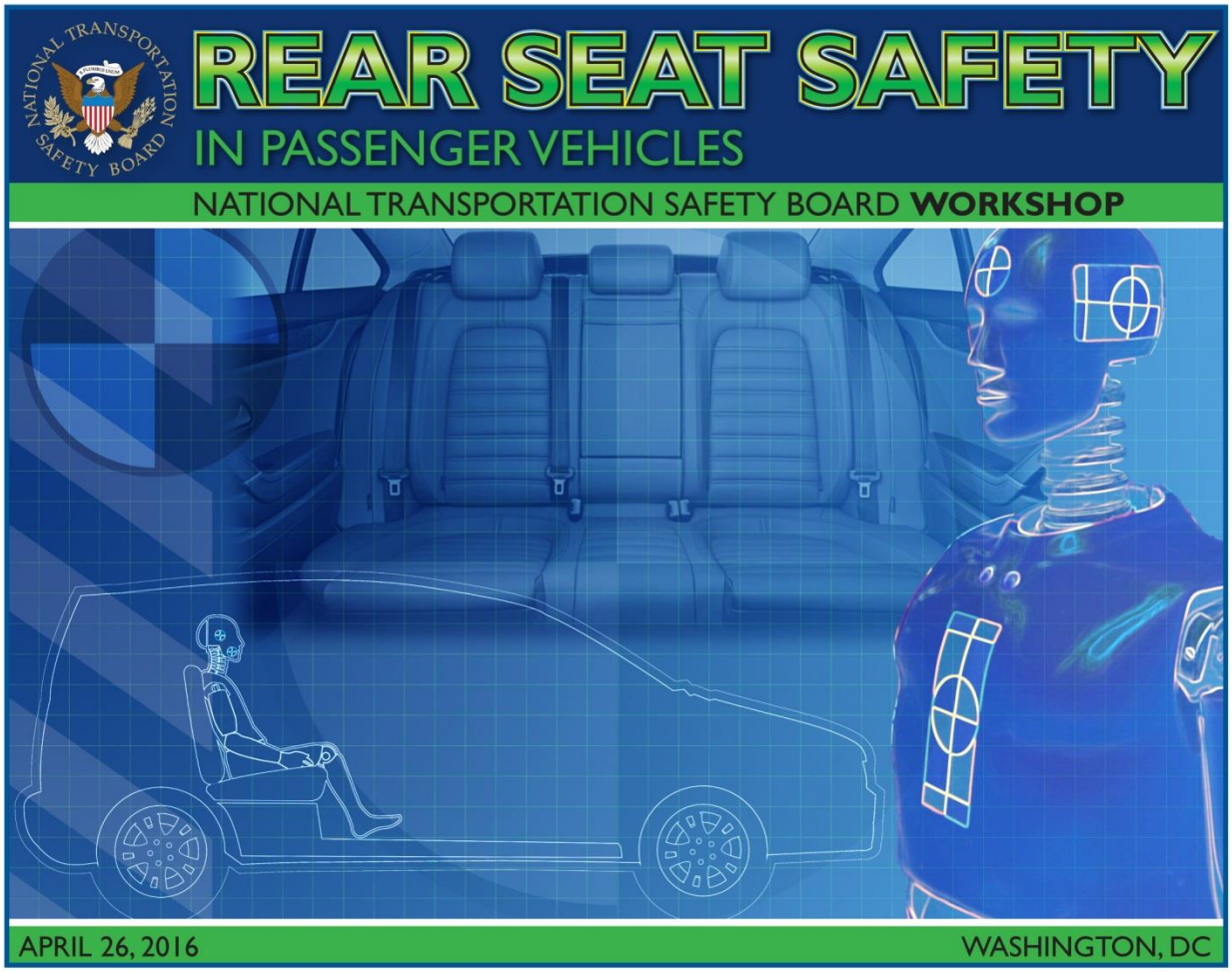

Rear Seat Safety in Passenger Vehicles

Workshop Summary

National Transportation Safety Board

490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

National Transportation Safety Board. 2016. *Rear Seat Safety in Passenger Vehicles Workshop Summary*. Washington, DC.

The National Transportation Safety Board (NTSB) is an independent federal agency dedicated to promoting aviation, railroad, highway, marine, and pipeline safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person." 49 C.F.R. § 831.4. Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report. 49 U.S.C. § 1154(b).

For more detailed background information on this workshop, visit http://www.ntsb.gov/rearseatsafety and search for NTSB docket ID DCA16SS001. Workshop presentations are available on the Internet at the NTSB home page NTSB Home Page. Other information about available NTSB publications also may be obtained from the website or by contacting:

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Report Summary

Improving the safety of the rear seat environment in passenger vehicles is vital to the goal of preventing fatalities and mitigating injuries in automobile crashes. The National Transportation Safety Board (NTSB) workshop on *Rear Seat Safety in Passenger Vehicles* held on April 26, 2016, focused on short- and long-term countermeasures that could improve safety for rear-seated passengers. The workshop presenters and participants discussed the current knowledge about rear seat occupants in motor vehicle crashes and how these occupants utilize existing vehicle safety systems, such as seat belts. Advanced vehicle technologies, innovative seat designs, emerging seat belt technologies, areas of needed research, education, and advocacy efforts were also addressed during breakout sessions, which enabled in-depth discussions of current and future technologies, their feasibility, and cost.

This report provides an archive of the workshop with summaries of the breakout session discussions. The workshop agenda, list of invited participants, and a glossary can be found at the end of the session summaries. *This document does not represent the views of, or any position held by, the NTSB, any other Federal agency, company, association or organization participating in the event.* The report is intended only to represent the totality of the workshop participants' verbal contributions. It is meant to capture the workshop discussions and, as such, may include opposing viewpoints and repetition in some sections.

Background

The NTSB's mission is to independently advance transportation safety. The NTSB is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. The NTSB determines the probable cause of the accidents and issues safety recommendations aimed at preventing future accidents and improving safety. In addition, the NTSB carries out special studies and issues safety reports concerning transportation safety.

The NTSB acknowledges the significant advancements made to improve the safety of occupants seated in the front seats of passenger vehicles, including the development of advanced restraint and airbag systems, seat designs to optimize occupant motion, and structural

improvements to minimize injury due to intrusion. However, because of the safety challenges affecting the rear seat environment, including those represented by the physical characteristics of some commonly rear-seated occupants including children and older adults, the NTSB recognized a need to direct attention to this important highway safety issue area. The NTSB's intent during the workshop was to highlight the safety advances made in the front seat environment and to explore ways that these benefits could be transferred to the rear seat environment. Expanding the focus of safety to the rear seat, through such means as advanced designs, education, outreach, and strengthened laws, would reduce the number of deaths and serious injuries of rear-seated passengers.

The workshop—held in Washington, DC, on April 26, 2016—was attended by more than 50 professionals representing a diverse group of participants from across the academic, public health, vehicle industry, and highway safety community.[1] The workshop brought together leading experts in occupant protection and public health to focus on safety in passenger vehicle rear seats, as well as injury and fatality mitigation measures and technologies. The workshop began with presentations from a panel of experts. Following the presentations, workshop participants were divided into breakout session groups to provide open forums for robust discussion of the current state of rear seat safety, challenges to improving safety, and short- and long-term goals and solutions. A concluding workshop session provided a summary of the breakout discussions. This report presents a digest of the safety issues raised during the workshop and of the countermeasures discussed during the breakout sessions.

Problem Statement

The NTSB has had a longstanding interest in occupant protection in passenger vehicles. In the past several decades, awareness of the lifesaving features of seat belts and airbags has increased as well as their use, standard availability, and improved technology to reduce and mitigate injury. Public and private entities focusing on this safety issue have changed social perceptions concerning seat belt use and consumer choice in purchasing vehicles with safety technology options; they have

[1] The list of invited organizations is provided at the end of the document, along with the workshop agenda.

also achieved important legislative actions to require seat belt use and expand vehicle crashworthiness assessment programs to provide consumer education on vehicle ratings.

These efforts have contributed to a reduction in the number of lives lost annually in motor vehicle crashes. However, with the focus on advancing the safety of front seat occupants through improvements in vehicle design, regulations, and crash testing, some recent studies have indicated that the protection offered to rear seat occupants is not advancing as quickly as protection for front seat occupants.[2] Advances in front seat design and technologies have created an environment where, for some occupants, such as older children and older adults in certain crash situations, the front seat may be safer than the rear seat.[3] This development is in contrast to the longstanding belief that the rear seat is always the safest position for these occupants.[4] Common injury mechanisms for rear-seated older children are likely to be preventable through use of improved rear seat design coupled with injury countermeasures to minimize head injury risk, such as curtain airbags. This development warrants attention because such a large portion of the child population travels in rear seats. In addition, researchers have found that rear seat restraints may offer improved protection to occupants of all ages, and in particular, to the elderly, if they are optimized to dynamic crash conditions.[5]

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[2] (a) Bilston, L.E., Dud, W., and J. Brown. 2010 "A matched-cohort analysis of belted front and rear seat occupants in newer and older model vehicles shows that gains in front occupant safety have outpaced gains for rear seat occupants." *Accident Analysis and Prevention* 42: 1974–1977; (b) Esfahani, E., and K. Diggs. 2009 "*Trend of Rear Occupant Protection in Frontal Crashes Over Model Years of Cars*." Stapp Car Crash Journal 53: 57-91; and, (c) Kent, R., Forman, J., Parent, D.P., and S. Kuppa. 2007 "Rear Seat Occupant Protection in Frontal Crashes and Its Feasibility." *Proceedings of the 20th International Technical Conference on the Enhanced Safety of Vehicles (ESV)* paper 07-0386.

[3] Because rear seats generally do not have the same advanced injury mitigation devices such as airbags, the nominal crashworthiness design parameters may not be optimal for these occupants. Older children may be too large for child seats but too small for the standard seat, and older adults are more sensitive to the crashworthiness design of the vehicle.

[4] Durbin D.R., Jermakian J.S., Kallan M.J., McCartt A.T., Arbogast K.B., Zonfrillo M.R., and Myers R.K. "Rear Seat Safety: Variation in Protection by Occupant, Crash, and Vehicle Characteristics," *Accident Analysis & Prevention*, July 2015; 80: 185–92.

[5] Kuppa S., Saunders J., and Fessahaie O. 2005 "Rear Seat Occupant Protection in Frontal Crashes." National Highway Traffic Safety Administration. *Proceedings of the 19th International Technical Conference on the Enhanced Safety of Vehicles (ESV)* paper 05-0212.

The goal of the workshop was to identify ways to improve rear seat safety in passenger vehicles. Workshop breakout session discussions were aimed at countermeasures for rear seat occupant safety including: (1) improving rear seat design, (2) providing advanced restraints systems, (3) extending seat belt use laws [to cover all ages] to the rear seat, (4) evaluating rear seat occupant protection systems, (5) improving consumer education on rear seat belt use and available safety technologies, and (6) accelerating development of new rear seat occupant protection strategies.[6] Moreover, breakout session participants identified the need to collect better crash-related data on rear seat occupants.

2. Presentations

The workshop's first session included six presentations, which provided an overview of the safety issue areas affecting the rear seats of passenger cars. The presentations are available on the NTSB website and are listed below.[7]

1. Ms. Suzanne Tylko, Transport Canada, "Crash Test Evaluation of Rear Seat Occupant Protection."
2. Dr. Kristy Arbogast, The Children's Hospital of Philadelphia, "Rear Seat Safety: Targeted Areas of Future Focus."
3. Dr. Lotta Jakobsson, Volvo Cars Safety Centre, "Rear Seat Safety @ Volvo Cars."
4. Mr. Steven J. Peterson, ZF TRW. [Not published]
5. Mr. Richard Schram, Euro NCAP, "Rear Seat Safety in Euro NCAP."
6. Dr. James H. Hedlund, Highway Safety North, "Belts in Back—How to Raise Rear Seat Belt Use."

3. Breakout Sessions

Participants were assigned to one of four breakout sessions to facilitate a thorough discussion of rear seat safety from a variety of perspectives and including a range of expertise

[6] In 2004, lap and shoulder belt assemblies were required for all rear seating positions in a passenger motor vehicle (with 100 percent compliance required by 2008). By 2013, 11 of 35 common vehicle brands offered optional or standard pretensioners or force-limiting seat belts in the rear seat. Virtually all were in outboard seat positions.

[7] Available at the NTSB Rear Seat Safety Workshop webpage: http://www.ntsb.gov/news/events/Pages/2016_rss_WS_agenda.aspx, accessed June 3, 2016.

areas. During the breakout sessions, many countermeasures were discussed, some which seemed, based on the availability of the technologies or the expected ease and cost of implementing the change, readily achievable. Other countermeasures were considered to be long-term solutions because the challenges they posed were considered obstacles to implementation.

The countermeasures were grouped into six main areas including: (1) overall vehicle design for second and third row seats; (2) seat design; (3) seat belt design (advanced restraint systems); (4) vehicle crash testing and safety ratings; (5) seat belt use, laws, and enforcement; and, (6) consumer education. Crash research needs were also identified and, although research was not considered a direct countermeasure, it was acknowledged that research areas could drive the implementation of some countermeasures and a seventh area was documented. The following tables summarize the countermeasures identified by each breakout group. Some countermeasures appear in multiple lists, because they span multiple groups' topic areas. As previously stated, the summaries below do not represent views or positions held by the NTSB, other Federal agencies, companies, associations or organizations; they are meant only to capture the workshop discussions and the verbal contributions of workshop participants.

OVERALL VEHICLE DESIGN FOR REAR SEATS (SECOND AND THIRD ROW)	
Short-Term Countermeasures	• Implement *basic* rear seat belt reminder systems (RSBRS) for all seating positions in passenger vehicles • Include crash test dummies (anthropomorphic test devices [ATD]) in rear seats during crash tests; include rear seat requirements in occupant testing protocols (*Federal Motor Vehicle Safety Standards* [*FMVSS*s]) • Address regulatory impediments (New Car Assessment Program [NCAP] versus *FMVSSs*) • Standardize electronic data recorder (EDR) requirements • Improve EDR communications with emergency medical services to help deploy appropriate response resources for care and triage, particularly in rural areas
Long-Term Countermeasures	• Implement *advanced* RSBRSs for all seating positions • Globally harmonize safety standards (such as FMVSS 201) and NCAP rating systems

	• Improve seat belt fit with better anchorage geometry and enhanced adjustability • Increase rear seat safety for small passenger vehicles, especially in rear impact crashes • Design the rear seat and restraint systems to better fit children older than booster seat law age • Introduce incentives for consumers and industry to promote better technology

Challenges, Barriers and Other Factors to Consider:

- Technology development and fleet turnover can be slow (enhanced seat belt reminder systems [SBRS] and EDRs)
- Basic SBRSs are relatively easy to implement now (SBRSs will be regulated by the United Nations Economic Commission for Europe by 2019)
- Because all European manufacturers decided to incorporate RSBRSs in their vehicles, the cost has come down dramatically, and they are now considered cheap; however, some US vehicle manufacturers have voiced that the high cost of RSBRSs prevents them from incorporating the systems into their vehicles
- The Alliance of Automobile Manufacturers recommends that NHTSA incorporate rear seat belt reminder systems into NCAP using the same rear seat belt reminder test protocols and criteria as currently employed by Euro NCAP Assessment-Protocol-AOP-V7.03
- The National Highway Traffic Safety Administration (NHTSA) is obligated under the Moving Ahead for Progress in the 21st Century Act (MAP-21) to initiate rulemaking about requiring RSBRSs
- EDR privacy concerns and infrastructure
- Vehicle manufacturers suggested that the NTSB can ask NHTSA to standardize EDRs; as SBRS sensors are provided for the rear seat, NHTSA should add those sensors to EDR data to improve knowledge about rear seat belt use
- Cost and affordability for rear seat improvements in vehicle design (exception is SBRSs)
- Need to make rear seat use more appealing to occupants, ideas include adding technologies and providing safety features
- Cannot require new technologies in first year of release because original equipment manufacturers (OEM) and researchers do not know how or whether they will work in the real world (for example, SBRS); need to field test technologies before making them standard
- Need to assess/examine how automated vehicle technologies may change crashworthiness challenges

- Need to be careful not to overemphasize improving rear seat safety while sacrificing safety in other areas
- Some US NCAP and federal regulations may inhibit advancements in safety designs that target specific segments of the population (for example, older drivers)
- Automated notification systems technology can be used to help with triage decisions concerning resource deployment; this is beneficial for rural areas; the challenge is who will use the data and how; another barrier to overcome is that the information does not immediately get to first responders; the volume and availability of relevant information is also a challenge
- The European Union will make automated notification systems mandatory by 2018
- BMW monitors its fleet when crashes occur to evaluate the effectiveness of crash avoidance technologies
- Automakers can always develop a technological solution, but it takes a long time to "migrate" it to the entire fleet (technology must be field-tested, which is why it is introduced as "optional equipment"); making technology standard in the rear seat is a better approach
- Competing resource priorities like Corporate Average Fuel Economy (CAFE) standards, collision avoidance systems, and autonomous vehicle technologies now and in the future have a negative effect on prioritizing rear seat safety
- Advanced emergency braking (AEB) is a challenge due to the possibility of moving the occupant out of a known nominal seating position
- Twenty manufacturers representing more than 99 percent of the U.S. auto market have agreed to make AEB a standard feature on virtually all new cars. This voluntary agreement may result in implementation faster than the formal regulatory process and should be considered as a guide to potentially also gain agreements to incorporate SBRS, adaptive seat belts, and better seat design countermeasures into vehicles faster than through the regulatory process

SEAT DESIGN	
Short-Term Countermeasures	• Optimize advanced seat designs from the front seat, such as seat pan length and ramp angle, to better control occupant motion in the rear seat • Improve seat belt fit through optimized (and standardized) anchor and buckle positions • Develop integrated seat belts for different occupant sizes as well as systems that work with the seat design as occupant protection systems

	• Address head restraints [For example, improve the distance between the occupant head and head restraint (reducing backset), extend head restraint closer to head height, and design restraint to respond to crash sensors over occupant motion] • Improve seat belt geometry to variety of occupant sizes • Determine how many integrated booster seats are currently in the marketplace • Test rear seat designs for varied occupant sizes
Long-Term Countermeasures	• Increase belt use through advances in the rear seat design for seat belt adjustability and ease of use • Design the rear seat and restraint systems to better fit children older than booster seat law ages • Design the rear seat and restraint systems to better fit older adults and smaller statured occupants • Include integrated booster seats • Update regulations for safety improvements—such as seatback strength • Retrofit and after-market for advanced seat belts

Challenges, Barriers and Other Factors to Consider:

- Balancing seat pan design technology improvements with potential unintended (biomechanics) consequences to different occupants (age, size, gender)
- Seat belt interlocks: strong consumer dislike but in general this technology is only applicable to the driver/front seats
- Integrated seat belts: many competing priorities for what consumers want from rear seats (cargo, folding, child restraints, etc.); they can be less affordable and heavier
- Performance standards for NCAP or consumer awareness ratings need to be developed to foster design changes and innovation
- Speed and accuracy of technology development may introduce errors; problems are considered potential trade-offs for quick countermeasure implementation into the market
- Expanded testing procedures for rear seat occupant protection would also require standards for seat belt anchor positioning; currently, there is variability in rear seats
- Requirements for seatback strength have not been upgraded for a long time (even though requirements have not changed, some manufacturers install seats with seatback strength about 3.5 – 4 times the standards' requirements)
- Rear seat parameters are broad and differ from front seat designs; engineers can design a system or components, but they need to be complemented with consumer education on use to reduce variability (scenarios manufacturers would need to design for)

SEAT BELT DESIGN	
Short-Term Countermeasures	• Design seat belts with load limiters • Design seat belts with pretensioners • Include inflatable seat belts • Provide upper anchorage adjustability for rear seat belts • Make rear seat belts adaptive to crash severity and load, as well as occupant variability
Long-Term Countermeasures	• Include integrated booster seats • Integrated booster seats in some vehicles are not universally integrated due to occupant comfort and related design issues that may conflict with a manufacturer's approach to rear seat design • Design the rear seat and restraint systems to better fit children older than booster seat law ages • Have auto and child seat manufacturers coordinate when designing rear seat belts • Increase ease of belt use with advances in rear seat design • Create partnerships and encourage voluntary action to solve engineering issues (model successful approach from depowered airbag issue)
Challenges, Barriers and Other Factors to Consider: • Potential safety trade-off with unintended consequences from load limiters, pretensioners, and child safety seats (potential incompatibility from variability) • Only helpful for those wearing the belts • Potential low demand for integrated booster seats in US consumer households because use in multiple vehicles requires flexibility/mobility of child seat • Determine the appropriate design point for the crash speed	

VEHICLE CRASH TESTING AND SAFETY RATING	
Short-Term Countermeasures	• Inform consumer through public outreach that rear seats are not included in vehicle crash testing, and use consumer safety ratings to leverage purchases based on safer rear seats and technology • Use NCAP to increase implementation of RSBRS; follow or harmonize with Euro NCAP model; have programs provide incentives to OEMs for implementing technology until performance standards become mandatory (for example, RSBRS are low cost because European manufacturers receive Euro NCAP points for installation) • Include rear seat dummies in all testing (all speeds and directions) • Use smaller, more vulnerable dummies in vehicle testing • Include moderate and high speed (velocity) scenarios in crash tests • Develop performance standards for NCAP or consumer awareness rating to foster design changes and innovation; this approach is faster and more flexible than regulation because it gives automakers options and creates marketplace competition • Create comprehensive set-up standards and evaluation tools to improve testing; use different ATD configurations; modify injury criteria; make use of computational tools standard; use "vulnerable" population ATDs in testing
Long-Term Countermeasures	• Use Insurance Institute for Highway Safety (IIHS) latch ratings as an example on how to incorporate the presence of RSBRS into vehicle ratings • Use IIHS side impact crash testing to improve NCAP (NHTSA) crashes tests by incorporating heavier barrier and higher placement on passengers cars to more closely simulate real world impacts at 90 degrees by SUVs and trucks • Survey automaker-specific technologies to study effectiveness on how these perform in a crash; requires OEM VIN information *and* identification of vehicle-specific technologies • Provide regulatory requirements for using rear seat dummies in crash tests
Challenges, Barriers and Other Factors to Consider: • Data needed on rear seat side impact intrusion with compartment infringement to evaluate body positioning for safety technologies and vehicle side structure compatibility • Consider how cars are used in the United States compared to Europe • Caution on occupant protection sensors and false alerts to consumer dissatisfaction	

SEAT BELT USE, LAWS, AND ENFORCEMENT	
Short-Term Countermeasures	• Implement consumer campaigns about importance of rear seat belt use to protect drivers and front seat passengers from unbelted rear seat passengers in a crash • Develop single voice in educating about seat belt use through— - State educational campaigns - Health classes (early habit forming) - Use of social media with new simple message - Ride-sharing and taxi, Uber, or Lyft messaging - Medical community outreach • Be aware that messaging is good, but it fades quickly; the ideal situation is a mix of approaches rather than relying on messaging alone • Provide enforcement: implement high-visibility enforcement, higher fines, license suspension, and fines to enforce rear seat belt tickets • Use targeted messaging (lower levels of belt use population focused) • Consider relationship between belted drivers and belt status of rear seat occupants as evidence to support increased enforcement of driver belt use as a method to increase rear seat passenger belt use
Long-Term Countermeasures	• Click-It or Ticket campaign needs a fresh approach; can be improved and there is an opportunity to include rear seat awareness • Increase ease of belt use and overall belt use through advances in the rear seat design • Provide integrated booster seats • Design the rear seat and restraint systems to better fit children older than booster seat law ages • Use vehicle-based encouragement (RSBRSs) to increase seat belt use • Promote adoption of a rear seat primary seat belt law or local ordinance if appropriate • Increase education and training for the judiciary to ensure consistent citing and adjudication of occupant protection offenses and consideration of alternative sentencing (i.e., safety education) • Link state highway funding to state seat belt laws or enforcement
Challenges, Barriers and Other Factors to Consider: • Primary seat belt laws are politically charged	

- Can be problematic in certain situations for police to see and enforce seat belt use, and higher fines may reduce enforcement; however, higher overall rear seat belt use results when laws are enforced *and* higher fines are imposed
- Vehicle-based technology works when high-visibility enforcement *and* improved consumer outreach efforts are combined; integrated strategy has been effective for increasing front seat belt use and can be a model for increasing rear seat belt use
- Dissemination of information through social media may be more effective in increasing rear seat belt use than state education campaigns

CONSUMER EDUCATION	
Short-Term Countermeasures	• Educate consumers about best child seating position • Use simple messaging to explain the science • Provide education about EDRs; explain that the technology is not to detect driver behavior but to focus on what happened in the crash to provide better data on belt use in crashes • Revamp and refresh Click-It or Ticket campaign • Use social media to share information about vehicle technologies; examples are short videos or texts • Promote safety while addressing how the public thinks versus how designers think • Educate public on rear seat safety (try good-better-best approach) • Communicate with consumers in plain language • Add manufacturer-prerecorded seat belt video to rear seat video systems and/or link video system use
Long-Term Countermeasures	• Educate on use through taxi, limo, and ride-share service companies, and work on corporate policy regarding rear seat belt use

Challenges, Barriers and Other Factors to Consider:

- Potential consequence of consumer awareness focusing on rear seat risks over safety benefits that can be achieved; complex message requires strategic execution to ensure message that rear seat is safer with belt use and front seat technologies, if they are implemented in the rear seat as well
- Need consumer outreach to explain that EDRs are for capturing what happened in a crash and not to capture driver or passenger behavior

- Front seat belt use remains low for some populations, such as young males; need to overcome mindset of generation that did not grow up with seat belts or when seat belt use was low
- Consider barriers and populations (disparity, low income, those who do not see the value)
- Vehicle-based countermeasures: impact of the new US NCAP, the amount of information is large, how do we communicate this to consumers so they do not become confused?
- Providing too much information may result in key information getting lost; for example, in the European Union, manufacturers only show an overall rating—the details are available on website, not on label; the United States uses the window sticker called the Monroney label, which lists all vehicle equipment and ratings
- States have competing budget priorities that potentially reduce seat belt education funds

CRASH RESEARCH	
Short-Term Countermeasures	• Improve data collection (detailed crash injury information) and integration (linkages) • Develop better crash data collection on older adults (such as seat location, belt use, age, gender, size and injury outcome) • Obtain better crash data on rear seat belt use (age, seat position of occupants); needed to provide support for enacting primary enforcement laws for rear seat belt use • Add data field to Fatality Analysis Reporting System (FARS) to capture seatback collapse/failure
Long-Term Countermeasures	• FARS and National Automotive Sampling System (NASS) data do not have necessary quality or include data on all occupants; more in-depth and complete data is needed to more clearly articulate the need to improve rear seat safety (through regulations and to establish appropriate benchmarks)

Challenges, Barriers and Other Factors to Consider:

- Confidentiality, privacy, data issues
- Limited data on seatback strength, and is it an issue if manufacturers already have seatbacks with four times the FMVSS strength requirement?
- More research on whether neck injuries are more critical than brain injuries for testing (for example, do Brain Injury Criteria (BrIC) over-predict brain injury?)
- Rear seat safety countermeasures are varied and provide no clear short-term solution; however, there is a lack of testing for rear occupant protection, which is the necessary starting point

6. Other Issues Discussed Related to Rear Seat Safety

The following other issues relating to rear seat safety were discussed during the workshop:

- Use AEB agreement between NHTSA and auto manufacturers as a guide to incorporate rear seat safety countermeasures into vehicles (first decide on priority of countermeasures, because there are numerous options, such as airbags, seat belt pretensioners, and rear seat ATD testing in FMVSS)
- Cargo securement in rear seat (or third row area) or trunk and potential crash-cause impact into seatbacks needs to be studied and addressed
- Advanced technologies are needed for small vehicles involved (as struck vehicle) in rear impacts
- Need child seat certification curriculum with added information about safety rating system; for example, the lack of harmonization between seats meeting International Organization for Standards (ISO) and i-Size European standards, as well as the difference in standards in United States and Europe for rear-facing infant seats (including fit and adjustment)

Workshop Agenda

08:00-08:10 - Welcome Remarks: ***Vice Chairman T. Bella Dinh-Zarr, PhD, MPH***

NTSB Staff:

Michele Beckjord, Office of Highway Safety

8:10–10:00 a.m. Session 1: Current Research Updates and Technologies

Presenters:

Ms. Suzanne Tylko - Transport Canada

Dr. Kristy Arbogast - The Children's Hospital of Philadelphia

Dr. Lotta Jakobsson - Volvo Cars Safety Centre

Mr. Steven J. Peterson - ZF TRW

Mr. Richard Schram - Euro NCAP

Dr. James H. Hedlund - Highway Safety North

10:00–10:15 a.m. Morning Break

10:15–12:00 p.m. Breakout Session 1

12:00–1:00 p.m. Lunch (on your own)

1:00–2:30 p.m. Breakout Session 2

2:30–2:45 p.m. Afternoon Break

2:45–3:30 p.m. Summary Session: Workshop Consensus & Going Forward

NTSB Staff:

Michele Beckjord, MFS, Office of Highway Safety

Jana Price, PhD, Office of Highway Safety

Thomas H. Barth, PhD, Office of Highway Safety

Kristin Poland, PhD, Office Research and Engineering

Stephanie D. Shaw, Office of Safety Recommendations and Communications

3:30-03:45 - Closing Remarks - Vice Chairman T. Bella Dinh-Zarr, PhD, MPH

Invited Participants

AAA Foundation for Traffic Safety
AAA National
Advocates for Highway and Auto Safety
Alliance of Automobile Manufacturers (Auto Alliance)
American Honda Motor Corp., Inc.
Association of Global Automakers
Automotive Safety Council
Autoliv
Centers for Disease Control and Prevention, U.S. Department of Health and Human Services
Columbia University Medical Center
Euro NCAP
Faurecia
FCA
Ford Motor Company
GM
Highway Safety North
IEE S.A.
Insurance Institute of Highway Safety (IIHS)
Key Safety Systems
Mazda
Medical College of Wisconsin
Mercedes-Benz Research & Development North America
Mitsubishi Motors R&D of America, Inc.
Motor & Equipment Manufacturers Association (MEMA)
National Highway Traffic Safety Administration (Observer Status)
National Safety Council
National Sheriffs' Association
Nichols and Associates
Safe Kids Worldwide
Subaru
Takata
Toyota Technical Center, U.S.A., Inc.
Toyota
Transport Canada
Transportation Safety Institute / U.S. Department of Transportation
University of Iowa, Transportation and Vehicle Safety Research Program
UNC Highway Safety Research Center, Occupant Restraint Program
University of Michigan Transportation Research Institute (UMTRI)
University of New South Wales, NeuRA
University of Pennsylvania, The Children's Hospital of Philadelphia
University of Virginia
Volvo Cars Safety Centre
ZF TRW

Glossary

AEB	advanced emergency braking
BrIC	Brain Injury Criteria
CAFE	Corporate Average Fuel Economy
EDR	electronic data recorder
Euro NCAP	European New Car Assessment Program
FARS	Fatality Accident Reporting System
FMVSS	Federal Motor Vehicle Safety Standards
IIHS	Insurance Institute for Highway Safety
MAP-21	Moving Ahead for Progress in the 21st Century Act
NASS	National Automotive Sampling System
NCAP	New Car Assessment Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
OEM	original equipment manufacturer
RSBRS	rear seat belt restraint system
SBRS	seat belt reminder system
VIN	vehicle identification number

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