UNITED STATES GOVERNMENT STATUS REPORT

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State of Motor Vehicle Safety

In 2011, 32,367 fatalities occurred in the U.S. as a result of motor vehicle crashes. This is the lowest number of deaths since 1949. The number of motor vehicle-related fatalities in 2011 fell 1.9 percent from the 32,999 fatalities in 2010.

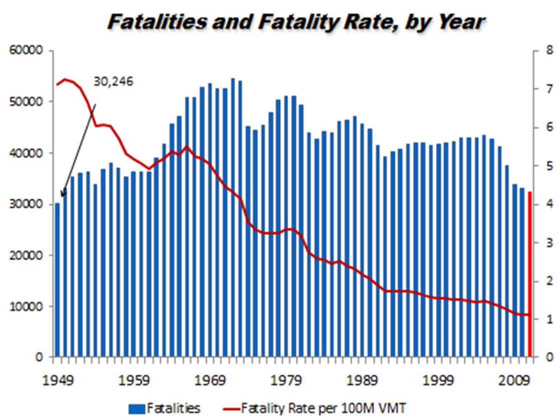


Figure 1. Fatalities and Fatality Rate per 100 Million Vehicle Miles Traveled Between 1949 and 2011.

Even more impressive, the fatality rate per 100 million Vehicle Miles Travelled (VMT) in 2011 fell to a historic low of 1.10 (see Figure 1). This downward trend is continuing.

The total number of police-reported crashes in the U.S. in 2011 was estimated by the National Automotive Sampling System (NASS) General Estimates System (GES) to be 5.3 million, resulting in 2.22 million persons being injured. In recent years, the estimated number of people injured has decreased. Unfortunately, the injury rate, based on VMT, increased slightly in 2011, rising from 75 to 76 people per 100 million VMT.

These improvements in motor vehicle safety are due in part to the collective efforts of the operating agencies of the Department of Transportation[1], the States, automobile manufacturers, and other private sector organizations. NHTSA's engineering efforts, combined with its educational and enforcement programs to ensure proper compliance with the U.S. regulations, have contributed to this significant achievement in safety.

Table 1 provides a breakdown of all motor vehicle fatalities by person type.

Table 1. 2010-2011 U.S. Fatalities by Person Type.

Motorists and Non-occupants Killed in Traffic Crashes				
Description	2010	2011	Change	% Change
Total*	32,999	32,367	-632	-1.9%
Motorists Killed in				
Passenger Vehicles	22,273	21,253	-1,020	-4.6%
Passenger Cars	12,491	11,981	-510	-4.1%
Light Trucks	9,782	9,272	-510	-5.2%
Large Trucks	530	635	+105	+20%
Motorcycles	4,518	4,612	+94	+2.1%
Non-occupants Killed				
Pedestrians	4,302	4,432	+130	+3.0%
Pedalcyclists	623	677	+54	+8.7%
Other/Unknown	185	198	+13	---
Source: FARS 2010 (Final), 2011 Annual Report File (ARF) * Total includes occupants of buses and other/unknown vehicles not shown in table				

In spite of these hard-fought gains in vehicle safety, motor vehicle crashes continue to be a major public health concern. For example, in 2009, motor vehicle crashes are the number one cause of death in ages 4 and 11 through 27. In addition, because of the young lives lost, in 2009, motor vehicle traffic crashes ranked 5th overall in terms of the years of life lost, behind major causes of death such as cancer, heart diseases, chronic lower respiratory diseases and stroke.

For these reasons, NHTSA remains fully committed to its mission of working with industry and the public to improve motor vehicle safety through a coordinated effort involving research, education, enforcement, and rulemaking.

Data Collection and Analysis

NHTSA conducts a motor vehicle crash data collection program through the National Center for Statistics and Analysis (NCSA). It is composed of: the data collected from the states, including Fatality Analysis Reporting System (FARS) and the State Data Program. In addition, NHTSA also performs detailed crash investigations in the National Automotive Sampling System (NASS)

[1] The National Highway Traffic Safety Administration (NHTSA), the Federal Motor Carrier Safety Administration (FMCSA), the Federal Highway Administration (FHWA), Federal Transit Administration (FTA) the Federal Railroad Administration (FRA) and the Research and Innovative Technology Administration (RITA)

Crashworthiness Data System (CDS) and the Special Crash Investigations (SCI) programs.

In the 1970s, NHTSA devised a method that utilizes a combination of State record and investigation based systems to provide nationally representative traffic crash data. The recoding of police-reported crashes from State record based systems into a uniform format provides counts and trends. The detailed field investigations provide the details required for countermeasure development and evaluation. This sample based approach provides nationally representative data at a small fraction of the cost it would take to collect and manually recode the millions of police-reported crashes into a uniform format.

FARS is a State crash record based system that provides a census of all fatal crashes occurring on public roads in the United States. The NASS is comprised of the General Estimates System (GES) and the Crashworthiness Data System (CDS). The GES is a State crash record based system that provides national estimates calculated from the approximately 50,000 crashes collected annually to provide characteristics of all motor vehicle crashes. The CDS conducts detailed investigations into a nationally representative sample of approximately 4500 crashes involving towed passenger vehicles to investigate injury-causing mechanisms and to evaluate countermeasures.

The NASS infrastructure was utilized in two surveys to collect nationally representative data on the events and factors related to the causation of crashes. The Large Truck Crash Causation Study (LTCCS) was conducted by the National Highway Traffic Safety Administration (NHTSA) and the Federal Motor Carrier Safety Administration (FMCSA) from 2001 to 2003 collecting about 1,000 crashes providing information on the causes or contributing factors for large truck crashes. From 2005-2007, NHTSA conducted the National Motor Vehicle Crash Causation Survey (MMVCCS) which collected about 7,000 crashes providing nationally representative information on the events and factors related to the causation of light motor vehicle traffic crashes. The SCI program provides in-depth data on crashes where emerging issues may be of interest.

The Not-in-Traffic Surveillance (NiTS) system is a virtual data collection system designed to provide counts and details regarding fatalities and injuries that occur in non-traffic crashes and in non-crash incidents related to motor vehicles. The NiTS 2007 system produced an overall annual estimate of 1,747 fatalities and 841,000 injuries in non-traffic crashes and non-crash incidents.

NCSA also conducts key analyses of the collected data and publishes reports, including the Traffic Safety Facts Annual Report and Traffic Safety Fact Sheets. Copies of the most recent reports can be found at NCSA's web site using the following URL: http://www.nhtsa.gov/NCSA.

Status of NHTSA Research Programs

NHTSA research priorities are driven by problem size (as defined by crashes, injuries and fatalities attributable to specific vehicle or driver issues), by technical innovations that present new opportunities for improving safety, and by changing driver behavior and demographics. These technical, market and economic factors are used to develop three-year vehicle safety priority plans, and 5 year and longer term strategic plans. Aligned with DOT and NHTSA goals, Figure 2 illustrates the program development process among NHTSA data collection, research, rulemaking, and enforcement activities. Collectively, planning teams continuously strategize, prioritize and implement research programs, furthering the agency's goals to reduce fatalities and injuries.

Figure 2. NHTSA Research Planning Process.

Strategic program plans and roadmaps are typically developed with outcomes aimed at regulatory decisions and implementations. Current plans and roadmaps include a Motorcoach Safety Plan, Automated Vehicle Research Roadmap, Connected Vehicles and Vehicle-to-Infrastructure Roadmap, Human Factors Roadmap, Distraction Plan, Biomechanics Plan, Alternative Energy Vehicle Safety Plan, Crashworthiness Plan, and Elderly Occupant Plan. Key programs are described in the sections that follow.

The Haddon Matrix is the most commonly used paradigm in the injury prevention field. Developed by William Haddon in 1970, the matrix provides a comparison of factors before, during and after an injury or death. By utilizing this framework, one can think about the relative importance of different factors, interventions, or programs. Figure 3 shows the NHTSA research program areas comprising an expanded Haddon matrix. A fundamental change to the Haddon matrix was adopted, whereby the pre-crash category is now composed of normal driving and crash imminent conditions. The expanded matrix better matches the breadth and scope of our crash avoidance and crashworthiness research programs.

Crashworthiness Research

Low Offset / Oblique Frontal

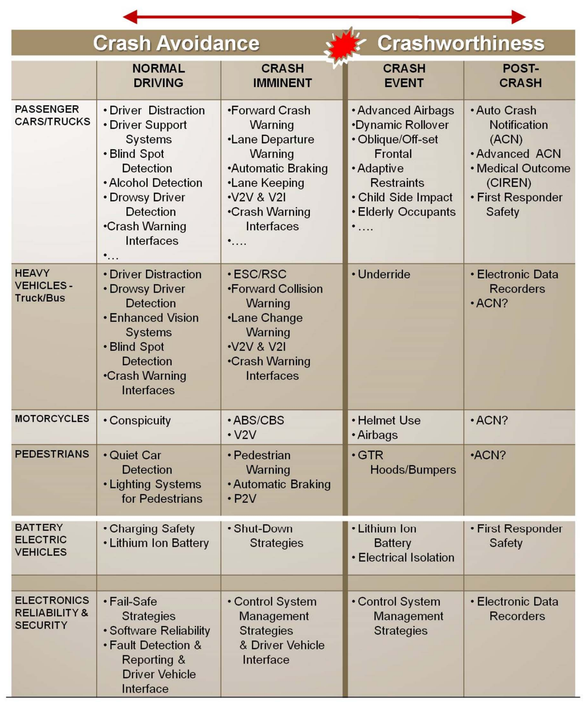
In September 2009 the National Highway Traffic Safety Administration (NHTSA) published a report that investigated the incidence of fatalities to belted non-ejected occupants with air bags in frontal crashes involving late-model vehicles. The report concluded that after exceedingly severe crashes, the largest number of fatalities occurred in crashes involving poor structural engagement between the vehicle and its collision partner, such as corner impacts, oblique crashes, and impacts with narrow objects.

In response to these findings, NHTSA began researching a test procedure intended to mitigate the risk of injuries and fatalities related to motor vehicle crashes involving poor structural engagement. This research demonstrated that an impact between a "research" moving deformable barrier (RMDB) and a stationary vehicle at a 15 degree angle can reproduce vehicle crush, occupant kinematics, and risk of injury seen in vehicle-to-vehicle crashes. It was also demonstrated that injury risk related to poor structural engagement has not been entirely mitigated in the current fleet, as newly-designed vehicles are still prone to large intrusions and potential injuries to the head, chest, knee/thigh/hip, and lower extremity.

Current research will test additional high sales volume vehicles to evaluate a larger portion of the current and future fleet performance using the Oblique test procedure. This research also includes oblique impacts to the right side of the vehicle and evaluates occupant kinematics on the far or opposite side of the impact.

Heavy Truck Safety

As mandated by the Moving Ahead for Progress in the 21st Century Act (MAP-21), P.L. 112-141, NHTSA research will evaluate the need for crashworthiness standards in heavy vehicles. This research focusses on crash characteristics, occupant injury types and their origin. Additional research will evaluate possible countermeasures to mitigate occupant injuries.



Crash Avoidance			Crashworthiness	
	NORMAL DRIVING	CRASH IMMINENT	CRASH EVENT	POST-CRASH
PASSENGER CARS/TRUCKS	• Driver Distraction • Driver Support Systems • Blind Spot Detection • Alcohol Detection • Drowsy Driver Detection •Crash Warning Interfaces •…	•Forward Crash Warning •Lane Departure Warning •Automatic Braking •Lane Keeping •V2V & V2I •Crash Warning Interfaces •….	• Advanced Airbags •Dynamic Rollover • Oblique/Off-set Frontal • Adaptive Restraints • Child Side Impact • Elderly Occupants • ….	• Auto Crash Notification (ACN) • Advanced ACN • Medical Outcome (CIREN) • First Responder Safety
HEAVY VEHICLES - Truck/Bus	• Driver Distraction • Drowsy Driver Detection • Enhanced Vision Systems • Blind Spot Detection •Crash Warning Interfaces	• ESC/RSC •Forward Collision Warning •Lane Change Warning •V2V & V2I •Crash Warning Interfaces	• Underride	• Electronic Data Recorders • ACN?
MOTORCYCLES	• Conspicuity	• ABS/CBS • V2V	• Helmet Use • Airbags	• ACN?
PEDESTRIANS	• Quiet Car Detection • Lighting Systems for Pedestrians	• Pedestrian Warning • Automatic Braking • P2V	• GTR Hoods/Bumpers	•ACN?
BATTERY ELECTRIC VEHICLES	• Charging Safety • Lithium Ion Battery	• Shut-Down Strategies	• Lithium Ion Battery • Electrical Isolation	• First Responder Safety
ELECTRONICS RELIABILITY & SECURITY	• Fail-Safe Strategies • Software Reliability • Fault Detection & Reporting & Driver Vehicle Interface	• Control System Management Strategies & Driver Vehicle Interface	• Control System Management Strategies	• Electronic Data Recorders

Figure 3. Expanded Haddon Matrix describes NHTSA Crash Avoidance and Crashworthiness programs.

NHTSA has released a report analyzing all 2008 fatal truck under ride crashes reported in the Trucks in Fatal Accidents database (TIFA) (Blower, 2012). This study found that a third of the heavy vehicles struck were single unit trucks and the other two thirds were nearly all tractor trailer combinations. Of the 539 fatal crashes, 72% of the striking vehicles were light vehicles, 20% were heavy vehicles and 8% were motorcycles.

The second report, in progress, includes a review of 2009 TIFA under ride data as well as estimates of relative speeds between vehicles for a portion of the 2008-2009 TIFA dataset. A significant portion of fatalities involving trailers with rear impact guards include vehicle under ride extending to the windshield and beyond. From the relative speed study, it was determined that 50% of rear end crashes occurred with relative speeds of 44 mph or higher between light and heavy vehicles. As the data indicate that the safety performance of the rear impact guards could be improved, the agency is considering upgrades to trailer rear impact guard requirements.

Dynamic Rollover Protection

A Dynamic Rollover Test System (DRoTS) is under development. Its capability has been optimized through numerous vehicle tests and refinement. This development work demonstrates good dynamic performance and repeatability. DRoTS fixture performance for various initial test conditions has been confirmed and adapts to a range of vehicle sizes.

Current focus for this test fixture is to evaluate occupant kinematics and injury potential for a range of rollover and vehicle conditions. Parametric studies will evaluate test dummy and cadaveric kinematics for a range of restraint and rollover conditions. Additional 2013 testing will incorporate a roof installed on the rollover buck to evaluate test dummy and cadaveric roof contact and injury predictions. The roof of the rollover buck can be quickly replaced to allow study of rollover dynamics, vehicle structure, restraint design, and their effects on occupant kinematics and ATD injury prediction.

Child Passenger Safety

Using NHTSA's Fatality Analysis Reporting System (FARS) data files for the years 2007-2011, the agency estimated that 34 % of fatalities among child (3 and under) rear seat passenger vehicle occupants in motor vehicle crashes were in frontal crashes while 32 % were in side impact crashes. Side impacts are less common than frontal impacts yet they result in a comparable amount of fatalities. From NASS-CDS(2003 to 2008) data files it was determined that 55% of AIS2+ injuries in 0-12 year old children were to the head and face, while 28% of AIS2+ injuries were to the torso.

NHTSA has been conducting research on the protection of children in side impact crashes. Much of that research has focused on developing a test procedure to evaluate CRS performance in side impact crashes. A side impact sled test procedure, replicating a near-side impact, is currently being evaluated for repeatability and reproducibility. Sled buck test parameters are being refined. Children can strike side structures and other interior surfaces of the vehicle. Thus, research efforts are also underway to investigate the injuries from contact with lower door sections and vehicle interior components to see if there is need to increase the protection for rear occupants.

The agency is also reviewing the current FMVSS No. 213 test procedure to determine the viability or advisability of increasing the simulated frontal impact speed from 30 mph to 35 mph, updating the existing test seat fixture and assessing high-weight rated CRSs.

Child seat manufacturers have begun to increase the upper weight limits on many of their CRS models as a result of consumers' needs and state laws that require children to be in some form of child restraint until 6-8 years of age. Consequently, the American Academy of Pediatrics and NHTSA issued updated guidelines in 2011 encouraging parents/caregivers to keep children rear-facing to the allowable extent of the child restraint system. Thus, the agency is undertaking efforts to develop test procedures to evaluate the safety performance, including the structural integrity of these higher weight rated rear facing CRS models. In addition to higher weight usage limits, the CRS themselves tend to be heavier than the lower rated models. The agency is conducting research to assess the performance capability of the Lower Anchorages and Tethers for Children (LATCH) systems when used with these higher weight rated CRS models.

Lithium Ion Battery Safety

NHTSA's safety research program for electrically propelled vehicles will focus on lithium ion based Rechargeable Energy Storage Systems (RESS). NHTSA has awarded two contracts for RESS research to develop baseline test procedures and performance metrics. These awards were to SAE and Ford Motor Company. Both contracts are two years in duration and are intended to build upon current industry practices and voluntary standards to help codify minimum vehicle level performance standards for lithium ion battery systems. These best practices shall encompass normal driving, charging, crash and post-crash conditions. NHTSA has also entered into a research program with Argonne National Laboratories to investigate common post incident RESS diagnosis and stranded energy removal. Procedures and devices will be developed to maintain safety by developing and integrating safety assessment algorithms that monitor and maintain RESS stability. NHTSA has also partnered with Sandia National Laboratories to investigate functional cycling test procedures for evaluating post-test RESS. Finally, NHTSA has initiated a program to examine the safe performance of RESS battery management systems.

Countermeasures for "Lightweighted" Vehicles

NHTSA recently released new Corporate Average Fuel Economy (CAFE) requirements for 2017 and beyond. As part of this effort, NHTSA investigated cost and safety implications for future light-weighted vehicle designs. On the safety side, NHTSA is investigating the crash response and potential safety impact of introducing light-weighted fuel efficient vehicles into the US fleet. Finite element models have been developed for various light-weighted vehicle designs and crash simulations will be conducted to study the crash safety performance for these designs in both single vehicle crashes and vehicle-to-vehicle crashes. These simulations will also be used to study potential safety countermeasures to maintain or improve the crash performance for future light-weighted vehicle designs.

Advanced Restraints

NHTSA has recently awarded a contract for the development of prototype adaptive occupant protection systems. This research should develop a system to address a range of occupant sizes and positions and test conditions to emphasize the system adaptability for variable high speed crashes. This research effort was awarded to Takata and should complete in early 2015.

In recent years, advanced restraint technologies have become widely available in front outboard seating positions, but are infrequently available in the rear seat environment, particularly in high volume vehicles. Although previous field data analyses have estimated that rear-seat occupants are at lower risk of serious injury and fatality than front-seat occupants in motor-vehicle crashes, some recent studies have shown that front seats may provide better protection, especially for elderly occupants, than rear seats in newer vehicle models. NHTSA has recently initiated a research project with UMTRI and TRW to design, optimize, fabricate, test, and demonstrate prototype advanced restraint systems for protecting rear-seat occupants. This project will consider a range of body sizes, ages, and multiple frontal crash conditions. This project will establish the baseline performance of a non-advanced restraint system and demonstrate the occupant safety improvements offered by the advanced restraint systems. This project will complete in early 2015.

NHTSA is also conducting sled tests for currently available rear seat restraint systems. These systems include inflatable belts, load limiters, and pre-tensioners, for improving protection for adults.

Motorcoach Research

NHTSA has studied the issue of motorcoach occupant safety for several years. On average, motorcoach crashes cause 19 deaths annually. Ejection from the motorcoach is common to both frontal and rollover type crashes accounting for about half of all motorcoach passenger fatalities. Ejection is particularly harmful in fatal crashes, with rollover accounting for 75 percent of those fatalities.

The agency is continuing its research into ejection through window openings. Component tests using a guided impactor are being carried out to evaluate the performance of various window glazing and latch designs. The agency also plans to conduct tests to assess interior impact protection and compartmentalization, pursuant to MAP-21 requirements.

The agency recently initiated a two year contract to develop and evaluate test procedures to assess fire detection, suppression and flammability of exterior materials for motorcoaches. This research project, headed by Southwest Research Institute, will focus on engine and wheel well fires.

Biomechanics Research

NHTSA's Human Injury Research and Applied Biomechanics Divisions have led NHTSA's biomechanics research efforts over the past 35+ years. Many of the current research efforts are documented in the Biomechanics Research Plan (NHTSA, 2011c), which is available on the NHTSA Research website. The plan includes numerous projects that support NHTSA's rulemaking initiatives (NHTSA, 2011a).

Injury Response/Tolerance

Research continues to focus on injury outcomes / mechanisms and the development of new and improved devices (e.g., anthropomorphic test devices or ATDs) to address the continuing issues observed in frontal, side, rear, and rollover crashes. Head/brain and thoracic injuries continue to be focus areas for the adult occupant as supported by real-world data.

Efforts include the analysis of traumatic brain injuries and the criteria that may be used to assess them. Continued collection and analysis of laboratory and full scale crash data using SIMon (**S**imulated **I**njury **Mon**itor) and other head/brain models is supporting the continued development and assessment of a rotational brain injury criterion (BRIC) that will utilize angular kinematics of the head derived from

ATD instrumentation to predict the risk of brain injury (Takhounts et al., 2011). Related research, including the analysis of football player head impacts, axonal strain related to diffuse axonal injury, and age related changes to brain anatomy and injury tolerance, will allow for further enhancements of finite element head models and for development of improved brain injury criteria.

Ongoing efforts in the area of thoracic response and injury tolerance include the application of standardized sled test conditions for assessing frontal ATD bio-fidelity. Other thoracic research includes testing to support the development of a multi-point thoracic injury criterion and efforts aimed at assessing thoracic response and injury tolerance under oblique loading.

Anthropomorphic Test Devices (ATD)

NHTSA's research efforts have focused on numerous ATD development, evaluation, and federalization projects. In the area of adult dummies, significant efforts continue with regards to the THOR 50th percentile male and 5th percentile female ATDs. Among other issues, current efforts are focusing on completing bio-fidelity assessments/comparisons, injury criteria, and technical documentation to support a 2013 NHTSA agency decision regarding next steps for the THOR 50th male dummy. The THOR 5th percentile will incorporate the updates that have been made to the 50th male. An agency decision on next steps for the THOR 5th is planned for 2014.

NHTSA has completed an assessment of WorldSID (50th percentile male) relative to bio-fidelity and crash test capability. The WorldSID 50th male shows improved bio-fidelity over existing side impact dummy designs and has performed well in current Agency side impact tests. Similar efforts are being done with the WorldSID 5th female to compare bio-fidelity versus existing ATDs.

A test series to determine the bio-fidelity of rear impact dummies, including the 50th percentile male BioRID dummy, has been completed and analysis is in progress. The Human Injury Research and Applied Biomechanics Divisions will assess the test results to determine potential injury criteria and calibration and certification procedures for these dummies and continue to work with the international vehicle safety community to complete the analysis.

Finally, NHTSA is completing efforts in support of child ATD development. First, NHTSA has supported the implementation of a revised neck, thorax and pelvis for the Q3s, 3-year-old side impact child dummy. The updated Q3s recently underwent evaluations for bio-fidelity, repeatability, reproducibility, and durability. Additionally, work continues to assess other child dummies such as the Hybrid III 6- and 10-year-old to include in future regulation as well as research to enhance the response of these dummies.

Vulnerable Occupants

NHTSA is completing research to address unique concerns related to vulnerable occupants, which include children, elderly, obese, and pregnant occupants.

Field data analyses of real-world crashes, together with census data projections for ongoing long-term increases in the population of those 65 and older, supports the need for research focused on the injury tolerance/response of older vehicle occupants. NHTSA is supporting research describing differences in geometry (e.g., brain, rib cage), material properties (bone, soft tissue), and other factors that may contribute to changes in fragility and frailty of older occupants. In particular, research focused on the brain and thorax is in process that will enable the development of improved, age-specific tools such as computer models and injury criteria. Improved models and criteria will facilitate the development of enhanced restraint system designs that account for the reduced injury tolerance and changing anthropometry/geometry of the aging vehicle occupant.

With regard to children, NHTSA leads a multi-center research effort to collect and document new child anthropometry, injury criteria and response data that together can be used in the development of advanced child dummies. Areas of study included the head, neck, shoulder, thorax, and abdomen.

Crash Injury Research and Engineering Network (CIREN)

CIREN continues to utilize its unique multidisciplinary approach for crash injury investigation and research to improve the agreement between laboratory research and real world crash results. Complete access to medical documentation and radiologic images allows CIREN an improved understanding of how occupants sustain injury in modern passenger vehicles. This greater awareness aids NHTSA in identifying new injury mechanisms that are not currently monitored by the vehicle safety standards or vehicle crash testing. CIREN has the unique capability of collecting and assigning contributing factors for injury causation and severity. The influence of health conditions such as osteoporosis, obesity, brain atrophy and age are reviewed and assigned accordingly in CIREN cases. CIREN will be increasing data access in 2013 with public release of case data in flat file form.

Advanced Automatic Collision Notification (AACN)

NHTSA is researching many aspects of AACN. These efforts include pilot studies of data transmission and data collection, data utility and injury prediction assessments, development of system specifications and evaluation protocols, and collection of end-user feedback. An agency decision on next steps is planned for 2013 (NHTSA, 2011a).

Crash Avoidance and Electronic Controls Research

Crash avoidance research is largely defined by data, including problem size estimates from crash data that are collected, reduced, and maintained by the National Center for Statistics and Analysis (NCSA). Data are also provided through driver performance and vehicle functional studies, test track evaluations of countermeasure technologies, naturalistic and simulator studies, and objective test procedures. Figure 6 illustrates the vulnerable areas around a vehicle that can be addressed by crash avoidance technologies.

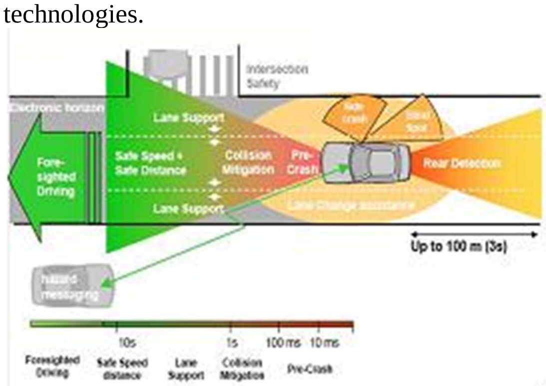


Figure 6. Vulnerable Areas Addressed by Crash Avoidance Technologies.

The major crash avoidance and electronic controls programs are: (1) Light Vehicle Crash Avoidance-Vehicle-based Systems; (2) Vehicle Safety Communications; (3) Heavy Vehicle Research; (4) Human Factors; and (5) Electronic System Safety (Cybersecurity, Reliability, and Automated Vehicle Research).

<u>Light Vehicle Crash Avoidance Research: Vehicle-based Systems</u>

For the past 15 years NHTSA has been engaged in research related to on-board crash warning systems that detect potential crash situations and warn the driver to take appropriate action. Such systems include forward collision warning (FCW); lane departure warning (LDW); and blind spot monitoring (BSM). Past research has included evaluations of prototype systems in both controlled settings (test track and simulators), and through field testing. NHTSA's work in crash warning systems continues, and the Agency is currently launching a large, 2,100 vehicle field study involving production crash warning systems from leading vehicle manufacturers. NHTSA will monitor the operation and driver use of these systems for a 1 year period to help better understand safety potential, driver acceptance and technology reliability issues. NHTSA is also engaged in considerable research related to evaluating effectiveness of alterative collision warning interface designs and implementations, as well as procedures for gauging such effectiveness—see Human Factors Research section for additional discussion).

Crash Avoidance technology has continued to progress, and NHTSA is aggressively pursuing research related to technologies that, in addition to warning drivers of a collision threat, can take active control of the vehicle to help mitigate or avoid the crash (if warnings are not heeded by the driver, or the driver's reaction is insufficient to avoid the crash). In particular, NHTSA is focusing its efforts on dynamic brake system (DBS) and collision imminent braking (CIB) technologies being offered by light vehicle OEMs. Such systems employ radar, camera, lidar and other sensor technologies to detect and track vehicles, pedestrians or objects in the forward path.

DBS technology serves to increase braking effort initiated by the driver during collision imminent situations if the driver's response is determined (by the system) to be insufficient to avoid the collision. CIB systems will operate to automatically energize the brakes in crash imminent situation if the driver does not respond at all to the warnings. NHTSA is currently evaluating the performance of such systems in a variety of crash scenarios and under controlled test conditions. We are also developing objective test procedures and associated test equipment including a strikeable "surrogate" target vehicle to simulate an actual in-path lead vehicle. While the majority of our research efforts to date have been focused on DBS and CIB systems that detect and react to other vehicles and objects, NHTSA is also pursuing research related to advanced systems that are also capable of pedestrian detection and automatic emergency braking.

Estimating the safety benefits of crash avoidance systems is also an important on-going research area for NHTSA. NHTSA has been working with industry partners to develop leading-edge modeling and analytical techniques to improve reliability of estimates—and forecast how changes in system performance attributes may affect safety benefits. In 2009 NHTSA completed four projects with teams led by automobile manufacturers which focused on estimating the safety benefits of technologies that address frontal crash mitigation (primarily rear-end crashes), back-over prevention, and lane departure warning. In June 2011, NHTSA completed two remaining projects with teams led by automobile manufacturers, which focused on technologies that address head-on crash mitigation, lane departure prevention, and blind spot detection.

In July 2012, the agency published a Request for Comments seeking feedback on our observations about these technologies as well as consideration of test protocols that could be used to test their effectiveness. NHTSA is in the process of evaluating industry and public feedback while advancing our research in the other areas listed above.

Vehicle Safety Communications (VSC)

As previously described, NHTSA has conducted extensive research on the effectiveness of vehicle-based collision countermeasures for rear-end, road departure, and lane-change crashes. Such systems use a variety of sensors (radar, camera, lidar, infrared, ultrasonic and others) to detect other in-path vehicles (and pedestrians). However, the systems have inherent limitations as they estimate the presence, intent, and pathways of nearby vehicles and pedestrians—but are subject to inaccuracies which may be induced by poor visibility, environmental conditions, or even roadway markings. Vehicle-based radio communications (based on 5.9 GHz Dedicated Short Range Communications (DSRC), paired with accurate GPS-based relative vehicle positioning, may overcome these shortcomings and improve safety system effectiveness by complementing or, in some instances, providing alternative approaches to autonomous safety equipment. NHTSA is exploring how both vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications can enable improved effectiveness of active safety systems.

NHTSA is conducting a collaborative research effort with a consortium of automobile manufacturers to facilitate the development and deployment of effective V2V communication safety systems. Figure 7 illustrates the V2V concept. This project is developing safety applications, addressing interoperability issues and evaluating safety benefits.

Figure 7. Vehicle-to-Vehicle Communications.

In summer, 2012, USDOT kicked-off the Safety Pilot Program. The Safety Pilot is intended to establish a real world model deployment test site for enabling wireless communications among vehicles. The deployment site encompasses vehicles of various types that include a mix of integrated, retrofit, and aftermarket vehicle safety systems.

The goals of the Safety Pilot Program are to:

- Supplement benefits analysis in support of NHTSA 2013 Agency Decision on V2V Communications through the use of real world field data.
- Demonstrate V2V and V2I safety applications, interoperability, and scalability in a data rich environment.
- Create public awareness and determine user acceptance.

Anticipated outcomes include:

- Obtaining empirical data for estimating benefits and user acceptance in support of future federal policy actions.
- Establishing a public database of archived road network data for supporting development of additional safety, mobility, and environmental applications.
- Establishing multiple supplier sources for safety devices and roadside infrastructure.
- Develop a better understanding of the operational policy issues associated with the deployment of V2V and V2I applications

Heavy Vehicle Research

NHTSA's heavy vehicle research program is targeted at examining the functionality, performance, and safety benefits of a variety of advanced crash avoidance and mitigation technologies for heavy vehicles. The heavy vehicle research program addresses safety technologies that are both commercialized but perhaps not widely deployed, as well as prototype and next generation safety systems. The program encompasses multiple vehicle platforms including tractor-trailers or combination vehicles, straight trucks, buses, and motorcoaches. Also, it is important to note that much of the research (described elsewhere in this paper) in areas such as human factors, autonomous crash avoidance systems, and vehicle safety communications, also include elements to address those same issues on heavy vehicle trucks and buses.

Electronic Stability Control for Heavy Vehicles

In the area of crash avoidance, NHTSA's heavy vehicle program is evaluating the performance benefits of electronic stability control (ESC). ESC systems are designed to reduce untripped rollovers and mitigate severe understeer and oversteer conditions that lead to loss of control, by using automatic computer-controlled braking and reducing engine torque output. (Figure 8).

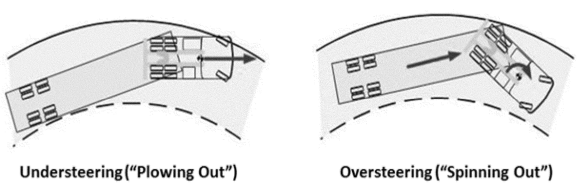


Figure 8. Loss of Control Conditions

Testing at NHTSA's Vehicle Research and Test Center in Ohio has been conducted to develop objective tests and performance measures to evaluate the test track performance of these systems. We also completed safety benefit studies using hardware-in-the-loop simulations, and clinical analyses of large truck crash reconstruction data to determine the effectiveness of stability control systems over a wide range of conditions. The agency published a Notice of Proposed Rulemaking on this issue in 2012.

Collision Imminent Braking-Heavy Vehicles

NHTSA has been evaluating performance and operational characteristics of warning-only crash avoidance systems for heavy vehicles for over 10 years—with a focus on forward collision warning (FCW). More recently NHTSA has been engaged in research focused on technology that combines FCW with collision imminent braking (CIB). Such systems employ radar and/or camera-based sensors to detect and track other vehicles in the forward path of the subject vehicle. If a collision threat is determined to exist (based on closure range, range-rate and other kinematic conditions), an audible/visual warning is first issued. If the threat persists or worsens, then the foundation brakes are automatically applied to mitigate or avoid the crash.

NHTSA is currently engaged in the following FCW/CIB research:

- documenting the performance of production FCW/CIB systems in a variety of pre-crash scenarios, and under controlled test track conditions (Figure 9),
- evaluating the performance of prototype "next generation" systems that combine radar and optical sensors to improve object recognition, reduce "nuisance" warnings, and enhance braking performance,
- developing objective test procedures for the technology, and
- developing advanced modeling and simulation methods to help understand the safety benefits of FCW/CIB systems as applied to heavy vehicles.

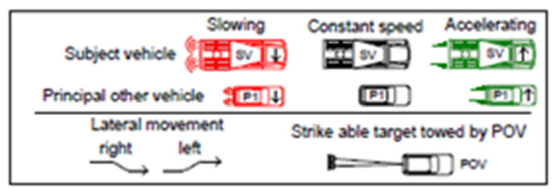


Figure 9. Examples of Pre-crash Scenarios.

To determine how such systems perform in real-world conditions, NHTSA is also launching a Field Operational Test which will target latest generation FCW/CIB production systems to be operated in a variety of fleet types and service environments. Operational, reliability and driver usage profiles will be monitored on approximately 150 trucks for a 1 year period. Results will be used to help assess customer satisfaction as well as safety benefits.

Lane Departure Warning for Heavy Vehicles

Lane departure warning (LDW) systems utilize digital camera technology to track the lateral position of the truck within lane markings, and/or the position of the truck relative to the roadway edge. These systems warn the driver of unintentional drifting out of their travel lane and/or off the edge of the roadway (i.e., roadway departure). NHTSA is currently engaged in evaluating the performance of latest generation systems from truck OEM suppliers (based on controlled track testing), and in developing objective test procedures. NHTSA is also examining the real-world performance of such systems through a 150-vehicle Field Operational Test.

Vehicle Safety Communications for Heavy Vehicles

For several years NHTSA has been working with light-duty passenger vehicle manufacturers to develop and test innovative wireless communication technologies that would allow vehicles to have enhanced "situational awareness" by continuously broadcasting their position and heading at a rapid rate. This information is then received and interpreted by other vehicles. Warnings are presented to drivers if a crash situation is developing or imminent.

NHTSA is now extending this research to include heavy trucks and buses, and is aggressively tailoring the technology and applications as needed to work in the unique operating environment characteristic of heavy vehicles. NHTSA is working with commercial vehicle partners to research and test the use of DSRC based vehicle-to-vehicle communications as a means of enhancing the performance of existing collision avoidance systems (such as FCW and LDW), but also enabling new collision avoidance applications for heavy vehicles such as intersection movement assist (IMA). Heavy vehicle trucks are an integral part of the Safety Pilot Model Deployment (see Vehicle Safety Communications section).

Human Factors Research

NHTSA's human factors research examines the interaction of driver, vehicle, and environment in order to improve driver-vehicle performance. The research supports Federal Motor Vehicle Safety Standards, safety defects investigations, consumer information, and the advancement of knowledge about driver behaviors and performance. Findings are applied to the development of vehicle technologies, which are compatible with driver abilities and limitations. Main focus areas of the Human Factors program include: (1) Reducing unsafe driving behaviors by addressing driver distraction and driver impairment (alcohol, drowsy driving), (2) Improving the driver-interface (DVI) design of Crash Warning Systems, (3) addressing vulnerable populations, such as blind pedestrians by developing human factors requirements for quiet cars, and (4) human factors for connected, and (5) automated vehicles.

Driver Distraction

NHTSA's mission is to "save lives, prevent injuries, and reduce economic costs due to road traffic crashes." One focus of this mission is the prevention of road traffic crashes for which driver distraction is a contributing factor.

In April, 2010 NHTSA released an Overview of the National Highway Traffic Safety Administration's Driver Distraction Program which summarized steps that NHTSA intends to take to help in its long-term goal of eliminating a specific category of crashes- those attributable to driver distraction (NHTSA 2010b). NHTSA's Driver Distraction Program consists of four initiatives as illustrated in Figure 10, and described below.

Figure 10. NHTSA Driver Distraction Initiatives

Of the areas described in the plan, the Human Factors program supports initiatives 1-3, which are:

1. *Improve the understanding of the extent and nature of the distraction problem*. This includes improving the quality of data NHTSA collects about distraction-related crashes along with better analysis techniques.
2. *Reduce the driver workload associated with performing tasks using both built-in and portable in-vehicle devices by improving the designs of device interfaces*. Better device interfaces will help to minimize the amount of time and effort involved in a driver performing a task using the device. Minimizing the workload associated with performing non-driving, or "*secondary*," tasks with a device will permit the driver to maximize the attention they focus toward the *primary* task of driving.
3. *Keep drivers safe through the introduction of crash avoidance technologies.* These include the use of crash warning systems to re-focus the attention of distracted drivers as well as vehicle

initiated braking and steering to prevent or mitigate distracted driver crashes.

Distraction Guidelines

Of the projects listed under Initiatives, 1-3, a main focus is to develop a set of Distraction Guidelines in support of Initiative 2 – Reduce Workload from Interfaces. As discussed in NHTSA's Driver Distraction Program, NHTSA's intent is to "develop voluntary guidelines for minimizing the distraction potential of in-vehicle and portable devices."

Drivers perform secondary tasks (communications, entertainment, informational, and navigation tasks not required to drive) using in-vehicle electronic devices by interacting with them through their user interfaces. The user interfaces of these devices can be designed to accommodate interactions that are visual-manual, auditory-vocal, or a combination of the two. Some devices may allow a driver to perform a task through either manual control manipulation with visual feedback, or through voice command with auditory feedback to the driver.

In general there are two functional categories based upon the mode of interaction: visual-manual and auditory-vocal. Visual-manual interactions involve the driver making inputs to the device by hand (e.g., pressing a button, rotating a knob) and visual feedback being provided to the driver. Auditory-vocal interactions involve the driver controlling the device functions through voice commands and receiving auditory feedback from the device. Note that a single device's driver interface could accommodate both visual-manual and auditory vocal interactions.

In 2012, NHTSA published draft Visual-Manual Driver Distraction Guidelines for In-Vehicle Electronic Devices for public comment. These guidelines are intended for application to in-vehicle device tasks that are performed by the driver through visual-manual means. The goal of the NHTSA Guidelines is to encourage the design of in-vehicle device interfaces that minimize driver distraction associated with secondary task performance. The Guidelines specify criteria and a test method for assessing whether a secondary task performed using an in-vehicle device may be acceptable for performance while driving. The Guidelines also seek to identify secondary tasks which interfere too much with a driver's ability to safely control their vehicle and to categorize those tasks as ones that are not acceptable for performance by the driver while driving. NHTSA is also currently developing the second phase of these guidelines that will focus on Portable Aftermarket Devices, as well as the third phase, which will focus on voice-based auditory interfaces.

Alcohol Detection Research: Driver Alcohol Detection System for Safety (DADSS)

Since 1997, about a third of all fatally-injured passenger vehicle drivers had blood alcohol concentrations at or above the legal limit. In order to address this problem, NHTSA entered into a five year cooperative agreement with the Automotive Coalition for Traffic Safety (ACTS) aimed at developing alcohol detection technologies with broad deployment potential. Desired technologies would be non-invasive, reliable, accurate, and precise, with the goal of preventing alcohol impaired drivers above the legal limit from moving their vehicle. This program has been involved in the development and testing of alcohol detection prototypes that would be suitable for installation and use in vehicles. The system prototypes—one focused on the driver's exhaled breathe, and the other a touch-based technology—are now being developed and undergoing extensive laboratory and field testing. This five year effort will result in working prototypes installed in a research vehicle.

Driver Impairment Monitoring

In 2010, the Impairment Monitoring to Promote Avoidance of Crashes using Technology (IMPACT) program developed real-time algorithms to detect driver alcohol impairment using vehicle-based sensors. The study developed two types of algorithm, a general algorithm that does not consider individual differences in driving and an individualized algorithm.

Ideally, one would desire both the capability of identifying impaired driving regardless of the source, and the capability of specifying the source of impairment. The IMPACT algorithms with slight modifications may present one or both capabilities in addition to detection of alcohol impairment. A follow on program, Driver Monitoring of Inattention and Impairment Using Vehicle Measures (DrIIVE), aims to evaluate the breadth and specificity of the algorithms developed in IMPACT for use in detecting and distinguishing among multiple forms of driver impairment (alcohol impaired driving, drowsy driving, and distracted driving). The current phase of DrIIVE focuses on developing algorithms to detect drowsy drivers.

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Collision Warning Interface Research

Recognizing the important role of the driver in crash avoidance systems, NHTSA is now focusing research on developing a better understanding of, and guidelines for, the collision warning interface for FCW and LDW systems. The work involves consideration of the unique driving environments for both light vehicle and commercial and heavy vehicle drivers. This work examines the effectiveness of various warning methods, determines the potential need for standardizing certain system features, and explores methods for objectively measuring the performance of interface solutions.

Quieter Car

Pedestrian safety can be compromised by modern vehicles, e.g. electric vehicles that produce little or no sound. The goal of this program is to understand the safety risks, characterize the acoustic environment, and identify possible countermeasures to enable pedestrians to detect the presence of vehicles in motion. Recent phases in the program have measured the effectiveness and acceptability of various countermeasures. Results will support agency rulemaking as directed by Congress, and reported elsewhere in this paper.

Human Factors for Connected Vehicles

The objective of the research program in human factors for wireless traffic safety systems is to assess, counteract, and ultimately eliminate possible driver distraction from technologies that enable wireless communication between vehicles. The program aims to research and implement technology-based solutions that could deter drivers from multitasking and reduce vehicular sources of distraction. The Human Factors Research program is a highly collaborative effort that addresses the effectiveness of safety applications by evaluating any potential issues around driver distraction. The program is working towards mitigating any distracting by products from using in-vehicle information systems and portable devices, and developing technology-based solutions. The program consists of five Tracks.

Track 1: Improve our understanding of crash risk due to driver distraction. This will be accomplished by evaluating the nature and scope of the distraction safety problem and the evolving technology devices and features offered to drivers by analyzing data from a variety of sources.

Track 2: Develop and evaluate performance metrics for distraction mitigation. By monitoring new technology interfaces and developing best practices, objective test procedures can be developed to assess distraction and usability factors in production vehicles and portable nomadic technologies.

Track 3: Produce an integration strategy that allows nomadic systems to be functionally integrated with vehicle-based systems to optimize the driver-vehicle interface. Integration can reduce interface complexity and the occurrence of multitasking.

Track 4: Develop qualified exposure testing through field experiments that determine the long-term safety impacts of crash warning technologies and their effects on driver behavior.

Track 5: Conduct strategic stakeholder outreach to identify requirements, information needs, and usability issues, toward the goal of public acceptance.

Human Factors Evaluation of Automated Driving Concepts

Motor vehicle automation can potentially improve highway safety by helping the driver to detect crash risk sooner, by providing precise and consistent vehicle control during normal driving, and by maintaining appropriate driver attention to traffic and roadway conditions.

Accordingly, a new research program has been initiated to improve motor vehicle safety by defining the requirements for automation in normal driving that is: 1) functionally safe and electronically reliable; 2) operationally intuitive for drivers under diverse driving conditions; 3) compatible with driver abilities and expectations; 4) supportive of improving safety by reducing driver error ; 5) operational only to the extent granted by the driver and always deferent to the driver; and, 6) secure from malicious external control and tampering.

Electronic Systems Safety

In addition to research involving current and emerging crash avoidance technologies, NHTSA is also engaged in research related to electronics reliability, cyber security; and automated vehicles. In 2011, electronic systems safety was added as a new area of vehicle safety research at NHTSA.

Electronic control systems in vehicles raise concerns for driver safety in the areas of system reliability, cyber security, and vehicle automation. The safe reliability area addresses strategies for fail safe operation, diagnostics, software reliability, hardware validation, and electromagnetic compatibility. The cybersecurity area addresses challenges of on-board tamper-proofing, hacking and malicious external control. The automated vehicles program addresses safety questions about driver engagement and re-engagement across levels of automation, evaluation of concepts of operation, development of system requirements and guidelines for automated sensing and control, and multi-modal coordination.

Significant Rulemaking Actions

Overview

NHTSA is continuing rulemaking efforts outlined in the NHTSA Vehicle Safety and Fuel Economy Rulemaking and Research Priority Plan 2011-2013 (NHTSA, 2011a). In addition, on July 6, 2012, President Obama signed the “Moving Ahead for Progress in the 21st Century Act” (MAP-21), P.L. 112-141 which among the various provisions includes action items for NHTSA regarding child safety standards, commercial motor vehicle safety, motorcoach enhanced safety, vehicle electronics, and enhanced safety authorities and accountability. The agency has incorporated the rulemaking action items in MAP-21 into its rulemaking agenda. The following provides a brief summary of the agency’s significant rulemaking actions.

Improve Rear Visibility

This action pertains to FMVSS 111 and the Cameron Gulbransen Kids Transportation Safety Act of 2007 requiring regulation related to power window safety, rearward visibility, and rollaway prevention. On December 7, 2010, the agency published a Notice of Proposed Rulemaking (NPRM) proposing an image behind the vehicle be visible to the driver when in reverse. On February 28, the agency extended the comment period until April 18, 2011, and announced two public meetings to be held in March.

Sound for Hybrid Vehicles

This action pertains to the Pedestrian Safety Enhancement Act, to provide means of alerting pedestrians, especially those who are blind, to the presence of a motor vehicle in operation. On January 14, 2013, the agency published a Notice of Proposed Rulemaking.

Heavy Vehicle Stability Control

After an extensive research program to evaluate the available technologies, an evaluation of the costs and benefits, and a review of manufacturer’s product plans, NHTSA believes it is necessary to promulgate a new Federal standard that considers stability control systems on truck tractors and motorcoaches that address both rollover and loss of control crashes. Rollover and Loss of Control crashes’ involving heavy vehicles is a serious safety issue that is responsible for 304 fatalities and 2,738 injuries. They are also a major cause of traffic tie-ups, resulting in millions of dollars of lost productivity and excess energy consumption each year. Suppliers and truck and motorcoach manufacturers have developed stability control technology for heavy vehicles to mitigate these types of crashes

Heavy Truck Tire Upgrade

This action pertains to FMVSS No. 119, applied to new pneumatic tires for motor vehicles with a GVWR of more than 4,536 kilograms (10,000 pounds) and motorcycles. This applies only to new tires, not to retreaded tires. On September 29, 2010, the agency published an NPRM proposing to upgrade FMVSS No. 119 by increasing the stringency of the endurance test, primarily by increasing the test speed, increasing the load, and lowering the inflation pressure, and adding speed rating labeling on the sidewall. A new high speed test with test speeds up to 75 mph was also proposed.

Keyless Ignitions

This action pertains to FMVSS 114, Theft protection and rollaway prevention. This rulemaking addresses three safety issues regarding Keyless Ignition systems: drivers’ inability to shut down a moving vehicle, drivers failure to place the transmission in park before shutting off the vehicle (leading to rollaways when the driver exits the vehicle), and drivers inadvertently leaving a vehicle with the propulsion system active (leading to carbon monoxide poisoning if the vehicle is parked in a garage adjoining a living space). The agency published the NPRM.

Accelerator Control Systems

This action pertains to FMVSS 124, accelerator control systems. The issues are: (1) updating the throttle disconnection safety requirements and test procedures of the standard to better address electronic throttle control and alternative power trains; and (2) adding a new requirement for a brake-throttle override system on light vehicles. The agency published the NPRM.

Lighting

FMVSS No. 108 has been in existence since 1968. The standard had been amended over the years but has never undergone a comprehensive review. Regulated parties had stated that the standard was difficult to interpret because of its organization. In response to these concerns the agency sought to rewrite the standard to make it more understandable by adopting a simplified numbering scheme, to improve organization by grouping related materials in a more logical and consistent sequence, and to reduce the certification burden of regulated parties who previously needed to review a few dozen third-party documents. The agency issued a final rule on December 4, 2007. Several petitions for reconsideration of the Final Rule are under consideration

Speed Limiters for Heavy Trucks

In 2007, NHTSA was petitioned by the American Trucking Association and Roadsafe America to require the installation of speed limiting devices on heavy trucks. In response, NHTSA requested public comment on the subject and received numerous comments supporting the petitioner's request. The agency has granted the petition. The agency anticipates issuing a proposal in 2013.

Tire Aging

Tire Aging refers to the reduction in a tire's material properties, which over time leads to a reduction of its performance capabilities and could result in tire failure. As a result of the agency's comprehensive tire aging research program, we have developed a tire aging test protocol that includes 5 weeks in the oven, which is followed by roadwheel testing. The protocol is available in docket NHTSA-2005-21276. Validation tests are being conducted on several currently produced light vehicle tire models to evaluate their performance to the test protocol. After completion of validation testing, the agency will decide on the next steps in 2013.

Next Generation New Car Assessment Program (NCAP)

The NHTSA's New Car Assessment program provides vehicle safety information that enables consumers to compare the safety performance and features of new vehicles. This helps consumers in making their new vehicle purchasing decisions and encourages manufacturers to improve the safety aspects of existing vehicle designs and include new or better safety technologies in future designs. As recently as the 2011 model year, NHTSA upgraded NCAP to increase the stringency of the criteria that must be met to achieve high safety ratings and to provide consumers with more vehicle safety information. The agency also added the first performance tests for crash avoidance advanced technologies: electronic stability control (ESC), lane departure warning (LDW), and forward collision warning (FCW) systems. These program enhancements created additional market forces to improve vehicle safety.

Since the last program upgrade three years ago, manufacturers have made significant safety improvements to their vehicles to achieve 4- and 5-star ratings. In addition, current crash avoidance advanced technologies promoted by the enhanced program, have resulted in a significant increase in the availability of ESC, LDW and FCW. Other new and emerging technologies are being considered for inclusion into the program. Thus, the agency plans to publish a Federal Register notice requesting public comments on various subject areas in 2013 to help the agency plan future enhancements to the NCAP program that will create additional incentives for manufacturers to continually improve vehicle safety. The crashworthiness aspects of vehicle safety improvements under consideration will include, among other things, improved rear seat, older occupant, and pedestrian protection, updating injury criteria in frontal impact and side impact programs, adjusting the baseline injury risk in all three programs to ensure that vehicles are measured against a meaningful benchmark, revising testing protocols, and providing improved consumer information.

Motorcoach Enhanced Safety

The MAP-21 incorporated in Subtitle G, the "Motorcoach Enhanced Safety Act of 2012," which directs the Secretary to consider various motorcoach rulemakings, in provided timeframes, relating to seat belts on motorcoaches, improved roof support standards, advanced glazing standards and other portal improvements to prevent partial and complete ejection of motorcoach passengers, rollover stability enhancing technology, tire pressure monitoring systems, and tire performance standards. Most of these MAP-21 rulemaking actions were already included in the DOT Motorcoach Safety Action Plan

In 2009, the Department of Transportation (DOT) issued the U.S. DOT Motorcoach Safety Action Plan, which outlined a department-wide strategy to enhance motorcoach safety.[1] An update of this plan was issued on December 12, 2012.[2] The 2009 DOT motorcoach safety action plan and the 2012 updated plan identified factors and a prioritized plan for enhancing motorcoach safety, which included mitigating passenger ejection, improving rollover structural integrity, improving emergency evacuation and fire safety, requiring advanced technologies such as electronic stability control systems (ESC) and event data recorders (EDRs), and addressing operational issues such as driver fatigue and vehicle maintenance.

The agency published a proposal to require lap/shoulder belts for all seating positions in motorcoaches on August 18, 2010. A final rule is expected in 2013. The agency is also developing proposals for enhancing motorcoach rollover structural integrity and advanced glazing and window retention which are expected in 2013.

Child Passenger Safety

The MAP-21 incorporated in Subtitle E, "Child Safety Standards," which directs the Secretary to consider various rulemaking actions to enhance child safety including improving side impact protection for children in child restraints, amending the bench seat in the standard to be more representative of the rear seat environment in the current vehicle fleet, improving the ease of use of child restraint anchorage systems, requiring safety belt use warning system for rear seat positions, and minimizing the risk of hyperthermia and hypothermia to unattended children in rear seating positions. The child safety action items in MAP-21 were already in progress according to the NHTSA's Vehicle Safety and Fuel Economy Rulemaking and Research Priority Plan 2011-2013.

On February 27, 2012, the agency issued two final rules expanding the applicability of FMVSS No. 213 to CRSs for children weighing up to 80 lb. by incorporating the Hybrid III 10 year old child dummy into FMVSS No. 213 and into Part 572. The agency is developing proposals to incorporate a side impact test procedure, performance requirements, and a new 3-year-old side impact child dummy, "Q3s" into current standards to evaluate side impact protection of child restraint systems. These proposals are expected to be issued in 2013. The agency is also developing a proposal to improve the ease of use of child restraint anchorage systems, which is expected in 2013.

In February 2011, NHTSA announced its intent to launch a new initiative as part of the New Car Assessment Program to provide consumers with information from auto manufacturers about the specific child safety seats they recommend for individual vehicles (76 FR 10637, Docket No. 2010-00062). Vehicle manufacturers would recommend a minimum of three seats from each of the three child restraint system type categories, rear facing, forward facing, and booster, and would span across a range of price points. Participation in the program would be voluntary.

Rear Seat Belt Reminder Systems

In 2010, the agency published a Federal Register notice requesting comments on petition for rulemaking that would require rear seat belt reminder systems in passenger cars. Additionally, the MAP-21 Subtitle E, "Child Safety Standards," requires the agency initiate a rulemaking for rear seat belt reminder systems (SBRSs) within two years from the Act's date of enactment, and to issue a final rule or report within three years from the Act's date of enactment. In support of the agency's efforts, a research contract was initiated in 2012 to collect information from the driving public to determine drivers' and car passengers' seat belt usage habits as well as the effectiveness and consumer acceptance of rear SBRSs in order to support an analysis of the potential benefits of requiring rear SBRSs.

Safety of Electric Powered Vehicles

On July 29, 2011, NHTSA issued a final rule responding to petitions for reconsideration of the June 14, 2010 final rule requiring manufacturers to design their electrically powered vehicles so that, in the event of a crash, all high voltage components of the power train are either electrically isolated from the vehicle's chassis or their voltage is below specified levels considered safe from electric shock hazards. The July 29, 2011 final rule better aligns the definitions and language with the draft global technical regulation for hydrogen powered vehicle safety.

The United States, along with China, Japan, and the European Union, is co-sponsoring an effort to develop a United Nations Global Technical Regulation (UN GTR) to address the safety of electric powered vehicles. The UN GTR would attain

[1] http://www.fmcsa.dot.gov/documents/safety-security/MotorcoachSafetyActionPlan_finalreport-508.pdf
[2] http://www.fmcsa.dot.gov/safety-security/pcs/Motorcoach-Safety-Action-Plan.aspx

equivalent levels of safety for electric powered vehicles as for conventional gasoline powered vehicles. The UN GTR would address the unique safety risks posed by the rechargeable energy storage systems of electric powered vehicles and their components, taking into account the actual use in the market. It would be performance-based to the extent possible so as not to restrict future technologies. The draft UN GTR is expected to be completed by the end of 2014.

Event Data Recorders (EDRs)

On December 13, 2012 NHTSA proposed to establish a new Federal Motor Vehicle Safety Standard to mandate the installation of Event Data Recorders (EDR) in light vehicles. EDRs are already voluntarily installed on 96% of model year 2013 vehicles to provide critical crash data that might not otherwise be available. The proposed standard would incorporate the current voluntary regulation, 49 CFR Part 563, which established the current reporting requirements of voluntarily installed EDRs in light vehicles. Part 563 presently requires vehicle manufacturers who are voluntarily installing EDRs to be in compliance with the regulation by September 1, 2012. This 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. Moreover, this proposal to mandate EDRs across the entire light vehicle fleet would contribute to advancements in vehicle designs, and advanced restraint and other safety countermeasures.

In a separate rulemaking action, NHTSA will propose expanding the amount and type of data EDRs capture in light vehicles in the event of a crash. The rulemaking would consider requiring some of the optional data elements specified in 49 CFR Part 563. In addition, this rulemaking would make revisions to the optional data elements to account for the latest advances in vehicle safety. To support this effort, the agency initiated a research project to improve the agency's understanding of current state-of-the-art light vehicle EDR technologies and vehicle manufacturer future plans for installation of EDRs. Additionally, the research will assess potential updates to EDR performance requirements (e.g. fire or immersion survival), data retrieval (e.g. EDR reader interface or connector standardization), and data elements collected (e.g. more data points, longer time intervals). The research effort will also conduct a feasibility study on implementing EDRs on heavy vehicles or vehicles with a GVWR greater than 4,536 kg (10,000 pounds). The project is scheduled for completion in 2013.

Pedestrian Safety

A Global Technical Regulation (GTR) providing standards for pedestrian safety was established in January 2009 by the United Nations' Economic Commission for Europe (UNECE) World Forum for the Harmonization of Vehicle Regulations (WP.29). The GTR No. 9 provides requirements for the hood and bumper areas of light vehicles to reduce injuries and fatalities to struck pedestrians. As a signatory to the United Nations commission, the United States has agreed to initiate domestic rulemaking by proposing a new pedestrian safety FMVSS based on the GTR. This rulemaking action may also require NHTSA to propose adding additional test device(s) to Part 572.

Evolving Vehicle Safety Strategy

Safety technology continues to evolve at a fast pace. Government agencies, acting alone, cannot expect to keep up with this pace. NHTSA believes it must continue to explore collaborative models with all stakeholders, such as OEMs, suppliers, research centers, advocates, and other government agencies. These collaborative models provide for a more transparent technology development and implementation process, significantly reducing the time for advanced safety technologies to reach the consumer.

In sum, our Vehicle Safety Strategy is designed to proactively expand our focus on vehicle safety needs and to dynamically manage our safety programs in a culture of accountability and global leadership. It constitutes a method for managing our responses to vehicle safety needs through a flexible but disciplined approach that keeps pace with changing vehicle safety priorities over time. As new opportunities for vehicle safety emerge from our strategy, our methods will help to ensure a clear path of transition of these to main stream vehicle safety programs, such as those described through the body of this paper.

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