill, and that is designed to deploy and protect the occupants in a side impact crash.” The proposal defined “side curtain/tube air bag” as “any inflatable occupant restraint device that is mounted to the side structure of the vehicle interior above the window sill, and that is designed to deploy and protect the occupants in a side impact crash or rollover.”

GM and DaimlerChrysler recommended revising the NPRM’s definitions of “side air bag” and “side curtain/tube air bag” to simplify the locational references in these definitions. GM’s recommended definitions would also drop the phrase “and that is designed to deploy and protect the occupants in a side impact crash,” as it appears in the

NPRM. GM's rationale is that the agency's current definitions do not fully comprehend evolving technology that may permit side curtains in a variety of locations. Ford provided a nearly identical comment. However, Ford recommended adding that these devices are "designed to help mitigate occupant injury and/or ejection."

After considering the comments by GM, DaimlerChrysler, and Ford, we have modified our definitions of "side air bag" and "side curtain/tube air bag" to provide more flexibility for evolving technology. However, we do believe that consumers need to know the conditions under which side air bags will deploy. To that end, we have deleted the specific mounting location references (*i.e.*, above the window sill) from the definitions and accepted Ford's recommendation, but retained the language that the devices will deploy "in a side impact" crash event.

In the final rule, the definition of "side air bag" now reads as "any inflatable occupant restraint device that is mounted to the seat or side structure of the vehicle interior, and that is designed to deploy in a side impact crash to help mitigate occupant injury and/or ejection." The final rule defines "side curtain/tube air bag" as "any inflatable occupant restraint device that is mounted to the side structure of the vehicle interior, and that is designed to deploy in a side impact crash or rollover and to help mitigate occupant injury and/or ejection."

#### "Speed, Vehicle Indicated"

In the NPRM, we proposed to define "speed, vehicle indicated" as "the speed indicated on the vehicle's speedometer." GM, DaimlerChrysler, Ford, and Toyota recommended what they believe is a more technically correct definition of the "speed, vehicle indicated," to read as follows: "the speed indicated by a manufacturer-designated

subsystem designed to indicate the vehicle's ground travel speed during vehicle operation, as recorded by the EDR." GM's rationale is that there are no data on the vehicle databus that indicate the speed actually being displayed to the driver via the speedometer. According to GM, vehicle speed should be reported as determined by the appropriate vehicle subsystem(s), which vary among manufacturers (*e.g.*, wheel speed sensors, driveline shaft sensors, differential sensors, or transmission sensors). Nissan commented that manufacturers should have the option of recording the vehicle speed from a variety of systems (*e.g.*, ABS) instead of the instrument panel speed. AIAM provided a similar comment.

We agree that the definition of "speed, vehicle indicated" in the final rule should be modified in a manner consistent with these recommendations. Accordingly, the definition of "speed, vehicle indicated" now reads: "the speed indicated by a manufacturer-designated subsystem designed to indicate the vehicle's ground travel speed during vehicle operation."

#### Timing Issues

GM, DaimlerChrysler, Ford, and Toyota recommended revising the NPRM's definitions for "time to deploy," "time to first stage," and "time to n<sup>th</sup> stage" to clarify that the elapsed time is in milliseconds and that those times are to be measured from time zero to the time of the air bag deployment command (rather than to the time of air bag inflation or air bag firing).

We agree with the commenters' suggestions for clarification of the time data elements for the air bag systems and other commanded systems, such as pretensioners. Accordingly, we have revised all relevant definitions, including "time to deploy,

pretensioner,” to reflect that these elements are measured to the time of the deployment command signal that is generated within the control unit.

“Time Zero” and “End of Event Time”

The NPRM defined “time zero” as the “beginning of the first 20 ms interval in which the trigger threshold is met during an event.” GM, DaimlerChrysler, Ford, and Toyota recommended revising the definition for “time zero” in order to better standardize a common reference point for all EDR data, thereby facilitating comparisons among data sets from different vehicles. GM proposed new language for that definition.

We have reviewed this definition of “time zero” in conjunction with our newly adopted definition of “trigger threshold,” and we have taken into account the different types of EDR system algorithms (*e.g.*, ones with continuously running algorithms, as opposed to ones using an algorithm “wake-up” strategy). As discussed above, we have revised the definition of “trigger threshold” to mean “8 km/h within a 150 ms interval.” This defines the crash level that will be captured and recorded in the EDR. We acknowledge that OEMs use different operational strategies to sense a crash in their air bag control modules. For example, some manufacturers use a continuously operating system that is always on and sensing acceleration and analyzing the signal(s) to make an air bag command decision. In contrast, other manufacturers utilize systems that “wake up” when a crash occurs.

We agree that “time zero” needs to be defined so as to ensure that each of these strategies will result in similar crash data time reporting in the EDR record. To accomplish this, NHTSA has turned to SAE J1698 for additional guidance. SAE,

working with members from companies that employ the two operating strategies, has worked out these issues, so we have adopted this approach, as discussed below.

For systems that wake up, “time zero” is defined as the time the control algorithm is activated. When a crash occurs, the system wakes up almost instantly, and it starts processing the crash data. Thus, “time zero” is established at or very close to the time the crash starts. “Wake up” is typically determined by the accelerometer exceeding a pre-defined threshold for a pre-defined time period, such as 2 G for 1 ms. The data are captured, and if the delta-V exceeds 8 km/h within a 150 ms interval, the data are recorded.

For systems with continuously running algorithms, the “time zero” determination is more complicated. In such systems, the CPU (central processing unit) is continuously processing accelerometer data in order to make air bag command decisions. SAE decided, for these systems, that the start of an event should be defined by a change in velocity. Thus, we have adopted the same strategy. For systems that run continuously, we are defining “time zero” as the first time point where a longitudinal, cumulative delta-V of over 0.8 km/h (0.5 mph) is reached within a 20 ms time period. Since acceleration rises quickly in a major crash, we anticipate that this strategy should work well, resulting in time zeros in good agreement with the “wake up” systems. Thus, for continuously-running systems, the CPU monitors the vehicle’s deceleration signal(s). If the total delta-V exceeds 8.0 km/h within a 150 ms period, an event is detected and the captured data are recorded.

In lateral crashes, the longitudinal trigger may not be triggered, and in those cases, there would be no data recorded in the EDR. For vehicles that choose to record “delta-V,

lateral,” we are extending the trigger threshold and time zero definition so that in those vehicles, EDR data is recorded. We have turned to SAE J1698-1 for the time zero definition, selecting time zero as the first point in the interval where the cumulative, lateral delta-V equals or exceeds 0.8 km/h (0.5 mph) within a 5 ms interval.

To facilitate detection of a second event in a multi-event crash, we have added a new definition to automate the detection of the end of an event. After once again consulting SAE J1698-1, we have defined “end of event time” as the moment when the cumulative delta-V within a 20 ms time period becomes 0.8 km/h (0.5 mph) or less. This will allow manufacturers to develop methodologies to automatically detect the end of one event and start processing data to determine whether a second event occurs during the crash.

### New Definitions

In reviewing our proposal and after making substantive modifications to other parts of the final rule based on the public comments, we have added a few terms to the “definitions” section of the final rule’s regulatory text for clarification purposes. The new terms are: (1) “air bag warning lamp status,” (2) “deployment time, frontal air bag,” (3) “volatile memory buffer,” (4) “non-volatile memory buffer,” (5) “occupant position classification,” and (6) “end of event time.” We also modified the definitions of “occupant size classification” and “seat position” to make them more flexible to account for developing technologies.

#### c. Data Capture

In the NPRM, we explained that once the trigger threshold has been met or exceeded, EDR data elements are captured in volatile memory. We further explained that

the EDR continues to capture data for an additional 500 ms. The EDR makes a determination (by comparing the absolute values of the maximum delta-V captured with the data previously recorded) of whether to discard the EDR data captured in favor of a previously recorded data set. We proposed a specific hierarchy on how an EDR should capture and record data, including data in cases of multi-event crashes. This strategy was proposed so that the EDR would retain crash data associated with the higher maximum delta-V. We developed this method in the NPRM to ensure that the EDR does not overwrite an important file generated in a crash with a minor subsequent event, such as loading a crashed car on a wrecker.

GM, DaimlerChrysler, Ford, and Toyota recommended that NHSTA delete subparagraphs (a), (b), (c), (f) from our proposed regulatory text section on “data capture.” Those commenters also suggested that NHSTA replace subparagraphs (d) and (e), which discuss data capture requirements associated with air bag deployment, with the following language: “a non-deployment event will overwrite a non-deployment event of lesser magnitude; deployment events must always overwrite non-deployment events; deployment events must lock the record and may not be overwritten.”

In their comments, GM, DaimlerChrysler, Ford, and Toyota stated that the NPRM’s proposed data capture requirements are complex and ambiguous and do not accurately recognize the system architecture in restraint control modules. These four commenters also stated that the requirements do not take into consideration the limitations of current technology. They argued that it is impractical to simultaneously buffer data, to write data to nonvolatile memory, to analyze the severity of the impact(s), and to appropriately deploy restraints.

To reduce the risk of data loss, Nissan stated that an air bag deployment event should be written to memory and locked, and that all further recording should cease. Advocates questioned whether a 5-second window is sufficient to capture an entire post-crash event.

We have carefully considered the comments and have developed a modified strategy for making the data recording decision, based on the comments submitted by the manufacturers. We have adopted these commenters' suggestions for a new definition of "trigger threshold," and based upon this new definition, all crashes captured and recorded will be of significant magnitude to be of interest. Thus, the comparative process, as proposed, is no longer necessary.

We also have decided that collecting data associated with an air bag event is our priority. Accordingly, in the final rule, we have specified a new capture logic that accounts for the comments, simplifies the EDR design, reduces the risk of losing important air bag data, and will likely reduce costs.

The new methodology requires the EDR to make two analytical decisions: one is related to an air bag crash event, and the other is related to a non-air bag crash event. In those crash events where an air bag is commanded to deploy, the EDR must delete the data previously recorded, and the data from the air bag crash event must be captured, recorded, and locked to prevent overwriting. In those crashes where air bags are not commanded to deploy, our logic deletes all previously captured and recorded data, for up to two events. If the second event turns out to be air bag related, the logic calls for a revision to the first condition. In these cases, collection of the first non-air bag related event is not necessary but is acceptable. We believe that this logic provides relief in

terms of the need for increased CPU power that might otherwise be necessary for an EDR to analyze and capture EDR data during a time when it might complicate safety-critical decisions.

d. Miscellaneous Comments

SEMA urged NHTSA to refrain from adopting requirements that could ossify EDR technology, commenting that the EDR system needs to be adaptable to allow for future developments and to work with other vehicle systems. According to SEMA, the system should not preclude servicing, repair, or installation of aftermarket equipment. SEMA argued that manufacturers, distributors, dealers, and motor vehicle repair businesses must have sufficient information about the EDR system to be able to service the vehicle and to install new or replacement products without fear of taking vehicle equipment out of compliance with any applicable Federal motor vehicle safety standard. In response to SEMA's comments, we do not believe that these systems will be any more complicated than current air bag control systems. EDRs are not new to the marketplace, and no specific problem of this sort has been brought to NHTSA's attention.

NADA, EPIC, and Honda commented on the need for public education and awareness of EDRs. NADA stated that NHTSA should work to educate the public "that, in addition to the potential for improving vehicle and roadway safety design effectiveness, appropriately utilized EDR system information will help to reduce accident-related investigation, medical, legal, and insurance costs." EPIC commented that currently, public awareness and understanding of EDRs is insufficient. EPIC urged NHTSA to create an EDR information website to educate the public about EDR technology and its uses, what types of users may gain access to EDR information and the

circumstances under which it may be accessed, and privacy rights associated with EDR data.

NHTSA agrees with the value of a website dedicated to EDRs. About five years ago, NHTSA launched the first EDR website. The website contained historical information about EDR technology, research material regarding EDR uses, patent information and other resources. In late 2004, NHTSA commenced work on a full update to the website, which was completed in early 2005. It is accessible through NHTSA's website, <http://www.nhtsa.dot.gov>, and at <http://safecar.gov>.

Concurrent with the publication of this final rule, we are posting a consumer-directed set of "questions and answers" on our website to provide educational materials and to raise awareness about the presence and functionality of EDRs. Topics include common privacy concerns and NHTSA's protocol for requesting EDR data during crash investigations. In developing these materials, we will consider NADA's recommendations to inform consumers that EDRs could lead to reductions in accident-related investigation, medical, legal, and insurance costs. Our plan is to keep these materials up to date, by adding new information as unique questions from the public are raised.

Honda suggested that NHTSA should conduct an EDR workshop so that all critical issues can be explored and discussed, thereby facilitating issuance of a final rule in an expedient fashion and minimizing the need for petitions for reconsideration. Although an EDR workshop, as recommended by Honda, would offer a means of gaining additional EDR-related input, we have decided that such a meeting is not necessary before proceeding to a final rule.

ATA stated that NHTSA should conduct additional human factors research to determine the effect of driver and employee awareness of EDRs on the number and severity of crashes. ATA's comment pertains to research, not to this final rule. We note, however, that we believe the issue of EDR awareness as related to the number and severity of crashes may be a valuable area for future research.

Public Citizen offered additional recommendations, including: (1) NHTSA should to fully integrate EDR data into all of its data collection systems and crash investigations; (2) police and municipal officials should be trained to enable them to collect accurate and complete EDR data for the Fatality Analyses Reporting System (FARS) database; and (3) NHTSA should create a new database solely for EDR data.

We agree with Public Citizen regarding the value of incorporating EDR data into our national databases. Starting in 2000, NHTSA began to routinely collect EDR data in our NASS/CDS, SCI, and Crash Injury Research and Engineering Network (CIREN) data systems. To date, we have collected over 2,700 cases with EDR data. However, we are not collecting EDR data in FARS at this time. The agency is working with police officials to develop guidelines for training classes to ensure that EDR data are downloaded properly and that these officials are educated on the limitations of these devices.

The European Communities requested that the U.S. refrain from finalizing its EDR proposal until there has been an opportunity for further consultations both bilaterally and in international fora. The European Communities' rationale is that EDRs have been identified as an item for bilateral research cooperation between NHTSA and the Directorate-General Enterprise of the European Commission. The European

Communities also noted that the World Forum for Harmonization of Vehicle Regulations (WP.29), administered by the UN Economic Commission for Europe (ECE), has agreed to establish an informal working group on EDRs. The European Communities expressed hope that with U.S. participation, it would be possible to develop a global technical regulation for EDRs.

We have carefully considered the EC's comments. NHTSA has concluded that it needs to move forward at this time with a basic set of requirements, because EDR data can help the government and industry better understand crash events and safety system performance, thereby contributing to safer vehicle designs and more effective safety regulations. EDR data can also play a role in advancing developing networks for providing emergency medical services, such as ACN. The agency has sought to establish this foundation in a way that would encourage broad application of EDR technologies in motor vehicles and maximize the usefulness of EDR data for researchers, regulators, and the medical community, while avoiding the imposition of unnecessary burdens or hampering future improvements to EDRs.

NHTSA looks forward to continuing work on this issue with the European Communities, as well as with the international community under the auspices of the World Forum for the Harmonization of Vehicle Regulations administered by the United Nations. The action taken today in no way precludes achieving common understandings in the future.

Mr. Bretherton, an individual, commented that better coordination of Traffic Records Coordinating Committees (TRCCs) within States is needed to facilitate the use of crash data and that funding is needed to address technology needs, to make data

uniform between States, and to ensure data collection by all States. He expressed concern that local governments may have increased liability as a result of crash data. He also stated that “Fast FARS” is not a good use of resources. Again, although these issues are worth considering at an appropriate time and in an appropriate forum, they are beyond the scope of the present rulemaking.

## **V. Rulemaking Analyses and Notices**

### **A. Vehicle Safety Act**

Under 49 U.S.C. 322(a), the Secretary of Transportation (the “Secretary”) has authority to prescribe regulations to carry out duties and power of the Secretary. One of the duties of the Secretary is to administer the National Traffic and Motor Vehicle Safety Act, as amended. The Secretary has delegated the responsibility for carrying out the National Traffic and Motor Vehicle Safety Act to NHTSA.<sup>58</sup>

We note that in 1994, the National Traffic and Motor Vehicle Safety Act, as amended, was repealed and simultaneously codified into 49 U.S.C. Chapter 301, Motor Vehicle Safety, by Pub. L. 103-272 (July 5, 1994). This involved moving these provisions from 15 U.S.C. Chapter 38 to 49 U.S.C. Chapter 301. Section 1(a) of Pub. L. 103-272 stated that the laws codified were so codified “without substantive change.” Prior to this codification, a specific provision in 15 U.S.C. 1407 provided, “The Secretary is authorized to issue, amend, and revoke such rules and regulations as he deems necessary to carry out this subchapter.” However, in the codification process, this provision was deleted as unnecessary, because, as specifically noted in the legislative history, the Secretary already had such powers pursuant to 49 U.S.C. 322(a).<sup>59</sup> Thus, the

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<sup>58</sup> 49 U.S.C. 105 and 322; delegation of authority at 49 CFR 1.50.

<sup>59</sup> H.R. REP. NO. 103-180, Table 2A, at 584 (1993).

Secretary, and NHTSA, have general authority to issue such rules and regulations as deemed necessary to carry out Chapter 301 of Title 49, United States Code.

Under 49 U.S.C. Chapter 301, Motor Vehicle Safety (49 U.S.C. 30101 *et seq.*), the Secretary of Transportation, and, by delegation, NHTSA, is responsible for prescribing motor vehicle safety standards that are practicable, meet the need for motor vehicle safety, and are stated in objective terms.<sup>60</sup> These motor vehicle safety standards set the minimum level of performance for a motor vehicle or motor vehicle equipment to be considered safe.<sup>61</sup> When prescribing such standards, NHTSA must consider all relevant, available motor vehicle safety information.<sup>62</sup> NHTSA also must consider whether a proposed standard is reasonable, practicable, and appropriate for the type of motor vehicle or motor vehicle equipment for which it is prescribed and the extent to which the standard will further the statutory purpose of reducing traffic accidents and associated deaths.<sup>63</sup>

Similar to our approach in the area of vehicle identification numbers, we decided to develop a general regulation for EDRs rather than a Federal motor vehicle safety standard. We did not believe it was appropriate to issue an FMVSS that would trigger the statute's recall and remedy provisions, because the benefits of EDRs are expected to be derivative from better crash-related information, rather than having a direct impact on the safety of the individual vehicle equipped with an EDR. A failure to meet the EDR requirements would, however, be subject to an enforcement action. While we have not

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<sup>60</sup> 49 U.S.C. 30111(a).

<sup>61</sup> 49 U.S.C. 30102(a)(9).

<sup>62</sup> 49 U.S.C. 30111(b).

<sup>63</sup> *Id.*

issued the regulation as an FMVSS, however, we have generally followed the statutory requirements that apply to FMVSSs.

First, this final rule was preceded by an initial request for comments and an NPRM, which facilitated the efforts of the agency to obtain and consider relevant motor vehicle safety information, as well as public comments. Further, in preparing this document, the agency carefully evaluated available research, testing results, and other information related to various EDR technologies. We have also updated our economic estimates and analyses to account for new cost information provided by public commenters. In sum, this document reflects our consideration of all relevant, available motor vehicle safety information.

Second, to ensure that the EDR requirements are practicable, the agency considered the cost, availability, and suitability of requiring various EDR data elements, consistent with our safety objectives. We note that EDRs are already installed on most light vehicles, and because the data elements in the final rule are to a large extent already incorporated in EDRs, we believe that it will be practicable to standardize these data elements in light vehicles voluntarily equipped with EDRs and that such incremental changes will be minor. In light of the steady advances made in EDR technologies over the past few years, we believe that vehicle manufacturers will have a number of technological choices available for meeting the requirements of the final rule for EDRs. In sum, we believe that this final rule is practicable and will provide several benefits, including provision of better pre-crash and crash-related data that may be valuable for designing safer vehicles and for use by medical first responders.

Third, the regulatory text following this preamble is stated in objective terms in order to specify precisely what performance is required and how performance will be tested to ensure compliance with the regulation. Specifically, the final rule sets forth performance requirements for operation of the EDRs, including the type of data that the EDR must capture and record, the data's range/accuracy/resolution, and the data's retrievability.

The final rule also includes test requirements for the survivability of EDR data through reference to existing crash test requirements in other FMVSSs (*i.e.*, Standard Nos. 208 and 214). This approach helps ensure that EDR data survive most crashes without establishing new kinds of vehicle tests. The test procedures under FMVSS Nos. 208 and 214 already carefully delineate how testing is conducted. Thus, the agency believes that these test procedures are sufficiently objective and will not result in any uncertainty as to whether a given vehicle satisfies the requirements of the EDR regulation.

Fourth, we believe that this final rule will meet the need for motor vehicle safety because the EDR regulation will help researchers better understand pre-crash and crash events. Standardization of EDR data should improve the consistency and comparability of these data. This information will be useful to NHTSA, vehicle manufacturers, and other interested stakeholders for a variety of purposes, including developing safety vehicle designs and more effective regulations. In addition, standardized EDR data may be useful for ACN and other systems for providing emergency medical services.

Finally, we believe that this final rule is reasonable and appropriate for motor vehicles subject to the applicable requirements (*i.e.*, light vehicles voluntarily equipped

with EDRs). As discussed elsewhere in this notice, the agency has sought to limit the minimum data set in this final rule to those elements necessary to achieve the agency's stated purposes and to minimize the burdens associated with the regulation. We believe that because most EDRs already possess many of these capabilities, any required adjustments should be minor. Accordingly, we believe that this final rule is appropriate for covered vehicles that are or would become subject to these provisions of the EDR regulation because it furthers the agency's objective of preventing deaths and serious injuries through better understanding of crash-related events that may lead to safer vehicle designs and more effective regulations.

B. Executive Order 12866 and DOT Regulatory Policies and Procedures

Executive Order 12866, "Regulatory Planning and Review" (58 FR 51735, Oct. 4, 1993), provides for making determinations whether a regulatory action is "significant" and therefore subject to OMB review and to the requirements of the Executive Order. The Order defines a "significant regulatory action" as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or Tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

This final rule has been determined to be significant, and the agency has prepared a separate document, a Final Regulatory Evaluation, addressing the benefits and costs for the rule. (A copy is available in the docket for this rulemaking.) As a significant notice, it was reviewed under Executive Order 12866. The rule is also significant within the meaning of the Department of Transportation's Regulatory Policies and Procedures. While the potential cost impacts of the final rule are far below the level that would make this a significant rulemaking, the rulemaking addresses a topic of substantial public interest.

As discussed in that document and in the preceding sections of this final rule, the crash data that will be collected by EDRs under this rule will be valuable for the improvement of vehicle safety. We believe that the EDR data we collect will improve crash investigations, the evaluation of safety countermeasures, advanced restraint and safety countermeasure research and development, and advanced ACN. However, the improvement in vehicle safety will not occur directly from the collection of crash data by EDRs, but instead from the ways in which the data are used by researchers, vehicle manufacturers, ACN and EMS providers, government agencies, and other members of the safety community. Therefore, it is not presently practical to quantify the safety benefits.

We estimate that about 64 percent of new light vehicles are already equipped with EDRs. As discussed earlier, vehicle manufacturers have provided EDRs in their vehicles by adding EDR capability to their vehicles' air bag control systems. The costs of EDRs

have been minimized, because they involve the capture into memory of data that is already being processed by the vehicle, and not the much higher costs of sensing much of that data in the first place.

The costs of the rule will be the incremental costs for vehicles equipped with EDRs to comply with the requirements. As discussed in the agency's separate document on benefits and costs, we estimate the total costs of the final rule will range up to \$1.7 million. While the potential costs include technology costs, administrative costs, and compliance costs, the administrative and compliance costs are estimated to be negligible. The final rule will not require additional sensors to be installed in vehicles, and the primary technology cost will result from a need to upgrade EDR memory chips. The total cost for the estimated 9.8 million vehicles that already have an EDR function to comply with the regulation will range up to \$1.7 million. If manufacturers were to provide EDRs in all 15.5 million light vehicles, the estimated total cost will range up to \$10.9 million. A complete discussion of how NHTSA arrived at these costs may be found in the separate document on benefits and costs.

C. Regulatory Flexibility Act

NHTSA has considered the impacts of this rulemaking action under the Regulatory Flexibility Act (5 U.S.C. § 601 *et seq.*) I certify that the final rule will not have a significant economic impact on a substantial number of small entities.

The following is the agency's statement providing the factual basis for the certification (5 U.S.C. § 605(b)). This rule directly affects motor vehicle manufacturers, second stage or final manufacturers, and alterers. Business entities are defined as "small businesses" using the North American Industry Classification System (NAICS) code, for

the purposes of receiving Small Business Administration assistance. One of the criteria for determining size, as stated in 13 CFR 121.201, is the number of employees in the firm. Affected business categories include the following. To qualify as a small business in: (a) Automotive Manufacturing (NAICS 336111), the firm must have fewer than 1,000 employees; (b) Light Truck and Utility Vehicle Manufacturing (NAICS 336112), the firm must have fewer than 1,000 employees; (c) Motor Vehicle Body Manufacturing (NAICS 336211), the firm must have fewer than 1,000 employees; (d) All Other Motor Vehicle Parts Manufacturing (NAICS 336399), the firm must have fewer than 750 employees; (e) Computer Storage Manufacturers (NAICS 334111), the firm must have fewer than 1,000 employees, and (f) Software Reproducing (NAICS 334611), the firm must have fewer than 500 employees.

Only four of the 18 motor vehicle manufacturers affected by this rule qualify as a small business. Most of the intermediate and final stage manufacturers of vehicles built in two or more stages and alterers have 1,000 or fewer employees. However, these small businesses adhere to original equipment manufacturers' instructions in manufacturing modified and altered vehicles. Based on our knowledge, original equipment manufacturers do not permit a final stage manufacturer or alterer to modify or alter sophisticated devices such as air bags or EDRs. Therefore, multistage manufacturers and alterers will be able to rely on the certification and information provided by the original equipment manufacturer. Accordingly, there will be no significant impact on small business, small organizations, or small governmental units by these amendments.

D. Executive Order 13132 (Federalism)

Executive Order 13132 sets forth principles of federalism and the related policies of the Federal government. As noted above, NHTSA expects that general principles of preemption law would operate so as to displace any conflicting State law or regulations (for further discussion of preemption, see section IV.B.9 above).

NHTSA sought comment from all stakeholders on the issue of preemption through publication of the proposed rule in the Federal Register. NHTSA received one comment on the proposed rule from State and local governmental entities.

Additionally, officials at NHTSA consulted with organizations representing the interests of state and local governments and officials about this rulemaking and the issue of preemption.

NHTSA has complied with Executive Order 13132 and has determined that this final rule is consistent with its provisions.

E. Executive Order 12988 (Civil Justice Reform)

Executive Order 12988 requires that agencies review proposed regulations and legislation and adhere to the following general requirements: (1) The agency's proposed legislation and regulations shall be reviewed by the agency to eliminate drafting errors and ambiguity; (2) The agency's proposed legislation and regulations shall be written to minimize litigation; and (3) The agency's proposed legislation and regulations shall provide a clear legal standard for affected conduct rather than a general standard, and shall promote simplification and burden reduction.

When promulgating a regulation, Executive Order 12988, specifically requires that the agency must make every reasonable effort to ensure that the regulation, as appropriate: (1) specifies in clear language the preemptive effect; (2) specifies in clear

language the effect on existing Federal law or regulation, including all provisions repealed, circumscribed, displaced, impaired, or modified; (3) provides a clear legal standard for affected conduct rather than a general standard, while promoting simplification and burden reduction; (4) specifies in clear language the retroactive effect; (5) specifies whether administrative proceedings are to be required before parties may file suit in court; (6) explicitly or implicitly defines key terms; and (7) addresses other important issues affecting clarity and general draftsmanship of regulations.

NHTSA has reviewed this final rule according to the general requirements and the specific requirements for regulations set forth in Executive Order 12988. The issue of the preemptive effect of this final rule was discussed in detail in the section on Executive Order 13132 (Federalism) immediately above, so rather than repeat those points here, we would refer readers to that section for a full discussion. A petition for reconsideration or other administrative proceeding is not required before parties may file suit in court.

F. Executive Order 13045 (Protection of Children from Health and Safety Risks)

Executive Order 13045, “Protection of Children from Environmental Health and Safety Risks” (62 FR 19855, April 23, 1997), applies to any rule that: (1) is determined to be “economically significant” as defined under Executive Order 12866, and (2) concerns an environmental, health, or safety risk that the agency has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonable feasible alternatives considered by the agency.

Because the EDR final rule is not an economically significant regulatory action under Executive Order 12866 and does not involve decisions based upon health and safety risks that disproportionately affect children, no further analysis under Executive Order 13045 is necessary.

G. Paperwork Reduction Act

GM DaimlerChrysler, Ford, and Toyota commented that the agency's NPRM underestimated the paperwork burden associated with section 563.12's requirement for filing technical instructions for manufacturing download devices for each vehicle model. The NPRM estimated those paperwork costs as 20 hours per year per manufacturer. GM's rationale is that the proposed requirement to file this information 90 days prior to the start of production for each vehicle model would require a continuous stream of data filings for the multiple vehicle launches that full-line manufacturers have throughout the calendar year. According to GM, each filing would involve a compilation of the technical data, as well as technical and legal review, tasks which would require more than 20 hours of work for each vehicle model.

These concerns have been addressed because we have decided not to adopt the proposed provision, so deleting those reporting requirements eliminates the paperwork costs that had been associated with this rulemaking. Thus, there are not any information collection requirements associated with this final rule.

H. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law 104-113 (15 U.S.C. § 272) directs the agency to evaluate and use voluntary consensus standards in its regulatory activities unless doing so would be

inconsistent with applicable law or is otherwise impractical. Voluntary consensus standards are technical standards (*e.g.*, materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies, such as the Society of Automotive Engineers. The NTTAA directs us to provide Congress (through OMB) with explanations when the agency decides not to use available and applicable voluntary consensus standards. The NTTAA does not apply to symbols.

There are several consensus standards related to EDRs, most notably those standards published by SAE and IEEE. NHTSA has carefully considered the consensus standards applicable to EDR data elements. Consensus standards for recording time/intervals, data sample rates, data retrieval, data reliability, data range, accuracy and precision, and EDR crash survivability were evaluated by NHTSA and adopted when practicable.

In this final rule, we have incorporated by reference SAE Recommended Practice J211-1, March 1995, “Instrumentation for Impact Test—Part 1—Electronic Instrumentation.” For those manufacturers that prefer to record acceleration data instead of or in addition to delta-V, SAE J211-1 provides a standard for filtering the acceleration data that are then converted to delta-V either during the recording period or in the data downloading process.

Previously in this notice, NHTSA has explained why other voluntary consensus standards were not adopted for certain technical standards set forth in this rule. For further analysis of the incorporation of consensus standards, please refer to section IV.B.14 above.

I. Unfunded Mandates Reform Act

Section 202 of the Unfunded Mandates Reform Act of 1995 (UMRA) requires Federal agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of more than \$ 100 million in any one year (adjusted for inflation with base year of 1995). Section 205 of the UMRA generally requires that, before promulgating a rule for which a written statement is needed, NHTSA identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows NHTSA to adopt an alternative other than the least costly, most cost-effective, or least burdensome alternative if the agency publishes with the final rule an explanation why that alternative was not adopted.

This rule does not impose any unfunded mandates under the Unfunded Mandates Reform Act of 1995. The rule does not result in the expenditure by State, local, or tribal governments, or the private sector, in the aggregate, or more than \$118 million annually (2004 dollars). Thus, this final rule is not subject to the requirements of sections 202 and 205 of the UMRA.

J. National Environmental Policy Act

NHTSA has analyzed this rulemaking action for the purposes of the National Environmental Policy Act. The agency has determined that implementation of this action will not have any significant impact on the quality of the human environment.

K. Regulatory Identifier Number

The Department of Transportation assigns a regulation identifier number (RIN) to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. You may use the RIN contained in the heading at the beginning of this document to find this action in the Unified Agenda.

L. Privacy Act

Please note that anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.) You may review DOT's complete Privacy Act statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70, Pages 19477-78), or you may visit <http://dms.dot.gov>.

List of Subjects in 49 CFR Part 563.

Incorporation by reference, Motor vehicle safety, Motor vehicles, Reporting and recordkeeping requirements.

For the reasons stated in the preamble, NHTSA hereby amends chapter V of title 49 of the Code of Federal Regulations by adding 49 CFR part 563 to read as follows:

**PART 563 – EVENT DATA RECORDERS**

Sec.

- 563.1 Scope
- 563.2 Purpose
- 563.3 Application
- 563.4 Incorporation by reference
- 563.5 Definitions
- 563.6 Requirements for vehicles

- 563.7 Data elements
- 563.8 Data format
- 563.9 Data capture
- 563.10 Crash test performance and survivability
- 563.11 Information in owner's manual
- 563.12 Data retrieval tools

**Authority:** 49 U.S.C. 322, 30101, 30111, 30115, 30117, 30166, 30168

delegation of authority at 49 CFR 1.50.

### **§ 563.1 Scope.**

This part specifies uniform, national requirements for vehicles equipped with event data recorders (EDRs) concerning the collection, storage, and retrievability of onboard motor vehicle crash event data. It also specifies requirements for vehicle manufacturers to make tools and/or methods commercially available so that crash investigators and researchers are able to retrieve data from EDRs.

### **§ 563.2 Purpose.**

The purpose of this part is to help ensure that EDRs record, in a readily usable manner, data valuable for effective crash investigations and for analysis of safety equipment performance (*e.g.*, advanced restraint systems). These data will help provide a better understanding of the circumstances in which crashes and injuries occur and will lead to safer vehicle designs.

### **§ 563.3 Application.**

This part applies to the following vehicles manufactured on or after September 1, 2010, if they are equipped with an event data recorder: passenger cars, multipurpose passenger vehicles, trucks, and buses with a GVWR of 3,855 kg (8,500 pounds) or less and an unloaded vehicle weight of 2,495 kg (5,500 pounds) or less, except for walk-in van-type trucks or vehicles designed to be sold exclusively to the U.S. Postal Service.

This part also applies to manufacturers of those vehicles. However, vehicles manufactured before September 1, 2011 that are manufactured in two or more stages or that are altered (within the meaning of 49 CFR 567.7) after having been previously certified to the Federal motor vehicle safety standards in accordance with Part 567 of this chapter need not meet the requirements of this part.

**§ 563.4 Incorporation by reference.**

The materials listed in this section are incorporated by reference in the corresponding sections as noted. These incorporations by reference were approved by the Director of the Federal Register in accordance with 5 U.S.C. 522(a) and 1 CFR Part 51. Copies of these materials may be inspected at the National Highway Traffic Safety Administration, Technical Information Services, 400 Seventh Street, S.W., Plaza Level, Room 403, Washington, D.C. 20590, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call (202) 741-6030, or go to:

[http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

(a) The following materials are available for purchase from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.

(1) Society of Automotive Engineers (SAE) Recommended Practice J211-1 rev. March 1995, “Instrumentation For Impact Test – Part 1 – Electronic Instrumentation.” SAE J211-1 (rev. March 1995) is incorporated by reference in Table 3 of § 563.8;

(2) [Reserved]

(b) [Reserved]

**§ 563.5 Definitions.**

(a) Motor vehicle safety standard definitions. Unless otherwise indicated, all terms that are used in this part and are defined in the Motor Vehicle Safety Standards, part 571 of this subchapter, are used as defined therein.

(b) Other definitions.

ABS activity means the anti-lock brake system (ABS) is actively controlling the vehicle's brakes.

Air bag warning lamp status means whether the warning lamp required by FMVSS No. 208 is on or off.

Capture means the process of buffering EDR data in a temporary, volatile storage medium where it is continuously updated at regular time intervals.

Delta-V, lateral means the cumulative change in velocity, as recorded by the EDR of the vehicle, along the lateral axis, starting from crash time zero and ending at 0.25 seconds, and recorded every 0.01 seconds.

Delta-V, longitudinal means the cumulative change in velocity, as recorded by the EDR of the vehicle, along the longitudinal axis, starting from crash time zero and ending at 0.25 seconds, recorded every 0.01 seconds.

Deployment time, frontal air bag means (for both driver and right front passenger) the elapsed time from crash time zero to the deployment command or for multi-staged air bag systems, the deployment command for the first stage.

Disposal means the deployment command of the second (or higher, if present) stage of a frontal air bag for the purpose of disposing the propellant from the air bag device.

End of event time means the moment at which the cumulative delta-V within a 20 ms time period becomes 0.8 km/h (0.5 mph) or less.

Engine RPM means, for vehicles powered by internal combustion engines, the number of revolutions per minute of the main crankshaft of the vehicle's engine, and for vehicles not powered by internal combustion engines, the number of revolutions per minute of the motor shaft at the point at which it enters the vehicle transmission gearbox.

Engine throttle, percent full means the driver requested acceleration as measured by the throttle position sensor on the accelerator pedal compared to the fully depressed position.

Event means a crash or other physical occurrence that causes the trigger threshold to be met or exceeded.

Event data recorder (EDR) means a device or function in a vehicle that records the vehicle's dynamic, time-series data during the time period just prior to a crash event (*e.g.*, vehicle speed vs. time) or during a crash event (*e.g.*, delta-V vs. time), intended for retrieval after the crash event. For the purposes of this definition, the event data do not include audio and video data.

Frontal air bag means an inflatable restraint system that requires no action by vehicle occupants and is used to meet the applicable frontal crash protection requirements of FMVSS No. 208.

Ignition cycle, crash means the number (count) of power cycles applied to the recording device at the time when the crash event occurred since the first use of the EDR.

Ignition cycle download means the number (count) of power cycles applied to the recording device at the time when the data was downloaded since the first use of the EDR.

Lateral acceleration means the component of the vector acceleration of a point in the vehicle in the y-direction. The lateral acceleration is positive from left to right, from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Longitudinal acceleration means the component of the vector acceleration of a point in the vehicle in the x-direction. The longitudinal acceleration is positive in the direction of forward vehicle travel.

Maximum delta-V, lateral means the maximum value of the cumulative change in velocity, as recorded by the EDR, of the vehicle along the lateral axis, starting from crash time zero and ending at 0.3 seconds.

Maximum delta-V, longitudinal means the maximum value of the cumulative change in velocity, as recorded by the EDR, of the vehicle along the longitudinal axis, starting from crash time zero and ending at 0.3 seconds.

Multi-event crash means the occurrence of 2 events, the first and last of which begin not more than 5 seconds apart.

Non-volatile memory means the memory reserved for maintaining recorded EDR data in a semi-permanent fashion. Data recorded in non-volatile memory is retained after a loss of power and can be retrieved with EDR data extraction tools and methods.

Normal Acceleration means the component of the vector acceleration of a point in the vehicle in the z-direction. The normal acceleration is positive in a downward direction and is zero when the accelerometer is at rest.

Occupant position classification means the classification indicating that the seating posture of a front outboard occupant (both driver and right front passenger) is determined as being out-of-position.

Occupant size classification means, for right front passenger, the classification of an occupant as an adult and not a child, and for driver, the classification of the driver as not being of small stature.

Pretensioner means a device that is activated by a vehicle's crash sensing system and removes slack from a vehicle safety belt system.

Record means the process of saving captured EDR data into a non-volatile device for subsequent retrieval.

Safety belt status means the feedback from the safety system that is used to determine than an occupant's safety belt (for both driver and right front passenger) is fastened or not fastened.

Seat track position switch, foremost, status means the status of the switch that is installed to detect whether the seat is moved to a forward position.

Service brake, on and off means the status of the device that is installed in or connected to the brake pedal system to detect whether the pedal was pressed. The device can include the brake pedal switch or other driver-operated service brake control.

Side air bag means any inflatable occupant restraint device that is mounted to the seat or side structure of the vehicle interior, and that is designed to deploy in a side impact crash to help mitigate occupant injury and/or ejection.

Side curtain/tube air bag means any inflatable occupant restraint device that is mounted to the side structure of the vehicle interior, and that is designed to deploy in a side impact crash or rollover and to help mitigate occupant injury and/or ejection.

Speed, vehicle indicated means the vehicle speed indicated by a manufacturer-designated subsystem designed to indicate the vehicle's ground travel speed during vehicle operation.

Stability control means any device that is not directly controlled by the operator (*e.g.*, steering or brakes) and is intended to prevent loss of vehicle control by sensing, interpreting, and adjusting a vehicle's driving and handling characteristics, is controlling or assisting the driver in controlling the vehicle.

Steering wheel angle means the angular displacement of the steering wheel measured from the straight-ahead position (position corresponding to zero average steer angle of a pair of steered wheels).

Suppression switch status means the status of the switch indicating whether an air bag suppression system is on or off.

Time from event 1 to 2 means the elapsed time from time zero of the first event to time zero of the second event.

Time, maximum delta-V, longitudinal means the time from crash time zero to the point where the maximum value of the cumulative change in velocity is found, as recorded by the EDR, along the longitudinal axis.

Time to deploy, pretensioner means the elapsed time from crash time zero to the deployment command for the safety belt pretensioner (for both driver and right front passenger).

Time to deploy, side air bag/curtain means the elapsed time from crash time zero to the deployment command for a side air bag or a side curtain/tube air bag (for both driver and right front passenger).

Time to first stage means the elapsed time between time zero and the time when the first stage of a frontal air bag is commanded to fire.

Time to maximum delta-V, lateral means time from crash time zero to the point where the maximum value of the cumulative change in velocity is found, as recorded by the EDR, along the lateral axis.

Time to n<sup>th</sup> stage means the elapsed time from the crash time zero to the deployment command for the n<sup>th</sup> stage of a frontal air bag (for both driver and right front passenger).

Time zero means for systems with “wake-up” air bag control systems, the time occupant restraint control algorithm is activated; for continuously running algorithms, the first point in the interval where a longitudinal, cumulative delta-V of over 0.8 km/h (0.5 mph) is reached within a 20 ms time period; or for vehicles that record “delta-V, lateral,” the first point in the interval where a lateral, cumulative delta-V of over 0.8 km/h (0.5 mph) is reached within a 5 ms time period.

Trigger threshold means a change in vehicle velocity, in the longitudinal direction, that equals or exceeds 8 km/h within a 150 ms interval. For vehicles that record “delta-V, lateral,” trigger threshold means a change in vehicle velocity, in either

the longitudinal or lateral direction that equals or exceeds 8 km/h within a 150 ms interval.

Vehicle roll angle means the angle between the vehicle y-axis and the ground plane.

Volatile memory means the memory reserved for buffering of captured EDR data. The memory is not capable of retaining data in a semi-permanent fashion. Data captured in a volatile memory is continuously overwritten and is not retained in the event of a power loss or retrievable with EDR data extraction tools.

X-direction means in the direction of the vehicle X-axis, which is parallel to the vehicle's longitudinal centerline. The X-direction is positive in the direction of forward vehicle travel.

Y-direction means in the direction of the vehicle Y-axis, which is perpendicular to its X-axis and in the same horizontal plane as that axis. The Y-direction is positive from left to right, from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Z-direction means in the direction of the vehicle Z-axis, which is perpendicular to the X- and Y-axes. The Z-direction is positive in a downward direction.

#### **§ 563.6 Requirements for vehicles.**

Each vehicle equipped with an EDR must meet the requirements specified in § 563.7 for data elements, § 563.8 for data format, § 563.9 for data capture, § 563.10 for crash test performance and survivability, and § 563.11 for information in owner's manual.

#### **§ 563.7 Data elements.**

(a) Data elements required for all vehicles. Each vehicle equipped with an EDR must record all of the data elements listed in Table I, during the interval/time and at the sample rate specified in that table.

**TABLE I – DATA ELEMENTS REQUIRED FOR ALL VEHICLES EQUIPPED WITH AN EDR**

<b>Data Element</b>	<b>Recording Interval / Time<sup>1</sup> (Relative to time zero)</b>	<b>Data Sample Rate Samples per Second</b>
Delta-V, longitudinal	0 to 250 ms	100
Maximum delta-V, longitudinal	0-300 ms	n.a.
Time, maximum delta-V	0-300 ms	n.a.
Speed, vehicle indicated	-5.0 to 0 sec	2
Engine throttle, % full (or accelerator pedal, % full)	-5.0 to 0 sec	2
Service brake, on/off	-5.0 to 0 sec	2
Ignition cycle, crash	-1.0 sec	n.a.
Ignition cycle, download	At time of download	n.a.
Safety belt status, driver	-1.0 sec	n.a.
Frontal air bag warning lamp, on/off	-1.0 sec	n.a.
Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, driver	Event	n.a.
Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, right front passenger	Event	n.a.
Multi-event, number of events (1,2)	Event	n.a.
Time from event 1 to 2	As needed	n.a.
Complete file recorded (yes, no)	Following other data	n.a.

<sup>1</sup> Pre-crash data and crash data are asynchronous. The sample time accuracy requirement for pre-crash time is -0.1 to 1.0 sec (e.g., T = -1 would need to occur between -1.1 and 0 seconds.)

(b) Data elements required for vehicles under specified conditions. Each vehicle equipped with an EDR must record each of the data elements listed in column 1 of Table II for which the vehicle meets the condition specified in column 2 of that table, during the interval/time and at the sample rate specified in that table.

**TABLE II-DATA ELEMENTS REQUIRED FOR VEHICLES UNDER SPECIFIED CONDITIONS**

<b>Data Element Name</b>	<b>Condition for Requirement</b>	<b>Recording Interval / Time<sup>1</sup> (Relative to time zero)</b>	<b>Data Sample Rate (Per Second)</b>
Lateral acceleration	If recorded <sup>2</sup>	0-250 ms	500
Longitudinal acceleration	If recorded	0-250 ms	500
Normal acceleration	If recorded	0-250 ms	500
Delta-V, lateral	If recorded	0-250 ms	100
Maximum delta-V, lateral	If recorded	0-300 ms	n.a.
Time maximum delta-V, lateral	If recorded	0-300 ms	n.a.
Time for maximum delta-V, resultant	If recorded	0-300 ms	n.a.
Engine rpm	If recorded	-5.0 to 0 sec	2
Vehicle roll angle	If recorded	-1.0 up to 5.0 sec <sup>3</sup>	10
ABS activity (engaged, non-engaged)	If recorded	-5.0 to 0 sec	2
Stability control (on, off, engaged)	If recorded	-5.0 to 0 sec	2
Steering input	If recorded	-5.0 to 0 sec	2
Safety belt status, right front passenger (buckled, not buckled)	If recorded	-1.0 sec	n.a.
Frontal air bag suppression switch status, right front	If recorded	-1.0 sec	n.a.

passenger (on, off, or auto)			
Frontal air bag deployment, time to n <sup>th</sup> stage, driver <sup>4</sup>	If equipped with a driver's frontal air bag with a multi-stage inflator.	Event	n.a.
Frontal air bag deployment, time to n <sup>th</sup> stage, right front passenger <sup>4</sup>	If equipped with a right front passenger's frontal air bag with a multi-stage inflator.	Event	n.a.
Frontal air bag deployment, n <sup>th</sup> stage disposal, driver, Y/N (whether the nth stage deployment was for occupant restraint or propellant disposal purposes)	If recorded	Event	n.a.
Frontal air bag deployment, n <sup>th</sup> stage disposal, right front passenger, Y/N (whether the nth stage deployment was for occupant restraint or propellant disposal purposes)	If recorded	Event	n.a.
Side air bag deployment, time to deploy, driver	If recorded	Event	n.a.
Side air bag deployment, time to deploy, right front passenger	If recorded	Event	n.a.
Side curtain/tube air bag deployment, time to deploy, driver side	If recorded	Event	n.a.
Side curtain/tube air bag deployment, time to deploy, right side	If recorded	Event	n.a.
Pretensioner deployment, time to fire, driver	If recorded	Event	n.a.
Pretensioner deployment, time to fire, right front passenger	If recorded	Event	n.a.
Seat track position switch, foremost, status, driver	If recorded	-1.0 sec	n.a.
Seat track position	If recorded	-1.0 sec	n.a.

switch, foremost, status, right front passenger			
Occupant size classification, driver	If recorded	-1.0 sec	n.a.
Occupant size classification, right front passenger	If recorded	-1.0 sec	n.a.
Occupant position classification, driver	If recorded	-1.0 sec	n.a.
Occupant position classification, right front passenger	If recorded	-1.0 sec	n.a.

<sup>1</sup> Pre-crash data and crash data are asynchronous. The sample time accuracy requirement for pre-crash time is -0.1 to 1.0 sec (e.g. T = -1 would need to occur between -1.1 and 0 seconds.)

<sup>2</sup> “If recorded” means if the data is recorded in non-volatile memory for the purpose of subsequent downloading.

<sup>3</sup> “vehicle roll angle” may be recorded in any time duration, -1.0 sec to 5.0 sec is suggested.

<sup>4</sup> List this element n-1 times, once for each stage of a multi-stage air bag system.

### § 563.8 Data format.

(a) The data elements listed in Tables I and II, as applicable, must be recorded in accordance with the range, accuracy, resolution, and filter class specified in Table III.

**TABLE III-RECORDED DATA ELEMENT FORMAT**

<b>Data Element</b>	<b>Range</b>	<b>Accuracy</b>	<b>Resolution</b>	<b>Filter Class</b>
Lateral acceleration	-50 g to +50 g	+/- 5 %	0.01 g	SAE J211-1 <sup>1</sup> , Class 60
Longitudinal acceleration	-50 g to +50 g	+/- 5%	0.01 g	SAE J211-1 <sup>1</sup> , Class 60
Normal Acceleration	-50 g to + 50 g	+/- 5%	0.01 g	SAE J211-1 <sup>1</sup> , Class 60
Longitudinal delta-V	-100 km/h to + 100 km/h	+/- 5%	1 km/h	n.a.
Lateral delta-V	-100 km/h to +100 km/h	+/- 5%	1 km/h	n.a.
Maximum delta-V, longitudinal	-100 km/h to +100 km/h	+/- 5%	1 km/h	n.a.
Maximum delta-V, lateral	-100 km/h to +100 km/h	+/- 5%	1 km/h	n.a.
Time, maximum	0-300 ms	+/- 3 ms	2.5 ms	n.a.

delta-V, longitudinal				
Time, maximum delta-V, lateral	0-300 ms	+/- 3 ms	2.5 ms	n.a.
Time, maximum delta-V, resultant	0-300 ms	+/- 3 ms	2.5 ms	n.a.
Vehicle Roll Angle	-1080 deg to +1080 deg	+/- 10 deg	10 deg	n.a.
Speed, vehicle indicated	0 km/h to 200 km/h	+/- 1 km/h	1 km/h	n.a.
Engine throttle, percent full (accelerator pedal percent full)	0 to 100%	+/- 5%	1 %	n.a.
Engine rpm	0 to 10,000 rpm	+/- 100 rpm	100 rpm	n.a.
Service brake, on, off	On and Off	n.a.	On and Off	n.a.
ABS activity	On and Off	n.a.	On and Off	n.a.
Stability control (on, off, engaged)	On, Off, Engaged	n.a.	On, Off, Engaged	n.a.
Steering wheel angle	-250 deg CW to +250 deg CCW.	+/- 5 deg	5 deg	n.a.
Ignition cycle, crash	0 to 60,000	+/- 1 cycle	1 cycle	n.a.
Ignition cycle, download	0 to 60,000	+/- 1 cycle	1 cycle	n.a.
Safety belt status, driver	On or Off	n.a.	On or Off	n.a.
Safety belt status, right front passenger	On or Off	n.a.	On or Off	n.a.
Frontal air bag warning lamp (on, off)	On or Off	n.a.	On or Off	n.a.
Frontal air bag suppression switch status	On or Off	n.a.	On or Off	n.a.
Frontal air bag deployment, time to deploy/first stage, driver	0 to 250 ms	+/- 2 ms	1 ms	n.a.
Frontal air bag deployment, time to deploy/first stage, right front passenger	0 to 250 ms	+/- 2 ms	1 ms	n.a.
Frontal air bag deployment, time to n <sup>th</sup> stage, driver	0 to 250 ms	+/- 2 ms	1 ms	n.a.
Frontal air bag	0 to 250 ms	+/- 2 ms	1 ms	n.a.

deployment, time to n <sup>th</sup> stage, right front passenger				
Frontal air bag deployment, nth stage disposal, driver, y/n	Yes/No	n.a.	Yes/No	n.a.
Frontal air bag deployment, nth stage disposal, right front passenger, y/n	Yes/No	n.a.	Yes/No	n.a.
Side air bag deployment, time to deploy, driver	0 to 250 ms	+/- 2 ms	1 ms	n.a.
Side air bag deployment, time to deploy, right front passenger	0 to 250 ms	+/- 2 ms	1 ms	n.a.
Side curtain/tube air bag deployment, time to deploy, driver side	0 to 250 ms	+/- 2 ms	1 ms	n.a.
Side curtain/tube air bag deployment, time to deploy, right side	0 to 250 ms	+/- 2 ms	1 ms	n.a.
Pretensioner deployment, time to fire, driver	0 to 250 ms	+/- 2 ms	1 ms	n.a.
Pretensioner deployment, time to fire, right front passenger	0 to 250 ms	+/- 2 ms	1 ms	n.a.
Seat track position switch, foremost, status, driver	Yes/No	n.a.	Yes/No	n.a.
Seat track position switch, foremost, status, right front passenger	Yes/No	n.a.	Yes/No	n.a.
Occupant size driver occupant 5 <sup>th</sup> female size y/n	Yes/No	n.a.	Yes/No	n.a.
Occupant size right front passenger child y/n	Yes/No	n.a.	Yes/No	n.a.

Occupant position classification, driver oop y/n	Yes/No	n.a.	Yes/No	n.a.
Occupant position classification, right front passenger oop y/n	Yes/No	n.a.	Yes/No	n.a.
Multi-event, number of events (1,2)	1 or 2	n.a.	1 or 2	n.a.
Time from event 1 to 2	0 to 5.0 sec	0.1 sec	0.1 sec	n.a.
Complete file recorded (yes/no)	Yes/No	n.a.	Yes/No	n.a.

<sup>1</sup> Incorporated by reference, see § 563.4.

(b) Acceleration Time-History data and format: The longitudinal, lateral, and normal acceleration time-history data, as applicable, must be filtered in accordance with the filter class specified in Table III either during the recording phase or during the data downloading phase to include:

- (1) the Time Step (TS) that is the inverse of the sampling frequency of the acceleration data and which has units of seconds;
- (2) the number of the first point (NFP), which is an integer that when multiplied by the TS equals the time relative to time zero of the first acceleration data point;
- (3) the number of the last point (NLP), which is an integer that when multiplied by the TS equals the time relative to time zero of the last acceleration data point; and
- (4) NLP-NFP+1 acceleration values sequentially beginning with the acceleration at time NFP\*TS and continue sampling the acceleration at TS increments in time until the time NLP\*TS is reached.

### **§ 563.9 Data capture.**

The EDR must capture and record the data elements for events in accordance with the following conditions and circumstances:

(a) In an air bag deployment crash, the data recorded from any previous crash must be deleted (both events). The data related to the deployment must be captured and recorded. The memory must be locked to prevent any future overwriting of these data.

(b) In an air bag non-deployment crash that meets the trigger threshold, delete all previously recorded data in the EDR's memory. Capture and record the current data, up to two events. In the case of two events, detection of the second event starts after the End of Event Time for event 1.

**§ 563.10 Crash test performance and survivability.**

(a) Each vehicle subject to the requirements of S5, S14.5, S15, or S17 of 49 CFR § 571.208, Occupant crash protection, must comply with the requirements in subpart (c) of this section when tested according to S8, S16, and S18 of 49 CFR § 571.208.

(b) Each vehicle subject to the requirements of 49 CFR § 571.214, Side impact protection, that meets a trigger threshold or has a frontal air bag deployment, must comply with the requirements of subpart (c) of this section when tested according to the conditions specified in 49 CFR § 571.214 for a moving deformable barrier test.

(c) The data elements required by § 563.7, except for the “Engine throttle, percent full,” “engine RPM,” and “service brake, on/off,” must be recorded in the format specified by § 563.8, exist at the completion of the crash test, and be retrievable by the methodology specified by the vehicle manufacturer under § 563.12 for not less than 10 days after the test, and the complete data recorded element must read “yes” after the test.

**§ 563.11 Information in owner's manual.**

(a) The owner's manual in each vehicle covered under this regulation must provide the following statement in English:

This vehicle is equipped with an event data recorder (EDR). The main purpose of an EDR is to record, in certain crash or near crash-like situations, such as an air bag deployment or hitting a road obstacle, data that will assist in understanding how a vehicle's systems performed. The EDR is designed to record data related to vehicle dynamics and safety systems for a short period of time, typically 30 seconds or less. The EDR in this vehicle is designed to record such data as:

- How various systems in your vehicle were operating;
- Whether or not the driver and passenger safety belts were buckled/fastened;
- How far (if at all) the driver was depressing the accelerator and/or brake pedal; and,
- How fast the vehicle was traveling.

These data can help provide a better understanding of the circumstances in which crashes and injuries occur. NOTE: EDR data are recorded by your vehicle only if a non-trivial crash situation occurs; no data are recorded by the EDR under normal driving conditions and no personal data (*e.g.*, name, gender, age, and crash location) are recorded. However, other parties, such as law enforcement, could combine the EDR data with the type of personally identifying data routinely acquired during a crash investigation.

To read data recorded by an EDR, special equipment is required, and access to the vehicle or the EDR is needed. In addition to the vehicle manufacturer, other parties, such as law enforcement, that have the special equipment, can read the information if they have access to the vehicle or the EDR.

(b) The owner's manual may include additional information about the form, function, and capabilities of the EDR, in supplement to the required statement in 563.11(a).

**§ 563.12 Data retrieval tools.**

Each manufacturer of a motor vehicle equipped with an EDR shall ensure by licensing agreement or other means that a tool(s) is commercially available that is capable of accessing and retrieving the data stored in the EDR that are required by this part. The tool(s) shall be commercially available not later than 90 days after the first sale of the motor vehicle for purposes other than resale.

Issued on:

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Nicole R. Nason  
Administrator

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[Signature page for Event Data Recorders, Final Rule]