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PRELIMINARY REGULATORY EVALUATION

FMVSS No. 405 EVENT DATA RECORDERS (EDRs)

Office of Regulatory Analysis and Evaluation

National Center for Statistics and Analysis

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People Saving People

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EXECUTIVE SUMMARY

This Preliminary Regulatory Evaluation (PRE) analyzes the potential impacts of a proposal to establish a Federal Motor Vehicle Safety Standard (FMVSS) No. 405, Event Data Recorders. The proposed rule would require all light vehicles with a gross vehicle weight rating (GVWR) of 3,855 kilograms (8,500 pounds) or less and an unloaded vehicle weight of 2,495 kilograms (5,500 pounds) or less to be equipped with EDRs that meets the data elements, data capture and format, data retrieval, and data crash survivability of 49 CFR Part 563, Event Data Recorders (Part 563).

Part 563 was established on August 2006. It specifies the definition and performance requirements of Event Data Recorders (EDRs) including the standardization of crash data elements, data collection and accuracy, survivability, and retrievability of the data. The compliance date for Part 563 was September 1, 2012.¹

Proposal

Essentially, the proposal would mandate EDRs for all vehicles with a GVWR no greater than 3,855 kilograms (kg; 8,500 pounds) and an unloaded vehicle weight not greater than 2,495 kg (5,500 pounds) (hereafter, applicable vehicles). Through FMVSS No. 405, compliance to specific provisions of Part 563 would be subject to the recall and remedy provisions of 49 U.S.C. §§ 30118 and 30120. Specifically, Part 563 requires an EDR to:

¹ 71 FR 51043, August 28, 2006. Amended in January 14, 2008 (73 FR 2179) and corrected on February 13, 2008 (73 FR 8408). Further amended on August 5, 2011 (76 FR 47478). Further amended 77 FR 47552 (August 9, 2012).

- a. Record the 15 essential data elements specified in Table 1 of Part 563
- b. Record up to 30 additional data elements if the vehicle is equipped to record these elements in Table II of Part 563
- c. Function after full-scale vehicle crash tests specified in FMVSS Nos. 208 and 214, and
- d. Have the capacity to record and lock data from a crash where the frontal air bag deploys or where the side air bag deploys and lateral delta v is captured.

In addition, Part 563 requires vehicle manufacturers to make a retrieval tool for the EDR information commercially available and to include a standardized statement in the owner's manual indicating that the vehicle is equipped with an EDR and describing its purposes.

The proposal does not modify any of the Part 563 data elements, data capture and format requirements, data retrieval specifications, or data survivability and crash test requirements. However, by September 1, 2014, the proposed new FMVSS No. 405 would require manufacturers of all applicable vehicles to install EDRs in compliance with Part 563.

Technological Feasibility

The agency estimated that about 91.6 percent of 2010 model year (MY) applicable vehicles are equipped with EDRs. The remaining 8.4 percent (1.2 million) of the light vehicles, mostly high-end luxury brand vehicles, are not equipped with an EDR.

However, these vehicles generally have the state-of-the-art electronic systems, safety technologies, and vehicle communication network. Therefore, the proposal is expected not to require significant redesign on their sensing technologies, software, electronic systems, and in-vehicle communication systems.

Benefits

The proposal would close the EDR installation gap and allow the agency and safety researchers to comprehensively understand ever more complex vehicles' electronic systems and to identify critical issues relating to the performance of safety devices. Furthermore, by requiring standardized information, such as crash severity, air bag deployment status and safety belt use, to be recorded on all applicable vehicles, the proposal may improve data availability to advanced automatic crash notification (AACN) systems, which evaluate the need for and the level of emergency response to traffic crashes.

Mandating that all light vehicles required to have frontal air bags be equipped with EDRs will enable the agency to use EDR data in assessing the performance of particular vehicle models in determining the need for conducting a safety defect investigation that may lead to a recall of the vehicle for repair or replacement of problem parts or systems.

Additionally, many of the vehicles anticipated to continue to lack EDRs, absent a mandate, are high end vehicles that have advanced safety technologies, including advanced collision avoidance technologies. The proposal thus will further facilitate crash investigations and research, which will enable the development of safer vehicles.

Costs

The estimated annual total costs associated with the proposal would be \$26.4 million (2010 dollars) which is measured from a baseline of 91.6 percent EDR installation to 100 percent installation. Assuming 16.5 million light vehicles with a GVWR less than 4,535 kilograms (10,000 pounds) sold per year and 15.7 million were applicable vehicles, 8.4 percent of these without EDRs amounted to 1.32 million vehicles annually that would be impacted by the proposal. This cost reflects hardware for housing the recorded data, the need for technology improvements, as well as assembly costs, compliance costs, and paperwork maintenance costs² for those 1.32 million vehicles. The cost per affected vehicle is estimated to be \$20.

Alternatives

No other alternatives were examined in the PRE. The cost of the proposal is less than \$136 million. Thus, the proposed rule is not subject to the requirements of section 205 of the Unfunded Mandates Reform Act of 1995 that requires the agency to examine significant alternatives if a rule would result in the expenditure by State, local, or tribal governments, and private sector, in the aggregate, of more than \$136 million (2010 \$) annually.

² These paperwork maintenance costs consist of the costs to modify the owner's manual with the required statement specified in 49 CFR 563.11.

Leadtime

The compliance date of the proposal is September 1, 2014. Multi-stage vehicle manufacturers and alterers must comply with the proposal beginning on September 1, 2015. This leadtime should enable vehicle manufacturers of the 8.4 percent of fleet that are not equipped with an EDR have time to make the necessary design changes as they introduce new make/models and minimize the compliance costs. The proposed lead time should also address the practical concerns of many new electric and hybrid electric manufacturers who are entering the market and who may not have been planning to install EDRs.

CHAPTER I. INTRODUCTION

This preliminary regulatory evaluation (PRE) accompanies the National Highway Traffic Safety Administration's (NHTSA) Notice of Proposed Rulemaking (NPRM) to establish a Federal Motor Vehicle Safety Standard (FMVSS) No. 405, Event Data Recorders (EDRs). The proposed rule would require all applicable light vehicles manufactured on or after September 1, 2014 to be equipped with an EDR. Specifically, FMVSS No. 405 would require compliance with the crash test performance and survivability requirements in Part 563. This would mean that the data elements required by the regulation, with certain exceptions, must be recorded in the format specified by the regulation, exist at the completion of the crash test, and be retrievable by the methodology specified by the vehicle manufacturer. As part of a FMVSS, these requirements would be subject to the recall and remedy provisions of 49 U.S.C. §§ 30118 and 30120. These EDRs would also need to comply with any of the remaining provisions under Part 563. The covered vehicles are all light vehicles with a GVWR no greater than 3,855 kg (8,500 pounds) and an unloaded vehicle weight of 2,495 kg (5,500 pounds) or less. Specialty vehicles are excluded. EDRs were typically recording information from the air bag control module of passenger vehicles. Therefore, Part 563 limited its applicability to vehicles that are required to be equipped with air bags. These vehicles are called applicable vehicles hereafter.

Background

On August 28, 2006, the agency established Part 563 which standardizes performance requirements for the accuracy, collection, storage, survivability, and retrievability of

onboard motor vehicle crash event data in all applicable vehicles voluntarily equipped with EDRs.³ Later, on January 14, 2008, the agency amended Part 563 to make several technical changes to the regulatory text and to set a later compliance date of September 1, 2012.⁴ The new compliance date helped manufacturers to avoid incurring significant redesign costs for EDR system architectures outside of the normal product cycle.

EDR as specified in Part 563 is a function or device installed in a motor vehicle to record technical vehicle and occupant information for a brief period of time (i.e., a few seconds) before and during a crash for the purpose of monitoring and assessing vehicle safety system performance. EDRs have been available in various forms in certain vehicles since the 1970s to gather real-world performance data for various vehicle safety systems. Most commonly, EDRs were incorporated into the vehicle air bag control systems to monitor the air bag performance.

Since 1991, the agency has been assessing the potential use of real-world EDR crash data for improving vehicle safety and crash data collection. In 1998, the agency sponsored two EDR working groups to identify crash data elements that can be recorded and be used to support the agency's mission of reducing highway deaths, injury, and societal costs and to examine critical issues relating to the implementation of EDRs. The working

³ 71 FR 50998, 51043 (August 28, 2006), amended 73 FR 2168, 2179 (January 14, 2008), corrected 73 FR 8408 (February 13, 2008), further amended on August 5, 2011 (76 FR 47478), further amended 77 FR 47552 (August 9, 2012).

⁴ 73 FR 2168 (January 14, 2008). Vehicles that are manufactured in two or more stages, or that are altered after having been previously certified to the Federal Motor Vehicle Safety Standards (FMVSS) have a compliance date of September 1, 2013.

groups were comprised of members from industry, academia, and other government organizations. In August 2001, the first EDR Working Group published a final report on the results of its deliberations.⁵ In May 2002, the second working group, the NHTSA Truck & Bus EDR Working Group, published its final report.⁶ NHTSA also developed a website for highway-based EDRs.⁷ These efforts culminated in establishing Part 563.

EDR Installation

In 2006 when promulgating the Part 563 final rule, the agency estimated that 64 percent of 2005 model year (MY) applicable vehicles were equipped with some forms of EDRs. In recent years, EDR technologies have advanced significantly and more manufacturers have voluntarily equipped their vehicles with EDRs. Based on the industry's response to the agency's New Car Assessment Program (NCAP) survey on 2010 MY vehicles, 91.6 percent of the 2010 MY applicable vehicles were already equipped with EDRs. This average was derived from the manufacturers' reported EDR installations for 2010 MY light vehicles and weighted by their corresponding projected vehicle sales. Table I-1 lists the industry's response on their projected 2010 MY vehicle sales, EDR installation rates, and the derived weighted overall EDR installation rate for the applicable 2010 MY fleet.

⁵ Event Data Recorders, Summary of Findings by the NHTSA EDR Working Group, August 2001, Final Report, Docket No. NHTSA-99-5218-9

⁶ Event Data Recorders, Summary of Findings by the NHTSA EDR Working Group, May 2002, Final Report, Volume II, Supplemental Findings for Trucks, Motorcoaches, and School Buses, Docket No. NHTSA-2000-7699-6

⁷ The web address is "<http://www.nhtsa.gov/EDR>."

Reasons for the Proposal

As shown in Table I-1, approximately 8.4 percent applicable MY 2010 vehicles did not incorporate EDRs. The majority of these vehicles were clustered in a special segment (i.e., luxury brands) of market. These vehicles are more likely than the typical vehicles to be equipped with advanced safety features and electronic systems. Additionally, during the investigation of unintended acceleration and pedal entrapment allegations relating to certain Toyota models, the agency found that the EDR data was helpful. EDR data allowed the agency (as well as vehicle manufacturers) to better understand driver-vehicle interaction and crash causation, to effectively identify safety defects in the vehicle design and/or performance, and to resolve conflicting information the agency received. In addition, the agency has incorporated EDRs into the agency's real-world database whenever EDR data were obtainable [such as the National Automotive Sampling System – Crashworthiness Data System (NASS-CDS)]. The incorporation of the EDRs has improved crash data quality and influenced research for safer vehicles. Furthermore, the agency also acknowledges the potential of EDR data for advancement of AACN systems and emergency management service providers. Therefore, the agency proposes to mandate EDRs for all applicable vehicles. In addition to the general benefits of EDR data, the inclusion of the specific segment of vehicles that are not expected to be equipped with EDRs would allow a more comprehensive evaluation of vehicle safety and broadly address highway safety issues. Mandating EDRs would also aid the agency in assessing the performance of all applicable vehicles in determining the need for, or conducting, safety defect investigations.

Table I-1
Estimate of the Number of EDRs in 2010 MY Light Vehicles with
A GVWR of 3,855 Kilograms (8,500 Pounds) or Less

Manufacturers	Sales	Percent of Sales	% With EDRs	# of EDRs
Audi	85,735	0.7%	0.0%	0
BMW	342,825	2.9%	0.0%	0
Chrysler	944,876	8.1%	99.9%	943,931
Daimler AG	113,940	1.0%	0.0%	0
Ford Motor Co.	1,613,410	13.8%	100.0%	1,613,410
General Motors	2,536,952	21.7%	100.0%	2,536,952
Honda	1,019,650	8.7%	100.0%	1,019,650
Hyundai	456,000	3.9%	100.0%	456,000
Jaguar	20,900	0.2%	100.0%	20,900
KIA	302,000	2.6%	100.0%	302,000
Land Rover	26,100	0.2%	100.0%	26,100
Mazda	220,000	1.9%	100.0%	220,000
Mitsubishi	64,817	0.6%	100.0%	64,817
Nissan	778,890	6.7%	100.0%	778,890
Porsche	24,140	0.2%	0.0%	0
Subaru	216,000	1.9%	0.0%	0
Suzuki	37,603	0.3%	100.0%	37,603
Toyota	2,606,280	22.3%	100.0%	2,606,280
Volkswagen	195,960	1.7%	0.0%	0
Volvo	66,953	0.6%	100.0%	66,953
Total	11,673,031		91.6%	10,693,486

Source: NHTSA's NCAP Industry Survey for 2010 MY light vehicles

Organization of the Remaining Analysis

Chapter II of this PRE discusses the proposal. Chapter III discusses the benefits, cost, and leadtime of the proposal. Finally, Chapter IV examines the impacts of the proposal on small business entities.

CHAPTER II. REQUIREMENTS OF THE PROPOSAL

The proposal would establish FMVSS No. 405, Event Data Recorders, requiring applicable vehicles to be equipped with an EDR by September 1, 2014. Applicable vehicles include passenger cars, multipurpose passenger vehicles, light trucks, and vans with a GVWR of 3,855 kilograms (8,500 pounds) or less and an unloaded vehicle weight of 2,495 kg (5,500 pounds) or less with the exception of walk-in type vans or vehicles that are designated to be sold exclusively to the U.S. Postal Service.

Basically, the proposed FMVSS No. 405 would require data elements of Table I of Part 563, with certain exceptions, to be recorded in the format specified by the regulation, exist at the completion of the crash test, and be retrievable by the methodology specified by the vehicle manufacturer. As part of a FMVSS, these requirements would be subject to the recall and remedy provisions of 49 U.S.C. §§ 30118 and 30120. The remainder of Part 563 will remain a voluntary regulation. The proposal does not modify any of the Part 563 data elements, data capture and format requirements, data retrieval specifications, or data survivability and crash test requirements.

In summary, Part 563 requires:

- 1) EDRs to record 15 essential data elements with a standardized data format including sampling rate, recording time duration, range, accuracy, resolution, and filter class for each event (Table I of Part 563),

- 2) EDRs to record up to 30 additional data elements with a standardized data format (including sampling rate, recording time duration, range, accuracy, resolution, and filter class for each event), if the vehicle is equipped to record these elements⁸ (Table II of Part 563),
- 3) EDRs to have the capacity to record and lock data from a crash where the frontal air bag deploys or where the side air bag deploys and lateral delta v is captured
- 4) EDRs to have the capacity to record up to two events other than when frontal or side air bags deploy.
- 5) EDRs to function during and after the full-scale vehicle crash tests specified in the FMVSS Nos. 208 and 214. The data elements must be retrievable for at least 10 days after the crash tests,
- 6) vehicle manufacturers to ensure the availability of download tools for the EDR data, and
- 7) vehicle manufacturers to include a standardized statement in the owner's manual indicating that the vehicle is equipped with an EDR and describing the purposes of EDRs.

Table II-1 in this document lists the 15 data elements and their corresponding format requirements including record time, sampling rate, data range, accuracy, and data resolution. Table II-2 in this document lists the 30 optional data elements to be recorded under specified conditions⁹ along with their data formats. These additional data elements

⁸ "If recorded" means if the data are recorded in non-volatile memory for the purpose of subsequent downloading.

⁹ If the data element is recorded or the vehicle is equipped with the specific safety device.

are required if vehicles were equipped to record these elements. Two of the data elements “Frontal air bag deployment, time to nth stage, driver” and “Frontal air bag deployment, time to nth stage, right front passenger” are required if vehicles were equipped with frontal air bags with a multi-stage inflator and the EDR optionally records the data. An EDR is required to record and lock these elements when a frontal air bag deploys or when the side air bag deploys and lateral delta v is captured. For other events, where the data is not locked, data from up to two events is captured and recorded.

**Table II-1
Required Essential Data Elements and Formats**

Item #	Data Elements	Recording Time*	Sampling Rate	Range	Accuracy	Resolution
1	Delta-V, Longitudinal	0 – 250 ms or 0 to end of event plus 30 ms, whichever is shorter	100/s	-100 to 100 km/h	± 10%	1 km/h
2	Maximum delta-V, Longitudinal	0 – 300 ms or 0 to end of event plus 30 ms, whichever is shorter	N.A.	-100 to 100 km/h	± 10%	1 km/h
3	Time, Maximum delta-V, Longitudinal	0 – 300 ms or 0 to end of event plus 30 ms, whichever is shorter	N.A.	0 – 300 ms or 0 to end of event plus 30 ms, whichever is shorter	± 3 ms	2.5 ms
4	Speed, vehicle indicated	-5.0 to 0 s	2/s	0- 200 km/h	± 1 km/h	1 km/h
5	Engine throttle, % full (accelerator pedal % full)	-5.0 to 0 s	2/s	0 – 100%	± 5%	1%
6	Service brake, on/off	-5.0 to 0 s	2/s	On/off	N.A.	On/off
7	Ignition cycle, crash	-1.0 s	N.A.	0 – 60,000	± 1 cycle	1 cycle
8	Ignition cycle, download	At time of download	N.A.	0 – 60,000	± 1 cycle	1 cycle
9	Safety belt status, driver	-1.0 s	N.A.	On/off	N.A.	On/off
10	Frontal air bag warning lamp	-1.0 s	N.A.	On/off	N.A.	On/off
11	Frontal air bag deployment time, Driver (1 st stage, in case of multi-stage air bags)	Event	N.A.	0 – 250 ms	±2 ms	1 ms
12	Frontal air bag deployment time, RFP (1 st stage, in case of multi-stage air bags)	Event	N.A.	0 – 250 ms	±2 ms	1 ms
13	Multi-event, number of events (1 or 2)	Event	N.A.	1, 2	N.A.	1, 2
14	Time from event 1 to 2	As needed	N.A.	0 - 5.0 s	0.1 s	0.1 s
15	Complete file recorded (yes or no)	Following Other Data	N.A.	Yes/no	N.A.	Yes/no

* Relative to time zero

s: second; ms: millisecond; km/h: kilometer per hour; RFP: right front outboard passenger; N.A.: not applicable

**Table II-2
Required Additional Data Elements and Formats Under Specified Conditions***

Item #	Data Elements	Recording Time**	Sampling Rate	Range	Accuracy ²	Resolution
1	Lateral acceleration	N.A.	N.A.	At option of manufacturer	At option of manufacturer	At option of manufacturer
2	Longitudinal acceleration	N.A.	N.A.	At option of manufacturer	At option of manufacturer	At option of manufacturer
3	Normal acceleration	N.A.	N.A.	At option of manufacturer	At option of manufacturer	At option of manufacturer
4	Delta-V, Lateral	0 – 250 ms or 0 to end of event plus 30 ms, whichever is shorter	100/s	– 100 to 100 km/h	±10%	1 km/h
5	Maximum delta-V, Lateral	0 – 300 ms or 0 to end of event plus 30 ms, whichever is shorter	N.A.	– 100 to 100 km/h h	±10%	1 km/h
6	Time, maximum delta-V, Lateral	0 – 300 ms or 0 to end of event plus 30 ms, whichever is shorter	N.A.	0 – 300 ms or 0 to end of event plus 30 ms, whichever is shorter	± 3 ms	2.5 ms
7	Time, maximum delta-V, resultant	0 – 300 ms or 0 to end of event plus 30 ms, whichever is shorter	N.A.	0 – 300 ms or 0 to end of event plus 30 ms, whichever is shorter	± 3 ms	2.5 ms
8	Engine RPM	-5.0 to 0 s	2/s	0 – 10,000 rpm	± 100 rpm	100 rpm
9	Vehicle roll angle (degree)	-1.0 up to 5 s	10/s	- 1,080 ⁰ to 1,080 ⁰	± 10 ⁰	10 ⁰
10	ABS activity	-5.0 to 0 s	2/s	On/off	N.A.	On/off
11	Stability control	-5.0 to 0 s	2/s.	On/off/engaged	N.A.	On/off/engaged
12	Steering input	-5.0 to 0 s	2/s	-250 ⁰ CW to 250 ⁰ CCW	± 5 %	± 1%
13	Safety belt status, RFP	-1.0 s	N.A.	On/off	N.A.	On/off
14	Frontal air bag suppression switch status, RFP	-1.0 s	N.A.	On/off/auto	N.A.	On/off/auto
15	Frontal air bag deployment, time to N th stage, Driver ¹	Event	N.A.	0 – 250 ms	± 2 ms	1 ms
16	Frontal air bag deployment, time to N th stage, RFP ¹	Event	N.A.	0 – 250 ms	± 2 ms	1 ms
17	Frontal air bag deployment, N th stage disposal, Driver ¹	Event	N.A.	Yes/no	N.A.	Yes/no
18	Frontal air bag deployment, N th stage disposal, RFP ¹	Event	N.A.	Yes/no	N.A.	Yes/no
19	Side air bag deployment time, Driver	Event	N.A.	0 – 250 ms	± 2 ms	1 ms

Item #	Data Elements	Recording Time**	Sampling Rate	Range	Accuracy ²	Resolution
20	Side air bag deployment time, RFP	Event	N.A.	0 – 250 ms	± 2 ms	1 ms
21	Side curtain/tube air bag deployment time, Driver	Event	N.A.	0 – 250 ms	± 2 ms	1 ms
22	Side curtain/tube air bag deployment time, Right side	Event	N.A.	0 – 250 ms	± 2 ms	1 ms
23	Pretensioner deployment time, Driver	Event	N.A.	0 – 250 ms	± 2 ms	1 ms
24	Pretension deployment time, RFP	Event	N.A.	0 – 250 ms	± 2 ms	1 ms
25	Seat track position, Driver	-1.0 s	N.A.	Yes/no	N.A.	Yes/no
26	Seat track position, RFP	-1.0 s	N.A.	Yes/no	N.A.	Yes/no
27	Occupant size classification, Driver	-1.0 s	N.A.	5th percentile female or larger	N.A.	Yes/no
28	Occupant size classification, RFP	-1.0 s	N.A.	Child	N.A.	Yes/no
29	Occupant position classification, Driver	-1.0 s	N.A.	Out of position	N.A.	Yes/no
30	Occupant position classification, RFP	-1.0 s	N.A.	Out of position	N.A.	Yes/no

* If the specific data element was recorded or if the vehicle is equipped with the specific safety device

**Relative to time zero

s: second; ms: millisecond; km/h: kilometer per hour; RFP: right front outboard passenger; N.A.: not applicable

¹List this element n-1 times, once for each stage of a multi-stage air bag system.

²Accuracy requirement only applies within the range of the physical sensor. For vehicles manufactured after September 1, 2014, if measurements captured by a sensor exceed the design range of the sensor, the reported element must indicate when the measurement first exceeded the design range of the sensor.

CHAPTER III. BENEFITS, COSTS, AND LEADTIME

This chapter estimates the costs of the proposal and discusses benefits and leadtime. As described in Chapter I, Introduction, the agency estimated that 91.6 of applicable 2010 MY vehicles already were equipped with EDRs. Assuming that the percentage of applicable vehicles equipped with EDRs would remain at this level without a mandate, the cost of the proposal thus is measured from the 91.6 percent (baseline) to the 100 percent of all applicable light vehicles to be equipped with EDRs.

An EDR is required to store certain event-related information (e.g., air bag deployment) before or during a crash. The stored data are extremely valuable for crash investigation, defect identification and verification, safety research, and developing emergency response systems. Although the agency believes that the proposal will improve vehicle safety, the safety benefits are difficult to quantify. Therefore, the benefits of this proposal are discussed qualitatively.

Benefits

Mandating the installation of EDRs in light vehicles required to have frontal air bags would provide for a standardized set of EDR data elements and formats throughout most of the light vehicle fleet rather than on just those manufacturers who chose to voluntarily install EDRs. This would expand and, therefore, potentially enhance the utilization of the recorded information and lead to further improvements in the safety of current and future motor vehicles.

Although the benefits of this NPRM derive from expansion of EDR coverage, we will briefly review the general benefits related to EDRs. Part 563 standardizes data recorded by voluntarily-installed EDRs across all applicable vehicles and requires the development of data access tools. This mandate is expected to enhance the utilization of the recorded information in research and crash investigation, improve the quality of real-world crash data, and enhance the injury severity prediction algorithms used by the AACN systems and emergency medical services (EMS).

Since the establishment of Part 563 in 2006, an increasing percentage of vehicles have incorporated the EDR technology from 64 percent for 2005 MY vehicles to 91.6 percent for the 2010 MY vehicles. In the mean time, automotive safety researchers, vehicle manufacturers, AACN and EMS providers, government agencies, and other members of the safety community are increasingly using the EDR data to improve highway/vehicle safety and to reduce injury severity outcomes.

EDR data improve crash investigation and crash data collection quality to assist safety researchers, vehicle manufacturers, and the agency to understand vehicle crashes better and more precisely. While crash investigators gather insightful information about the dynamics of crashes, some of these parameters cannot be determined (such as anti-lock braking system or electronic stability control functioning status) or cannot be as accurately measured (such as the change in velocity) by traditional post-crash investigation procedures such as visually examining and evaluating physical evidence, e.g., the crash-involved vehicles and skid marks. Further, some vehicle crash dynamics related to rollover (such as roll angle, roll rate and normal acceleration) cannot be effectively estimated by crash investigators post-crash. Data collected by the EDR can provide a direct means for measuring these needed crash parameters.

Moreover, the agency has increasingly incorporated EDR data into the agency-collected real-world crash databases (e.g., NASS-CDS). EDR data elements such as delta v and belt use status have been used to cross-verify those recorded in the NASS-CDS. EDR recordings of advanced restraint systems such as advanced air bags have been used to examine the performance of these systems.

Based on these experiences, the agency agrees with the conclusion from a 2005 report published by the National Academies that EDR data can improve the accuracy of real-

world crash databases and its long term benefit is its influence on vehicle safety (NCHRP report).¹⁰

Furthermore, the advent of AACN and its use by EMS providers is dependent upon the standardized collection of crash information in the vehicle and the availability of critical crash information such as crash severity (delta v), seat belt use status, air bag deployment status, etc. Thus, EDRs will enable and further enhance the development and usefulness of AACNs by EMS providers.

In addition to the general benefits derived from EDR installation, there are benefits specific to this NPRM to mandate EDRs. Specifically, EDR data have provided the agency and manufacturers valuable insight during the investigation of unintended acceleration and the sticking and pedal entrapments¹¹ related to certain Toyota vehicles with an electronic throttle control. The EDR data, supplemented with follow-up conversations with the complainant and crash scene evidence, provided objective information regarding the pre-crash operation of the vehicles. The objective assessment enabled the agency and manufacturers to identify the defect, to resolve conflicting information, and to verify the validity of complaints.¹² EDR data can have significant value in aiding the agency in assessing the performance of particular vehicle models in determining the need for, or conducting, a safety defect investigation that may lead to a

¹⁰ NCHRP Project 17-24, "Use of Event Data Recorder (EDR) Technology for Highway Crash Data Analysis.", Transportation Research Board of the National Academies

¹¹ For Pedal Entrapment: See NHTSA Recall Nos. 06V-253, 07E-082, 09V-023, 09V-388, and 10V-023. For Sticking Pedals: See NHTSA Recall No. 10V-017.

¹² See NHTSA Pre-Crash EDR Field Inspections March – August 2010, ODI Report

recall of the vehicle for repair or replacement of problem parts or systems. To serve this purpose for all light vehicles required to have frontal air bags, EDR data must be available for all such vehicles.

Additionally, the 8.4 percent of applicable vehicles (1.32 million) that currently do not have EDRs belong to specific segments of vehicles and are limited to a few manufacturers. Many of the vehicles anticipated to continue to lack EDRs, absent a mandate, are high end vehicles that have advanced safety technologies, including advanced collision avoidance technologies. Such technologies are typically first introduced on high end vehicles. The inclusion of these vehicles would allow the agency and safety researchers to comprehensively understand ever more complex vehicle safety systems for all applicable vehicle model types and to non-discriminately identify critical issues relating to the performance of safety devices. Thus, the proposal would further facilitate the development of safer vehicles and help the agency to better prioritize its regulatory agenda of developing state-of-the-art vehicle safety standards.

Costs

The costs are the incremental costs from the 91.6 percent (baseline) to the 100 percent of EDR installation among all applicable light vehicles. In other words, the cost of the proposal would be the total costs for the 8.4 percent applicable vehicles that currently do not have EDRs (affected vehicles) to equip with a Part 563 compliant EDR. The total cost (TC) of the proposal can be noted as:

$$\begin{aligned}
 C_p &= C_u * V_a \\
 &= C_u * V * (1 - 0.916) \\
 &= C_u * V * 0.084
 \end{aligned}$$

Where, C_p = Total cost of the proposal

C_u = Unit cost, i.e., cost per vehicle

V_a = Affected vehicles (i.e., vehicles without EDR).

V = Total annual sales of applicable vehicles

Unit Cost (C_u)

The unit cost (C_u) is based on the engineering judgment and knowledge obtained during the 2006 EDR final rule. As previously discussed, the majority of vehicles that are without EDRs are luxury vehicles. These vehicles generally are equipped with state-of-the-art electronic systems, sensors, safety technologies, and vehicle communication networks. Thus, the agency believes that the proposal will not require these manufacturers to significantly redesign their sensing technologies, software, electronic systems, and in-vehicle communication systems. Based on the agency's engineering judgment, the cost is estimated to be \$20 to equip each affected vehicle with an EDR that would comply with Table I of the Part 563. The \$20 cost includes hardware for housing the data, redesign of the vehicle communication network and air bag module, software calibration, functioning and survivability cost, assembly cost, paperwork maintenance costs, and compliance testing costs. The paperwork maintenance cost includes the cost for modifying owners' manuals. The compliance cost is the cost to conduct the required tests. Software calibration, paperwork maintenance, and compliance costs are negligible.

Affected Vehicles

Affected vehicles are those without EDRs. As described previously, affected vehicles are 8.4 percent of total annual sales of applicable vehicles. Based on the agency's prediction of new light vehicle sales (up to 10,000 pounds GVWR) in the fuel economy program (CAFE)¹³, the projected sales for MY 2015 were 16.45 million and the projected sales for MY 2016 were 16.51 million sales. We assume an average of 16.5 million light passenger vehicle sales per year for this rulemaking. Of these 16.5 million light passenger vehicles, about 95.2 percent were applicable vehicles (up to 8,500 pounds GVWR). The 95.2 percent was derived from two sources: the estimation of 10 percent of light trucks and vans (LTV) had a GVWR greater than 8,500 pounds by the CAFE program and 47.6 percent of light passenger vehicles are LTVs¹⁴. Multiplying the 10 percent by the 47.6 percent derives the portion (i.e., 4.8 percent) of light passenger vehicles that the proposal will not apply. The remaining 95.2 light vehicles are the applicable vehicles. Therefore, the annual applicable vehicle sales were 15.71 million (= $16.5 * 0.952$). Of these applicable vehicle, 1.32 million (= $15.71 * 0.084$) would be affected by the proposal.

¹³ "Final Regulatory Impact Analysis, Corporate Average Fuel Economy for MY 2012 – MY 2016 Passenger Cars and Light Trucks," March 2010, NHTSA, Docket No. 2009-0059-0344.1) Table VIII-1.

¹⁴ 2010 Ward's Automotive Year Book

Total Cost

Multiplying the unit cost by the affected vehicles derives the total cost of the proposal.

Thus, the cost of the proposal would be \$26.4 million (= \$20 * 1.32 million vehicles).

Leadtime

The date for full compliance with the proposed rule is September 1, 2014. This compliance date should enable the manufacturers of the remaining 8.4 percent of the fleet that are not equipped with an EDR to have time to redesign the data bus architecture, air bag control module, other electronic hardware and software calibration, and conduct the requisite validation testing. This lead time should address the practical concerns of small volume manufacturers and many new electric and hybrid electric manufacturers who are entering the market and who may not have been planning to install EDRs.

In addition, the proposed leadtime should also enable these vehicle manufacturers to design their EDRs so that the data may be downloaded by a commercially available tool 90 days after first sale.

CHAPTER V. REGULATORY FLEXIBILITY ACT, UNFUNDED MANDATES REFORM ACT, AND PAPERWORK REDUCTION ACT ANALYSIS

A. Regulatory Flexibility Act

The Regulatory Flexibility Act of 1980 (5 U.S.C. § 601 et seq.) requires agencies to evaluate the potential effects of their proposed and final rules on small businesses, small organizations, and small governmental jurisdictions.

5 U.S.C. § 603 requires agencies to prepare and make available for public comment an initial and final regulatory flexibility analysis (RFA) describing the impact of proposed and final rules on small entities if the agency decides that the proposal may have a significant economic impact on a substantial number of small entities. Each RFA must contain:

- (1) A description of the reasons why action by the agency is being considered;
- (2) A succinct statement of the objectives of, and legal basis for, the final rule;
- (3) A description of and, where feasible, an estimate of the number of small entities to which the final rule will apply;
- (4) A description of the projected reporting, record keeping and other compliance requirements of a final rule including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;
- (5) An identification, to the extent practicable, of all relevant Federal rules which may duplicate, overlap or conflict with the final rule;

(6) Each final regulatory flexibility analysis shall also contain a description of any significant alternatives to the final rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the final rule on small entities.

1. Description of the reasons why action by the agency is being considered

NHTSA has determined that this action would improve EDRs and enhance the utility of recorded crash information. The enhanced crash information would further improve motor vehicle safety through safer vehicle and highway designs and facilitation of AACN.

2. Objectives of, and legal basis for, the final rule

Under 49 U.S. C. 322(a), the Secretary of Transportation (the “Secretary”) has authority to prescribe regulations to carry out the duties and powers 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.¹⁵ The agency is authorized to issue Federal motor vehicle safety regulations that meet the need for motor vehicle safety. NHTSA is issuing the proposal under 49 U.S.C. 322, 30111, 30115, 30117, 30166, and 30177; delegation of authority at 49 CFR 1.95.

¹⁵ 49 U.S.C. 105 and 322; delegation of authority at 49 CFR 1.95.

3. Description and estimate of the number of small entities to which the final rule will apply

The final regulation would apply to motor vehicle manufacturers. Even though the regulation would have a positive economic impact on computer storage manufacturers and software developers, the Regulatory Flexibility Act only applies to those entities directly regulated by the agency.

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: (a) To qualify as a small business in Automotive Manufacturing (NAICS 336111), the firm must have fewer than 1000 employees, (b) In Light Truck and Utility Vehicle Manufacturing (NAICS 336112), the firm must have fewer than 1000 employees, (c) In Motor Vehicle Body Manufacturing (NAICS 336211), the firm must have fewer than 1000 employees, and (d) In All Other Motor Vehicle Parts Manufacturing (NAICS 336399), the firm must have fewer than 750 employees.

Small motor vehicle manufacturers

There are nine vehicle manufacturers that would qualify as a small business. Table V-1 provides information about these small domestic manufacturers in MY 2010.

**Table V-1
Small Vehicle Manufacturers
(2010 \$)**

Manufacturer	Employees	Estimated Sales	Sale Price Range	Est. Revenues*
Carbon Motor ¹	NA	NA	NA	NA
CODA ²	150	NA	\$44,900**	NA
Fisker Automotive Inc. ³	NA	15,000	\$80,000	\$1,200,000,000
Mosler Automotive	25	20	\$189,000	\$3,780,000
Panoz Auto Development Company	50	150	\$90,000 to \$125,000	\$16,125,000
Saleen	170	1,000 16***	\$39,000 to \$59,000 \$585,000	\$144,355,000
Shelby American, Inc. ⁴	44	60	\$42,000 to \$135,000	\$5,310,000
Standard Taxi ⁵	35	80	\$25,000	\$2,000,000
Tesla Motors, Inc.	250	2,000	\$50,000 to \$100,000	\$150,000,000

1. Designs, manufactures, and sells law enforcement patrol vehicles
2. Designs, manufactures, and sells electric vehicles; Vehicle lunch are expected to start on December 2011
3. A joint venture of Quantum Fuel Systems Technologies Worldwide, Inc, and Fisker Coachbuild, LLC. The company is just starting. These are planned sales.
4. A division of Carroll Shelby International, Inc.
5. A subsidiary of Vehicle Production Group LLC (VPG). VPG has 35 employees.

* Assuming an average sales price from the sales price range

** Before the \$8,000 federal tax credit and state incentives

*** Ford Mustang Conversions

As with other systems in the vehicle, these manufacturers will have to rely on suppliers to provide the EDR-related hardware, and then they would have to integrate the system into their vehicles. The average price increase per vehicle is estimated to be \$20. Compared to the least expensive vehicle in Table V-1, the cost is less than one-tenth of one percent ($\$20/\$25,000 = .0008$). Compared to a weighted average sales price (\$82,367), the cost is about two-hundredths of one percent ($\$20/\$82,367 = .00024$).

The agency believes that the market for the products of these small manufacturers is highly inelastic. Purchasers of these products are enticed by the desire to have an unusual vehicle. Thus, we do not believe that raising the price by this small amount will have any

effect on vehicle sales. We suspect these price increases will be passed on to the final customer. Based on this analysis, the agency believes that the proposal will not have a significant economic impact on these nine small vehicle manufacturers.

4. Description of the projected reporting, record keeping and other compliance requirements for small entities

The proposal would require motor vehicle manufacturers to make the EDR download tools commercially available. No other reporting and record keeping are required by the proposal. Nine vehicle manufacturers are qualified as a small business.

5. Duplication with other Federal rules

Part 563 is the relevant regulation and was the foundation for the proposed FMVSS No. 405. There are no other relevant Federal regulations that may duplicate, overlap or conflict with the proposed standard.

6. Description of any significant alternatives to the final rule

This proposed rule is not expected to result in the expenditure by State, local, or tribal governments, in the aggregate, of more than \$136 (2010 \$) million annually. It also will not result in the expenditure of that magnitude by vehicle manufacturers and/or their suppliers. Thus, this proposed rule is not subject to the requirements of sections 202 and 205 of the Unfunded Mandates Reform Act of 1995.

In summary, the proposal requires vehicle manufacturers to install EDRs in their light vehicles with standardize EDR data in terms of content and format. There are 30 vehicle manufacturers. Nine of them are considered to be small businesses. 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 would be able to rely on the certification and information provided by the original equipment manufacturer. Accordingly, there would be no significant economic impact on small business, small organizations, or small governmental units by this proposal.

B. Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act of 1995 (Public Law 104-4) requires 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 expenditures by State, local or tribal governments, in the aggregate, or by the private sector, of more than \$100 million annually (adjusted annually for inflation with base year of 1995). Adjusting this amount by the implicit gross domestic product price deflator for the year 2010 results in \$136 million ($110.644/81.533 = 1.36$).¹⁶ The assessment may be included in conjunction with other assessments, as it is here.

¹⁶ National Income and Product Account Table, Price Indexes for Gross Domestic Product as of January 28, 2011

This proposal is not estimated to result in expenditures by State, local or tribal governments of more than \$136 million annually. It is not going to result in the expenditure by the automobile manufacturers and/or their suppliers of more than \$136 million annually. The estimated annual cost would be up to \$26.4 million which has been discussed previously in Chapter III, Benefits, Costs, and Leadtime of this Preliminary Regulatory Evaluation.

C. Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501, et. seq.), Federal agencies must obtain approval from the Office of Management and Budget (OMB) for each collection of information they conduct, sponsor, or require through regulations.

This proposal would mandate the installation of EDR devices in most light vehicles manufactured after September 1, 2014, and would require such vehicles to meet the EDR requirements contained in Part 563. Most manufacturers are already voluntarily installing compliant EDRs and are already voluntarily collecting the specified information. Nevertheless, because voluntary compliance with a paperwork requirement is regarded under the Paperwork Reduction Act as proposing to require a new collection of information, the agency must comply with the Act.

The proposal would require vehicle manufacturers to install EDRs in most light vehicles manufactured on or after September 1, 2014. The EDRs in those vehicles would be required to meet the data elements, data capture and format, data retrieval, and data crash survivability requirements of Part 563, the existing regulation setting forth requirements

for voluntarily-installed EDRs. This proposal would also require manufacturers to comply with the Part 563 requirements for ensuring the availability of EDR data retrieval tools and the requirement that the owner's manual in each vehicle contain a specified statement regarding EDRs.

The likely respondents are manufacturers of passenger cars, multipurpose passenger vehicles, trucks, and buses having a GVWR of 3,855 kg (8,500 pounds) or less and an unloaded vehicle weight of 2,495 kg (5,500 pounds). The agency estimates that there are approximately 30 such manufacturers. The agency estimates that no annual reporting or recordkeeping burdens are associated with this proposal. Vehicle manufacturers are not required to retain or report information gathered by EDRs because the devices themselves continuously monitor vehicle systems and determine when to record, retain, and/or overwrite information. The information is collected automatically by electronic means. Data are only required to be locked and cannot be overwritten when an air bag deploys in a crash event. When recordable events do occur, EDRs only capture data for a few seconds. Therefore, the costs to respondents are the costs of designing and equipping each covered vehicle with a compliant EDR. These costs include technology improvements, assembly costs, and paperwork maintenance costs.¹⁷ Technology improvements account for the majority of these costs. Because the costs of EDRs under the PRA are those associated with the capture of data that is already being processed by

¹⁷ These paperwork maintenance costs consist of the costs to modify the owner's manual with the required statement specified in 49 CFR 563.11. Because this statement is supplied by the agency to manufacturers for the purpose of public disclosure, it is not considered a collection of information for purposes of the Paperwork Reduction Act.

the vehicle, the additional burden hours necessary to equip vehicles with EDR capability are minimal.

The cost of this proposal under the PRA is estimated to be \$314.20 million annually which includes the cost for all 15.71 applicable vehicles (including those voluntarily complaint vehicles) with \$20 per vehicle, if a vehicle does not have an EDR, for the installation of an EDR. We emphasize that the regulatory costs of the proposal would only be the incremental costs for the 1.32 million vehicles not currently equipped with EDRs to be equipped with an EDR meeting Part 563's requirements. As discussed previously in the cost section, the total annual regulatory cost of the proposal is estimated to be \$26.4 million.