No. 17-1229

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

IN RE KIDS AND CARS, Inc., and THE CENTER FOR AUTO SAFETY,

Petitioners.

PETITION FOR A WRIT OF MANDAMUS

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October 30, 2017

PETITIONERS' CERTIFICATE OF PARTIES AND CORPORATE DISCLOSURE STATEMENT

A. Parties

Petitioners are KIDS AND CARS, Inc., and the Center for Auto Safety. They seek a writ of mandamus directed to the Secretary of the Department of Transportation.

B. Corporate Disclosure Statement

Petitioners KIDS AND CARS, Inc. and the Center for Auto Safety are non-profit organizations. Neither has any parent companies or issues any stock or partnership shares.

C. Related Cases

Petitioners are unaware of any related cases.

Respectfully submitted,

___/s/_____

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INTRODUCTION

Petitioners seek a writ of mandamus to compel the Secretary of the Department of Transportation ("DOT") to comply with statutorily mandated deadlines to promulgate a critical automobile safety standard that will save almost a thousand lives each year—including those of young children—and prevent many other thousands of people, including children, from experiencing physical injuries, pain, and suffering. The standard at issue—which has already been mandated by Congress—would require a safety belt warning system for all designated rear seating positions of vehicles, *i.e.*, an audible warning if someone in the back seat of the car were not buckled up, similar to the warning that currently exists when *drivers* fail to fasten their seat belts.

On June 29, 2012 Congress enacted legislation requiring all designated seating positons in the rear seats of cars to be equipped with a seat belt warning as part of the Moving Ahead for Progress in the 21st Century Act ("MAP-21"). Pub. L. 112-141, § 31503, 126 Stat. 405, 774 (2012) (codified at 49 U.S.C. § 30127 note). Congress directed the Secretary to initiate a rulemaking proceeding to promulgate that standard within two years of the effective date of the statute, i.e., by October 1, 2014, and to issue a final rule by October 1, 2015. *Id.*

However, more than three years since the *proposed* rule was to be published for public comment—*and despite many thousands of preventable deaths and*

injuries of children and others due to the lack of this important safety standard—the Secretary has yet to even *initiate* the requisite rulemaking to establish this much needed safety standard. Accordingly, the Secretary has unlawfully withheld and unreasonably delayed action required by law within the meaning of the Administrative Procedure Act ("APA"), 5 U.S.C. § 706(1). Therefore, because this Court would have jurisdiction over a challenge to any final safety standard, *see* 49 U.S.C. §30161(a), it has authority to issue the requested writ of mandamus. *See, e.g., Telecomms. Research & Action Ctr. v. FCC* ("*TRAC*"), 750 F.2d 70, 72 (D.C. Cir. 1984); *see also* 49 U.S.C. §30161(a) (challenges to final motor vehicle safety standards are reviewed by the Court of Appeals).

BACKGROUND

A. Seat Belts Save Thousands of Lives Each Year

According to the National Highway Traffic Safety Administration ("NHTSA")—the agency within the Department of Transportation responsible for issuing motor vehicle safety standards—"[o]f the 35,092 people killed in motor vehicle crashes in 2015, 48 percent"—or 16,845 people—"were not wearing seat belts." *See* NHTSA Seat Belt Report, Petitioners' Exhibit ("Pet. Ex.") A at 4. Also according to NHTSA, "[i]n 2015 alone, seat belts *saved an estimated 13,941 lives*." *Id.* at 1 (emphasis added). NHTSA further estimates that, on average, about 38 people each day who do not wear their seat belts are killed in motor vehicle

crashes, and that half of these people would be alive today if they had worn their seat belts. *See* NHTSA Most Wanted: 45 million Americans still not buckling up," Pet. Ex. B*; see also* Pet. Ex. A at 4 ("Not buckling up can result in being totally ejected from the vehicle in a crash, which is always deadly"); *id.* at 9 ("wearing your seat belt is your best insurance to prevent injury and death in the tragic case of a motor vehicle crash"); *id.* at 19 ("[w]earing a seat belt *can reduce the risk of fatal injury by 45%*" (emphasis added)).

Those sitting in the rear seats of cars are particularly at risk of death or injury as a result of not wearing seat belts during a crash. According to a 2017 Report by the Insurance Institute for Highway Safety ("IIHS"), unrestrained rear-seat occupants are nearly 8 times more likely to be seriously injured in a crash as restrained rear-seat occupants. Status Report, "Unbelted," Insurance Institute for Highway Safety (Aug. 3, 2017), Pet. Ex. C, at 2. Moreover, according to NHTSA, in 2014 58% of back seat passengers killed in crashes were not buckled up. NHTSA Poster ("Sitting in the Back Doesn't Excuse You from Using a Seat Belt"), Pet. Ex. D.

This risk to back-seat passengers is particularly significant for children, who routinely ride in the back seats of vehicles. In fact, NHTSA has *instructed parents to put children in the back seats of cars as the safest place to be in a car. See, e.g.,* Pet. Ex. A at 12 ("All children under 13 should ride in the back seat for maximum

safety. The back seat is the safest place for your children"); *see also* Pet. Ex. F (NHTSA directing parents to "keep kids in the back seat at least through age 12").

However, according to NHTSA, "[e]very 33 seconds, one child under the age of 13 is involved in a crash," and, in the last five years, "1,552 kids between ages of 8 and 14 died in cars crashes" and "of those who died, almost half were unbelted." *See* NHTSA, Child Passenger Safety Week, Facts and Talking Points (Sept. 2017), Pet. Ex. E. In fact, "[v]ehicle crashes are one of the leading causes of death for children between 1 and 13 years old." *See* NHTSA Report, "Keeping Kids Safe: A parent's guide to protecting children in and around cars" (2017), Pet. Ex. F at 5; *see also* NHTSA Report, "Identifying Strategies to Reduce the Percentage of Unrestrained Young Children (2009), Pet. Ex. G at 3 (Motor vehicle crashes are *the leading cause of death and disability for pediatric and adolescent children*); *id.* (Of the 3,300 unrestrained children of the same age group involved in crashes involving a fatality between 1998 and 2002, 27.7% were killed).

Yet, children often do not wear their seat belts, or start off wearing them but unfasten them at some point. *See, e.g.,* Pet. Ex. F at 12 ("Children can get bored during car trips and may play with the seat belt—sometimes pulling the seat belt all the way out"); Pet. Ex. A at 11 ("As your child grows, you may face challenges enforcing seat belt safety").

Teenagers and young adults who are passengers in cars also often do not wear their seat belts, placing them at great danger of serious injury or death. In 2015, 57% of unrestrained 13-15 year olds were killed in car crashes, Pet. Ex. A at 14, and 59% of passenger vehicle occupants 21-24 years old not wearing seat belts were killed in traffic crashes—"the highest percentage of all groups." *Id.* at 10; *see also id.* at 21 ("NHTSA data show that as children get older they are less likely to want to buckle up. Over the last 5 years, 1,552 kids between the ages of 8 and 14 died in car, SUV and van crashes—of those who died, *almost half were unbelted*") (emphasis added).

It is also well established that people riding in the *front* seat of a vehicle wearing a seat belt can be killed by an unbelted passenger in the *rear* seat in a crash who is propelled forward. As explained by Dr. Alisa Baer, a pediatrician and nationally certified child passenger safety instructor, being hit by someone riding in the rear seat weighing 100 pounds in a typical 30-mile-an hour crash is the equivalent of being slammed by someone weighing 2,000 to 2,500 pounds.[1]

B. <u>Seat Belt Warnings Save Lives</u>.

Although there is a current Federal Motor Vehicle Safety Standard ("FMVSS") requiring the driver's seating position to be equipped with a seat belt

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[1] Kate Rope, *Car Seat Mistakes You May Be Making*, PARENTING, http://www.parenting.com/gallery/car-seat-laws-requirements-installation?page=8 (last visited Oct. 24, 2017).

warning system that activates when the driver's seat belt is not buckled, FMVSS 208 (codified at 49 C.F.R. § 571.208), despite the fact that in 2012 Congress enacted legislation requiring a comparable warning when passengers in the *rear seats of the vehicle* are not wearing seat belts, to date no such standard has been promulgated. However, it is absolutely clear that such a warning system would save almost a thousand lives each year.

To begin with, audio warnings now provided for drivers in the front seat have proven to be "*highly effective in increasing belt wearing rates of a vehicle's front seat occupants*." "Advanced Seat Belt Reminder System for Rear Seat Passengers," Report of the International Electronics and Engineering ("IEE") at NHTSA's 2015 Enhanced Safety of Vehicles Conference, Pet. Ex. H (emphasis added). According to that same report, in a laboratory study conducted in Japan in 2012, when an audiovisual warning was used to remind rear seated passengers to fasten their seat belts, *95% of the initially non-belted rear seat occupants fastened their seat belts*. *Id.* at 3. Indeed, according to the recent IIHS report, nearly two-thirds of part-time and nonusers said audible rear seat belt reminders would make them more likely to buckle up. Pet. Ex. C at 4; *see also, e.g.,* Buckling Up Technologies to Increase Seat Belt Use, Special Report 278 (2003), Transportation Research Board, National Academy of Sciences, Pet. Ex. I at 13 (73% of drivers interviewed reported that they had buckled their seat belts after being reminded to

do so by a reminder system); *id.* at 77 (83% of drivers interviewed after being observed not wearing their safety belts in traffic said they would buckle up if they rented a car with an aggressive audible warning system).

NHTSA itself has acknowledged the importance of rear seat belt safety warnings, particularly to saving the lives of children riding in the back seats of cars. *See* Pet. Ex. F at 6-7 (identifying "Rear seat belt safety warnings" as one of the "Car Safety Features that Help Protect Kids"); *see also* Pet. Ex. E at 4 ("Parents need regular and salient reminders to consistently secure seatbelt compliance for themselves and their tweens [children 8-14 years old] children").

However, again, despite the fact that in 2012 Congress instructed the Secretary of Transportation to promulgate such a standard, to date the Secretary has failed to do so, and, as a result, very few vehicles sold in the United States have belt reminders for the rear seating positions. According to the recent IIHS Report, in 2015 *only 3 percent of models sold in the U.S. had them, and the number has not increased appreciably in newer vehicles*. Pet. Ex. C at 4. This statistic stands in sharp contrast to the situation in European countries and Australia where, since 2015, almost all new cars sold there come equipped with rear seat belt reminders[2]—a development that has surely decreased the number of

[2] *See, e.g.,* Europe New Car Assessment Program ("NCAP") Seat Belt Reminder Data (2017), Pet. Ex. J, (showing that since 2015, between 95-100% of tested new cars sold in the European Union had rear seat belt reminders); Australia

deaths and injuries by vehicle passengers in those countries. *See, e.g.,* Pet. Ex. H (IEE report concluding that *front* seat belt warnings have proven to be "*highly effective in increasing belt wearing rates of a vehicle's front seat occupants*."); *id.* at 3 (reporting that a 2012 Japanese study demonstrated that use of an audiovisual warning to remind rear seated passengers to fasten their seat belts resulted in 95% of the initially non-belted rear seat occupants fastening their seat belts).

C. Congress Enacts Legislation Mandating A Safety Standard Requiring a Warning System for Rear Seat Belt Restraints.

On July 6, 2012, Congress enacted MAP-21—a funding and authorization bill governing United States federal surface transportation spending. Subtitle E of MAP-21 includes provisions that require the Secretary of Transportation to promulgate "Child Safety Standards" by specified statutory deadlines. Pub. L. 112-141, § 31503, 126 Stat. 405, 774 (2012) (codified at 49 U.S.C. § 30127 note).

The Map-21 statute provided that "[n]ot later than 2 years after the date of enactment of this Act, the Secretary shall initiate a rulemaking proceeding to amend Federal Motor Vehicle Safety Standard Number 208 (relating to occupant crash protection) to provide a safety belt use warning system for designated seating

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NCAP Seat Belt Reminder Data, Pet. Ex. K (showing that since 2015, approximately 90% of tested new cars sold in Australia had rear seat belt reminders.); *see also* Economic and Social Council Report (September 2, 2016), Pet. Ex. L, (recommending that all new cars sold world-wide have rear seat belt reminders).

positions in the rear seat." *Id.* The statute further provided that "[e]xcept as provided under paragraph (2) and section 31505, the Secretary shall issue a final rule under subsection (a) not later than 3 years after the date of enactment of this Act." *Id.*

Congress included only two caveats that would excuse the Secretary from promulgating a final rule within three years of enactment of the legislation. First, a final rule would not be required within three years if the Secretary determined within that timeframe that an amendment to the standard did not meet the requirements and considerations that govern all motor vehicle safety standards as set forth in the Motor Vehicle Safety Act, 49 U.S.C. § 30111(a)–(b), in which event the Secretary was required to submit a report describing the reasons for not prescribing such a standard to: (A) the Senate Committee on Commerce, Science, and Transportation; and (B) the House of Representatives' Committee on Energy and Commerce.

Second, § 31505 of MAP-21 provided that

> [i]f the Secretary determines that any deadline for issuing a final rule . . . cannot be met, the Secretary shall—(1) provide the Committee on Committee on Commerce, Science, and Transportation of the Senate and the Committee on Energy and Commerce of the House of Representatives with an explanation for why such deadline cannot be met; and (2) establish a new deadline for that rule.

Id. § 31505, 126 Stat. at 775.

The statute provided that the provisions requiring a new seat belt safety warning system would take effect on October 1, 2012. *Id.* § 3(a), 126 Stat. at 413. This means that *the Secretary of Transportation was required to publish a proposed standard by October 1, 2014, and, unless one of the caveats described above applied, a final rule by October 1, 2015.*

However, to date—more than three years after being required to do so by Congress—the Secretary has not even published a *proposed* rule for the standard required by the statute. Nor, as far as Petitioners are able to ascertain, has the Secretary made and transmitted to the relevant congressional committees any of the determinations that would have excused DOT from issuing a final rule by October 1, 2015. Accordingly, Petitioners seek an order compelling the Secretary to immediately initiate the rulemaking required for rear seat belt reminders and to issue a final standard within one year from the date of publication of the proposed rule, as required by Congress.

ARGUMENT

I. THE COURT SHOULD ISSUE A WRIT OF MANDAMUS ORDERING DOT TO INITIATE AND COMPLETE A RULEMAKING PROCEEDING TO SET A STANDARD FOR A MANDATORY REAR SEAT BELT REMINDER, AS REQUIRED BY CONGRESS.

The Administrative Procedure Act provides that a reviewing court shall "compel agency action unlawfully withheld or unreasonably delayed." 5 U.S.C. §706(1). This Court assesses several factors to determine whether an agency's

delay is "unreasonable." *TRAC*, 750 F.2d at 80. Further, after the Supreme Court's decision in *Norton v. Southern Utah Wilderness Alliance*, 542 U.S. 55 (2004), analysis of whether an agency action has been "unlawfully withheld" versus "unreasonably delayed" also hinges on application of the *TRAC* factors. *See Am. Hosp. Ass'n v. Burwell*, 812 F.3d 183, 189-90 (D.C. Cir. 2016).

Here, as demonstrated below, application of the *TRAC* factors compels the conclusion that the agency's delay in promulgating a standard for rear seat belt reminders is patently unreasonable. Accordingly, the Court should issue a writ of mandamus requiring DOT to initiate and complete the process for promulgating a rear seat belt warning standard.

A. Because The Agency Has Already Violated The Statutory Timetable By Three Years, Its Delay Is Unreasonable.

The first two factors to be applied under *TRAC* are closely related—i.e., (1) the "time agencies take to make decisions must be governed by a 'rule of reason,'" 750 F.2d at 80 (quoting *Potomac Elec. Power Co. v. ICC*, 702 F.2d 1026, 1034 (D.C. Cir.1983)); and (2) "[w]here Congress has provided a timetable or other indication of the speed with which it expects the agency to proceed in the enabling statute, *that statutory scheme may supply content for the rule of reason*." *Id.* (citations omitted).

These factors are inextricably intertwined because, as this Court has succinctly explained, where a statute provided a mandatory deadline for agency

action, "Congress meant what it said." *In re United Mine Workers of Am. Int'l Union* ("*In re UMW*"), 190 F.3d 545, 551 (D.C. Cir. 1999); *see also Harbor Gateway Commercial Prop. Owners Ass'n v. EPA*, 167 F.3d 602, 606 (D.C. Cir. 1999) ("[W]hen a statute's meaning is clear, and the enactment is within the constitutional authority of Congress, the '*sole function of the court's is to enforce it according to its terms.*'" (emphasis added) (quoting *Higgins v. Marshall,* 584 F.2d 1035, 1038 (D.C. Cir. 1978))); *Public Citizen Health Research Grp. v. Auchter*, 702 F.2d 1150, 1158 n.30 (D.C. Cir. 1983) ("The reasonableness of the delay must be judged *in the context of the statute which authorizes the agency's action*." (emphasis added) (internal quotation omitted)); *Cutler v. Hayes*, 818 F.2d 879, 897-98 (D.C. Cir. 1987) ("The court must also examine *the extent to which the delay may be undermining the statutory scheme* . . . ." (emphasis added)).

Here, over five years ago Congress made the decision that DOT must promulgate a safety standard requiring rear seat belt reminders to protect the public's health and safety, and that to carry out that mandate, the proposed rule must be published by October 1, 2014, and, absent certain findings and congressional reports by the agency, a final rule must be published by October 1, 2015. Therefore, by imposing these statutory deadlines, Congress has already determined that the requisite standard is important to protect the public's safety, and that this standard must be in place by October 2015—over two years ago.

Accordingly, under *TRAC*'s "rule of reason factor," as informed by the statutory deadlines actually imposed by Congress, the agency's delay is clearly unreasonable. *See, e.g.*, *Am. Hosp. Ass'n v. Burwell*, 812 F.3d at 191 (finding HHS's failure to meet a statutorily prescribed 90-day deadline unreasonable because "*[f]ederal agencies must obey the law*" (emphasis added)).

B. DOT's Delay is Particularly Unreasonable Because Peoples' Lives—Including Those of Children—are at Stake.

The third and fifth *TRAC* factors—whether "human health and welfare are at stake" and "the nature and extent of the interests prejudiced by delay," 750 F.2d at 80, are also closely related. As this Court held in *TRAC*, "delays that might be reasonable in the sphere of economic regulation are *less tolerable when human health and welfare are at stake*." *Id.* (emphasis added) (citations omitted); *see also In re Barr Labs. Inc.*, 930 F.2d 72, 75 (D.C. Cir. 1991) (explaining that under the third *TRAC* factor, the court "asks whether the case is primarily about 'human health and welfare' or 'economic regulation'"); *Auchter*, 702 F.2d at 1156 (in determining that an agency's delay is unreasonable the court must take into account the fact that "'*the interests at stake are not merely economic interests in a license or a rate structure, but personal interests in life and health*'" (emphasis added) (quoting *Wellford v. Ruckelshaus*, 439 F.2d 598, 601 (D.D. Cir. 1971))); *Cutler v. Hayes*, 818 F.2d at 898 (acknowledging that, even in the absence of a statutory deadline, "[t]he deference traditionally accorded to an agency to develop

its own schedule is sharply reduced *when injury likely will result from avoidable delay*" (emphasis added)); *Public Citizen Health Research Grp. v. Comm'r, FDA*, 740 F.2d 21, 34 (D.C. Cir. 1984) ("When an agency is charged with the administration of a statutory scheme whose paramount concern is protection of the public health, *the pace of agency decisionmaking must account for this statutory concern*." (emphasis added)).

Here, where the lives of people—and especially young children—are at stake, there can be no question that the agency's delay in issuing the motor vehicle safety standard mandated by Congress is patently unreasonable. Again, Congress has already made the policy decision that this standard is required to *save lives*. Indeed, as explained, *supra*, NHTSA itself has reported that "[e]very 33 seconds, one child under the age of 13 is involved in a crash," and approximately half of children between the ages of 8 and 14 who died in car crashes were not wearing their seat belts." Pet. Ex. A at 21; *see also* 2017 IIHS Report, Pet. Ex. C, at 3 (unrestrained rear-seat occupants are nearly 8 times as likely to sustain a serious injury in a crash as restrained rear-seat occupants); NHTSA Poster, Pet. Ex. D, (in 2014 58% of back seat passenger vehicle occupants killed in crashes were not buckled up).

As NHTSA has also reported, "[i]n 2015 alone seat belts saved an estimated 13,941 lives." Pet. Ex. A at 2. And, as the IIHS recently demonstrated, "nearly

two-thirds of individuals who do not regularly use seat belts stated that audible rear seat belt reminders would make them more likely to buckle up." IIHS Report, Pet. Ex. C, at 4; *see also* National Academy of Sciences Report (2003), Pet. Ex. I, at 13 (73% of drivers interviewed reported that they had buckled their seat belts after being reminded to do so by a reminder system); *id.* at 77 (83% of drivers interviewed after being observed not wearing their safety belts in traffic said they would buckle up if they rented a car with an aggressive audible warning system).

Indeed, bizarrely, at the same time it is violating its mandatory duty to promulgate a rear seat belt reminder safety standard, NHTSA is actively advising the public that "Rear seat belt safety warnings" are one of the "*car safety features that help protect kids*" from death and serious injury. *See* Pet. Ex. F at 6-7 (emphasis added). Yet, according to the recent IIHS Report, in 2015 *only 3% of cars sold in the United States had such reminders*. Pet. Ex. C at 5. This is in sharp contrast to the situation in other countries where the vast majority of cars sold since 2015—the year the standard was supposed to be imposed in *this* country—have rear seat belt reminders, demonstrating that the requisite technology for implementing this standard is clearly available. *See* Pet. Exhs. J-K.

Therefore, particularly when the agency itself is conducting a public education campaign touting the importance of "rear seat belt warning systems" to *save children's lives*, Pet. Ex. F, the agency's egregious delay in promulgating this

standard should not be tolerated by this Court. *See, e.g., Public Citizen Health Research Grp. v. Comm'r, FDA*, 740 F.2d at 34 (recognizing that where the agency itself is "conducting an education campaign to warn physicians and parents of the potential risks that salicylates pose" to children's health, the "record strongly suggests that *the pace of agency decisionmaking* [in issuing an appropriate warning label] *is unreasonably dilatory*" (emphasis added)); *see also In re Pesticide Action Network N. Am.*, 798 F.3d 809, 814 (9th Cir. 2015) (explaining that when the agency itself acknowledges the risk to public health posed by a pesticide, the court "has little difficulty concluding it should be compelled quickly to resolve the administrative petition" seeking to ban the use of the substance).

Accordingly, under the third *TRAC* factor—whether the agency's delay adversely affects "human health and welfare"—and the fifth factor, "the nature and extent of the interests prejudiced by delay," 750 F.2d at 80—DOT's over three-year delay in publishing even a *proposed* rear seat belt warning standard is clearly unreasonable.

C. The Remaining *TRAC* Factors Further Demonstrate That DOT's Delay Is Unreasonable.

The final *TRAC* factors—"the effect of expediting delayed action on agency activities of a higher or competing priority," and the fact that the court need not find "any impropriety lurking behind agency lassitude," 750 F.2d at 80 (citations omitted)—also demonstrate that DOT's delay here is unreasonable.

As the Supreme Court has observed, the Motor Vehicle Safety Act was "created for the purpose of '*reduc[ing] traffic accidents and deaths and injuries to persons resulting from traffic accidents* [.]'" *Motor Vehicle Mfrs. Ass'n. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 33 (1983) (quoting 15 U.S.C. § 1381) (emphasis added)). Therefore, there simply is no higher priority for DOT than to comply with a congressional command requiring it to promulgate a safety standard that Congress has already decided, and as demonstrated above, NHTSA agrees, is needed to protect the lives of the public, including our most vulnerable citizens—children.

Moreover, particularly in light of Congress' inclusion of a specific timetable for the requisite standard, "[h]owever many priorities the agency may have, and however modest its personnel and budgetary resources may be, *there is a limit to how long it may use these justifications to excuse inaction in the face of the congressional command to act within [a specified timeframe]*." *In re UMW*, 190 F.3d at 554 (emphasis added). In any event, as this Court recently succinctly explained, "*[f]ederal agencies must obey the law, and congressionally imposed mandates and prohibitions trump discretionary decisions*." *Am. Hosp. Ass'n v. Burwell*, 812 F.3d at 193 (emphasis added).

Finally, as emphasized by the Court in *TRAC*, Petitioners need not demonstrate any "impropriety lurking behind" the agency's delay in order to be

entitled to a writ of mandamus. 750 F.2d at 80. Rather, for the Court to find that the agency has "unreasonably delayed" the agency action at issue within the meaning of the APA, 5 U.S.C. §706(1), it is enough that: (1) Congress has directed the agency to promulgate the requisite safety standard; (2) Congress included specific statutory deadlines for this purpose; (3) the standard at issue will save thousands—indeed, over time, *tens of thousands*—of lives, including those of children; and (4) the agency has not even *begun* the mandated rulemaking proceeding required by Congress five years ago. As this Court has observed, "although courts must respect the political branches and hesitate to intrude on their resolution of conflicting priorities, *our ultimate obligation is to enforce the law as Congress has written it*." *Am. Hosp. Ass'n v. Burwell*, 812 F.3d at 193 (emphasis added).

II. PETITIONERS HAVE ARTICLE III STANDING TO REQUEST A WRIT OF MANDAMUS.

Petitioners also have the requisite standing to request a writ of mandamus. To satisfy Article III, they must show that (1) they are currently being injured or face an imminent injury; (2) that injury is "fairly traceable" to the challenged action of the defendant; and (3) the injury will "likely" be redressed if Plaintiffs prevail on the merits. *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 560-61 (1992). Further, the Court need only find that one Plaintiff has the requisite standing, *Watt v. Energy Action Educ. Found.*, 454 U.S. 151, 160 (1981), and in determining standing the

Court "must . . . assume that on the merits the plaintiffs would be successful in their claims." *Defenders of Wildlife v. Gutierrez*, 532 F.3d 913, 924 (D.C. Cir. 2008) (quoting *City of Waukesha v. EPA*, 320 F.3d 228, 235 (D.C. Cir. 2003)). Here, Petitioners meet all of the requirements for standing.

A. Injury-In-Fact

Petitioner KIDS AND CARS, Inc. is a non-profit organization founded to protect children in and around motor vehicles. Declaration of Janette Fennell, Pet. Ex. M, ¶ 2. It has long advocated for a safety standard that would require rear seat belt reminders and its President and founder, Janette Fennell, testified in support of the MAP-21 requirement for such a standard. *Id.; see also* Testimony of Janette E. Fennell, before the Subcommittee on Commerce, Trade and Consumer Protection of the House Commerce Committee on Energy and Commerce (May 18, 2009), Pet. Ex. N. KIDS AND CARS brings this case on behalf of its officers and board members who, with their families, as a result of DOT's failure to promulgate the mandated standard, are exposed to the increased risk of personal and economic injury, and even death, from a vehicle crash if they or their children are sitting in the rear seat of a vehicle and not wearing their seat belts.

Petitioner Center for Auto Safety ("the Center") is a non-profit membership organization founded in 1970 by Consumers Union and Ralph Nader to advocate for auto safety on behalf of consumers, and it is the nation's leading consumer

advocacy group dedicated to these issues. Declaration of Jason Levine, Pet. Ex. O, ¶ 1. In furtherance of its mission, it has long advocated for motor vehicle safety standards that would increase the use of safety belts in automobiles and school buses, and has consistently advocated for incorporating available safety technology in motor vehicle safety standards wherever possible. *Id.* ¶ 2. The Center brings this case on behalf of its thousands of members who ride in rear seating positions or are parents of children riding in the back seats of motor vehicles—whether in the parents' or others' vehicles.

KIDS AND CARS' officers and board members and Center members are injured by DOT's challenged inaction because it exposes them to an imminent risk of serious injury or death if they or their family members sitting in the back seats of cars are involved in vehicle crashes but are not restrained in seat belts. As Congress understood when it enacted the legislation at issue, rear seat passengers clearly face such an increased risk of injury and death. Further, because drivers cannot always ensure that their children and other occupants are fastened in safety belts, a mandated audio reminder would significantly increase the probability that passengers would be wearing safety belts in the rear seats.

Indeed, the standard mandated by Congress was intended to decrease, or even eliminate, the risk that passengers would not wear safety belts in the rear seats of vehicles. Hence Defendants' failure to promulgate the standard required by

Congress is directly responsible for the continuing risk of injury and death to passengers in those seating positions, and others. These injuries are more than adequate to satisfy the injury-in-fact component of Article III standing. *See, e.g., Public Citizen v. Nat'l Highway Traffic Safety Admin.*, 489 F.3d 1279, 1292 (D.C. Cir. 2007) ("Injuries from car accidents—including death, physical injuries, and property damage—are plainly concrete harms under the Supreme Court's [Article III] precedents."); *see also Ass'n of Data Processing Serv. Orgs. Inc., v. Camp*, 397 U.S. 150, 154 (1970) (providing that those who are "likely to be financially" injured demonstrate a sufficient injury in fact for Article III standing) (citation omitted).

This risk of injury is by no means speculative. As demonstrated *supra*, NHTSA itself has determined that "[o]f the 35,092 people killed in motor vehicle crashes in 2015, 48 percent"—or almost 17,000 people—"were not wearing seat belts." Pet. Ex. A at 4. NHTSA has also reported that "[e]very 33 seconds, one child under the age of 13 is involved in a crash," and that, in the last five years, "1,552 kids between ages 8 and 14 died in car crashes," and "of those who died, almost half were unbuckled." *Id.* at 21. NHTSA has also found that in 2015, 57% of unrestrained 13-15 year olds were killed in car crashes," *id.* at 15, and that 59% of passenger vehicle occupants 21-24 years old not wearing seat belts were killed in traffic crashes. *Id.* at 10.

NHTSA has also reported that "[i]n 2015 alone, seat belts saved an estimated 13,941 lives," Pet. Ex. A at 4, that, on average, nearly half of the people killed in car crashes "would be alive today if they had worn their seat belts," *id.* at 4, and that "[r]ear seat belt safety warnings" "help protect kids" from death and injury. Pet. Ex. F at 6-7. Therefore, clearly the *absence* of such warnings—mandated by Congress over five years ago—are presently contributing to such deaths and injuries.

For all of these reasons, and regardless of the fact that many people would have standing to complain about the agency's unreasonable delay in promulgating this standard, Petitioners have demonstrated the requisite injury-in-fact for standing purposes. *See also, e.g.*, *Ctr. for Auto Safety v. Nat'l Highway Traffic Safety Admin.*, 793 F.2d 1322, 1330 (D.C. Cir. 1986) (acknowledging that the Center for Auto Safety has standing to represent its members in a challenge to NHTSA's amendment to fuel economy standards—regardless of the fact that its members' injuries are common to the entire society); *accord In re Ctr. for Auto Safety*, 793 F.2d 1346, 1351 (D.C. Cir. 1986).[3]

---

[3] The Center meets all of the other requirements for representational standing. *Hunt v. Washington State Apple Advertising Commission*, 432 U.S. 333 (1977). "[T]he interests it seeks to protect are germane to the organization's purpose"—to protect the public from unnecessary injuries and fatalities due to car crashes, *see* Levine Dec. ¶¶1-2—and "neither the claim asserted nor the relief requested requires the participation of individual members in the lawsuit." 432 U.S. at 343.

B. Causation

Petitioners' injuries are also "fairly traceable" to Defendants' failure to promulgate the mandatory standard for rear seat belt reminders, *Simon v. Eastern Ky. Welfare Rights Organization*, 426 U.S. 26, 41-42 (1976), because, as a direct result of the DOT's unreasonable delay, the vast majority of new cars sold in this country since October 1, 2015 do *not* have rear seat belt warning systems, as required by Congress.

As this Court has held, "Supreme Court precedent establishes that the causation requirement for constitutional standing is met when a plaintiff demonstrates that *the challenged agency action authorizes the conduct that allegedly caused the plaintiff's injuries, if that conduct would allegedly be illegal otherwise.*" *Animal Legal Def. Fund v. Glickman*, 154 F.3d 426, 440 (D.C. Cir. 1998) (en banc) (emphasis added). As the Court has also observed: "[t]he proper comparison for determining causation is not between what the agency did and the status quo before the agency acted. Rather, *the proper comparison is between what the agency did and what the plaintiffs allege the agency should have done under the statute.*" *Id.* at 441 (emphasis added).

Of course here, the "status quo," *id.*, is that Congress decided over five years ago that DOT must promulgate the safety standard at issue to protect the public from avoidable deaths and injuries. In any event, Plaintiffs contend—and hence

this Court must accept for purposes of determining standing, *Defenders of Wildlife v. Gutierrez*, 532 F.3d at 924—that DOT must *prohibit*, not allow, the sale of new cars that do not have rear seat belt warnings. Therefore, because the agency has violated Congress' statutory command by failing to promulgate this much needed safety standard, KIDS AND CARS' board members and officers, the Center's members, and their families presently face an increased risk of death or injury.

C. Redressability

Petitioners can also demonstrate that their injuries would "likely" be redressed if Defendants were compelled to promulgate the safety standard required by Congress, *Friends of the Earth, Inc. v. Laidlaw Envtl. Servs., Inc.*, 528 U.S. 167, 180-81 (2000), because this would mean that at some point in the near future all new cars sold in this country would have to be equipped with rear seat belt reminders, which in turn would reduce injuries and fatalities from the failure to wear seat belts. There is no question that if the mandated standard were in place, these injuries would be greatly reduced, because a warning would sound in the car every time a rear seat belt was not fastened, or was unfastened while the car was in motion, which in turn would ensure that more back seat passengers actually fasten their seat belts.

For example, as a result of the present Federal Motor Vehicle Safety Standard requiring a warning if the *driver* of a vehicle is not buckled up, FMVSS

208 (codified at 49 C.F.R. § 571.208), many more drivers wear seat belts than would do so if that warning were not heard. Again, according to the IEE's recent presented at NHTSA's 2015 Enhanced Safety of Vehicles Conference, the audio warnings now provided for drivers in the *front* seat have proven to be "*highly effective in increasing belt wearing rates of a vehicle's front seat occupants*." "Advanced Seat Belt Reminder System for Rear Seat Passengers," Report of the IEE, Pet. Ex. H, at 2 (emphasis added). According to that same report, a laboratory study conducted in Japan demonstrated that use of an audiovisual warning to remind rear seated passengers to fasten their seat belts resulted in 95% of the initially non-belted rear seat occupants fastening their seat belts. *Id.* at 3.

The IIHS also recently reported that nearly two-thirds of part-time and nonusers of seat belts said audible rear seat belt reminders would make them more likely to fasten their seat belts, Pet. Ex. C at 5—a finding that is supported by a previous study by the National Academy of Sciences. *See* Buckling Up Technologies to Increase Seat Belt Use, Special Report 278 (2003), Transportation Research Board, National Academy of Sciences, Pet. Ex. I, at 13 (73% of drivers interviewed reported that they had buckled their seat belts *after being reminded to do so by a reminder system*). Indeed, Congress itself recognized that a mandatory rear seat belt warning would save many people's lives—which is precisely why it enacted the legislation requiring this standard.

Therefore, as demonstrated above, Petitioners have the requisite Article III standing to request this Court to issue a writ of mandamus.

CONCLUSION

For all of the foregoing reasons, this Court should issue a writ of mandamus requiring the Department of Transportation to immediately publish in the Federal Register a proposed safety standard requiring rear seat belt reminders, and, within one year from the date of the proposed rule, issue a final standard, as required by the 2012 MAP-21 legislation.

Respectfully submitted,

___/s/_____
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Date: October 30, 2017

CERTIFICATE OF COMPLIANCE

I certify that the foregoing brief contains 6371 words.

_____/s/_____
Katherine A. Meyer
Attorney for Petitioners

CERTIFICATE OF SERVICE

I certify that the foregoing Petition for Mandamus has been served on the Secretary for the Department of Transportation by having a copy delivered by hand this 30th day of October, 2017 to:

Judith S. Kaleta, Deputy General Counsel
James C. Owens, Deputy General Counsel
Department of Transportation
1200 New Jersey Ave., S.E.
Washington, D.C. 20590

_____/s/_____
Katherine A. Meyer

EXHIBITS

LIST OF EXHIBITS

Exhibit A	NHTSA Seat Belt Report
Exhibit B	NHTSA Most Wanted: 45 million Americans still not buckling up
Exhibit C	Status Report, "Unbelted," Insurance Institute for Highway Safety (Aug. 3, 2017)
Exhibit D	NHTSA Poster ("Sitting in the Back Doesn't Excuse You from Using a Seat Belt")
Exhibit E	NHTSA, Child Passenger Safety Week, Facts and Talking Points (Sept. 2017)
Exhibit F	NHTSA Report, "Keeping Kids Safe: A parent's guide to protecting children in and around cars" (2017)
Exhibit G	NHTSA Report, "Identifying Strategies to Reduce the Percentage of Unrestrained Young Children (2009)
Exhibit H	"Advanced Seat Belt Reminder System for Rear Seat Passengers," Report of the International Electronics and Engineering
Exhibit I	Buckling Up Technologies to Increase Seat Belt Use, Special Report 278 (2003), Transportation Research Board, National Academy of Sciences
Exhibit J	Europe New Car Assessment Program Seat Belt Reminder Data (2017)
Exhibit K	Australia New Car Assessment Program Seat Belt Reminder Data (2017)
Exhibit L	Economic and Social Council Report (September 2, 2016)
Exhibit M	Declaration of Janette Fennell

Exhibit N	Testimony of Janette E. Fennell, before the Subcommittee on Commerce, Trade and Consumer Protection of the House Commerce Committee on Energy and Commerce (May 18, 2009)
Exhibit O	Declaration of Jason Levine

PETITIONERS' EXHIBIT A

Seat Belts

Language: **English**

Overview

One of the safest choices drivers and passengers can make is to buckle up. In 2015, seat belt use in passenger vehicles saved an estimated 13,941 lives. Many Americans understand the lifesaving value of the seat belt – the national use rate is at 90.1 percent – but nearly 27.5 million people still don't buckle up. Understand the potentially fatal consequences of not wearing a seat belt and learn what you can do to make sure you and your family are properly buckled up every time.

Share:


Beyond Booster Seats

THE ISSUE

Consequences

48 %

PERCENTAGE OF PASSENGER VEHICLE OCCUPANTS KILLED IN 2015 WHO WERE UNRESTRAINED

Of the 35,092 people killed in motor vehicle crashes in 2015, 48 percent were not wearing seat belts. In 2015 alone, seat belts saved an estimated 13,941 lives and could have saved an additional 2,814 people if they had been wearing seat belts.

The consequences of not wearing, or improperly wearing, a seat belt are clear:

1. Buckling up helps keep you safe and secure inside your vehicle, whereas not buckling up can result in being totally ejected from the vehicle in a crash, which is almost always deadly.

2. Air bags are not enough to protect you; in fact, the force of an air bag can seriously injure or even kill you if you're not buckled up.

3. Improperly wearing a seat belt, such as putting the strap below your arm, puts you and your children at risk in a crash.

The benefits of buckling up are equally clear:

1. If you buckle up in the front seat of a passenger car, you can reduce your risk of:
    - Fatal injury by 45 percent (Kahane, 2015)
    - Moderate to critical injury by 50 percent

2. If you buckle up in a light truck, you can reduce your risk of:
    - Fatal injury by 60 percent (Kahane, 2015)
    - Moderate to critical injury by 65 percent (NHTSA, 1984)

THE ISSUE

Seat Belt Safety for Adults

Follow these seat belt tips and guidelines, including do's and don'ts when you're pregnant. Then have some fun quizzing yourself about the myths and facts of buckling up, and test your seat belt IQ.

The Top 5 Things You Should Know About Buckling Up

80 %

IN FATAL CRASHES IN 2015, ABOUT 80 PERCENT OF PASSENGER VEHICLE OCCUPANTS WHO WERE TOTALLY EJECTED FROM THE VEHICLE WERE KILLED.

1. Buckling up is the single most effective thing you can do to protect yourself in a crash

Seat belts are the best defense against impaired, aggressive, and distracted drivers. Being buckled up during a crash helps keep you safe and secure inside your vehicle; being completely ejected from a vehicle is almost always deadly.

2. Air bags are designed to work with seat belts, not replace them

If you don't wear your seat belt, you could be thrown into a rapidly opening frontal air bag. Such force could injure or even kill you. Learn about air bag safety.

3. Guidelines to buckle up safely

- The lap belt and shoulder belt are secured across the pelvis and rib cage, which are better able to withstand crash forces than other parts of your body.
- Place the shoulder belt across the middle of your chest and away from your neck.
- The lap belt rests across your hips, not your stomach.
- NEVER put the shoulder belt behind your back or under an arm.

4. Fit matters

- Before you buy a new car, check to see that its seat belts are a good fit for you.

- Ask your dealer about seat belt adjusters, which can help you get the best fit.
- If you need a roomier belt, contact your vehicle manufacturer to obtain seat belt extenders.
- If you drive an older or classic car with lap belts only, check with your vehicle manufacturer about how to retrofit your car with today's safer lap/shoulder belts.

5. Seat belt safety for children and pregnant women

Find out when your child is ready to use an adult seat belt and learn about seat belt safety when you're pregnant.

If You're Pregnant: Seat Belt Recommendations for Drivers and Passengers

If you're pregnant, make sure you know how to position your seat and wear a seat belt to maximize your safety and the safety of your unborn child. Read our recommendations below or view the instructional diagram version of our seat belt recommendations for pregnant drivers and passengers (PDF 497 KB).

I'm Pregnant. Should I Wear a Seat Belt?

- **YES**—doctors recommend it. Buckling up through all stages of your pregnancy is the single most effective action you can take to protect yourself and your unborn child in a crash.
- **NEVER** drive or ride in a car without buckling up first!

What's the Right Way to Wear My Seat Belt?

- The shoulder belt away from your neck (but not off your shoulder) and across your chest (between your breasts), making sure to remove any slack from your seat belt with the lap belt secured below your belly so that it fits snugly across your hips and pelvic bone.
- **NEVER** place the shoulder belt under your arm or behind your back.
- **NEVER** place lap belt over or on top of your belly.

Should I Adjust My Seat?

- **YES**—Adjust to a comfortable, upright position
- Keep as much distance as possible between your belly and the steering wheel*
- Comfortably reach the steering wheel and pedals**

- To minimize the gap between your shoulder and the seat belt, avoid reclining your seat more than necessary.
- Avoid letting your belly touch the steering wheel.

What if My Car or Truck Has Air Bags?

- You still need to wear your seat belt properly.
- Air bags are designed to work with seat belts, not replace them.
- Without a seat belt, you could crash into the vehicle interior, other passengers, or be ejected from the vehicle.

My Car Has an ON-OFF Air Bag Disabling Switch. Should I turn it off?

- **NO**—Doctors recommend that pregnant women wear seat belts and leave air bags turned on. Seat belts and air bags work together to provide the best protection for you and your unborn child.

What Should I Do if I am Involved in a Crash?

- Seek immediate medical attention, even if you think you are not injured, regardless of whether you're the driver or passenger.

Myth vs. The Real Deal

There are many myths surrounding seat belt safety. See if you can distinguish the myths from the real deal by correctly answering the questions below.

If your car has air bags you still need to wear a seat belt. Myth or Real Deal?

The Real Deal. The safest way to ride is buckled up in a vehicle equipped with airbags. Even without an airbag, you are safer buckled up than you are with an airbag and not buckled up.

Seat belts can trap you in a fire or under water. Myth or Real Deal?

Myth. Incidents involving fire or water account for ½ of 1 percent of all crashes. But more importantly, you can't escape such dangers unless you're conscious. Wearing a seat belt gives you a much greater chance of being conscious and able-bodied.

If you're not going far or not traveling fast, seat belts are unnecessary. Myth or Real Deal?

Myth. Seemingly routine trips can be deceptively dangerous. Most fatal crashes happen within 25 miles from home and at speeds of less than 40 mph.

Your seat belt can't hurt you in a crash. Myth or Real Deal?

Real Deal. In a crash, everything in your car can cause bodily harm, but your seat belt is one of the few things that can actually save you.

You're safer in a pickup truck, so wearing a seat belt is unnecessary. Myth or Real Deal?

Myth. For occupants in SUVs, pickups, and vans, seat belts reduce the risk of fatal injury to the driver and front seat passenger by 60 percent.

It's not as essential for guys to wear seat belts; they are the least at risk. Myth or Real Deal?

Myth. Young men are most at risk. Among male passenger vehicle occupants ages 18-34 who were killed in fatal crashes, 65 percent were not buckled.

What's Your Seat Belt IQ?

Any time you're in a motor vehicle, no matter where you're sitting or where you're going, you should always play it safe. Remember to buckle up every trip, every time! Use this quiz to test your seat belt IQ.

True or False: Every State has at least some kind of seat belt law.

False

Far too many Americans die in crashes every year. Do you know how many unbuckled passenger vehicle occupants died in 2015?

9,874

If you wear a seat belt correctly while riding in the front seat of a car, your chances of a fatal injury are reduced by ___ percent.

45

Is it best to use your seat belt on long trips or short trips?

Both

What is the best defense against drunk drivers on the road?

A seat belt

Most crashes happen within ___ miles of home.

25

Child restraint use drops by 40 percent when?

When parents ride without their seat belts.

In 2015, seat belts saved approximately how many lives?

13,941

In 2015, what percent of passenger vehicle occupants 21 to 24 years old were not using restraints when killed in traffic crashes?

59 percent, the highest percentage of all age groups

True or False: Wearing your seat belt is your best insurance to prevent injury and death in the tragic case of a motor vehicle crash.

True

THE ISSUE

Seat Belt Safety for Tweens

When Is My Child Ready for an Adult Seat Belt?

RELATED TOPIC

CAR SEATS AND BOOSTER SEATS

The time to transition your child out of a booster seat and into a seat belt usually comes when the child is between 8 and 12 years old. Keep your children in booster seats until they outgrow the size limits of the booster seats or are big enough to fit properly in seat belts.

Fitting a Child Correctly in a Seat Belt

For your child to properly fit in a seat belt, he or she must be tall enough to sit without slouching and be able to:

- Keep his or her back against the vehicle seat;
- Keep his or her knees naturally bent over the edge of the vehicle seat; and
- Keep his or her feet flat on the floor.

Additionally:

- The lap belt must lie snugly across the upper thighs, not the stomach.

- The shoulder belt should lie snug across the shoulder and chest, and not cross the neck or face.
- Never let a child put the shoulder belt under an arm or behind the back because it could cause severe injuries in a crash.
- Keep your child in the back seat because it is safer there.

Remember, always check your child's belt fit in every vehicle. A booster seat may be needed in some vehicles and not in others. If the seat belt does not fit properly yet, your child should continue to use a booster seat.

Modeling Seat Belt Safety

As a parent, you are your kids' strongest influence when it comes to modeling safe driving practices, including buckling up every time you get in the car. Teach your family that safety is the responsibility of all passengers as well as the driver.

Tweens (8-14)

As your child grows, you may face challenges enforcing seat belt safety. Life as a parent is full of compromises, but seat belt safety is never up for negotiation. Follow these pointers and set the example of buckling up every time you get into the car. And remember: Never give up until they buckle up!

NOTE: All children under 13 ride in the back seat for maximum safety.

You're the #1 Influence: Make Sure Your Tween is Properly Buckled Up the Whole Ride, Every Time

Seat Belt Safety Starts With Good Role Models

Learning the importance of wearing a seat belt starts with a good role model—and that's you. As a parent or caregiver, you are the number one influence on your child's seat belt safety. Research shows that children whose parents buckle up are much more likely to buckle up themselves.

Consistency is Key

Consistently remind your children to buckle up properly the whole ride, and never assume they're buckled up! Learn tips to motivate your tweens to buckle up, and make it a rule in your family that everyone follows the same practices as you: Always buckle up before moving the car, no matter how short or routine the drive, and make sure all children are buckled up properly.

The Proper Seat Belt Fit for Your Child

The risk of injury among child passengers is significantly higher when their seat belts are loose and/or improperly positioned. Learn about the proper seat belt fit for your child and why your children may not be wearing their seat belts correctly.

Front or Back—When is the Front Seat Safe for My Child?

All children under age 13 should ride in the back seat for maximum safety. The back seat is the safest place for your children because most crashes occur in the front of the car and the back seat is farthest from this impact.

Why Parents and Caregivers Forget About or Forego Seat Belt Safety

We know life as a parent is full of distractions and often hectic, making it easy to forget or forego buckling up altogether. See if any of these excuses for not buckling up sound familiar, then do whatever it takes to buckle up and make sure your kids do the same:

- Rushed and chaotic pre-travel routines
- Distractions
- Need to minimize conflict or keep the peace
- Seat belt discomfort or perceived nuisance when in a hurry
- Shorter distances, slower speeds and familiar roads falsely associated with lower risk
- Kids persistently asking to ride in the front seat

Tips to Motivate Your Tweens to Buckle Up

Getting your kids to properly buckle up and stay buckled can be a battle of wills. There are several reasons why children 8 to 14 may forget or not want to wear their seat belts. For as many reasons as your kids can protest against wearing a seat belt, we've got tips to help you motivate them to buckle up.

Tweens are going through several developmental stages—social, cognitive and emotional—which offer helpful insights into what makes sense to them and what motivates them. Learn about the developmental stages and motivational messages get your kids to buckle up properly, the whole ride, every time.

It's Non-Negotiable: Tween Seat Belt Safety

We know you make every effort to keep your kids safe. However, parenting can be a hectic job. The daily routine of getting your kids to and from school and other activities can be hurried and chaotic, creating an environment where insisting on wearing a seat belt is not top of mind. See if you face these five challenges to getting tweens to wear — and stay in — their seat belts.

No Matter How Hurried or Chaotic, Don't Negotiate!

As a parent, sometimes you let your kids have their way. But their safety should never be up for negotiation, no matter how much they push back on the seat belts being uncomfortable or unnecessary for just a "short drive." Here are some tips to help you win the seat belt battle:

1. **Consistently Model Seat Belt Safety.** Teaching your children to consistently wear seat belts can take a great deal of resolve. Your first line of defense, as your children's number one influence, is to wear your seat belt and insist that all family members do the same.
2. **Never Give Up Until They Buckle Up.** Make sure your kids are buckled up with their lap and shoulder belt—no shoulder belts behind their backs or under their arms, or seat belts so loose that they can wrestle in the back seat. Learn how to motivate your kids to buckle up properly and consistently using age-appropriate messages and rewards to reinforce the importance of seat belt safety.
3. **Never Assume Your Kids Are Buckled Up.** One conversation is not enough: Remind your children to wear their seat belts every time they get into a car—no matter whose car it is—and stay buckled up, including at night and on longer rides.

Teenagers

57 %

UNRESTRAINED 13- TO 15-YEAR-OLDS KILLED IN CAR CRASHES IN 2015

It's been a long time since your little ones transitioned from a booster seat into an adult seat belt, and now they're teenagers. Think it's time to relax? Think again. The majority of teens involved in fatal crashes aren't wearing their seat belts.

Buckling up is not a one-time conversation—it's ongoing. Set the example by always wearing your seat belt, and remind your teens buckling up is the law.

To learn more, visit our Teen Driving section.

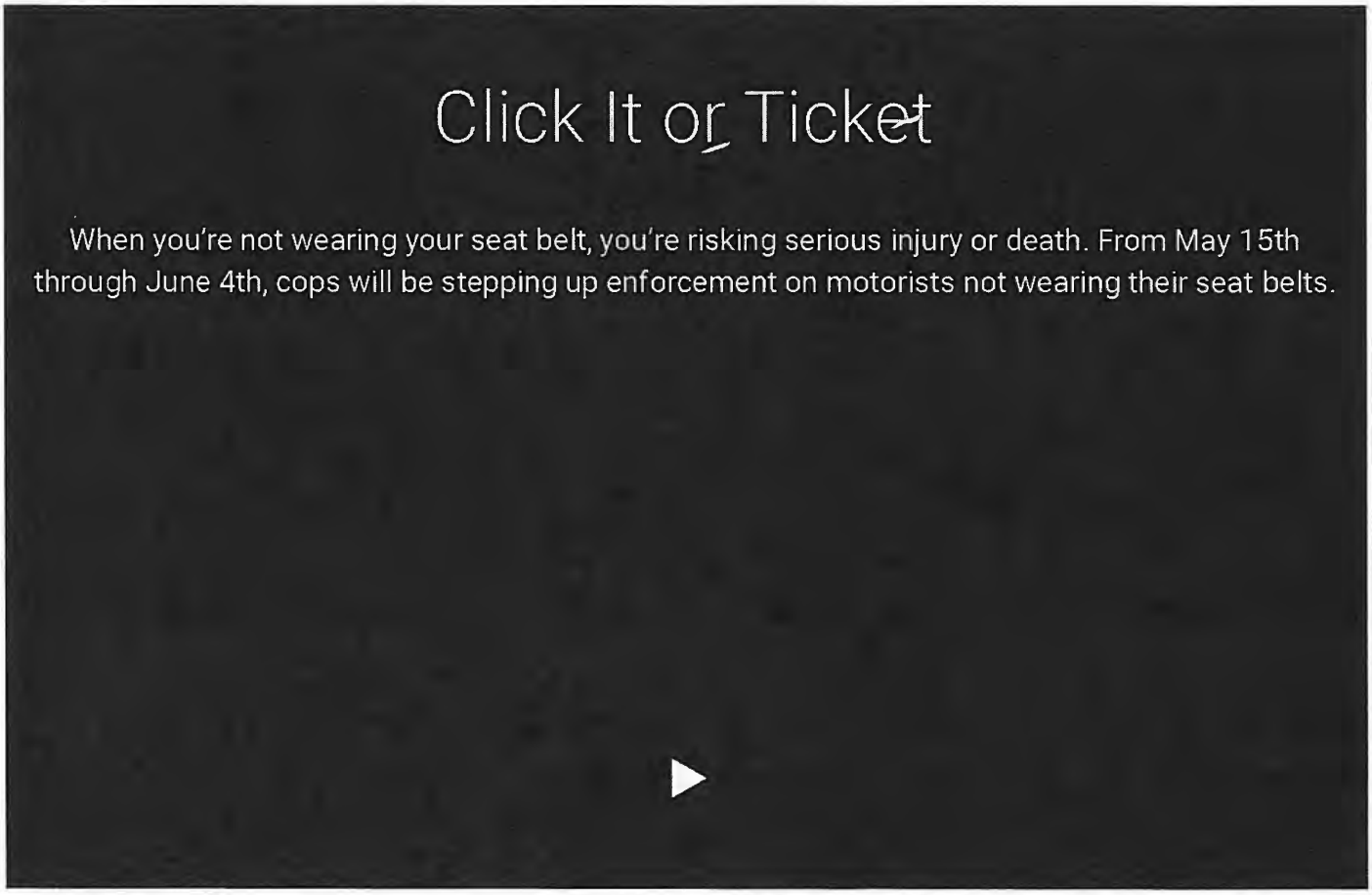
NHTSA IN ACTION

NHTSA is dedicated to eliminating risky behaviors for safer roads.

As part of NHTSA's mission to help Americans drive, ride and walk safely, we work to educate Americans about how to protect themselves and others on the road through public service campaigns such as Buckle Up America, Never Give Up Until They Buckle Up (promoting tween seat belt use), and Click It or Ticket, (associated with increased seat belt enforcement periods supported by State and local law enforcement across the country).

Campaigns

View Campaign



What Are the Odds?

Don't play the odds. In 2015, seat belts saved an estimated 13,941 people from dying. From 2011 to 2015 seat belts saved nearly 64,000 lives.

In 2015, 58% of 18- to 34-year-olds killed in crashes weren't buckled up.

Find resources to help you raise awareness about the dangers of not buckling up in your community →

Save a life: buckle up

Your seat belt is crucial to surviving a crash. Make it a habit to always buckle up every time.

- In 2015, nearly half of passenger vehicle occupants who died in crashes were unrestrained.
- From 2011 to 2015, seat belts saved nearly 64,000 lives – enough to fill a football stadium.

#ClickItOrTicket

Share:

Search for more resources

1 Results

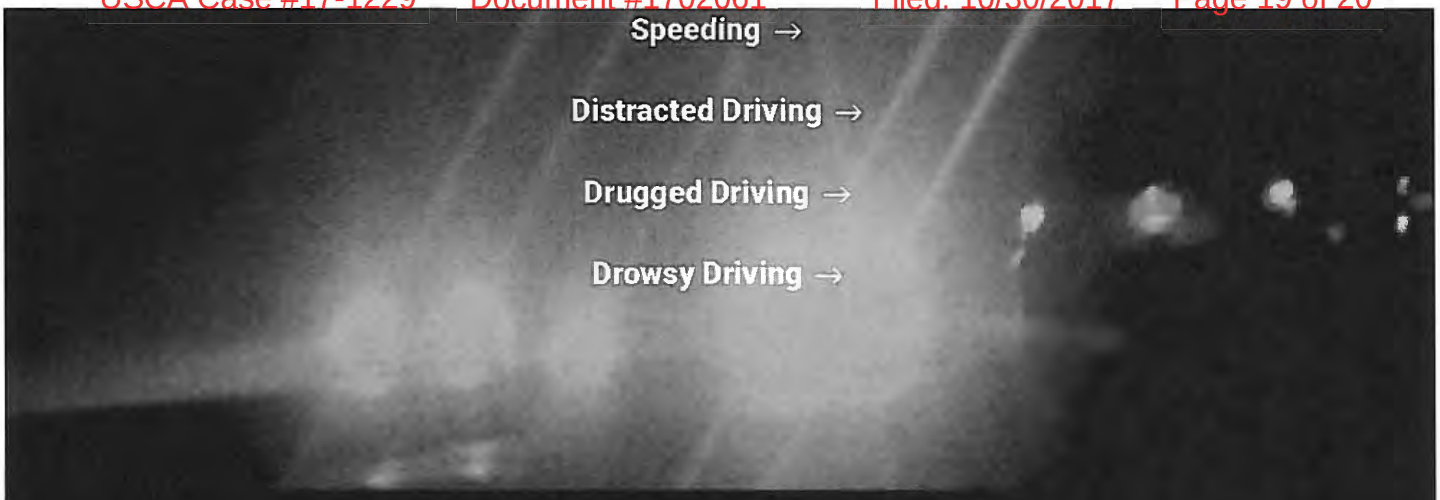
TITLE	TYPE	AUDIENCE	DATE
Demonstration of the Trauma Nurses Talk Tough Seat Belt Diversion Program in North Carolina Reaches High-Risk Drivers PDF, 583.74 KB	Document	Federal Government	

RESOURCES

Web Resources

ADDITIONAL RESOURCES AVAILABLE ON THE NHTSA WEBSITE

- Effectiveness of the May 2005 Rural Demonstration Program and the Click It or Ticket Mobilization in the Great Lakes Region: First Year Results
- Occupant Protection Issues Among Older Drivers and Passengers
- Increasing Seat Belt Use Among 8- to 15-Year-Olds
- Motor Vehicle Occupant Protection Facts (2003-2008)
- Identifying Information That Promotes Belt-Positioning Booster Use



NHTSA Information
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Website Information

NHTSA

National Highway Traffic Safety Administration

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Washington, DC 20590

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U.S. Department of Transportation

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Seat Belt Safety - Tweens (ages 8-14)

CHILD SAFETY | CAR SEAT SAFETY CHILD PASSENGER SAFETY WEEK

Seat Belt Safety - Tweens (ages 8-14)

Don't Wimp Out / Never Give Up Until They Buckle Up

NHTSA data show that as children get older they are less likely to want to buckle up. Over the past 5 years, 1,552 kids between the ages of 8 and 14 died in car, SUV and van crashes - of those who died, almost half were unbelted.

Parents need regular and salient reminders to consistently ensure seatbelt compliance for themselves and their tween children. The Tween Seat Belt Safety campaign aims to improve the consistent and proper use of seat belts and reaffirms that "life as a parent is full of compromises, but seat belt safety for my child is not up for negotiation." Parents will be motivated to make sure their children are consistently and properly wearing their seat belts at all times.

The PSAs, produced in partnership with the Ad Council and created pro bono by McCann Worldgroup, Casanova Pendrill, and Mister Face, are available in English and Spanish.

Want to customize one of our radio or print PSAs with the tag of your local DOT or organization? Please email Elizabeth at elizabeth.nilsson@dot.gov for more information on this process. Assets are available for use in donated and paid media.

Target Audience: Parents and caregivers of children 8-14 years old.

Banner Ads - animated

PETITIONERS' EXHIBIT B

NHTSA
www.nhtsa.gov

NHTSA'S MOST WANTED:
45 million Americans still not buckling up

Since the first *Click It or Ticket* enforcement campaign in 1993, seat belt use nationwide has increased to 84 percent from less than 60 percent. Despite the Nation reaching record high seat belt use, about 45 million Americans still risk their lives by failing to regularly buckle up when driving or riding in motor vehicles.

In 2008, nearly 14,000 passenger vehicle occupants who did not wear seat belts were killed. On average about 38 people each day who do not wear their seat belts are killed in motor vehicle crashes. About half these people would be alive today if they had worn their seat belts.

Who are the Americans not wearing their seat belts?

Teens — In 2008, 70 percent of the passenger vehicle occupants 13 to 15 years old killed in traffic crashes were not buckled up — the highest percentage of all age groups.

Young Adults — When comparing occupants 21 and older in fatal motor vehicle crashes, the age groups least likely to wear their seat belts are 21- to 24-year-olds and 25- to 34-year-olds. Among passenger vehicle occupants 21 to 34 who were killed in crashes from 2004-2008, 65 percent were not buckled up.

Men — Men are less likely than women to buckle up. This is especially true of young men. In 2008, 60 percent of male passenger vehicle occupant fatalities were unrestrained, compared to 45 percent for females.

Pickup drivers and passengers — Pickup truck drivers and passengers continue to have lower seat belt usage rates than occupants of other passenger vehicles. In 2008, 68 percent of pickup truck occupants who were killed in traffic crashes were **NOT** buckled up. Approximately 62 percent of sport utility vehicle occupants who died were not wearing their seat belts.

Nighttime drivers — According to NHTSA, of the 12,671 passenger vehicle occupants who died in motor vehicle crashes between the nighttime hours of 6 p.m. and 5:59 a.m. in 2008, nearly **two-thirds** (64%) were **NOT** wearing seat belts — compared to less than **half** (45%) of the passenger vehicle occupants killed during the daytime hours of 6 a.m. to 5:59 p.m.

Rural areas — In 2008, 56 percent of fatally injured passenger vehicle occupants in rural areas were unrestrained, while 52 percent of those killed in urban areas were unrestrained.

These statistics are from the National Highway Traffic Safety Administration's National Occupant Protection Use Survey (NOPUS) and Fatality Analysis Reporting System (FARS).

PETITIONERS' EXHIBIT C

Status Report

Insurance Institute for Highway Safety | Highway Loss Data Institute

Unbelted

Adults admit they often skip belts in rear seat

- Lap/shoulder belt better than lap belt alone in rear middle seat
- Studies link marijuana legalization with rise in crashes
- Noise mandate for hybrids, electrics faces NHTSA delay

ALSO IN THIS ISSUE

Vol. 52, No. 5
August 3, 2017

Adults have gotten the message that it's safer for kids to ride in the back seat properly restrained, but when it comes to their own safety, there is a common misperception that buckling up is optional. Among adults who admit to not always using safety belts in the back seat, 4 out of 5 surveyed by IIHS say short trips or traveling by taxi or ride-hailing service are times they don't bother to use the belt.

The new survey reveals that many rear-seat passengers don't think belts are necessary because they perceive the back seat to be safer than the front. This shows a clear misunderstanding about the importance of safety belts, no matter where a person sits in a vehicle.

Before the majority of Americans got into the habit of buckling up, the back seat was the safest place to sit, and the center rear seat was the safest place of all in 1960s-70s vehicles. In recent decades, high levels of restraint use and the advent of belt crash tensioners, airbags and crashworthy vehicle designs have narrowed the safety advantages of riding in the rear seat for teens and adults.

A study by IIHS and The Children's Hospital of Philadelphia published in *Accident Analysis and Prevention* in 2015 found no difference in the risk of dying in a crash when seated in the rear compared with the front seat for restrained occupants ages 13 to 54 in model 2000 and newer passenger vehicles (see *Status Report*, Dec. 23, 2014, at iihs.org). Belted occupants 55 and older, however, had a higher relative risk of death when seated in the back than when seated in the front. Unrestrained rear-seat occupants were nearly 8 times as likely to sustain a serious injury in a crash as restrained rear-seat occupants.

For most adults, it is still as safe to ride in the back seat as the front seat, but not if you aren't buckled up. That applies to riding in an Uber, Lyft or other hired vehicle, too. In the rear seat, a lap/shoulder belt is the primary means of protection in a crash. Unbelted passengers put themselves and other occupants at risk.

"For most adults, it is still as safe to ride in the back seat as the front seat, but not if you aren't buckled up," says Jessica Jermakian, an IIHS senior research engineer and a coauthor of the study. "That applies to riding in an Uber, Lyft or other hired vehicle, too."

While driver and front-passenger belt use has been extensively studied, there is not a lot of research on why rear-seat passengers don't buckle up. Prior IIHS surveys of belt use among adults focused on their belt-use habits in general, but not specifically belt use in the rear seat. The latest study fills this gap.

IIHS surveyed adults 18 and older by cellphone and landline between June and August 2016. Of the 1,172 respondents who said they had ridden in the back seat of a vehicle during the preceding six months, 72 percent said they always use their belt in the back seat, while 91 percent said they always use their belt when seated in front. This is in line with the 2015 nationwide observed belt use of 75 percent for adult rear-seat occupants and 89 percent for drivers and front-seat passengers.

IIHS surveyed adults who had ridden in the back seat of a personal or hired vehicle

Top reasons respondents cited for not always using belts in rear seat compared with front seat	percent
Safer in the back so I don't need it	25
Habit/forget/rarely wear it	13
Uncomfortable/doesn't fit	12
Difficult to use, find belts/buckles	10
Law doesn't require it	9

Top reasons respondents cited for not always using belts in taxi, Uber or other hired vehicle	
Habit/forget/it's inconvenient	17
I don't know	17
Only going short distances/ at low speeds	15
Difficult to use, can't find buckle/belt	10

"I would be more likely to wear my safety belt in the back if..."	
Someone in the car reminded me	75
If the driver could get pulled over because I'm not wearing my safety belt	73
There was an audible belt reminder	62
I knew there was a law	60
Shoulder belt was more comfortable	59
Lap belt was more comfortable	52
There was a visual belt reminder	50
Buckle was easier to find	49

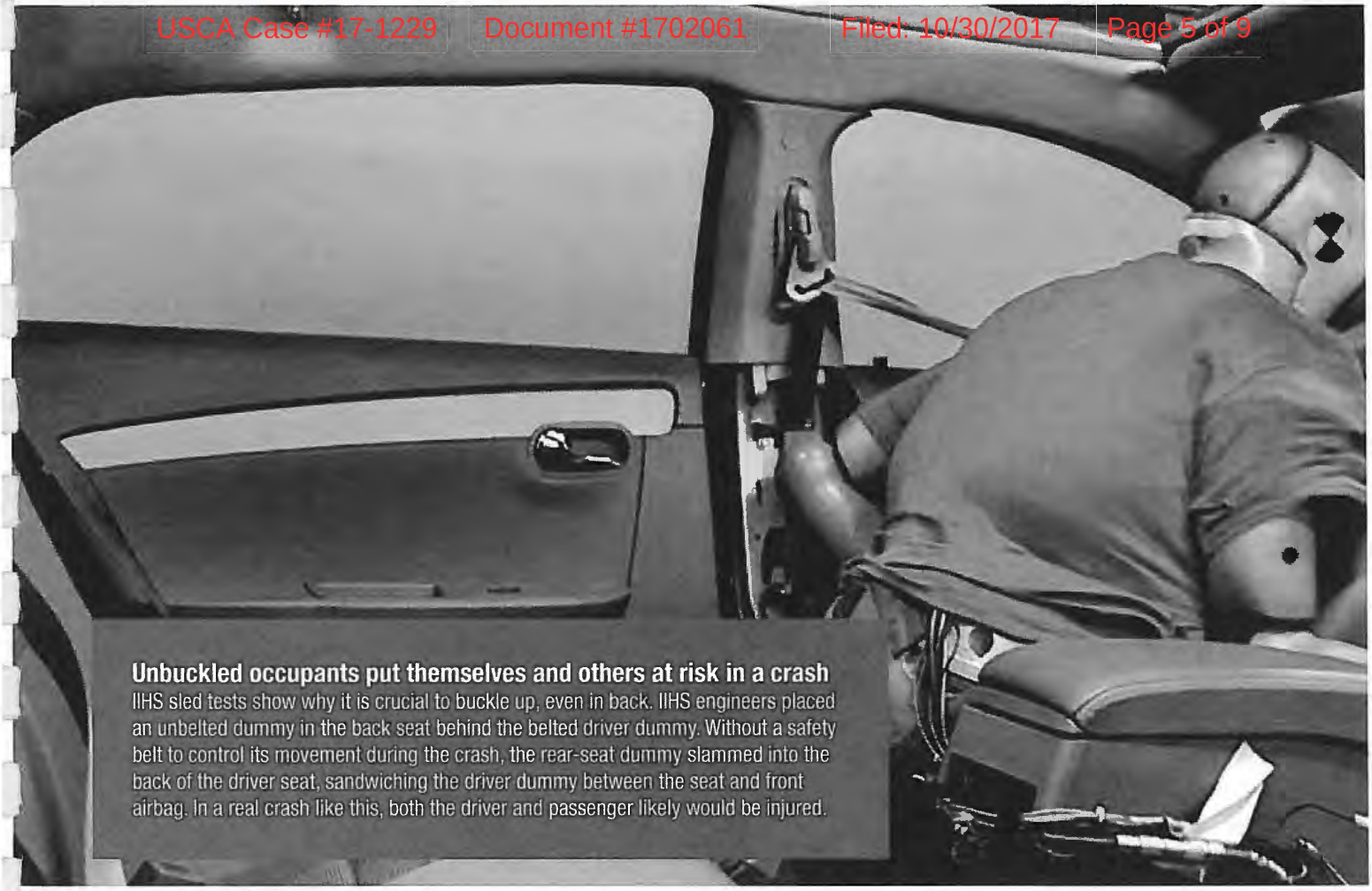
Although safety belts are proven to save lives, more than half of the people who die in passenger vehicle crashes in the U.S. each year are unbelted.

One person's decision not to buckle up can have consequences for other people riding with them.

"People who don't use safety belts might think their neglect won't hurt anyone else. That's not the case," Jermakian says.

Drivers are about twice as likely to be fatally injured in crashes in which the left rear passenger was unrestrained compared with crashes in which the passenger was belted, a 2013 University of Virginia study found.

"In the rear seat a lap/shoulder belt is the primary means of protection in a frontal crash. Without it, bodies can hit hard surfaces or other people at full speed, leading to serious injuries," Jermakian says.



Unbuckled occupants put themselves and others at risk in a crash
IIHS sled tests show why it is crucial to buckle up, even in back. IIHS engineers placed an unbelted dummy in the back seat behind the belted driver dummy. Without a safety belt to control its movement during the crash, the rear-seat dummy slammed into the back of the driver seat, sandwiching the driver dummy between the seat and front airbag. In a real crash like this, both the driver and passenger likely would be injured.

Passengers say they would be more likely to buckle up in the back seat if the lap/shoulder belt were more comfortable. Softer or padded belts that can be adjusted so they don't rub the neck would help.

Belt holdouts

Prime-age adults (35 to 54 year-olds) were the least likely group to report always buckling up in the back seat. Sixty-six percent of this group reported always using a belt in back, compared with 76 percent of adults 55 and older and 73 percent of adults 18 to 34.

Women were more likely than men to report always using a belt in the rear seat, and adults who had attended college were more likely to buckle up than adults with less education. These findings are in line with prior surveys of belt use.

When asked why they don't buckle up, a quarter of respondents in the group who reported buckling up less often in the back seat than in the front said they believe the rear seat is safer than the front, so using a belt isn't necessary. The next most popular reason this group gave was that using a belt isn't a habit or they forget about it or simply never or rarely use it. Twelve percent of respondents cited uncomfortable or poorly fitting belts as a reason for not buckling up, and 10 percent said the belt is difficult to use or they can't find the belt or buckle.

People who said that most of their trips as a rear-seat passenger were in hired vehicles were more likely to report not always using their safety belt than passengers in personal vehicles. In the survey, 57 percent of passengers in hired vehicles reported always using their belt in the rear seat, compared with 74 percent of passengers in personal vehicles.

"If your cab or ride-hailing driver is involved in a crash, you want that safety belt," Jermakian says. "Even if state law says belts are optional, go ahead and buckle up anyway. If you can't find the belt or it's inaccessible, ask your driver for help."

Reminders, laws and comfort

Nearly two-thirds of part-time belt users and nonusers said audible rear-seat belt reminders would make them more likely to buckle up. IIHS studies have shown that driver belt use is higher and fatality rates are lower in vehicles with enhanced belt reminders than in vehicles without them (see *Status Report*, Feb. 9, 2002, June 13, 2006, and March 6, 2012). Results of a 2012 IIHS survey show that most motorists support enhanced belt reminders that are more persistent and intense than most U.S. vehicles have now (see *Status Report*, Jan. 24, 2013).

Still, few vehicles have belt reminders for the rear seat. In 2015, only 3 percent of models sold in the U.S. had them, and the number hasn't increased appreciably in newer vehicles.

Nearly 40 percent of people surveyed said they sometimes don't buckle up in the rear seat because there is no law requiring it. If there were such a law, 60 percent of respondents said it would convince them to use belts in the back seat. A greater percentage said they would be more likely to buckle up if the driver could get pulled over because someone in the back wasn't buckled.

Except for New Hampshire, all states and the District of Columbia require adults in the front seat to use belts. All rear-seat passengers are covered by laws in 29 states and D.C. Of these laws, 20 carry primary

enforcement, meaning a police officer can stop a driver solely for a belt-law violation. The rest are secondary, so an officer must have another reason to stop a vehicle before citing an occupant for riding unbelted.

Aside from stronger belt laws, more than half of part-time belt users and nonusers said more comfortable belts would make them more likely to buckle up in the rear seat. They want softer or padded belts, plus shoulder belts that are adjustable so they don't rub the neck. Tight and locking belts are turnoffs for them. Participants cited a variety of comfort and usability issues, regardless of age or body size.

Safety belts saved 13,941 lives during 2015, the National Highway Traffic Safety Administration estimates. If everyone buckled up, an additional 2,800 deaths could have been prevented. For drivers and front passengers, using a lap and shoulder belt reduces the risk of fatal injury by 60 percent in a pickup, SUV or van and by 45 percent in a car.

For a copy of "Passenger use of and attitudes toward rear seat belts" by J. S. Jermakian and R. A. Weast, email publications@iihs.org. ■

Lap/shoulder belt better than lap belt alone in rear middle seat to reduce fatality risk

Using a lap/shoulder belt reduces the chances of dying in a crash by 58 percent for people seated in the center rear seat of cars and 75 percent for people buckled up in minivans, pickups and SUVs, a new National Highway Traffic Safety Administration (NHTSA) report indicates. Using a lap belt alone reduces the risk of a fatality, too, though not as much as a three-point belt.

The center rear seat was the last to get lap/shoulder belts among seating positions in passenger vehicles sold in the U.S. Also known as three-point belts, lap/shoulder belts were mandated in the outboard rear seats of cars starting in model year 1990, and in pickups, passenger vans, and SUVs starting in model year 1992. It wasn't until 2005 that lap/shoulder belts were required for the center rear seat, with a phase-in extending to September 2007. Until then, many manufacturers made do with lap belts in the center rear seat.

Chuck Kahane, a former NHTSA researcher, examined 1990 to 2014 crash data from the Fatality Analysis Reporting System (FARS) for model year 1990-2015 vehicles to estimate the effectiveness of safety belts and the relative risk of various seating positions. Kahane focused on teenage and adult occupants, not children.

Using lap belts alone reduced the risk of a fatality by 48 percent for occupants in the center rear seat of cars and by 73 percent for minivan, pickup, and SUV occupants, Kahane estimated.

For the outboard rear seat positions, using lap/shoulder belts reduced the risk of a fatality by 54 percent for car occupants and by 75 percent for occupants of minivans, pickups and

SUVs. The estimates update a 1999 NHTSA report that found a 44 percent reduction in the risk of fatal injury for back-seat outboard occupants in cars and a 73 percent reduction in fatal injury risk for back-seat outboard occupants of vans and SUVs.

In the new study, side impacts accounted for a bigger proportion of deaths in cars than in minivans, pickups and SUVs, while minivans, pickups and SUVs saw more frontal impacts and rollovers than cars.

"Fatality reduction by seat belts in the center rear seat and comparison of occupants' relative fatality risk at various seating positions" by C.J. Kahane is available at https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812369. ■

Studies link legalized use of recreational marijuana with increase in crashes

A HLDI analysis released in June found a higher-than-expected frequency of collision claims reported to insurers in the first three states to permit recreational use of marijuana for adults. In a study published the same day as HLDI's release, researchers at the University of Texas at Austin found an increase in fatal crashes in two states with legalized recreational marijuana use, although the results weren't significant. Both studies provide evidence that loosening restrictions on marijuana use affects highway safety.

HLDI found a 3 percent increase in the frequency of collision claims in Colorado, Oregon and Washington associated with the advent of retail marijuana sales (see *Status Report*, June 22, 2017, at iihs.org). HLDI also looked at loss results for each state individually compared with loss results for adjacent states without legalized recreational marijuana use prior to November 2016. Colorado, which was first to begin retail sales of recreational marijuana, saw the biggest estimated increase in claim frequency compared with its control states.

The UT Austin study published in the *American Journal of Public Health* looked at changes in fatal crashes in Colorado and Washington associated with the recreational use of marijuana between 2009-15. The authors conclude that, "Three years after recreational marijuana legalization, changes in motor vehicle crash fatality rates for Washington and Colorado were not statistically different from those in similar states without recreational marijuana legalization."

Not surprisingly, some journalists cast this study as conflicting with HLDI's analysis, but both yield similar estimates of the effect of legalizing recreational use of marijuana.

The UT Austin study found "approximately 77 excess crash fatalities (of 2,890 total)" coincident with legalizing recreational use of marijuana. This equates to a 2.7 percent increase, the same as HLDI's unrounded, statistically significant estimate. The UT Austin authors state that they do not view the increase in deaths as "clinically significant" and do not indicate how many deaths need to occur before they would deem them clinically significant.

Claims reported to insurers contain many lower-speed crashes, while fatal crashes make up a small, severe subset of all crashes. More data are needed to determine whether the rise in fatalities is statistically significant. In the meantime, the UT Austin analysis suggests deaths will go up.

"Together, these studies are consistent and support the conclusion that crashes have increased in states that have legalized the recreational use of marijuana," says Adrian Lund, IIHS-HLDI president.

The methodologies, data sets, control states and time periods used in both studies differ. HLDI examined monthly collision claim frequencies per insured vehicle year to evaluate crash risk, while the UT Austin study used annual fatal crashes per billion miles traveled.

HLDI compared Colorado, Washington and Oregon among themselves and with neighboring Idaho, Nebraska, Nevada, Montana, Utah and Wyoming. Analysts chose the control states based on geographic contiguity (to control for weather or other regional differences), as well as having reasonably similar patterns of collision claim frequencies prior to marijuana legalization. The UT Austin authors primarily used

Southern/Southeastern states to control for Northwestern states, comparing Colorado and Washington with Alabama, Indiana, Kentucky, Missouri, South Carolina, Tennessee, Texas and Wisconsin.

"There is no reason, for example, to expect year-to-year weather changes to be similar in Washington as in Alabama," Lund says. "The authors indicated that they wanted to have control states that had not legalized marijuana for medical or recreational use, and that could have restricted their choice of states. However, as long as the states don't change their laws, that is an unnecessary constraint."

The HLDI analysis began in January 2012, and the UT Austin study began in 2009. HLDI's data spanned claims filed between January 2012 and October 2016. HLDI used the dates that retail sales of recreational marijuana began as intervention points: Colorado in January 2014, Washington in July 2014 and Oregon in October 2015. Monthly collision claim rates after those dates compared with earlier months were used to estimate the effect of recreational marijuana.

The UT Austin study used December 2012 for Colorado (when a person age 21 and older could legally possess small amounts of marijuana) and November 2012 for Washington (when voters approved the measure) as intervention dates. Annual fatality counts in 2013-15 compared with earlier years were used to estimate the effect of recreational marijuana.

"We think that the biggest changes in behavior would occur after citizens in the study states could walk into a store and buy marijuana. Thus, it is possible that the estimated effect of recreational marijuana use on fatal crashes may have been larger had the UT Austin study used the date when retail sales began, rather than the date when use became legal," Lund says.

The HLDI results stand on their own.

"There has been an increase in collision claims in the first three states to legalize recreational marijuana that can't be explained by regional variation, weather, years of exposure, the economy or changes in vehicle density," Lund says.

"Crash fatality rates after recreational marijuana legalization in Washington and Colorado" by J.D. Aydelotte et al. appears in the August 2017 issue of the *American Journal of Public Health*. ■

Noise mandate for hybrids, electrics faces NHTSA delay

A regulation requiring normally quiet hybrid and electric vehicles to make noise at low speeds in order to warn pedestrians of their approach has been delayed.

The National Highway Traffic Safety Administration (NHTSA) announced the final rule in November 2016, and it was set to take effect in February (see *Status Report*, Feb. 1, 2017, at iihs.org). Since then, NHTSA has delayed the effective date several times. The latest postponement goes until Sept. 5.

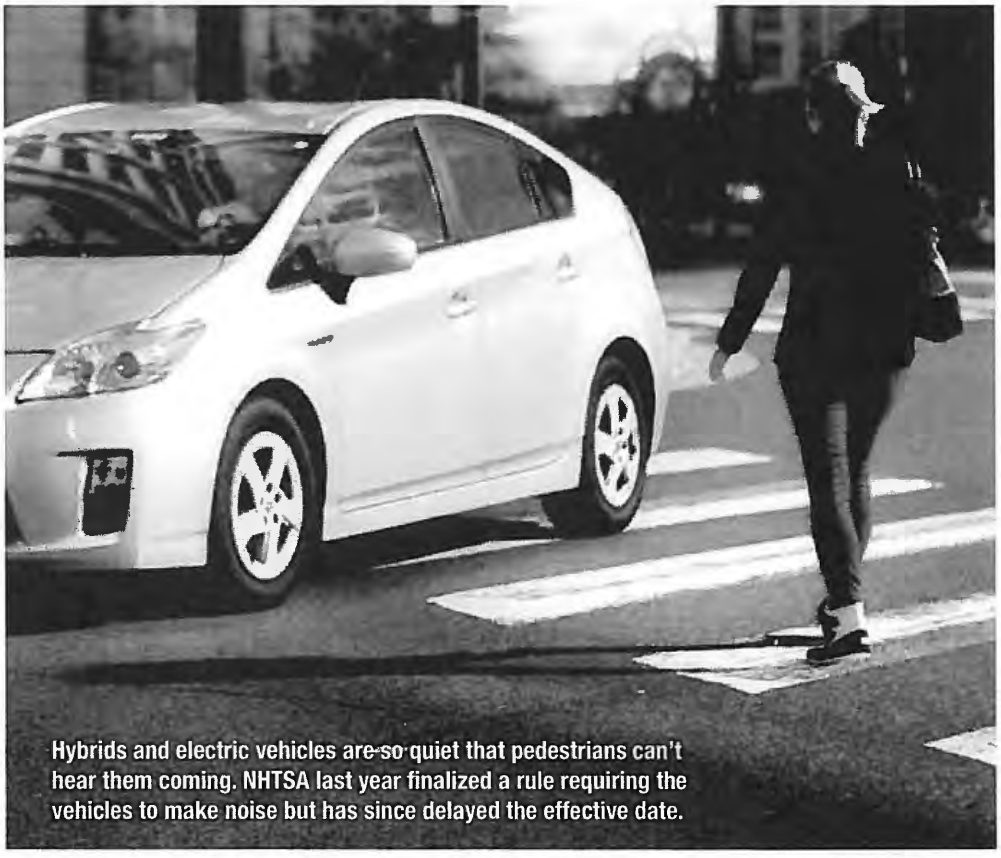
NHTSA initially delayed the rule because of the Trump Administration's Jan. 20 memo instructing agencies to postpone the effective dates of regulations that had been approved but hadn't yet taken effect.

The agency says it also is taking time to respond to petitions from some automakers and industry groups, who are asking NHTSA to change the compliance deadline from 2019 to 2020 and to clarify the rule's technical requirements.

Electric motors are much quieter than internal combustion engines. Pedestrians and bicyclists can be at risk if they can't hear a moving vehicle nearby. Advocates for the blind were the first to draw attention to the issue.

Under the new rule, hybrid and electric vehicles must emit an engine-like sound while moving forward or in reverse at speeds up to 19 mph. The rule also requires the noise from stationary vehicles if they aren't in park.

IIHS supported the requirement. A 2011 HLDI analysis found that hybrids were about 20 percent more likely to have a bodily injury liability claim without an associated claim for vehicle damage than their conventional counterparts. Such claims are likely to result from pedestrian crashes (see *Status Report*, Nov. 17, 2011). ■



Hybrids and electric vehicles are so quiet that pedestrians can't hear them coming. NHTSA last year finalized a rule requiring the vehicles to make noise but has since delayed the effective date.

IIHS HLDI
Insurance Institute for Highway Safety
Highway Loss Data Institute

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IIHS is an independent, nonprofit scientific and educational organization dedicated to reducing the losses — deaths, injuries and property damage — from motor vehicle crashes.

HLDI shares and supports this mission through scientific studies of insurance data representing the human and economic losses resulting from the ownership and operation of different types of vehicles and by publishing insurance loss results by vehicle make and model.

Both organizations are wholly supported by the following auto insurers and funding associations:

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Progressive Insurance
PURE Insurance
Qualitas Insurance Company
Redpoint County Mutual Insurance Company
The Responsive Auto Insurance Company
Rider Insurance
Rockingham Group
RSA Canada
Safe Auto Insurance Company
Safeco Insurance
Samsung Fire & Marine Insurance Company
SECURA Insurance
Sentry Insurance
Shelter Insurance Companies
Sompo America
South Carolina Farm Bureau Mutual Insurance Company
Southern Farm Bureau Casualty Insurance Company
State Auto Insurance Companies
State Farm Insurance Companies
Tennessee Farmers Mutual Insurance Company
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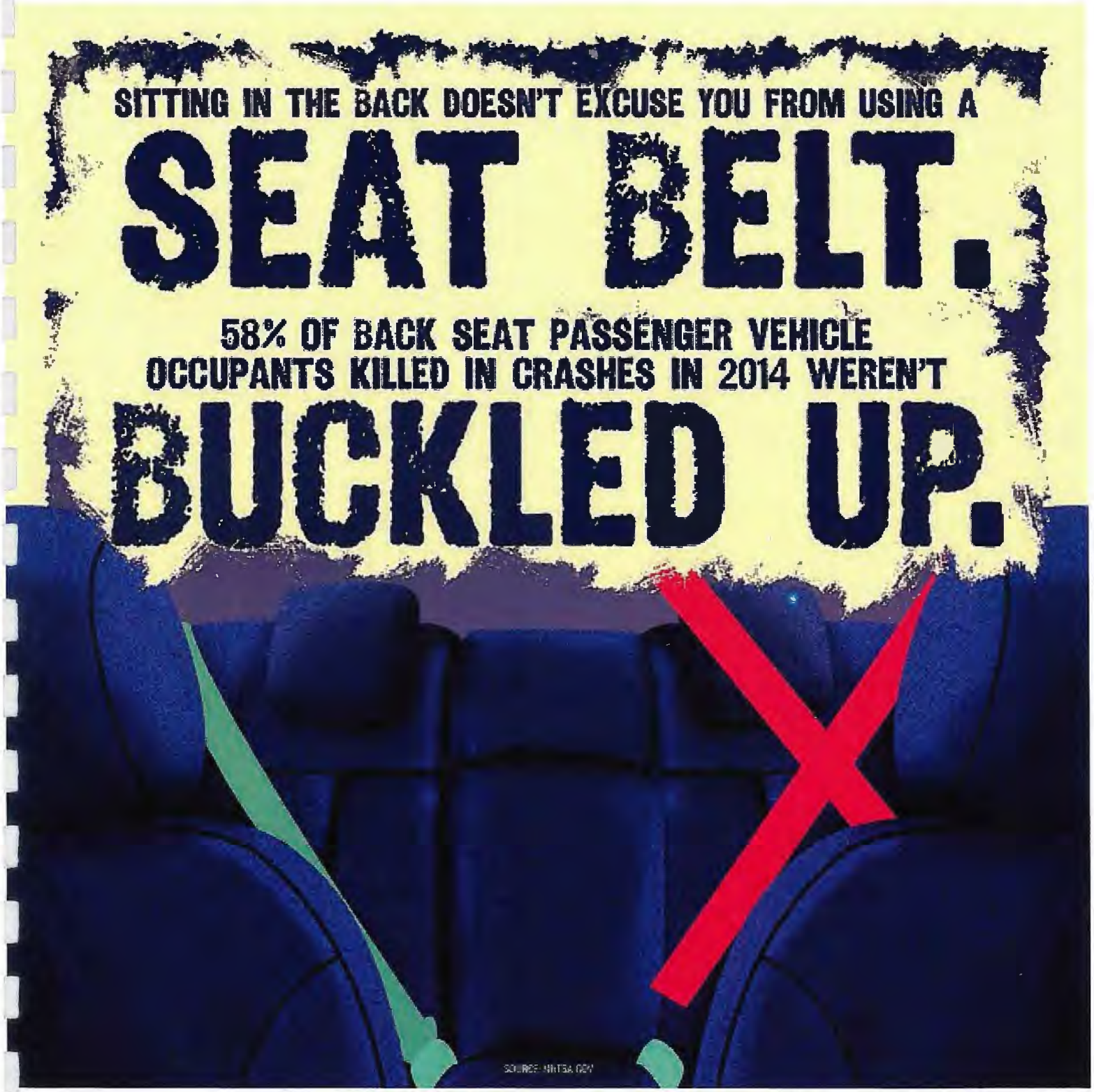
PETITIONERS' EXHIBIT D


SITTING IN THE BACK DOESN'T EXCUSE YOU FROM USING A
SEAT BELT.
58% OF BACK SEAT PASSENGER VEHICLE OCCUPANTS KILLED IN CRASHES IN 2014 WEREN'T
BUCKLED UP.

PETITIONERS' EXHIBIT E

NHTSA Child Car Safety

Child Passenger Safety Week 2017

FACTS and TALKING POINTS

GOAL/POSITIONING

The U.S. Department of Transportation's National Highway Traffic Safety Administration's (NHTSA) primary goal for child passenger safety is to make sure all parents and caregivers are correctly using the right car seats (rear-facing car seats, forward-facing car seats, booster seats, or seat belts) for their children's ages and sizes.

During Child Passenger Safety Week, being held September 17-23, 2017, many communities will have Certified Child Passenger Safety Technicians on-hand to provide education on how to use car seats, booster seats, and seat belts for children. Technicians can also help educate consumers about choosing the right car seat for their child, the importance of registering that car seat with its manufacturer, and what to expect if the seat is subject to a safety recall. The week concludes with National Seat Check Saturday on September 23, when certified Child Passenger Safety Technicians across the country will be available at car seat events to offer advice and instruction to parents and caregivers.

KEY STATISTICS

Lives lost and injuries

- Car crashes are a leading cause of death for children.
- Every 33 seconds in 2015, 1 child under the age of 13 was involved in a crash.
- From 2011 to 2015, there were 3,194 children under 13 killed and an estimated 559,000 children injured in car crashes.
- In 2015 alone, an estimated 116,000 children under 13 were injured as passengers in car crashes.
- On average, nearly 2 children under 13 were killed, and 319 children were injured every day in 2015 while riding in cars, SUVs, pickups, and vans.
- From 2011 to 2015, there were 1,692 "tweens" (8 to 14 years old) killed in passenger vehicles.
- In 2015, the 8-12 age group had the highest number of fatalities (236) among children.
- In 2015, over one-third (35%) of children under 13 killed in car crashes were not restrained in car seats, booster seats, or seat belts.

Car seats, booster seats, and seat belts save lives

- In 2015, among children under 5, car seats saved an estimated 248 lives. A total of 316 children could have survived if they had been buckled up 100 percent of the time.

Car seats work best when used correctly

- In passenger cars, car seats reduce the risk of fatal injury by 71 percent for infants and by 54 percent for toddlers. For infants and toddlers in light trucks, the corresponding reductions were 58 percent and 59 percent, respectively.
- Most parents are confident that they have correctly installed their child's car seat, but in most cases (59%) the seat has not been installed correctly.
- According to NHTSA data, in 2015, about 25.8 percent of children 4 to 7 were prematurely moved to seat belts, when they should have been riding in booster seats.

NHTSA Child Car Safety

Child passenger safety laws

- For the past 30 years, all 50 States, the District of Columbia, and all U.S. territories have had laws requiring children to be buckled up while riding in cars.
- States now require children to ride in appropriate car seats or booster seats until as old as age 9.

Remember

- Remember to read and carefully follow the installation instructions included with a car seat as well as the vehicle owner's manual. Failure to do this can lead to incorrect installation, exposing a child passenger to the risk of injury or death in a crash.
- All children under 13 should always ride in the back seat.

For the purpose of this document, the following terms and definitions are used:

- "Children killed/injured in car crashes" are defined as passenger car, van, pickup, and SUV passengers under 13 years old killed in motor vehicle traffic crashes, and
- "Tweens killed in car crashes" are defined as passenger car, van, pickup, and SUV passengers 8 to 14 years old killed in motor vehicle traffic crashes.

Seat Belt Safety - Tweens (ages 8-14)

CHILD SAFETY | CAR SEAT SAFETY CHILD PASSENGER SAFETY WEEK

Seat Belt Safety - Tweens (ages 8-14)

Don't Wimp Out / Never Give Up Until They Buckle Up

NHTSA data show that as children get older they are less likely to want to buckle up. Over the past 5 years, 1,552 kids between the ages of 8 and 14 died in car, SUV and van crashes - of those who died, almost half were unbelted.

Parents need regular and salient reminders to consistently ensure seatbelt compliance for themselves and their tween children. The Tween Seat Belt Safety campaign aims to improve the consistent and proper use of seat belts and reaffirms that "life as a parent is full of compromises, but seat belt safety for my child is not up for negotiation." Parents will be motivated to make sure their children are consistently and properly wearing their seat belts at all times.

The PSAs, produced in partnership with the Ad Council and created pro bono by McCann Worldgroup, Casanova Pendrill, and Mister Face, are available in English and Spanish.

Want to customize one of our radio or print PSAs with the tag of your local DOT or organization? Please email Elizabeth at elizabeth.nilsson@dot.gov for more information on this process. Assets are available for use in donated and paid media.

Target Audience: Parents and caregivers of children 8-14 years old.

Banner Ads - animated

PETITIONERS' EXHIBIT F

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
CHILD SAFETY PROGRAM

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DOT Vehicle Safety Hotline:
888-327-4236

Mail:
NHTSA
Office of Communications
and Consumer Information
1200 New Jersey Avenue SE.
Washington, DC 20590

WHAT YOU'LL FIND INSIDE:

Better understand today's vehicle safety features, how to select and properly install car seats, and how to keep kids safe in and around vehicles. For additional information on child safety, visit **www.nhtsa.gov/carseat.**

CONTENTS

Did You Know?

- Vehicle crashes are one of the leading causes of death for children between 1 and 13 years old.
- Every 33 seconds in 2015, one child under the age of 13 was involved in a crash.
- Nearly 60 percent of car seats are installed or adjusted incorrectly.

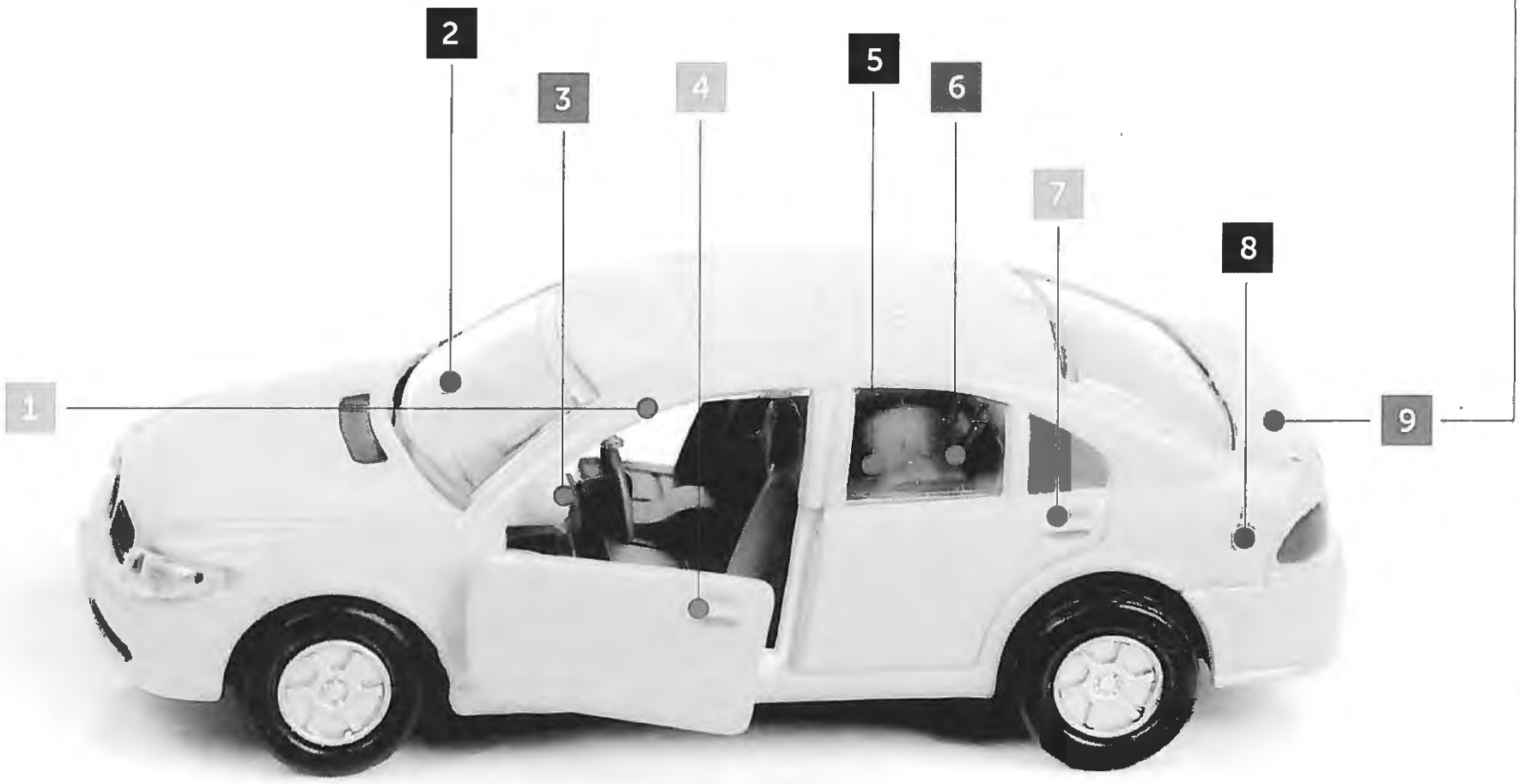
CAR SAFETY FEATURES THAT HELP PROTECT KIDS

Today's vehicles come with safety features that you should consider when buying a car. Your current vehicle may have some of these features already, so check your owner's manual or contact your car's manufacturer to find out more. And as always, more information on these and other car safety features can be found at **www.nhtsa.gov/ratings.**

EACH YEAR, BACKOVER CRASHES CAUSE:

210
DEATHS

15,000
INJURIES



1 Side impact air bags

Side impact air bags (SABs) protect passengers during side impact crashes. Because the SABs deploy quickly, children should not be allowed to lean against parts of the vehicle where side impact air bags are stored. Most vehicle manufacturers conduct "SAB Out-of-Position" tests to assess how SABs affect children and smaller adults. Check **www.nhtsa.gov/ratings** for more information.

2 Advanced frontal air bags

During a crash, frontal air bags prevent drivers and front seat passengers from hitting the steering wheel, dashboard, or windshield. New vehicles have advanced frontal air bags that use a combination of sensors to detect the severity of the crash, size of the passenger, use of the seat belt, and/or the positioning of the seat. If the crash is not severe or if the front seat passenger isn't heavy enough, the air bags may not deploy.

The safest place for children 12 and under is properly buckled in the back seat. If a child in a forward-facing seat must sit in the front seat because no other seat is available, the seat should be moved as far back from the air bag as possible, and the child should sit in a car seat that's appropriate for his or her size and age. Read your vehicle manufacturer's recommendations and instructions for additional information.

3 Rear seat belt warning systems

Rear seat belt warning systems tell the driver if children in the rear seat are wearing seat belts. This could be a visual warning symbol on the instrument panel or an audible chime. The system can also alert the driver if a rear seat passenger unfastens their seat belt at any point during the trip.

4 Automatic door locks

Automatic door locks help prevent the door from accidentally opening when your vehicle is moving, reduce the risk of falling out of a vehicle in a crash, and stop someone from forcing their way in if you're stopped in traffic. In vehicles with this safety feature, the door automatically locks when the car is put into gear or when it reaches a certain speed.

5 Anti-pinch/auto-reverse windows

Automatic reverse windows stop closing and reverse direction if the window senses something is in the way. This technology is also known as "pinch protection," "anti-entrapment," or "bounce back" windows. Children can be trapped by closing windows if they lean on or play with power window switches. Before driving away, make sure all children are clear from the windows and properly seated.

6 Seat belts and child safety seat lower anchors

Every car seat needs to be installed using either the lower anchors or the seat belt to secure it in place. If you choose to use a seat belt to install your car seat, check the vehicle owner's manual for instructions on how to properly lock the seat belt in place. For best protection, forward-facing car seats that provide a tether strap should always connect the tether strap to the tether anchor in the vehicle. Because every car seat and vehicle is different, it's important to follow all instructions carefully. For more information on how to install your car seat, visit: **www.nhtsa.gov/carseat**.

7 Child safety locks

Child safety locks allow the driver to control the rear door locks. When child safety locks are turned on, the rear doors cannot be opened from the inside.

8 Interior trunk release

To a child, the trunk of a vehicle can be the perfect place to hide and play. Teach children that the trunk is not a hiding spot, and always keep car keys out of reach. Almost all vehicles on the market today have an interior trunk release, so make sure your children know how to use it if they get stuck. If a child is missing, the trunk should be one of the first places you check.

9 Backup cameras

Backover crashes cause approximately 210 deaths and 15,000 injuries each year, but the good news is that backup cameras are now available and can help drivers see behind their vehicles while they're backing up. To prevent backover crashes, choose a vehicle with a backup camera feature, tell children not to play around vehicles, and check around and behind your vehicle before starting your car.

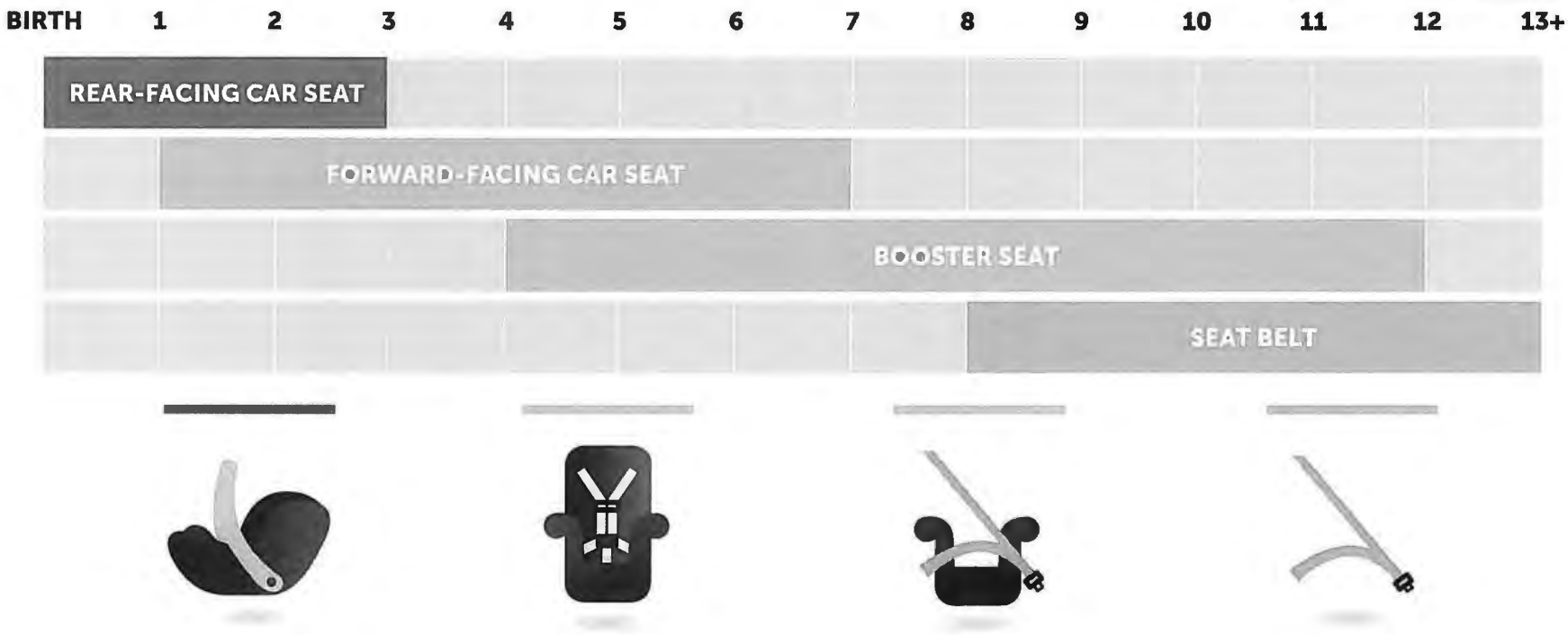
FIND THE RIGHT CAR SEAT

There are many car seat choices on the market. Use the information below to help you choose and install a car seat that best meets your child's needs. More information is available at **www.nhtsa.gov/carseat.**

TYPES OF CAR SEATS

Children require rear- and forward-facing car seats and booster seats before they are ready to use an adult seat belt. The following chart will help you decide which car seat is best for your child. For more information, visit **www.nhtsa.gov/carseat.**

AGE (YEARS)



	REAR-FACING CAR SEAT	FORWARD-FACING CAR SEAT	BOOSTER SEAT	SEAT BELT
BEST PRACTICES	Children under the age of 1 should always be in a rear-facing seat in the back seat. They should remain in a rear facing seat until they reach the top height or weight limits listed on the seat.	Children should remain in a rear-facing seat until they reach the top height or weight limits listed on the seat. Only then should a child move into a forward-facing seat with a harness that is installed in the back seat using the seat belt or lower anchors and the tether.	Children should remain in a forward-facing seat with a harness until they reach the top height or weight limits listed on the seat. Only then should a child move into a booster seat placed in the back seat.	Keep children in a booster seat for as long as possible until a seat belt fits them properly. Children are generally ready to use a seat belt when 1) they can keep their back against the vehicle seat without slouching; 2) their knees bend over the edge of the seat; and 3) they can keep their feet flat on the vehicle floor. To fit a seat belt properly, the lap belt must lie snugly across the upper thighs, not the stomach. The shoulder belt should lie snugly across the shoulder and chest, not across the neck or face. Seat belt fit may vary depending on the vehicle model and where your child sits in the vehicle.
TYPES OF CAR SEAT	**Infant-only seat (rear-facing only):** Designed for newborns and infants, the infant-only seat is a small, portable, rear-facing seat. **Convertible seat:** As a child grows, this seat can convert from a rear-facing to a forward-facing seat. Because it fits children of various sizes, it allows for children to stay in a rear-facing position longer. **All-in-one seat:** This seat can change from a rear-facing seat to a forward-facing seat to a booster seat as a child grows. This type of seat is called by other names, including a 3-in-1, so you should carefully read the manufacturer's description to see when it's time for your child to switch.	**Forward-facing-only seat:** Equipped with a harness and tether and designed to be used forward-facing only. **Convertible seat:** See description in the previous column. **Combination seat:** As a child grows, this seat transitions from a forward-facing seat with a harness into a booster. **All-in-one seat:** See description in the previous column.	**Booster seat with back:** A booster seat is designed to boost the child's height so the seat belt fits properly. This type of booster provides neck and head support and is ideal for vehicles that don't have head rests or high seat backs. **Backless booster seat:** A backless booster seat is designed to boost the child's height so the seat belt fits properly. It does not provide head and neck support. It is only for vehicles that already have head restraints. **Combination seat:** See description in the previous column. **All-in-one seat:** See description in the rear-facing car seat column.	**Seat belt:** Seat belts come standard in all vehicles. Make sure that the belt fits properly on your child (see the tips provided above).
HOW IT WORKS	In a crash, a rear-facing car seat helps to decrease the risk of injuries because it protects the head, neck and spine by distributing the force of a crash over the entire body. Small children have fragile necks and spinal cords, and a rear-facing seat reduces the amount of stress on these critical areas.	During a crash, the harness distributes the forces of the crash across the child's body and keeps the child in the seat. The tether limits the child's forward head movement.	A booster seat positions the seat belt so that it fits properly over the strongest parts of a child's body. This can help reduce injury during a crash.	A seat belt restrains a grown child or adult in the event of a crash to help prevent injury. The seat belt is placed over the strongest parts of the body.

CAR SEATS:
Before you start

The car seat manual, as well as the vehicle owner's manual, will provide you with the best guidance for installing a car seat. Keep these tips in mind before buying a car seat:

- **Find a car seat that fits your child.** As children grow, the car seat position changes from rear-facing to forward-facing. Make sure your car seat fits your child's current size and age.
- **Make sure that the car seat is the right fit for your vehicle.** Not all car seats fit in all vehicles. Try to install the car seat you plan to buy to make sure it's suitable. It can be difficult to install a car seat in pickup trucks, two-door vehicles or in vehicles with small rear seats, deep bucket seats, split bench seats or forward-anchored belts.
- **Buy a car seat that you can install and use correctly every time.**

NHTSA EASE-OF-USE RATINGS

Ease-of-Use Ratings will help you evaluate car seats before you buy one. NHTSA uses a 5-Star Ratings System—with five being the highest—to evaluate how easy certain car seat features are to use in four basic categories:

- **Evaluation of Instructions**
  Is the instruction manual user-friendly and understandable?
- **Vehicle Installation Features**
  Are the car seat features easy to install?
- **Evaluation of Labels**
  Are the labels on the car seat simple to understand?
- **Securing the Child**
  Do the car seat features make it easy to correctly secure a child in the seat?

Each of the four categories above are evaluated using a 5-Star rating system:

- ★★★★★ **Excellent features**
- ★★★★☆ **Above-average features**
- ★★★☆☆ **Average features**
- ★★☆☆☆ **Below-average features**
- ★☆☆☆☆ **Poor features**
- N/A **Does not contain any features that require a rating**

As a reminder, all car seats meet strict Federal safety performance standards and are available for vehicles of all sizes. For more information, visit **www.nhtsa.gov/carseat** to find updated ratings for car seats and booster seats.

KEEP IN MIND:
Cars can be dangerous places for kids

Even with new safety features that can keep children safe, there are still hazards to look for. Talk to your kids about the potential dangers of playing around vehicles, and watch them closely when they're around vehicles. Common dangers that you should be especially aware of are:

HEATSTROKE

Heatstroke is one of the leading causes of vehicle-related deaths for children under the age of 14. Cars can heat up very quickly in almost all weather conditions. You should never leave a child unattended in a car no matter how short the stop, or what the weather is, even if the windows are cracked. Also, be sure to lock your vehicle's doors at all times when it's not in use. Put the keys in a place where children can't get to them. Children who enter vehicles on their own with no adult supervision can be killed or injured.

ROLLAWAY

Leaving a child unattended in a vehicle with the keys in the ignition is never safe. Unattended children can accidentally cause the vehicle to roll—or even drive—away, especially if the engine is running.

SEAT BELT ENTANGLEMENT

Children can get bored during car trips and may play with the seat belt—sometimes pulling the seat belt all the way out, locking the retractor, and accidentally wrapping it around their head and neck. Be sure to explain to them that seat belts are not toys. Any seat belts you don't use should be buckled and locked to prevent getting caught, and make sure your child is properly secured.

For more information about the potential dangers of playing around vehicles, visit **www.nhtsa.gov/road-safety/child-safety.**

TIPS FOR INSTALLING A CAR SEAT

If a car seat is not installed correctly, your child's safety could be compromised. Every car seat has different installation instructions, but here are a few things to keep in mind when installing a car seat. For more information and how-to videos, visit **www.nhtsa.gov/carseat.**

INSTALLING A CAR SEAT:

1. Read the car seat instruction manual and the section of your vehicle's owner's manual on car seat installation. Every car seat needs to be installed using either the lower anchors on the car seat or the seat belt to secure it in place. If you choose to use a seat belt to install your car seat, make sure you follow the instructions in your vehicle owner's manual so that you lock the seat belt. Because every car seat and vehicle is different, it's important to follow all instructions carefully.
2. Place the car seat in the back seat of your vehicle and follow the manufacturer's installation directions.
3. The car seat must be secured tightly. It should not move side-to-side or front-to-back more than one inch if you pull on the belt path. If it is a forward-facing seat and has a tether strap, connect it to the tether anchor and tighten. This step is very important as it limits forward head movement in a crash.
4. If it is a rear-facing seat, make sure the car seat is installed at the correct angle. Most car seats have built-in angle indicators or adjusters that help with this step.

If you have questions, trained professionals can help you. Many local fire and police stations offer free seat checks. Find the closest trained inspector at **www.nhtsa.gov/carseatinspection** or call the Department of Transportation Vehicle Safety Hotline at 888-327-4236. For how-to videos visit **www.nhtsa.gov/carseat.**

FITTING YOUR CHILD CORRECTLY IN A CAR SEAT:

1. Properly position the car seat harness straps on your child
   - **Rear-facing**—The car seat harness straps should lie flat, not twisted, and be placed through the slots that are at or **below** your child's shoulders.
   - **Forward-facing**—The car seat harness straps should lie flat, not twisted, and be placed through the slots that are at or **above** your child's shoulders.
2. Buckle the harness and the chest clip and tighten. You'll know the harness is snug enough when extra material cannot be pinched at the shoulder.
3. Make sure the chest clip is at armpit level.

REGISTERING YOUR CAR SEAT:

You may not realize it, but child safety seats can be recalled, just like a car. Be sure to register your car seat at **www.nhtsa.gov/carseat** or by visiting the manufacturer's website. Registering makes it easy for manufacturers to contact you if they discover a safety defect and need to issue a recall. Although recalls are rare, if your car seat manufacturer issues one, they'll fix the problem for free. If you suspect your car seat has a safety defect, report it at **www.nhtsa.gov/recalls.**

Always remember

- Use a car seat, booster seat, or seat belt for every trip—even when you're just going down the street.
- Select a car seat based on your child's age and size, and always follow the manufacturer's directions.
- Make sure your car seat is compatible with your vehicle by checking the car seat manufacturer's instructions.
- Keep kids in the back seat at least through age 12.

ADDITIONAL RESOURCES

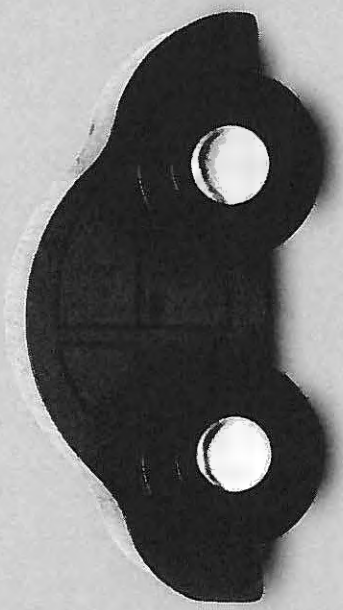
More information on child safety and car seats can be found on the following NHTSA websites:

Child Safety
www.nhtsa.gov/road-safety/child-safety

Car Seat Ease-of-Use Ratings System
www.nhtsa.gov/carseat

Find Your Local Certified Safety Seat Technician
www.nhtsa.gov/carseatinspection

Spanish Resources
www.nhtsa.gov/protegidos



U.S. Department of Transportation
National Highway Traffic Safety Administration

NHTSA

DOT Vehicle Safety Hotline
888-327-4236
TDD 800-424-9153

NHTSA
1200 New Jersey Avenue SE.
Washington, DC 20590

13237-091517-v4

PETITIONERS' EXHIBIT G

Seat Belts
Language: **English**
Overview
One of the safest choices drivers and passengers can make is to buckle up. In 2015, seat belt use in passenger vehicles saved an estimated 13,941 lives. Many Americans understand the lifesaving value of the seat belt – the national use rate is at 90.1 percent – but nearly 27.5 million people still don't buckle up. Understand the potentially fatal consequences of not wearing a seat belt and learn what you can do to make sure you and your family are properly buckled up every time.

Seat Belts Save Lives
13,941
NUMBER OF LIVES SAVED BY SEAT BELTS IN 2015

Beyond Booster Seats

Seat Belts The Issue NHTSA in ActionResources **VIEW CAMPAIGN**
THE ISSUE
Consequences
48 %**PERCENTAGE OF PASSENGER VEHICLE OCCUPANTS KILLED IN 2015 WHO WERE UNRESTRAINED**
Of the 35,092 people killed in motor vehicle crashes in 2015, 48 percent were not wearing seat belts. In 2015 alone, seat belts saved an estimated 13,941 lives and could have saved an additional 2,814 people if they had been wearing seat belts.
The consequences of not wearing, or improperly wearing, a seat belt are clear:
1. Buckling up helps keep you safe and secure inside your vehicle, whereas not buckling up can result in being totally ejected from the vehicle in a crash, which is almost always deadly.
2. Air bags are not enough to protect you; in fact, the force of an air bag can seriously injure or even kill you if you're not buckled up.
3. Improperly wearing a seat belt, such as putting the strap below your arm, puts you and your children at risk in a crash.
The benefits of buckling up are equally clear:

1. If you buckle up in the front seat of a passenger car, you can reduce your risk of:
    - Fatal injury by 45 percent (Kahane, 2015)
    - Moderate to critical injury by 50 percent
2. If you buckle up in a light truck, you can reduce your risk of:
    - Fatal injury by 60 percent (Kahane, 2015)
    - Moderate to critical injury by 65 percent (NHTSA, 1984)

THE ISSUE
Seat Belt Safety for Adults
Follow these seat belt tips and guidelines, including do's and don'ts when you're pregnant. Then have some fun quizzing yourself about the myths and facts of buckling up, and test your seat belt IQ.
The Top 5 Things You Should Know About Buckling Up
80 %**IN FATAL CRASHES IN 2015, ABOUT 80 PERCENT OF PASSENGER VEHICLE OCCUPANTS WHO WERE TOTALLY EJECTED FROM THE VEHICLE WERE KILLED.**
1. Buckling up is the single most effective thing you can do to protect yourself in a crash
Seat belts are the best defense against impaired, aggressive, and distracted drivers. Being buckled up during a crash helps keep you safe and secure inside your vehicle; being completely ejected from a vehicle is almost always deadly.
2. Air bags are designed to work with seat belts, not replace them
If you don't wear your seat belt, you could be thrown into a rapidly opening frontal air bag. Such force could injure or even kill you. Learn about air bag safety.
3. Guidelines to buckle up safely

- The lap belt and shoulder belt are secured across the pelvis and rib cage, which are better able to withstand crash forces than other parts of your body.
- Place the shoulder belt across the middle of your chest and away from your neck.
- The lap belt rests across your hips, not your stomach.

- NEVER put the shoulder belt behind your back or under an arm.

4. Fit matters

- Before you buy a new car, check to see that its seat belts are a good fit for you.
- Ask your dealer about seat belt adjusters, which can help you get the best fit.
- If you need a roomier belt, contact your vehicle manufacturer to obtain seat belt extenders.
- If you drive an older or classic car with lap belts only, check with your vehicle manufacturer about how to retrofit your car with today's safer lap/shoulder belts.

5. Seat belt safety for children and pregnant women

Find out when your child is ready to use an adult seat belt and learn about seat belt safety when you're pregnant.

If You're Pregnant: Seat Belt Recommendations for Drivers and Passengers

If you're pregnant, make sure you know how to position your seat and wear a seat belt to maximize your safety and the safety of your unborn child. Read our recommendations below or view the instructional diagram version of our seat belt recommendations for pregnant drivers and passengers(PDF 497 KB).

I'm Pregnant. Should I Wear a Seat Belt?

- **YES**—doctors recommend it. Buckling up through all stages of your pregnancy is the single most effective action you can take to protect yourself and your unborn child in a crash.
- **NEVER** drive or ride in a car without buckling up first!

What's the Right Way to Wear My Seat Belt?

- The shoulder belt away from your neck (but not off your shoulder) and across your chest (between your breasts), making sure to remove any slack from your seat belt with the lap belt secured below your belly so that it fits snugly across your hips and pelvic bone.
- **NEVER** place the shoulder belt under your arm or behind your back.
- **NEVER** place lap belt over or on top of your belly.

Should I Adjust My Seat?

- **YES**—Adjust to a comfortable, upright position
- Keep as much distance as possible between your belly and the steering wheel*
- Comfortably reach the steering wheel and pedals**
- To minimize the gap between your shoulder and the seat belt, avoid reclining your seat more than necessary.
- Avoid letting your belly touch the steering wheel.

What if My Car or Truck Has Air Bags?

- You still need to wear your seat belt properly.
- Air bags are designed to work with seat belts, not replace them.
- Without a seat belt, you could crash into the vehicle interior, other passengers, or be ejected from the vehicle.

My Car Has an ON-OFF Air Bag Disabling Switch. Should I turn it off?

- **NO**—Doctors recommend that pregnant women wear seat belts and leave air bags turned on. Seat belts and air bags work together to provide the best protection for you and your unborn child.

What Should I Do if I am Involved in a Crash?

- Seek immediate medical attention, even if you think you are not injured, regardless of whether you're the driver or passenger.

Myth vs. The Real Deal

There are many myths surrounding seat belt safety. See if you can distinguish the myths from the real deal by correctly answering the questions below.

If your car has air bags you still need to wear a seat belt. Myth or Real Deal?
Seat belts can trap you in a fire or under water. Myth or Real Deal?
If you're not going far or not traveling fast, seat belts are unnecessary. Myth or Real Deal?
Your seat belt can't hurt you in a crash. Myth or Real Deal?
You're safer in a pickup truck, so wearing a seat belt is unnecessary. Myth or Real Deal?
It's not as essential for guys to wear seat belts; they are the least at risk. Myth or Real Deal?

What's Your Seat Belt IQ?

Any time you're in a motor vehicle, no matter where you're sitting or where you're going, you should always play it safe. Remember to buckle up every trip, every time! Use this quiz to test your seat belt IQ.

True or False: Every State has at least some kind of seat belt law.

Consistently remind your children to buckle up properly the whole ride, and never assume they're buckled up! Learn tips to motivate your tweens to buckle up, and make it a rule in your family that everyone follows the same practices as you: Always buckle up before moving the car, no matter how short or routine the drive, and make sure all children are buckled up properly.

The Proper Seat Belt Fit for Your Child

The risk of injury among child passengers is significantly higher when their seat belts are loose and/or improperly positioned. Learn about the proper seat belt fit for your child and why your children may not be wearing their seat belts correctly.

Front or Back—When is the Front Seat Safe for My Child?

All children under age 13 should ride in the back seat for maximum safety. The back seat is the safest place for your children because most crashes occur in the front of the car and the back seat is farthest from this impact.

Why Parents and Caregivers Forget About or Forego Seat Belt Safety

We know life as a parent is full of distractions and often hectic, making it easy to forget or forego buckling up altogether. See if any of these excuses for not buckling up sound familiar, then do whatever it takes to buckle up and make sure your kids do the same:

- Rushed and chaotic pre-travel routines
- Distractions
- Need to minimize conflict or keep the peace
- Seat belt discomfort or perceived nuisance when in a hurry
- Shorter distances, slower speeds and familiar roads falsely associated with lower risk
- Kids persistently asking to ride in the front seat

Tips to Motivate Your Tweens to Buckle Up

Getting your kids to properly buckle up and stay buckled can be a battle of wills. There are several reasons why children 8 to 14 may forget or not want to wear their seat belts. For as many reasons as your kids can protest against wearing a seat belt, we've got tips to help you motivate them to buckle up.

Tweens are going through several developmental stages—social, cognitive and emotional—which offer helpful insights into what makes sense to them and what motivates them. Learn about the developmental stages and motivational messages get your kids to buckle up properly, the whole ride, every time.

It's Non-Negotiable: Tween Seat Belt Safety

We know you make every effort to keep your kids safe. However, parenting can be a hectic job. The daily routine of getting your kids to and from school and other activities can be hurried and chaotic, creating an environment where insisting on wearing a seat belt is not top of mind. See if you face these five challenges to getting tweens to wear — and stay in — their seat belts.

No Matter How Hurried or Chaotic, Don't Negotiate!

As a parent, sometimes you let your kids have their way. But their safety should never be up for negotiation, no matter how much they push back on the seat belts being uncomfortable or unnecessary for just a "short drive." Here are some tips to help you win the seat belt battle:

1. **Consistently Model Seat Belt Safety.** Teaching your children to consistently wear seat belts can take a great deal of resolve. Your first line of defense, as your children's number one influence, is to wear your seat belt and insist that all family members do the same.
2. **Never Give Up Until They Buckle Up.** Make sure your kids are buckled up with their lap and shoulder belt—no shoulder belts behind their backs or under their arms, or seat belts so loose that they can wrestle in the back seat. Learn how to motivate your kids to buckle up properly and consistently using age-appropriate messages and rewards to reinforce the importance of seat belt safety.
3. **Never Assume Your Kids Are Buckled Up.** One conversation is not enough: Remind your children to wear their seat belts every time they get into a car—no matter whose car it is—and stay buckled up, including at night and on longer rides.

Teenagers

57 %UNRESTRAINED 13- TO 15-YEAR-OLDS KILLED IN CAR CRASHES IN 2015

It's been a long time since your little ones transitioned from a booster seat into an adult seat belt, and now they're teenagers. Think it's time to relax? Think again. The majority of teens involved in fatal crashes aren't wearing their seat belts.

Buckling up is not a one-time conversation—it's ongoing. Set the example by always wearing your seat belt, and remind your teens buckling up is the law.
To learn more, visit our Teen Driving section.

NHTSA IN ACTION

NHTSA is dedicated to eliminating risky behaviors for safer roads.

As part of NHTSA's mission to help Americans drive, ride and walk safely, we work to educate Americans about how to protect themselves and others on the road through public service campaigns such as Buckle Up America, Never Give Up Until They Buckle Up (promoting tween seat belt use), and Click It or Ticket, (associated with increased seat belt enforcement periods supported by State and local law enforcement across the country).

Campaigns

Seat Belt Safety - Tweens

View Campaign

Click It or Ticket

When you're not wearing your seat belt, you're risking serious injury or death. From May 15th through June 4th, cops will be stepping up enforcement on motorists not wearing their seat belts.

What Are the Odds?

Don't play the odds. In 2015, seat belts saved an estimated 13,941 people from dying. From 2011 to 2015 seat belts saved nearly 64,000 lives.

01 /04

PreviousNext

Save a life: buckle up

Your seat belt is crucial to surviving a crash. Make it a habit to always buckle up every time.

- In 2015, nearly half of passenger vehicle occupants who died in crashes were unrestrained.
- From 2011 to 2015, seat belts saved nearly 64,000 lives – enough to fill a football stadium.

#ClickItOrTicket

Share:

In 2015, 58% of 18- to 34-year-olds killed in crashes weren't buckled up.

Find resources to help you raise awareness about the dangers of not buckling up in your community

Search for more resources

1 Results

Related resources for this topic

TITLE	TYPE
Demonstration of the Trauma Nurses Talk Tough Seat Belt Diversion Program in North Carolina Reaches High-Risk Drivers PDF, 583.74 KB	Docum

RESOURCES

Web Resources

ADDITIONAL RESOURCES AVAILABLE ON THE NHTSA WEBSITE

- Effectiveness of the May 2005 Rural Demonstration Program and the Click It or Ticket Mobilization in the Great Lakes Region: First Year Results
- Occupant Protection Issues Among Older Drivers and Passengers
- Increasing Seat Belt Use Among 8- to 15-Year-Olds
- Motor Vehicle Occupant Protection Facts (2003-2008)
- Identifying Information That Promotes Belt-Positioning Booster Use

https://www.nhtsa.gov/risky-driving/seat-belts

PETITIONERS' EXHIBIT H

ADVANCED SEAT BELT REMINDER SYSTEM FOR REAR SEAT PASSENGERS

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Paper Number 13-0306

ABSTRACT

Advanced seat belt reminder systems with audiovisual warnings have proven to be highly effective in increasing the belt wearing rates of a vehicle's front seat occupants. While the availability of such advanced SBR systems for the front seats is almost common in some markets and fast-growing in others, also thanks to NCAP incentives, the systems available on the rear seats have so far only offered a basic functionality. In 2014, an upgraded SBR function entered the mass market, and the world's first car with an advanced rear seat SBR system including occupant detection was launched on the Japanese market. This vehicle, the Subaru LEVORG, offers an advanced audiovisual SBR warning for the rear outboard seating positions. This advanced function is enabled by occupant detection sensors designed to detect human rear seat occupants, while being robust against the detection of child restraint systems (CRS) or other objects frequently transported on a vehicle's rear seats. The robustness of the occupant detection and the object non-detection has been tested extensively. Occupants shifted their position forward and laterally away from the nominal seating position. A multitude of CRSs and objects were tested to ensure that they do not trigger unnecessary warnings. Advanced rear seat SBR systems have the potential to significantly increase the belt wearing rates, especially as those tend to be much lower on the rear than on the front seats in almost all countries. As belt load limiters and belt tensioners are more and more available for the rear seats, the advanced SBR systems ensure that more rear seat occupants will benefit from the restraint system enhancements.

INTRODUCTION

Seat belts have proven to be highly effective in reducing the likelihood of severe or fatal occupant injuries in vehicle collisions. Additional technologies like seat belt tensioners and load limiters have helped to improve the seat belt effectiveness and to reduce belt induced injuries to the chest area. Many people, however, do not buckle up, for various reasons, often simply forgetting about it. Seat belt reminder (SBR) systems with audiovisual warnings have proven to be highly effective in increasing the seat belt use. The number of unbelted drivers is reduced by 80% in vehicles with advanced SBR systems meeting the Euro NCAP requirements [1]. For the front seat passengers the reminder effectiveness is comparable [2]. As seat belt reminders have such a significant impact on the belt wearing rates, the large majority of NCAP programs have decided to introduce incentives for front seat SBR systems into their rating. These incentives were very successful in motivating the vehicle manufacturers worldwide to fit SBRs in an increasing number of vehicle models [3]. In addition to the front seat SBR systems with audiovisual warnings, more simple systems had been developed for the rear seats, providing the driver with visual information on the buckle status on the rear seats. However, the effectiveness of those simple systems is limited as they are highly dependent on the driver response to the information. In 2014, a first car with an advanced seat belt reminder system also providing an audiovisual warning to the rear seat occupants entered the Japanese market. This paper describes the motivation behind this development, as well as the challenges that had to be solved with regards to occupant detection on the rear seats.

MOTIVATION FOR ADVANCED REAR SEAT SBR

Subaru's roots go back to an aircraft manufacturer, so safety is one of the company's core values. In the domain of active safety, Subaru has proven this philosophy with its award-winning EyeSight technology, which was the first system ever to use only stereo camera technology to support functionalities like Adaptive Cruise Control, Lane Departure Warning and Autonomous Emergency Braking.
But also in the area of passive safety, Subaru identified additional road safety potential, aiming to reduce the number of vehicle occupant fatalities, namely by increasing the seat belt wearing rates on the rear seats. Although belt usage on rear seats has been mandatory since 2008, the rear belt wearing rates tend to be low in Japan, resulting in easily preventable occupant injuries and fatalities. Advanced seat belt reminder systems have

proven to be effective in raising the belt wearing rates on the front seats, but no such system had ever been implemented on a vehicle's rear seats. One key component for such a system, a rear seat occupant detection sensor simply did not yet exist.
In a joint development effort, Subaru and sensing system specialist IEE created the world's first advanced rear seat SBR system for a production vehicle, the Subaru LEVORG, launched in 2014. The expectation is that the system will increase the belt wearing rates, thus reducing the number of injuries or fatalities in Subaru vehicles.

Rear Seat Belt Wearing Rates

Seat belt wearing rates on the rear seats are lower than those for the front seats in all countries for which data is available. The reasons for this difference in belt usage behaviour are manifold, possible contributing factors are:

- rear seat occupants feel safer because of the backrest in front of them
- belt usage on the rear seats was mandated much later than for the front seats, so fewer people have acquired the habit to use the seat belt on the rear bench
- a lower enforcement level by police, also because belt usage is more difficult to verify
- unavailable or less effective seat belt reminders

Seat belt wearing data from Japan for front and rear seat vehicle occupants is shown in Figure 1 for the time frame 2005 to 2014. It shows the data for public highways (cities and rural roads). Additional data had been collected for express highways [4]. The belt wearing rates are highest for the driver (driver SBR fitment has been mandatory in Japan since 2005), closely followed by the front passenger. Belt wearing rates for the rear seat occupants are much lower, only about 1/3 (35.1 %) of the rear passengers buckle up on public highways. On express highways the belt usage increases to 70.3%, but is still far below the front seat usage rates. Seat belt usage on the rear seats was made mandatory in 2008, which explains the significant increase in the belt wearing rate for that year.

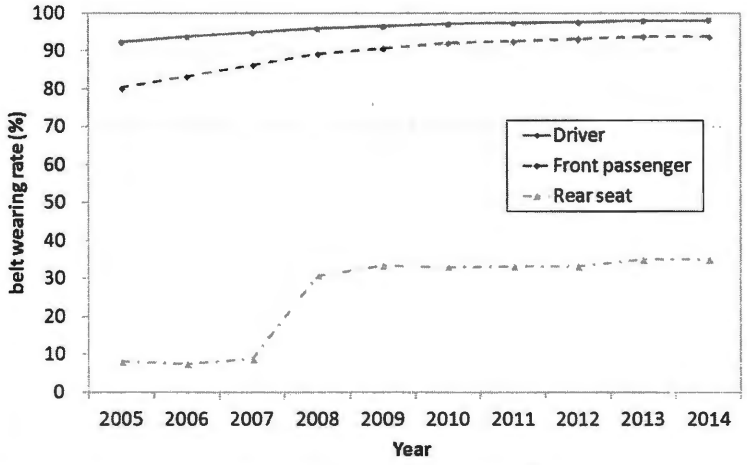

Figure 1. Seat belt wearing rates in Japan on public highways.

Rear seat belt usage in the US [5] is also lower than for the front seats, as shown in Figure 2. However, the difference is less important than in Japan. At 75%, the rear seat belt wearing rate in the US is only about 10% lower than the one for the front seats, while in Japan the rear seat usage rate is about 60% lower compared to the front seats. However, it should be noted that front seat belt usage in Japan (driver 98%, front passenger 94%) is about 10% higher than in the US (86%).
The US data also allows the analysis of rear seat belt usage by age group. The lowest belt wearing rate can be found for the age group teenagers and young adults (age 16 – 24), where only 67% buckle up, compared to the overall average of 75% belt users. The highest belt use can be found for children aged 8 to 15 (83%) and occupants aged 70 and higher (80%).

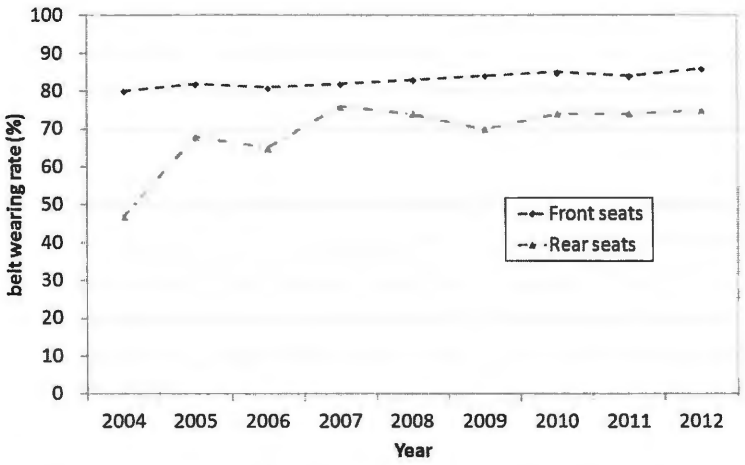

Figure 2. US seat belt wearing rates for front and rear seat occupants.

In Europe, large differences in rear seat belt usage can be found when comparing the different countries [6]. While the belt wearing rates of the rear seat passengers tend to be high with more than 80% for the Western and Northern European countries, much lower belt use is observed in most Eastern and Southern European countries.

Table 1. Front and rear seat belt use rates for a selection of European countries.

Country	Belt use - front seat	Belt use - rear seat
Austria	89%	75%
Belgium	86%	80%
Czech Republic	97%	66%
France	98%	84%
Germany	98%	98%
Greece	71%	21%
Italy	60%	50%
Poland	80%	43%
Spain	91%	81%
UK	95%	89%

In Korea, belt usage on the rear seats is significantly lower than on the front seats [7]. Only 19% of the rear seat occupants are belted, versus 84% of the front seat occupants.

Rear Seat SBR Effectiveness

The simple monitoring of the rear seat belt buckle status only allows for visual information to the driver and optionally the rear seat passengers at vehicle start. A brief audible warning can only be triggered if there is a "change of status", i.e. if a belted rear seat occupant unbuckles during the trip. The lack of a continuous audible alert limits the effectiveness of those simple systems.

Very little data is available on the effectiveness of such SBR systems. In a comment to NHTSA in 2010 [8], Volvo stated: *"...Volvo surveyed Volvo owners in Sweden and Italy in 2005. The survey clearly demonstrated that the belt usage rate in the rear seat, with the monitoring system as compared to without belt reminders, had increased from around 60% to around 82%"*. This would correspond to a reminder effectiveness of approximately 50%.

A laboratory study was conducted in Japan in 2012 [9], comparing the effect of various optical and audible SBR warnings on the belt use of rear seat passengers. Table 2 summarises the most important study results. The initial belt wearing rate without SBR warning was 38%. When an optical warning was only presented to the driver, who then reminded the rear seat passengers, the belt use increased to 56%. When both, driver and rear seat passengers were presented with an optical warning, the usage rose to 72%. And when an audiovisual

warning was used, 97% of the rear seat passengers buckled-up. So audiovisual SBR warnings motivated up to 95% of the initially non-belted rear seat occupants to buckle up. For visual-only warnings the effectiveness was limited to 50% (in line with the Volvo data above).

Table 2. Belt wearing rates for various SBR warning systems.

		Rear seat passenger information		
		No SBR information	Ceiling icon, blinking with frequency change, no audible signal	Ceiling icon, blinking with frequency change, audible signal with frequency change
Driver information	No SBR information	38 %	-	-
	Meter cluster icon, blinking with frequency change, no audible signal	56 %	72 %	-
	Meter cluster icon, blinking with frequency change, audible signal with frequency change	-	-	97 %

As the first vehicle with an advanced rear seat SBR system only entered the market in Japan in June 2014, no field-data is available with regards to its effectiveness in increasing the belt wearing rates. But the laboratory study indicates a clear trend with regards to the effectiveness of various warning strategies.

OCCUPANT DETECTION SENSOR DEVELOPMENT

Occupant detection on the rear seat can be achieved in principle in a similar way as on the front seat, a foil-based pressure sensitive sensor, integrated between seat foam and trim, is activated by the occupant's weight. However, some rear seat peculiarities have to be taken into consideration. The rear bench is often used to transport various objects, child restraint systems (CRS) are predominantly installed there, and the backrest can be folded down. For those scenarios sensor activation has to be prevented. In addition, the occupant himself often has a higher freedom of movement on the rear seat compared with the front seat, due to missing or less distinct side bolsters. Therefore sensor design and size have to be adapted to the specific rear bench needs.

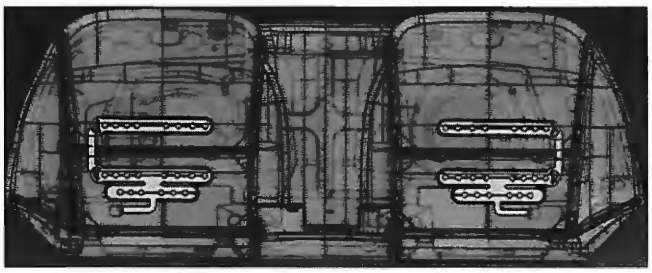

Figure 3. Top view onto rear bench with occupant detection sensors on outboard positions.

A dedicated test matrix has been developed to ensure robust sensor performance for occupant detection and object non-detection. Typically occupant detection has to be guaranteed for a 5% female, but also smaller occupants like young teenagers can be taken into consideration. Occupancy detection tests are performed with occupants of the specified size and weight. In addition to the nominal seating position, testing includes some forward and lateral position shifts. Non-detection is among others tested with beverage packs, rice and potato bags and a multitude of child restraint systems. In particular ISOFIX CRS with an integrated harness should not actuate the sensor, as those don't require the 3-point seat belt of the car to fix the CRS or to secure the child. Another non-detection test puts some weight onto the folded backrest to simulate a heavy trunk load.

A rear seat specific sensor layout and an IEE patented interconnection of the sensor's pressure sensitive cells allows the differentiation of the pressure profiles typically generated by humans from those generated by CRS or other test matrix objects. Figure 4 shows pressure profiles of a 5% female and various CRS, recorded with a high resolution pressure sensitive mat on a front passenger seat. The pressure distribution looks similar on the outboard rear seats. Although CRS or other objects can also exercise some load on the area usually covered by a human buttock, a smart senor design can almost entirely exclude unnecessary SBR warnings. For objects that are heavy enough to nevertheless activate the sensor, it is recommended to secure them with the belt or to load them into the trunk, as otherwise they are a potential danger for vehicle occupants if there is a crash.

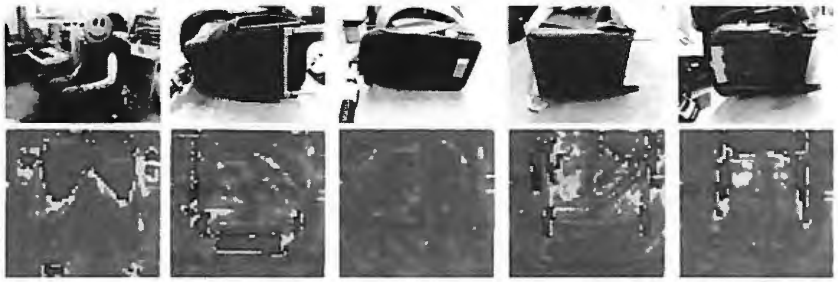

Figure 4. High resolution pressure profiles of human and CRS on a vehicle seat.

The system integrated into the Subaru model "LEVORG" has occupant detection only on the outboard seating positions. A system covering three positions on the rear bench is under development in order to cover all seating positions with an advanced seat belt reminder function.
The current system has the sensors and buckles connected to the car's wire harness via cables and connectors. For vehicles with highly flexible seat configurations or removable seats, a wired system layout could be considered a limiting factor. Therefore a wireless prototype concept has been developed by IEE to address those concerns. It is based on the same communication technology as currently used by tire pressure monitoring or keyless-go systems. A serial feasibility evaluation for the wireless system, as well as other occupant detection technologies that could be used for rear seat passenger detection, is currently under investigation.

EXISTING AND FUTURE NCAP INCENTIVES

NCAP star ratings for a vehicle only have real-life relevance if occupants are belted during a collision. A five star car can only provide a "five star protection" if the occupants are buckled-up. That was the motivation for many NCAP programs to promote effective seat belt reminder systems, with a focus for the front seats. Several NCAP programs have now started to perform crash tests with adult dummies on the rear seats. One aim is to motivate the vehicle manufacturers to make restraint system technology that's widely available for the front seats, like belt tensioners and load limiters, also available on the rear seats in a larger number of vehicle models. However, as for the front seats, the rear seat occupants can only benefit from those improved belt systems if they are buckled up. Hence the NCAP programs have an increasing interest to promote more efficient SBR systems for the rear seat, especially taking into consideration the generally lower belt wearing rates on the rear compared to the front seats.

Japan NCAP

When Japan NCAP introduced an overall rating scheme in 2011, SBR points became part of the evaluation. Since then, the overall rating score has been based on the sum of three elements: occupant protection (up to 100 points), pedestrian protection (up to 100 points) and seat belt reminder (up to four points for the front passenger seat and up to four points for the rear seats) [10].
J-NCAP was the first NCAP program to create an incentive for advanced seat belt reminders on the rear seats. Simple buckle monitoring only systems limited to telltale/display-type information are awarded with a maximum of two points, with the score depending on display location and its visibility to the occupants. Two additional points can be scored if the rear SBR alert includes an audible warning of at least 30 seconds. Such a warning, however, can only be triggered if passenger presence information is available.
The Subaru LEVORG is the first car where such an advanced SBR functionality will be assessed for the rear outboard seating positions, and it is expected to score between 3.0 and 3.33 points for the rear SBR system (official results not yet published at paper deadline).

Euro NCAP
Euro NCAP was the first NCAP to introduce SBR bonus points in 2002. Their SBR protocols evolved over time, and currently two combined points are available for advanced SBR systems covering both front seats, and one point for the buckle monitoring variant on the rear seats. The Euro NCAP protocol recommends occupant detection on the rear seats, but does so far not require it.
In its "2020 Roadmap" [11] Euro NCAP announced to introduce incentives for advanced rear seat SBR systems in 2018. Out of 2 points available for rear seat SBR, 1.5 points will be available for the buckle monitoring function (all rear seats), and 0.5 point will be allocated to additional occupant detection covering the 2nd row outboard seating positions, enabling an advanced reminder function.

Australasia NCAP
Australasia NCAP has announced it will fully harmonise with the Euro NCAP rating from 2018 on, so advanced rear seat SBR systems will become rating relevant in Australasia NCAP too.

Other NCAPs
Some NCAPs are now about to introduce incentives for the simple rear SBR systems into their rating (Korea NCAP in 2015, ASEAN NCAP in 2017, Latin NCAP – year to be confirmed). It can be assumed that incentives for more advanced systems will follow a couple of years later.

CONCLUSIONS AND RECOMMENDATIONS

The relatively simple rear seat SBR systems so far used in cars, warning only via telltale or text message, have a limited effectiveness on increasing the belt wearing rate. Now the time has come to extend the concept of advanced SBRs to the rear seats and to address the issue of occupant detection in an environment with a higher variability than on the front seats.

Driven by Subaru's safety strategy and Japan NCAP incentives, a first vehicle model with an advanced rear seat SBR system has entered the Japanese market. Occupant detection sensors, dealing with the specific needs of the rear seat environment have been developed by IEE.

Although field data on the effectiveness of an advanced rear seat SBR system is not yet available, a laboratory study on various rear seat SBR variants and the proven effectiveness for front seat occupants raise the expectation that rear seat belt wearing rates, typically much lower than those for the front seats, can be increased significantly.

And with NCAPs worldwide increasingly addressing the safety of rear seat occupants, it makes sense that they also create incentives for systems that ensure high belt wearing rates for those occupants. Euro NCAP and Australia NCAP will follow Japan NCAP, and start rewarding advanced rear seat SBR systems from 2018 on. By achieving higher belt wearing rates in combination with improved rear seat restraint systems one can expect to achieve additional road safety benefits in the future.

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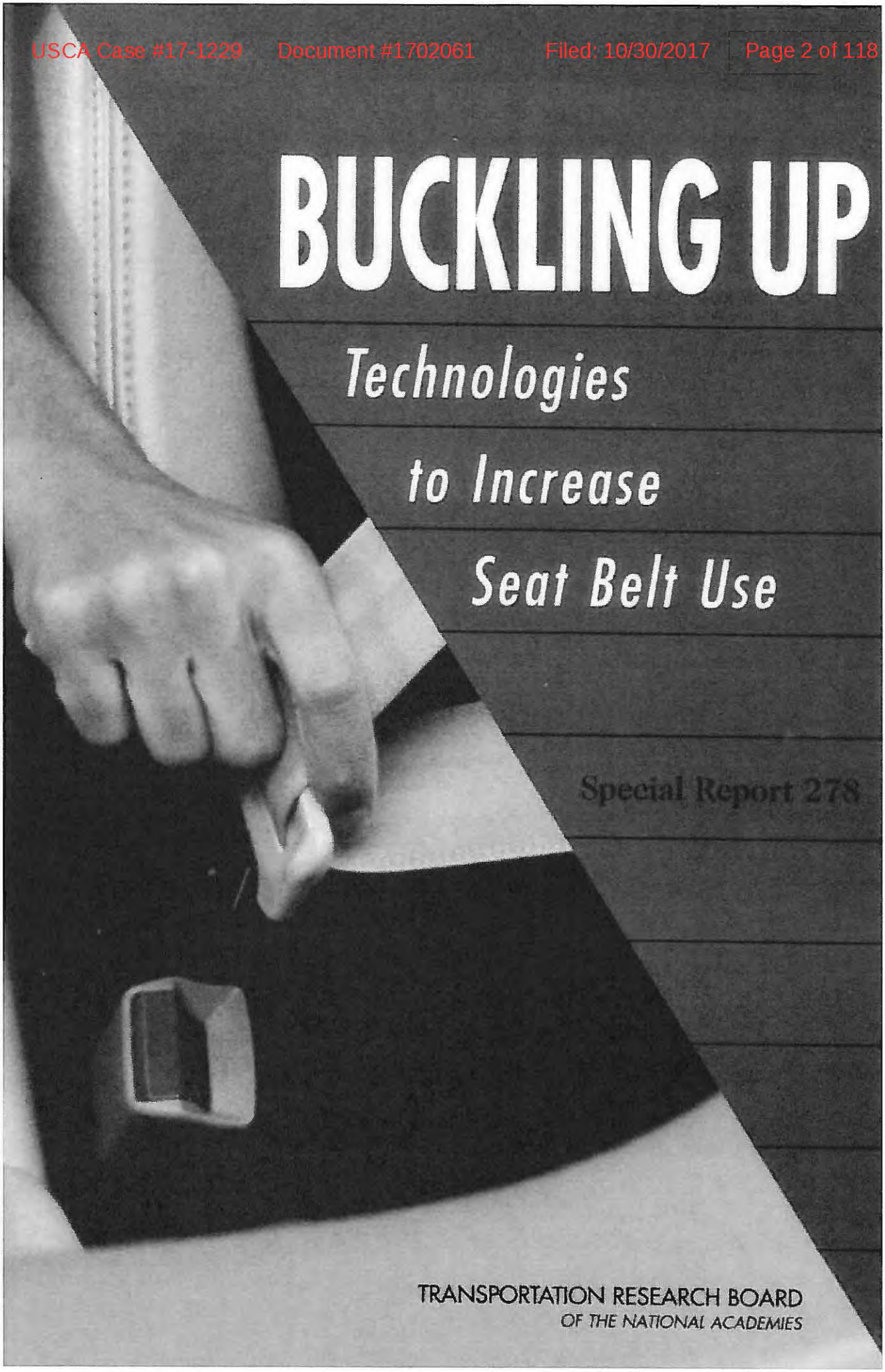
PETITIONERS' EXHIBIT I



BUCKLING UP

Technologies to Increase Seat Belt Use

Special Report 278

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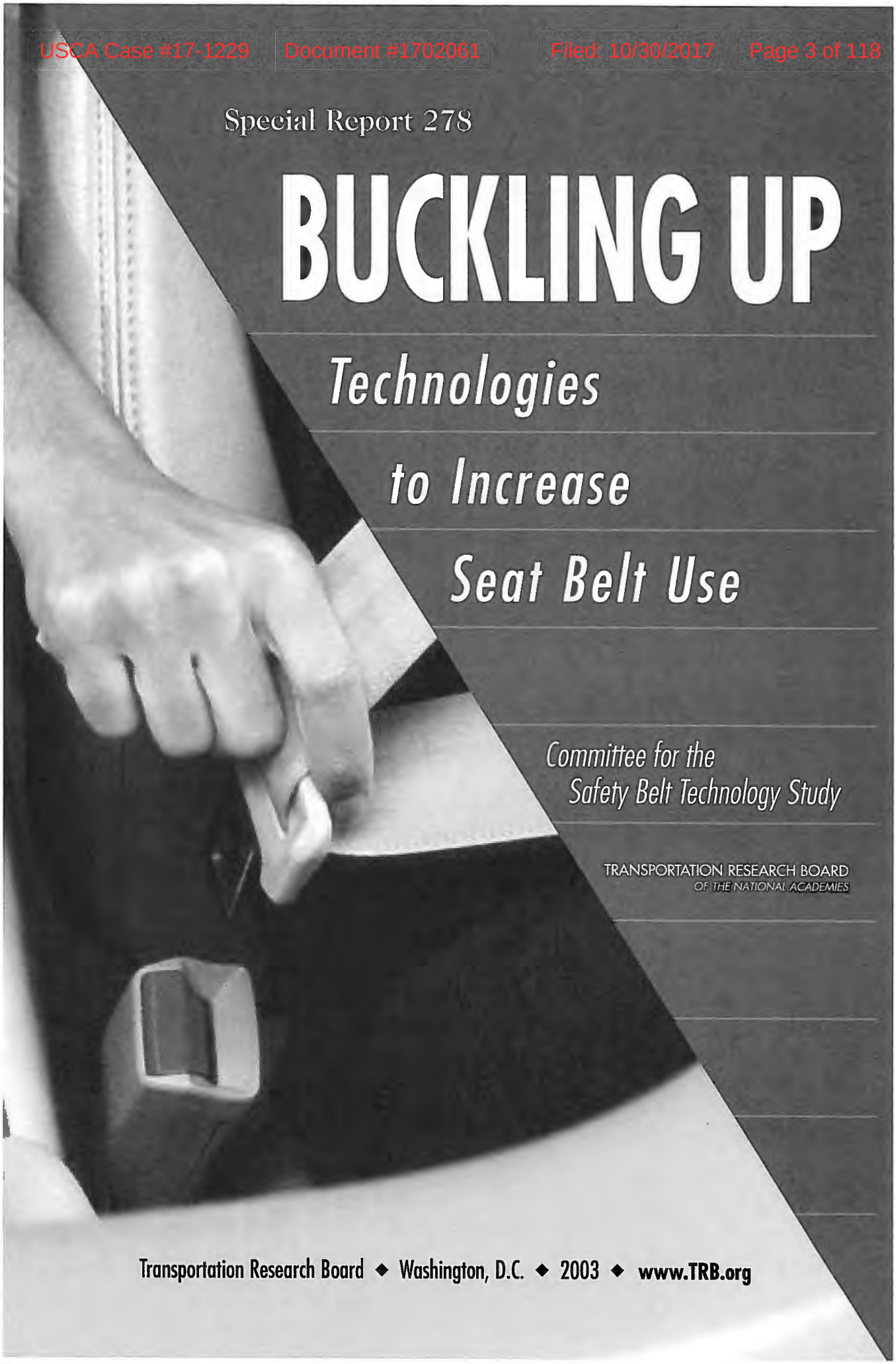

Committee for the
Safety Belt Technology Study

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NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competencies and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to the procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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COMMITTEE FOR THE SAFETY BELT TECHNOLOGY STUDY

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PREFACE

Increasing seat belt use is one of the most effective and least costly ways of reducing the lives lost and injuries incurred on the nation's highways each year, yet about one in four drivers and front-seat passengers continues to ride unbuckled. Congress requested this study to examine the potential of in-vehicle technologies to increase belt use.

In response to this request, the Transportation Research Board (TRB) of the National Research Council (NRC) formed a panel of 12 experts chaired by William C. Howell, Adjunct Professor at Arizona State and Rice Universities. Panel members have expertise in the areas of automotive engineering, design, and regulation; traffic safety and injury prevention; human factors; survey research methods; economics; and technology education and consumer interest.

The panel is aware of the breadth of approaches that have been introduced over the years by the federal government, states, safety groups, and the private sector to increase seat belt use and vehicle occupant safety more generally. Strategies have included efforts to educate the public about the benefits of seat belts; technological approaches that attempted to force motorists to buckle up (such as ignition interlocks that prevented cars from starting unless front-seat occupants were belted); the provision of automatic protection (through automatic belts and supplemental protection through air bags); and enactment of state seat belt use laws and targeted enforcement programs requiring motorists to buckle up. Other approaches have focused on improving seat belt design and comfort to encourage belt wearing. This report does not attempt to address these important topics in any depth, although it does include discussion of those relating directly to the congressional charge. For example, the report touches on the temporary federal requirement for vehicle ignition interlocks as well as on strategies of the states to increase the wearing of safety belts through laws mandating their use. The national experience with air bags—both those required by regulation and those available as consumer options—is not addressed. The committee views air bags and seat belts as complementary strategies to improve occupant safety. The regulations governing air bags, their effectiveness alone and in combination with belts, and the controversies

surrounding their introduction and subsequent revisions in the regulations governing their use, however, go well beyond the scope of this committee's charge to concentrate on emerging technologies, such as belt reminder systems, that offer potential for further gains in seat belt use.

As an important input to the study, the National Highway Traffic Safety Administration (NHTSA)—the study sponsor—funded and conducted interviews and focus groups of samples of different belt user groups to learn more about the potential effectiveness and acceptability of technologies ranging from seat belt reminder systems to more aggressive interlock systems that prevent putting the vehicle in gear unless the driver and front-seat passengers are buckled up. In particular, the committee thanks Roger Saul, Nathaniel Beuse, and Richard Compton of NHTSA; Roger Kurrus, a consultant previously with NHTSA; and Jonathan Bentley of Equals Three Communications for providing timely and useful empirical results to enhance the data available to the committee.

The committee also supplemented its expertise by holding its second meeting in Dearborn, Michigan, where it met in proprietary sessions with several of the major automobile manufacturers, a key supplier, and a small business inventor of a shifter interlock system to learn of planned new seat belt use technologies as well as about company data concerning their effectiveness and acceptability. The committee thanks Scott Schmidt of the Alliance of Automobile Manufacturers, Michael Cammisa of the Association of International Automobile Manufacturers, and George Kirchoff of the Automotive Occupant Restraints Council for helping organize the meeting. It also thanks the following individuals for their briefings: Robert Lange, James Khoury, Patricia Featherstone, Joseph Fitzsimmons, and Stephen Gehring of General Motors Corporation; Michael Berube, Barry Felrice, Kristen Kreibich-Staruch, Randy Edwards, and Dirk Ockel of DaimlerChrysler; Chris Tinto, Christina Mullen, and Ted Koase of Toyota Motor Corporation; James Boland, Peter Ducharme, Thomas Falahee, Scott Gaboury, David Kizyma, and James Vondale of Ford Motor Company; Ingrid Skogsmo of Volvo; Orlando Robinson and Joseph Price of D&D Innovations, Inc.; Wendell Lane and Michael Moore of Breed Technologies, Inc.; and Aki Yasuoka

of Honda and Frank Kiiskila of Autoliv, who provided written responses to the committee's questions following the meeting.

The committee thanks the Chief Counsel of NHTSA, Jacqueline Glassman, who provided the agency's current interpretation of the regulations concerning seat belt use technologies at the committee's third meeting, and Rebecca MacPherson, Senior Counsel at NHTSA, who prepared the supporting documentary materials.

Finally, the committee acknowledges Anders Lie of the Swedish National Road Administration, who provided valuable information on EuroNCAP policies related to belt reminder systems, and Paul Schockmel of International Electronics Engineering, a major manufacturer of sensor systems, for his information on automotive applications.

The report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that assist the authors and NRC in making the published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. The committee thanks the following individuals for their participation in the review of this report: Paul Green, University of Michigan, Ann Arbor; Henry Jasny, Advocates for Highway and Auto Safety, Washington, D.C.; Craig Newgard, Oregon Health and Science University, Portland; James Nichols, NHTSA (retired), Vienna, Virginia; David F. Preusser, Preusser Research Group, Inc., Trumbull, Connecticut; Kenneth Stack, General Motors Corporation (retired), Stanwood, Michigan; and Cheryl Stecher, Franklin Hill Group, Santa Monica, California.

Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the committee's conclusions or recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by Elsa Garmire, Dartmouth College, Hanover, New Hampshire, and Lester A. Hoel, University of Virginia, Charlottesville. Appointed by NRC, they were responsible for making certain that an independent examination of

the report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Nancy P. Humphrey managed the study and drafted major sections of the final report under the guidance of the committee and the supervision of Stephen R. Godwin, Director of Studies and Information Services. Michelle M. Crowder drafted sections of Chapter 2 of the report, which summarize what is known about the characteristics of those who do not wear seat belts and the potential effectiveness of technologies that could influence their propensity to buckle up. Suzanne Schneider, Associate Executive Director of TRB, managed the report review process. Special appreciation is expressed to Norman Solomon, who edited the report under the supervision of Nancy A. Ackerman, Director of Publications. Amelia Mathis assisted with meeting arrangements and communications with committee members.

CONTENTS

Executive Summary

Using seat belts is one of the most effective strategies available to the driving public for avoiding death and injury in a crash (Dinh-Zarr et al. 2001, 48). Today, however, nearly 35 years after the federal government required that all passenger cars be equipped with seat belts, approximately one-quarter of U.S. drivers and front-seat passengers are still observed not to be buckled up (Glassbrenner 2002, 1). Nonusers tend to be involved in more crashes than belt users (Reinfurt et al. 1996, 215), and belt use is lower—about 40 percent for drivers—in severe crashes (O'Neill 2001). Moreover, at observed national belt use rates of 75 percent, the United States continues to lag far behind the 90 to 95 percent belt use rates achieved in Canada, Australia, and several northern European countries.

Convincing motorists to buckle up is a top priority of the National Highway Traffic Safety Administration (NHTSA) as it looks for ways to reduce the 42,000 deaths and more than 3 million injuries that occur each year on U.S. highways (NHTSA 2002a). NHTSA is urging industry to deploy vehicle-based technologies, such as seat belt reminder systems, to encourage further gains in belt use, but the agency is prohibited from requiring such technologies by federal legislation dating back to 1974. A brief history of the events leading up to this action and its impact on technology introduction today are provided in a subsequent section.

Congress requested the present study[1] to

- Examine the potential benefits of technologies designed to increase belt use,
- Determine how drivers view the acceptability of the technologies, and
- Consider whether legislative or regulatory actions are necessary to enable their installation on passenger vehicles.[2]

[1] The request was contained in Conference Report 107-308 to accompany Appropriations for the Department of Transportation and Related Agencies for fiscal year 2002, June 22, 2001 (see Appendix A). Given the nature of the charge, the committee did not analyze other strategies for increasing seat belt use, such as seat belt use laws, enforcement, and fines.

[2] Passenger vehicles include cars and light-duty trucks driven for personal use (i.e., sport utility vehicles, vans, and pickup trucks).

In short, congressional interest in this study is focused on an assessment of the potential for technology to increase seat belt use and the extent to which federal laws and regulations pertaining to these technologies may inhibit their introduction.

BENEFITS OF SEAT BELT USE

Properly used seat belts are one of the most effective measures for reducing death and injury on the highway (Dinh-Zarr et al. 2001, 48). Buckling up can reduce the risk of fatal injury for drivers and front-seat occupants of passenger cars involved in crashes by about 45 percent. The fatality reduction for front-seat belt wearers in light trucks is 60 percent (Kahane 2000, 28–29). Moreover, seat belts reduce the risk of moderate-to-critical injury in crashes by 50 percent for passenger vehicle occupants and by 65 percent for light truck occupants (NHTSA 2002b).[3]

NHTSA estimates that approximately 147,000 lives were saved between 1975 and 2001 because of seat belt use (NHTSA 2002b). If current belt nonusers in passenger vehicles buckled up, thousands of deaths and hundreds of thousands of injuries could be prevented each year at an estimated societal savings of $26 billion in medical care, lost productivity, and other injury-related costs (Blincoe et al. 2002, 55). Because of the proven effectiveness of seat belts, measures to encourage further belt use would have big payoffs. NHTSA estimates that a percentage point increase in belt use would result in 250 lives saved per year (Glassbrenner 2002, 1). As the pool of nonusers shrinks, more lives are saved for each incremental point increase in belt use. The reason is that those most resistant to buckling up tend to exhibit other high-risk behaviors (e.g., alcohol use, speeding) and are more frequently involved in crashes (Blincoe et al. 2002, 53).

Seat belt use is also cost-effective. The marginal monetary cost of seat belt use is zero because all U.S. passenger vehicles are required to be equipped with seat belts. The marginal nonmonetary costs are modest. They include the time and effort required to buckle up and, for some, the discomfort of wearing the belt.

[3] Air bags supplement seat belts in providing protection. Air bags alone are 10 percent and 14 percent effective in reducing deaths and injuries, respectively (NHTSA 1999 in Dinh-Zarr et al. 2001, 48). Between 1987 and 2001, approximately 8,400 lives were saved by air bags (NHTSA 2002b, 3).

REASONS FOR BELT NONUSE

If seat belts are so effective, why don't more motorists buckle up? Unlike air bags or automatic restraint systems, manual belts require action on the part of drivers and passengers. Reasons for not using belts stem from a complex mix of situational, habitual, and attitudinal factors.

Many drivers and vehicle occupants report that they would like to be wearing a seat belt in a crash but have not acquired the habit of buckling up on all trips. For this group (referred to hereafter as "part-time users"), belt use is situational; they tend to buckle up when the weather is poor or when they are taking longer trips on high-speed roads where they perceive driving as riskier. In surveys, these users report that the primary reasons for their not buckling up are driving short distances, forgetting, being in a hurry, or discomfort from the belt (Block 2001, v).

In contrast, the much smaller group of motorists who never or rarely use their belts—the so-called "hard-core nonusers"—report negative attitudes toward seat belts as the primary reason for nonuse. These include discomfort, unfounded claims that belts are dangerous in a crash (e.g., could trap the driver in the vehicle), infringement of personal freedom and resentment of authority, and the attitude that they "just don't feel like wearing them" (Block 2001, v).

According to NHTSA's most recent telephone survey on occupant restraint issues (Block 2001, 12), one-fifth of drivers can be characterized as part-time users, that is, they report using their belts most or some of the time, and about 4 percent as hard-core nonusers, those who report never or rarely using their belts.[4] The latter group is small but has a high crash risk. Unbelted drivers have significantly more traffic violations, higher crash involvement rates, higher arrest rates, and higher alcohol consumption than those who buckle up all or part of the time (Reinfurt et al. 1996).

The distinction between these two groups is important from the perspective of technology effectiveness and acceptability. If, in fact, the majority of belt nonusers are aware of the benefits of seat belts but have not

[4] As discussed in more detail in Chapter 2, these categorizations are approximate. For example, 83 percent of drivers reported wearing their seat belts "all the time." However, 8 percent of these full-time users reported in a follow-up question that they had not worn their seat belts while driving at some time during the past week (Block 2001, 24).

developed the habit of belt use in all situations, their behavior may be amenable to a belt reminder system. However, more aggressive systems may be needed to reach the small group of hard-core nonusers.

OVERVIEW OF STRATEGIES FOR INCREASING BELT USE

The history of NHTSA's approach to occupant protection is instructive in understanding the agency's current policies and regulatory constraints, particularly as they apply to the use of technology to increase seat belt use.

Comprehensive automobile safety legislation in 1966 established the federal role in highway safety regulation. Federal Motor Vehicle Safety Standard (FMVSS) 208, which required the installation of lap and shoulder belts in all new passenger vehicles,[5] was one of the 19 original safety standards put in place by the newly created National Highway Safety Bureau (Kratzke 1995, 1).[6] It soon became apparent, however, that motorists would not use the belts voluntarily with much regularity. Thus, the renamed National Highway Traffic Safety Administration began promoting so-called "passive restraint systems," primarily air bags but also automatic belt systems (Kratzke 1995, 1).

Negative public and political reaction to such systems, stemming in part from their early stage of development, led NHTSA in 1972 to provide manufacturers with an alternative—a required 60-second flashing light and buzzer system to remind motorists to buckle up (Robertson 1975, 1320). Soon thereafter, the agency required that, effective August 15, 1973, all passenger vehicles not providing automatic protection be equipped with an interlock system, which prevented the engine from starting if any front-seat occupant was not buckled up. The interlock requirement was intended as an interim measure to increase belt use until acceptable automatic systems became available (Kratzke 1995, 2).

With seat belt use rates of only 12 to 15 percent (Haseltine 2001), no laws requiring belt use, lap and shoulder belt systems that many mo-

[5] The standard has been upgraded to require that all new passenger vehicles be equipped with three-point belt systems that integrate lap and shoulder belts in a single detachable unit.

[6] The National Traffic and Motor Vehicle Safety Act of 1966 intended that safety standards not depend on current technology and could be "technology forcing" in the sense of inducing the development of superior safety design (Motor Vehicle Manufacturers Association *v.* State Farm Mutual Automobile Insurance Company, 463 U.S. 29, 49, 1983).

torists found clumsy and uncomfortable to wear, and unreliable occupant sensing systems, it is hardly surprising that the ignition interlock requirement met almost immediately with strong public and political opposition. Although by some reports belt use rates soared to about 60 percent immediately following the installation of interlock systems, some motorists learned to disable the system, and others began to complain to their elected representatives (Kratzke 1995, 3). One year after the interlock requirement took effect, Congress enacted legislation prohibiting NHTSA from requiring either ignition interlocks or continuous buzzer warnings of more than 8 seconds.[7] The agency revised FMVSS 208 accordingly, retaining a requirement for only a 4- to 8-second warning light and buzzer[8] of similar duration that is activated when front seat belts are not fastened at the time of ignition. This standard still applies today (*Federal Register* 1974, 42,692–42,693).

Following the interlock requirement interdiction, NHTSA's focus returned to passive restraint systems. In 1984, then Secretary of Transportation Elizabeth Dole crafted a final rule providing for a phase-in of air bags and automated belts, but with the possibility of rescinding this requirement if, by 1989, two-thirds of the nation's population was covered by state-mandated seat belt use laws meeting NHTSA's requirements (Kratzke 1995, 8). The deadline was not met, but seat belt use laws were rapidly introduced and have proved to be one of the most effective approaches for increasing belt use (Dinh-Zarr et al. 2001, 48). Today, all states except New Hampshire have belt use laws that apply to adults, and observed use rates have grown from about 14 percent in 1984 to about 75 percent today (Figure ES-1), largely the result of laws coupled with well-publicized enforcement (O'Neill 2001).[9] Over the past decade, however, the rate of belt use gains has slowed, in part because of the reluctance of many states to promote enforcement through

[7] Motor Vehicle and Schoolbus Safety Amendments of 1974, Public Law 93-492, 15 USC 1410b, October 27, 1974.

[8] According to NHTSA's Chief Counsel, the requirement extends to other audible alerts. At the time, buzzers were the predominant, if not the only, audible signals used by manufacturers who were certifying their vehicles as compliant with the audible alert option (letter from NHTSA to Dr. William Howell, April 3, 2003, Docket No. 15156-3).

[9] Most states, for example, conduct month-long, federally supported seat belt campaigns, dubbed "Click It or Ticket," typically in May and November each year. These campaigns involve increased enforcement of seat belt use laws and high-visibility targeted advertising (*AASHTO Journal* 2003, 16).

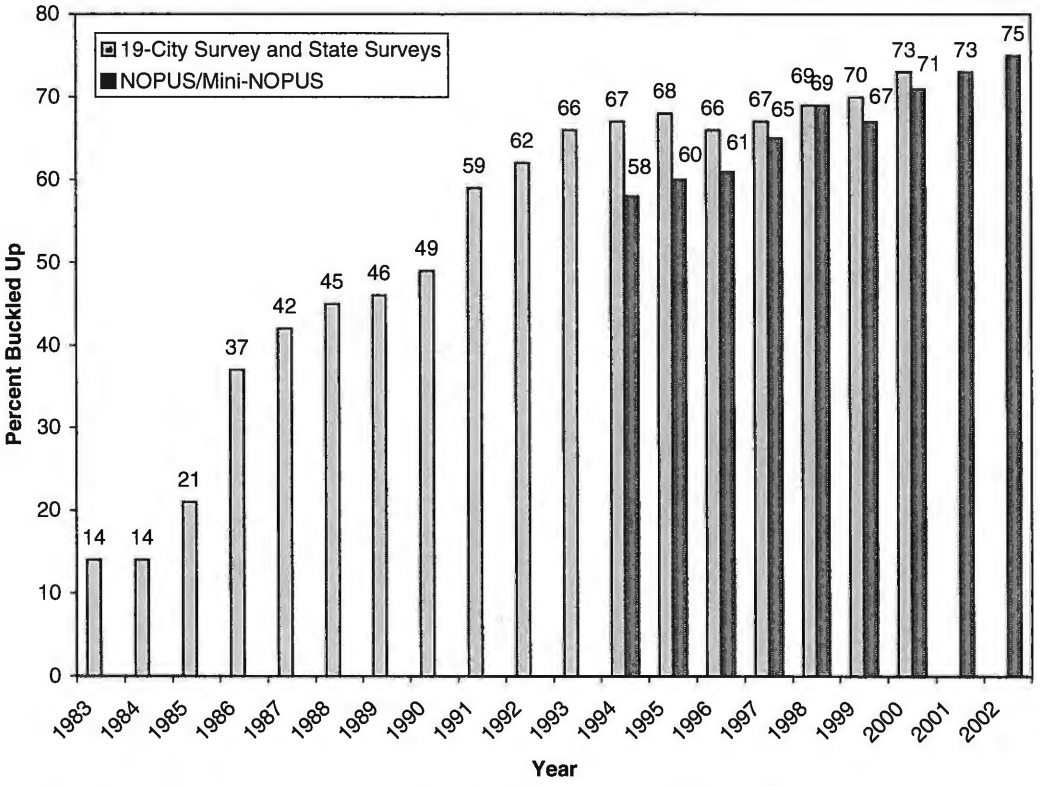

Figure ES-1 U.S. observed seat belt use. [Sources: NHTSA, 1983–1990: 19-City Survey; 1991–2000: State Surveys; 1994–2002: National Occupant Protection Use Survey (NOPUS)/Mini-NOPUS.]

"primary" seat belt use laws (i.e., those that specify failure to buckle up as the sole justification needed to stop and ticket a motorist).[10] The slower rate of progress also reflects the difficulty of convincing the remaining group of nonusers to buckle up.

TECHNOLOGY REVISITED

Congress and NHTSA have expressed interest in the potential of technology to increase seat belt use. While current federal law prohibits NHTSA from mandating in-vehicle seat belt use technologies other than

[10] The majority of states still have "secondary" seat belt use laws, which allow a police officer to issue a citation for belt nonuse only after the motorist has been stopped for another reason (Glassbrenner 2002, 5). The United States is the only country with secondary laws.

the limited 4- to 8-second reminder system, manufacturers are not prevented from voluntarily adopting such technologies, including interlocks. However, the U.S. automobile industry has been wary of pursuing aggressive approaches, such as those specified in the NHTSA prohibition, for both perceived legal and marketing reasons. Nevertheless, Ford Motor Company has initiated a technology enhancement with the introduction of its BeltMinder™ (a registered company trademark) now on all Ford vehicles—a system of warning chimes and flashing lights that operates intermittently for up to 5 minutes to alert and remind the unbelted driver to buckle up. NHTSA Administrator Dr. Jeffrey Runge urged other manufacturers to follow Ford's lead.[11] Many have responded with plans to deploy enhanced belt reminder systems—technologies that go beyond the NHTSA-required 4- to 8-second reminder—in the United States, with introductions to be phased in during the 2004–2005 model years. All the planned systems include light and chime components but vary in their loudness, urgency, and duration.

In Sweden, Australia, and Japan, where belt use rates are substantially higher than in the United States, enhanced belt reminder systems are being tested and put in vehicles to help persuade the small remaining group of belt nonusers, who are overrepresented in severe crashes, to buckle up. Technological solutions were thought to hold more promise than additional public information campaigns and enfocement efforts (Larsson 2000, 1–2). The European consumer information New Car Assessment Program—EuroNCAP—has established protocols for such systems and rewards manufacturers who meet them with higher safety ratings.[12] No manufacturers are currently developing interlock systems, although General Motors is working with a small business, D&D Innovations, Inc., to make available a seat belt shifter lock as an aftermarket option in the United States.

Clearly, today's environment is far more conducive to the successful introduction of technologies for increasing seat belt use than was that of the early 1970s with respect to both technological advances and driver behavior. Belt use is compulsory in all but one state, belt use rates are

[11] Letters dated February 25, 2002, and March 24, 2003.

[12] The most recent specifications can be found in the EuroNCAP Belt Reminder Protocol, Doc 61b, Version November 2002.

significantly higher, belts are better designed, and sensing technologies are more sophisticated and reliable. Nevertheless, the pace and type of technology introduction continue to be affected by the interlock experience. While sympathetic to NHTSA's appeal for enhanced belt use technologies, the industry is understandably sensitive to the implications of overly aggressive and costly systems that are poorly accepted by potential customers. And for its part, NHTSA is still prohibited by Congress from mandating more aggressive technologies.

STUDY APPROACH

In view of the history of seat belt use technology development in the United States, the successful introduction of new technologies is likely to depend on a careful balancing of system effectiveness and acceptability. "Effectiveness" is typically measured as the increase in belt use attributable to a technology. Since belt use is clearly correlated with fatality and injury reduction, it serves as a reasonable proxy for these consequences (which are not currently available in sufficient numbers to provide statistically reliable measures). "Acceptability" is closely related to effectiveness in that motorists are inclined to resist, by one means or another, any technology that they find excessively intrusive. And if they defeat it by disabling, selective purchasing, or political action (as they did in the early 1970s), a technology's actual effectiveness may reduce to zero no matter what its potential safety impact might be. Hence to be effective, a seat belt use technology must be sufficiently intrusive to prompt motorists to act, but not so intrusive that it exceeds their threshold for tolerance.

The available technologies can be ordered logically according to degree of intrusiveness. They range from belt reminder systems that provide a minimal visual and auditory prompt to buckle up, to demanding ones that are more insistent and persistent, to interlock systems that simply prohibit the unwanted behavior (e.g., the unbelted driver is unable to shift the car into gear). As a general principle, which is corroborated by the evidence in Chapter 4, the more intrusive the system, the less acceptable it is likely to be to motorists. That said, it is important to note that acceptability is not an issue for the majority of drivers who are

habitual seat belt users and thus will never or rarely experience the intervention, no matter how intrusive it is.

The study committee investigated what is known about both the effectiveness and the acceptability of seat belt use technologies. It reviewed the available literature, held closed-session briefings with key automobile manufacturers and suppliers, and reviewed the results of in-depth interviews and focus groups conducted by NHTSA for this study.[13] Interviews were thought to be more useful than a large population survey because demonstration of the technologies with follow-up questions would provide more valid data than asking hypothetical questions to respondents unfamiliar with the devices. The objective of the in-depth interviews and focus groups was to obtain a greater understanding of the perceived effectiveness and acceptability of four technologies that were judged to span a wide range of intrusiveness—from the Ford BeltMinder, to a more aggressive Saab prototype belt reminder system (where the chime increases in intensity with vehicle speed), to an entertainment interlock (which prevents playing the radio or stereo unless belts are buckled), to a transmission interlock (which prevents putting the vehicle in gear unless belts are buckled). The results show a convergence of responses that are indicative of the likely consumer reaction to new seat belt use technologies. Finally, the committee was briefed by the NHTSA Chief Counsel in an effort to learn to what extent the agency views the current statutory and regulatory restrictions on seat belt use technologies as impediments to their introduction in the marketplace.

FINDINGS

New seat belt use technologies exist that present opportunities for increasing belt use without being overly intrusive. The current NHTSA-required belt reminder has proved ineffective in further increasing belt use (Westefeld and Phillips 1976, 2). There is no scientific basis for the 8-second maximum duration of the system. Many motorists—the

[13] One hundred six in-depth interviews of 89 part-time users and 17 hard-core nonusers each were conducted in Phoenix, Arizona; Portsmouth, New Hampshire; and St. Louis, Missouri. In addition, four focus groups for a total of 35 full-time users were held in St. Louis. Participants were limited to those who had purchased a vehicle within the previous 12 months or intended to purchase one within the next year, and thus may not be typical of the general population.

majority of whom do not buckle up until some time after starting their vehicles (70 percent according to General Motors' survey data)—report that they ignore the chime, simply do not hear it over the radio, or have forgotten it by the time they are backing down the driveway, and that they could use a stronger reminder to buckle up. In contrast, the results from the NHTSA interviews conducted for this study and the manufacturer briefings suggest that motorists would be aware of and heed the characteristics of enhanced belt reminder systems now being introduced by industry. More important, although the results are based on a limited sample, many part-time users interviewed by NHTSA—the primary target group for the technology—were receptive to the new systems. Nearly two-thirds rated the reminders "acceptable," and approximately 80 percent thought that they would be "effective."

Preliminary research on the only system currently deployed in the United States—the Ford BeltMinder—found a statistically significant 7 percent increase in seat belt use for drivers of vehicles equipped with the Ford system compared with drivers of unequipped late-model Fords (Williams et al. 2002, 295).[14] The results were gathered in two Oklahoma locations and provide a snapshot of belt use behavior, but they are suggestive of the potential benefits of enhanced belt reminder systems. A subsequent study in Boston of drivers with BeltMinder-equipped Ford vehicles found that, of the two-thirds who activated the system, three-quarters reported buckling up and nearly half of all respondents said their belt use had increased (Williams and Wells 2003, 6, 10).

According to the automobile manufacturers and suppliers, enhanced belt reminder systems can be provided at minimal cost for front-seat occupants because of the availability of sensors that can detect the presence of front-seat occupants for advanced air bag systems.[15] Rear-seat systems appear costly compared with front-seat systems because of the absence of rear-seat sensors on many vehicles, installation complexities (e.g., removable seats, child seats), and low rear-seat occupancy rates. However, lower-cost systems that alert the driver when rear-seat occu-

[14] Belt use was 76 percent for drivers in vehicles equipped with the BeltMinder compared with 71 percent for drivers in vehicles without the reminder system—a 7 percent increase and a 5 percentage point gain.

[15] The committee was provided with more specific cost data in the briefings, but the manufacturers indicated that the data are proprietary.

pants have not buckled up or have unbuckled their belts during a trip are currently available on some vehicles in Europe. The risks posed to all vehicle occupants by unbelted rear-seat occupants, particularly in more severe crashes, suggest that the benefits of full-scale rear-seat reminder systems could be significant (Ichikawa et al. 2002). Furthermore, recent efforts by NHTSA and industry to encourage parents to place their children in rear seats away from front-seat air bags has increased parental interest in systems that monitor belt use in rear seats.

Transmission interlock systems are perceived to be highly effective—more than 85 percent of all respondents to the NHTSA interviews and focus groups rated them effective. However, fewer than half rated them acceptable. The highest percentage of respondents who rated the transmission interlock not acceptable—71 percent—came from the small group of hard-core nonusers. Objections to the entertainment interlock, which was thought to be most effective for younger drivers, were weaker among full-time users and even among the hard-core nonusers. This result can be attributed in part to the fact that the system would not be experienced by some people (e.g., older people who do not use the radio, drivers on short trips) or could be circumvented (e.g., by installing an aftermarket stereo). Part-time users, who found the entertainment interlock slightly more objectionable than the transmission interlock, were the exception.

Interlock systems could be engineered to avoid many motorists' objections. For example, they could be designed to enable drivers to start their cars without buckling up and to drive in reverse and perhaps at low speeds to accommodate the majority of drivers who do not buckle up before starting their vehicles. However, the negative reaction indicated by the NHTSA interviews and focus groups and the hesitancy of industry to reintroduce interlock systems for the general driving public suggest that, for the moment, their use be considered only for certain high-risk groups (e.g., drivers impaired by alcohol, teenage drivers) who are overrepresented in crashes.

The current legislation prohibiting NHTSA from requiring new seat belt use technologies other than the ineffective 4- to 8-second belt reminder is outdated and unnecessarily prevents the agency from requiring effective technologies to increase belt use. Seat belt use has grown fivefold since 1974. Many more motorists now recognize the benefits of

seat belts and appear to be receptive to their use. However, NHTSA does not currently have the legislative authority to establish performance standards to encourage development of minimum performance criteria for the most effective systems or to require them to be sold in the U.S. market.

RECOMMENDATIONS

On the basis of its findings, the committee reached consensus on the following recommendations:

1. **Congress should amend the statute regarding belt reminder systems by lifting the restrictions on systems with lights and chimes longer than 8 seconds, which would provide NHTSA more flexibility and the authority to require effective belt reminder technologies.** At this time, the committee does not see any compelling need to delete the prohibition on requiring interlock systems. However, this subject should be revisited in 5 years (see Recommendation 8).
2. **Every new light-duty vehicle should have as standard equipment an enhanced belt reminder system for front-seat occupants with an audible warning and visual indicator that are not easily disconnected. Any auditory signal should be audible above other sounds in the vehicle. For the short term, manufacturers should be encouraged to provide these systems voluntarily** so that field experience can be gained concerning the absolute and differential effectiveness and acceptability of a range of systems. Those who rate vehicles—NHTSA, the Insurance Institute for Highway Safety, Consumers Union—should be urged to note those vehicles that have belt reminder systems in their consumer safety rating publications.
3. **NHTSA should encourage industry to develop and deploy enhanced belt reminder systems in an expeditious time frame, and NHTSA should monitor the deployment. As differences in effectiveness and acceptability of belt reminder systems are identified, manufacturers should install systems that are determined by empirical evidence to result in the greatest degree of effectiveness while remaining acceptable to the general public. Should voluntary efforts not produce sufficient results, NHTSA should mandate the most effective acceptable**

systems as determined by the current data. The agency should also conduct studies to identify factors that will increase the effectiveness and acceptability of the systems.

4. **Rear-seat reminder systems should be developed at the earliest possible time as rear-seat sensors become available,** to take advantage of the benefits of restrained rear occupants to the safety of both front- and rear-seat occupants. Until that time, manufacturers should provide systems that notify the driver if rear-seat occupants either have not buckled up or have unbuckled their belts during a trip.
5. **NHTSA and the private sector should strongly encourage research and development of seat belt interlock systems for specific applications.** For example, the courts should consider requiring the use of interlocks for motorists with driving-under-the-influence-of-alcohol convictions or with high numbers of points on their driver's licenses. Interlocks could also be made available for other high-risk groups, such as teenage drivers. Insurance companies could lower premium rates for young drivers who install interlock systems. Finally, interlocks could be installed on company fleets.
6. **Seat belt use technologies should be viewed as complementary to other proven strategies for increasing belt use, most particularly enactment of primary seat belt use laws that enable police to pull over and cite drivers who are not buckled up and well-publicized enforcement programs.** Seat belt use technologies have the potential to increase belt use, but their effect is largely confined to new vehicle purchasers, whereas seat belt use legislation affects all drivers.
7. **Congress should provide NHTSA with funding of about $5 million annually[16] to support a multiyear program of research on the effectiveness of different enhanced seat belt reminder systems.** NHTSA should coordinate its efforts with other federal agencies, such as the Centers for Disease Control and Prevention, that are conducting related research. The research could involve undertaking more

[16] The committee developed the $5 million estimate for the cost of this research in consultation with NHTSA staff and consultants, who, together, have been involved in many similar efforts to estimate the effectiveness of various motor vehicle safety features. Although the figure is not intended to be precise, it should be about the right amount given the complexity of the proposed activities and NHTSA's extensive experience in conducting such evaluations.

comprehensive studies of the effects of belt reminder systems on belt use; conducting controlled fleet studies of aggressive reminder systems; gathering more survey data on the effectiveness and acceptability of belt reminder systems from existing NHTSA and public health sources; and examining design issues, such as loudness of the chime, desirability of muting the radio when the chime is sounding, duration and cycling of the systems, and the presence and design of any cutoff capability. This research should help establish the scientific basis for regulation of belt reminder systems should regulation be needed.

8. **In 2008 another independent review of seat belt use technologies should be conducted to evaluate progress and to consider possible revisions in strategies for achieving further gains in belt use, including elimination of the statutory restriction against NHTSA's requiring vehicle interlock systems.**

The benefits of enhanced seat belt use technologies could be significant. If increases in belt use rates on the order of 7 percent (or 5 percentage points) found in the initial evaluation of the Ford BeltMinder could be achieved nationally, a minimum of 1,250 additional lives could be saved annually, according to NHTSA estimates (Glassbrenner 2002, 1), once all passenger vehicles have been equipped with enhanced belt reminder systems. These figures do not include the potential lives saved from the installation of reminder systems for rear seat belts or the hundreds of thousands of injuries that could also be prevented each year. The modest additional costs of installing the systems, particularly once sensor systems are available for all seating positions, and the annual $5 million cost of conducting the recommended multiyear research program, constitute a small price to pay for the lives saved and the hundreds of thousands of costly injuries prevented.

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Abbreviations

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NHTSA	National Highway Traffic Safety Administration

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1

INTRODUCTION

Seat belts have proved to be one of the most effective safeguards against death and injury in a vehicle crash (Dinh-Zarr et al. 2001, 48). Efforts to encourage seat belt use span 30 years, yet in 2002 approximately one-quarter of U.S. drivers and front-seat passengers were still observed not to be buckled up (Glassbrenner 2002). The number was considerably higher for drivers with a high risk of crash involvement; nearly 60 percent of drivers in high-speed fatal crashes were unrestrained despite the fact that drivers and passengers can reduce their risk of dying in a crash nearly by half simply by buckling up (O'Neill 2001). U.S. belt use rates are substantially lower than in many other industrialized nations. Canada, many northern European countries, and Australia can document belt use rates that exceed 90 percent (O'Neill 2001).

Making further gains in U.S. belt use poses a considerable challenge. The proven safety benefits, better design, and especially laws combined with aggressive enforcement have contributed to increased belt use. Nevertheless, on average, one in four drivers and passengers continues to ride unbuckled. Consequently, technological approaches for changing motorists' behavior are currently being explored. In legislation passed in December 2001, Congress requested that the National Highway Traffic Safety Administration (NHTSA) contract with the Transportation Research Board to undertake a study to consider whether newly developed vehicle technologies may present opportunities for increasing seat belt use without being overly intrusive.[1]

The study charge comprises three tasks:

- Examine the potential benefits of technologies designed to increase belt use,
- Determine how drivers view the acceptability of the technologies, and
- Consider whether legislative or regulatory actions are necessary to enable their installation on passenger vehicles.

[1] The request was contained in Conference Report 107-308 to accompany Appropriations for the Department of Transportation and Related Agencies for fiscal year 2002, June 22, 2001 (see Appendix A).

The scope of the study is further limited in the following ways. First, the congressional request is focused on passenger vehicles only, which include cars and light-duty trucks driven for personal use (i.e., sport utility vehicles, vans, and pickup trucks). Second, the focus is on technologies in new vehicles and new car buyers, although aftermarket devices are considered. This has implications for belt use gains because many new car drivers already buckle up (Williams et al. 2002, 295). Third, issues of belt comfort and convenience and perceived effectiveness are considered as factors affecting belt use. However, belt design is considered to be outside the study scope. Finally, although the study committee recognized the wide range of other strategies for increasing belt use, it did not attempt to analyze them in any depth. Congressional interest in this study is focused on an assessment of the potential for technology to increase seat belt use and the extent to which federal laws and regulations pertaining to these technologies may inhibit their introduction.

SEAT BELT EFFECTIVENESS

Use of seat belts is the single most effective means of reducing fatal and nonfatal injuries in motor vehicle crashes (Dinh-Zarr et al. 2001, 48). NHTSA estimates that approximately 147,000 lives were saved between 1975 and 2001 because of seat belt use (NHTSA 2002b, 2). However, failure to buckle up continues to result in thousands of deaths and hundreds of thousands of injuries each year at an estimated societal cost of $26 billion in medical care, lost productivity, and other injury-related costs (Blincoe et al. 2002, 55).

Seat belts protect vehicle occupants during a crash in two ways. They reduce the frequency and severity of occupant contact with the vehicle's interior, and they prevent ejection from the vehicle (Evans 1991, 232). Specifically, when a crash occurs, occupants are traveling at the vehicle's original speed at the moment of impact. Seat belts help prevent occupants from rapid and penetrating contact with the steering wheel, windshield, or other parts of the vehicle's interior immediately after the vehicle comes to a complete stop, reducing the fatalities and injuries caused by this "second collision." Seat belts also protect occupants from ejection, one of the most severe events that can occur in a

crash. Nearly half of the reduction in fatality risk from using seat belts in cars and light trucks can be traced to the prevention of ejection from vehicles (Evans 1991, 247).

In all types of crashes involving passenger cars, seat belts reduce the risk of fatal injury for drivers and front-seat passengers by about 45 percent; in light trucks, the reduction is about 60 percent (Kahane 2000, 28).[2] Moreover, seat belts reduce the risk of moderate-to-critical injury by 50 percent in crashes for passenger vehicle occupants and by 65 percent for light truck occupants (NHTSA 2002b, 1).[3] Belt use by rear-seat occupants is also beneficial, not only for the rear-seat passengers but also for the driver and front-seat passengers. A Japanese study of crashes resulting in occupant injury found that unbelted rear-seat occupants increase the risk of death for belted front-seat occupants by nearly fivefold. The increased risk of injury comes from unbelted rear-seat occupants, who are thrown forward into the back of the front seat with immense force in a crash (Ichikawa et al. 2002, 43). An earlier study also found that unbelted rear-seat occupants increase the fatality risk to front-seat occupants by nearly 4 percent in all crashes, and by nearly 30 percent in severe frontal crashes (Park 1987, 13). The adverse effect of unbelted rear-seat occupants is presumably attributable to the increased loading force that they impose on front-seat occupants in a crash (Park 1987, 1).

Even a small increase in belt use should have large benefits. NHTSA estimates that a percentage point increase in belt use results in 250 lives saved per year (Glassbrenner 2002, 1). Research on the characteristics of seat belt nonusers suggests that the benefits could be higher, because many of those who refrain from buckling up tend to exhibit other high-risk behaviors (e.g., alcohol use, speeding) and are more frequently involved in crashes (Haseltine 2001).

[2] Three-point seat belts, which integrate lap and shoulder belts in a single nondetachable unit, provide good protection in frontal crashes (50 and 53 percent fatality reduction in cars and light-duty trucks, respectively) and in rear-impact crashes, particularly for light-duty trucks (56 and 81 percent fatality reduction, respectively) (Kahane 2000, 28). Three-point belts offer more limited protection for cars (21 percent fatality reduction) than for light-duty trucks (48 percent fatality reduction) in side-impact crashes, reflecting greater compartment intrusion to cars in such crashes where belts are unable to prevent fatalities (Kahane 2000, 29). The highest level of protection afforded by three-point belts for both cars and light-duty trucks is for prevention of occupant ejection in rollover crashes where vehicle rollover is the primary crash event (74 and 80 percent fatality reduction, respectively) (Kahane 2000, 28).

[3] Air bags supplement seat belts in providing protection. Air bags alone are 10 percent and 14 percent effective in reducing deaths and injuries, respectively (NHTSA 1999 in Dinh-Zarr et al. 2001, 48). Between 1987 and 2001, approximately 8,400 lives were saved by air bags (NHTSA 2002b, 3).

STUDY CONTEXT

Introduction of Seat Belts

Seat belts first became standard equipment for the driver and front-seat occupants in 1964 in response to state laws (O'Neill 2001). Then, in 1966, the National Traffic and Motor Vehicle Safety Act authorized the federal government to establish national safety standards for motor vehicles and created a new agency, subsequently known as NHTSA, to carry out this function.[4] Federal Motor Vehicle Safety Standard (FMVSS) 208 was one of the original 19 safety regulations. It required that, effective January 1, 1968, all new cars be equipped with both lap belts and shoulder harnesses in the front outboard seating positions and lap belts in other seating positions (Kratzke 1995, 1).[5] In 1973 the federal standard was upgraded to require three-point belt systems that connect the shoulder to the lap belt for the front seating positions (O'Neill 2001).

Despite the requirement that vehicles be equipped with seat belts, belt use was low. According to an observational survey of drivers, lap belt use alone ranged from 9 to 16 percent for 1968 to 1971 model-year (MY) vehicles; shoulder and lap belt use ranged from 1 to 6 percent for the same MY (Robertson et al. 1972). Although some efforts were made to educate drivers about the benefits of belt use, studies by NHTSA and the Insurance Institute for Highway Safety indicated that educational efforts alone were not effective in increasing belt use (O'Neill 2001; States 1973, 434–435). Thus, NHTSA turned to technological solutions to boost belt use.

Seat Belt Ignition Interlock

The primary focus of the newly created National Highway Traffic Safety Administration was on passive restraint systems—primarily air bags, but also automatic seat belts (Kratzke 1995, 2). These systems would

[4] For a short period (1967 to 1970), all highway safety activities were merged under a single entity, the National Highway Safety Bureau within the Federal Highway Administration (FHWA). The Federal-Aid Highway Act of 1970 elevated the bureau to a separate administration independent of FHWA named the National Highway Traffic Safety Administration (TRB 1990, 52).

[5] The National Traffic and Motor Vehicle Safety Act of 1966 intended that safety standards not depend on current technology and could be "technology forcing" in the sense of inducing the development of superior safety design (Motor Vehicle Manufacturers Association v. State Farm Mutual Automobile Insurance Company, 463 U.S. 29, 49, 1983).

automatically protect vehicle occupants, hence the term "passive restraints." Both technical and political factors delayed their introduction. Thus, on January 1, 1972, as an alternative to passive restraints, NHTSA required that all cars manufactured for sale in the United States be equipped with a flashing light and buzzer seat belt reminder system, which activated continuously for at least 1 minute if the vehicle was placed in gear and the driver or front outboard passenger was not belted (*Federal Register* 1971, 4601). Soon thereafter, NHTSA required that, effective August 15, 1973, all new cars not providing automatic protection be equipped with an ignition interlock that prevented the vehicle from starting if the driver or front-seat passengers were not buckled up (*Federal Register* 1973). The interlock requirement was intended as an interim measure to increase belt use until acceptable automatic systems became available (Kratzke 1995, 2).

The interlock immediately boosted belt use rates, but some motorists found the system intrusive and learned to disconnect it. In response to numerous complaints, Congress rescinded the interlock requirement 1 year later, in 1974. Legislation was passed[6] that prohibited NHTSA from issuing any future safety standard that required either an interlock system or a continuous buzzer warning that sounded for more than 8 seconds after the ignition was turned to the "on" or "start" position. NHTSA revised FMVSS 208 accordingly. The modified standard, which went into effect for cars produced after February 1975 and remains in effect today, requires manufacturers to provide a warning light of no more than 4 to 8 seconds that is activated when the ignition is turned on and a buzzer that sounds for the same duration unless the driver is belted.[7]

Seat Belt Use Laws

Following the interlock requirement interdiction, NHTSA returned its focus to passive restraints to encourage belt use. The history of this 15-year controversy is too lengthy to record here, but in 1984 a regulation was crafted by then Secretary of Transportation Elizabeth Dole that resulted in the phase-in of automatic protection systems—both passive

[6] Public Law 93-492, Sec. 109, Occupant Restraint Systems, October 27, 1974.

[7] Occupant crash protection, 49 C.F.R. § 571.208 (2001).

seat belts and air bags—but offered the possibility of rescinding the requirement if enough states enacted mandatory seat belt use laws that met NHTSA's regulatory criteria (Kratzke 1995, 8).[8] The regulation resulted in the phase-in of automatic protection systems—both passive belts and air bags. Air bags, in conjunction with manual lap and shoulder belts, proved to be more comfortable, effective, and popular with consumers. Automakers began switching from passive belts to air bags, which Congress ultimately mandated. The regulation also stimulated many states to pass seat belt use laws in what has proved to be one of the most effective approaches for increasing belt use (Dinh-Zarr et al. 2001, 48).

New York, in 1984, was the first state to enact seat belt use legislation. By 1992, largely in response to industry lobbying, 42 states and the District of Columbia had enacted belt use laws (Haseltine 2001). Observed belt use rates rose accordingly, from 14 percent in 1984 to 62 percent in 1992 (Figure 1-1). Today, all states except New Hampshire have belt use laws that apply to adults.[9] According to NHTSA's National Occupant Protection Use Survey (Glassbrenner 2002, 1), observed national belt use rates reached 75 percent in 2002. In the past decade, however, the rate of belt use gains has slowed (Figure 1-1), in part because of the reluctance of many states to promote enforcement through "primary" seat belt use laws (i.e., those that specify failure to buckle up as the sole justification needed to stop and cite a motorist).[10] The slower rate of progress also reflects the difficulty of convincing the remaining group of nonusers to buckle up.

TECHNOLOGY REVISITED

Since the interlock requirement interdiction nearly 30 years ago, the protection afforded by seat belts in crashes has become widely recognized, seat belt use laws are nearly universal, belt use rates have increased

[8] The 1984 amendment to FMVSS 208 required automobile manufacturers to install automatic restraint systems (air bags or automatic seat belts) unless two-thirds of the nation's population was covered by seat belt use laws (49 FR 28962).

[9] The majority of state laws cover seat belt use for the driver and front-seat occupants only. However, in 18 states, seat belt use laws cover all seating positions (NHTSA 2002a, 184).

[10] The majority of states (32) still have "secondary" seat belt use laws, which allow a police officer to issue a citation for belt nonuse only after the motorist has been stopped for another reason (Glassbrenner 2002, 5). The United States is the only country with secondary laws.

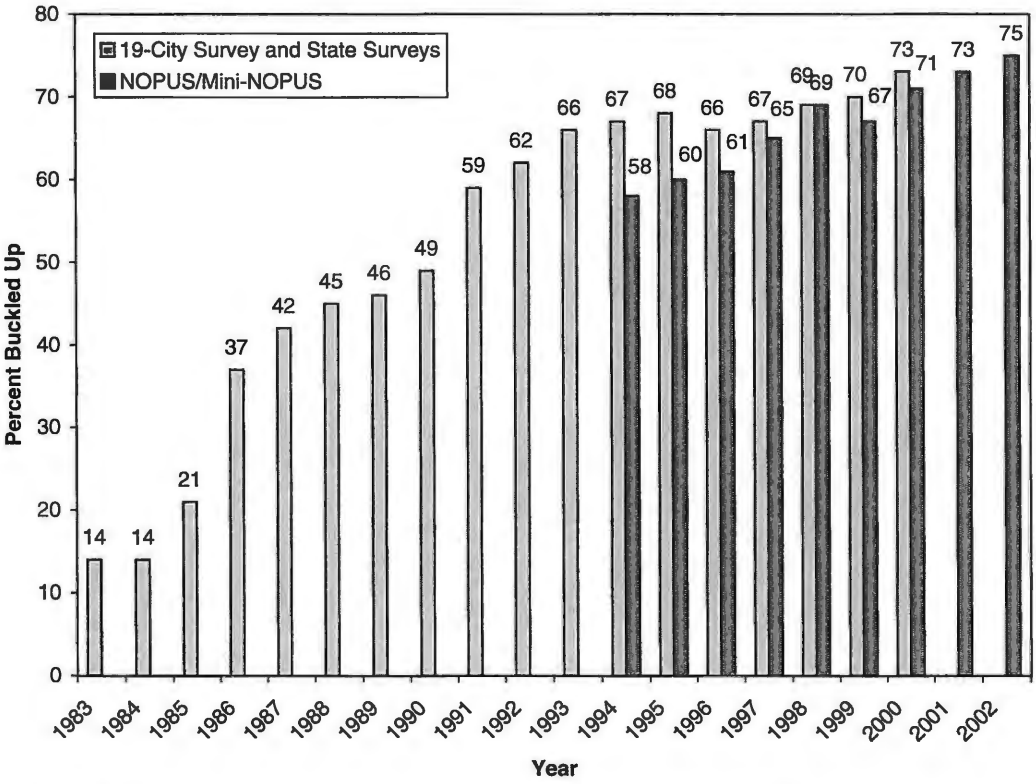

Figure 1-1 U.S. observed seat belt use. [Sources: NHTSA, 1983–1990: 19-City Survey; 1991–2000: State Surveys; 1994–2002: National Occupant Protection Use Survey (NOPUS)/Mini-NOPUS.]

sharply, and seat belts are better designed and more comfortable to wear. In addition, technologies that monitor the driver and make driving safer and easier are rapidly appearing on vehicles. They include intelligent cruise control and collision- and road departure–avoidance warning systems. Motorists are becoming accustomed to such technologies, and the cost of their installation is declining as sensors and other facilitating technologies are manufactured in volume.

In 1998, NHTSA was petitioned to mandate effective belt use technologies, such as belt reminder systems that go beyond the existing 8-second reminder.[11] However, NHTSA denied the petition, stating that

[11] Letter and Petition from Carl E. Nash, Ph.D., to Ricardo Martinez, M.D., Administrator, NHTSA, dated December 17, 1998.

it did not have the authority to require audible warnings outside the 8-second reminder (*Federal Register* 1999, 60,625).

Then, Ford Motor Company introduced an enhanced seat belt reminder system—a system that goes beyond the NHTSA-required 4- to 8-second belt reminder—for the U.S. market in selected MY 2000 passenger vehicles. Following the NHTSA-required 8-second reminder, the Ford BeltMinder™, a registered trademark of Ford Motor Company, resumes a warning chime and flashing light at approximately 65 seconds if the driver remains unbuckled while the engine is running and the vehicle is moving at more than 3 mph (4.8 km/h). The system flashes and chimes for 6 seconds; then it pauses for 30 seconds. This cycle repeats for up to 5 minutes. By MY 2002, all Ford vehicles were equipped with the enhanced belt reminder for the driver, with a phase-in for the right front-seat passenger starting with MY 2003 vehicles.

In February 2002, Dr. Jeffrey Runge, NHTSA Administrator, urged the automobile industry to follow Ford's lead and voluntarily introduce enhanced belt reminder systems and other appropriate technologies as an added incentive for motorists to buckle up.[12]

Belt reminder systems are also being developed for the European and Australian markets to convince remaining groups of belt nonusers in those markets to buckle up. The European New Car Assessment Program (EuroNCAP), which is modeled on a similar U.S. consumer safety rating program,[13] offers bonus points for vehicles equipped with belt reminder systems that meet certain performance criteria, thus providing a strong incentive for manufacturers to introduce effective technologies.

KEY STUDY ISSUES, DEFINITION OF TERMS, AND APPROACH

In light of the history of the 1970s interlock experience, a major goal of manufacturers is to introduce technologies that encourage seat belt use but that are acceptable to customers and will not be overly intrusive. Thus, the manufacturers are developing belt reminder systems for the new car market rather than more aggressive interlock technologies that

[12] Letters dated February 25, 2002, and March 24, 2003.

[13] NHTSA's NCAP program, begun in 1978, provides comparative information to consumers on crashworthiness of passenger vehicles.

interfere with vehicle operations. Nevertheless, for the purposes of this study, the full range of seat belt use technologies, from belt reminder systems to interlocks, is being considered.

The first two tasks of the committee are to consider what is known about the potential effectiveness and acceptability of the technologies. "Effectiveness" is typically measured as the increase in belt use attributable to a technology. Because seat belt use is clearly correlated with fatality and injury reduction, it serves as a reasonable proxy for these consequences (i.e., lives saved and injuries avoided), which are not currently available in sufficient numbers to provide statistically reliable estimates.

"Acceptability" is closely related to effectiveness, and they can be inversely related. For example, initially the 1973 ignition interlock was very effective in increasing belt use. However, consumers quickly learned to defeat the system, and Congress ultimately prohibited its installation in passenger vehicles. Thus, if a technology is so intrusive that a consumer is motivated to defeat it by disabling, selective purchasing, or political action (as in the 1970s), a technology's actual effectiveness may reduce to zero no matter what its potential safety impact might be. Although consumer acceptability is a concern, the vast majority of motorists today buckle up, in contrast to the 1970s, and should not even be aware of the new systems, particularly if they are engineered properly to reflect typical belt-buckling habits.[14]

The committee approached the first task of its charge—to determine the potential effectiveness of the technology—by reviewing the literature for studies of early experience (1970s) with belt reminder and interlock systems. It then examined more recent but limited field data on the effectiveness of current enhanced belt reminder systems. It also sought proprietary information directly from the major automobile manufacturers and suppliers by meeting with them about new belt system characteristics, plans for deployment, and industry assessments of system effectiveness.

[14] For example, research on buckling habits, which is discussed in greater detail in Chapter 4, suggests that the vast majority of drivers buckle up after starting the vehicle, even when it is first moving. Belt technologies should be designed to reflect these habits.

Data on likely consumer acceptance of new seat belt use technologies—the second task—were limited and dated. Thus, NHTSA conducted in-depth interviews of belt nonusers (i.e., those who reported not using seat belts all the time) especially tailored for this study to ascertain consumer views on the acceptability and potential effectiveness of technologies ranging from belt reminder to interlock systems. Focus groups of full-time belt users were also conducted to ensure that proposed technologies would not have unintended negative effects on those who consistently buckle up. NHTSA developed its approach after discussing various options for soliciting consumer response with the committee. Individual committee members commented directly on the study design, screening criteria, and interview and focus group guides. Finally, the committee requested market research data directly from the automobile manufacturers with regard to consumer acceptance of new seat belt use technologies.

To address the third task—to determine whether changes in regulation or legislation are necessary to facilitate introduction of effective technologies—the committee requested that NHTSA's Chief Legal Counsel provide the agency's current interpretation of the statutory and regulatory restrictions affecting both belt reminder and interlock systems.

ORGANIZATION OF REPORT

The remainder of this report elaborates the committee's findings from its investigation of each task of its charge. In Chapter 2, an overview is provided of what is known about the target group for seat belt technologies—belt nonusers—including key factors that affect belt use, and implications for current technology introduction are described. In Chapter 3, the history of the 1970s experience with belt reminder and interlock systems, as well as other key approaches for increasing belt use, are reviewed with an eye to what lessons can be brought forward to today. Chapter 4 is focused on current information concerning the potential effectiveness and acceptability of recently introduced seat belt use technologies. The results of the literature review, manufacturer briefings, and NHTSA interviews and focus groups conducted for this

study are summarized, and the implications for the introduction of belt use technologies are discussed. In Chapter 5, NHTSA's interpretation of the current statutory and regulatory prohibitions concerning the introduction of new seat belt use technologies is reviewed, and manufacturers' concerns are explored. The committee then provides its findings and recommendations concerning the role of technology in increasing belt use.

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Abbreviations

NHTSA	National Highway Traffic Safety Administration
TRB	Transportation Research Board

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2

SEAT BELT USE AND CHARACTERISTICS OF NONUSERS

Seat belt use technologies currently being introduced in passenger vehicles to induce greater belt use are targeted toward the approximately 25 percent of U.S. drivers and front-seat passengers who are observed not to be buckled up (Glassbrenner 2002, 1). In this chapter, what is known about the nonuser population and its various subgroups is reviewed. The literature and recent surveys on the characteristics associated with seat belt use are summarized, and the reasons and attitudes that underlie nonbuckling behavior are examined. In the final section, inferences are drawn concerning the potential for seat belt use technologies to induce the nonuser population to buckle up.

OVERVIEW OF SEAT BELT USE IN THE UNITED STATES

Sources of Information

The National Highway Traffic Safety Administration (NHTSA) conducts two surveys on seat belt use in the United States. The National Occupant Protection Use Survey (NOPUS), a probability-based observational survey of belt use by drivers and front-seat occupants of passenger vehicles, has been conducted annually since 1994. This survey provides nationally representative data on observed belt use in passenger vehicles and some demographic detail, such as belt use by race, ethnicity, and gender (Glassbrenner 2002, 13).[1] The companion Motor Vehicle Occupant Safety Survey (MVOSS), a telephone survey that provides self-reported information on belt use, has been conducted biennially since 1994.

NHTSA bases its estimates of national belt use on the observational data collected by the NOPUS. However, the survey is limited to observations of drivers and other front-seat occupants during daylight hours

[1] The NOPUS is conducted in two studies that provide different types of information. The Moving Traffic Study, conducted at random road sites at which traffic is typically in motion, provides a quick general assessment of belt and helmet use. The Controlled Intersection Study, conducted at intersections controlled by a stop sign or stoplight at which traffic is slowed or stopped, permits more detailed data collection. Both studies collect data during daylight hours on general roadways (Glassbrenner 2002, 13).

and thus is not necessarily representative of high-risk driving times when belt use may be lower (Glassbrenner 2002, 18). The NOPUS can distinguish only two groups—those who are wearing their belts at the time of observation and those who are not. Thus, observed users comprise full-time users and some part-time users who are buckled up at the time of observation. Observed nonusers comprise a mix of part-time users, who for whatever reason were not buckled up at the time of observation, and habitual nonusers.

In comparison, the MVOSS can distinguish many more belt use and nonuse categories through self-reported responses to the survey questions. However, NHTSA does not consider the MVOSS a good indicator of national belt use. Self-reported belt use rates from the telephone survey are typically about 10 percentage points higher than from the NOPUS (Glassbrenner 2002, 13). The difference reflects the well-established tendency for survey participants to give socially desirable rather than completely truthful answers. It also reflects a large number of part-time respondents, who typically consider themselves to be belt users. Nevertheless, the MVOSS is the only source of unobservable demographic and socioeconomic detail about belt nonusers and insights into the reasons why motorists do not always buckle up (Glassbrenner 2002, 13).

Both the NOPUS and the MVOSS were analyzed for this study to determine what is known about the target group for seat belt use technologies—in particular, the size and characteristics of various nonuser groups. In addition, the literature on seat belt use was reviewed, and interviews and focus groups were conducted by NHTSA especially for this study to explore motorists' behaviors and attitudes concerning belt use as well as reactions to seat belt use technologies.[2]

Estimates of Belt Use

The most recent NOPUS (2002) reported a 75 percent observed national belt use rate for drivers and front-seat occupants of passenger vehicles (Glassbrenner 2002, 1). Belt use rates vary widely by state. Washington, California, Puerto Rico, and Hawaii reported observed belt use rates of

[2] A more detailed discussion of the methodology for and results of these NHTSA-sponsored interviews and surveys is presented in Chapter 4.

90 percent or higher, while Massachusetts recorded an observed belt use rate of 51 percent, the lowest reported (Glassbrenner 2003b, 2). Belt use rates also differ by vehicle type. The 2002 NOPUS observed belt use rates of 77 percent for passenger vehicles and 78 percent for vans and sport utility vehicles. Belt use rates for pickup trucks lagged at only 64 percent (Glassbrenner 2002, 8).

The vast majority of drivers (83 percent) interviewed in the most recent MVOSS (2000) reported wearing their seat belts "all the time" while driving. Another 9 percent reported wearing their belts "most of the time" (Block 2001, 12). However, closer investigation found inconsistencies in the responses, suggesting that the categories of belt use are more fluid than the descriptors imply. For example, 8 percent of those reporting "all-the-time" use (6.64 percent of all respondents) immediately stated in a follow-up question that they had not worn their seat belts while driving at some time during the past week (Block 2001, 24). Four percent of drivers reported wearing their seat belts "some of the time," while few drivers acknowledged wearing their belts "rarely" (2 percent) or "never" (2 percent) (Block 2001, 12).

The literature on seat belt use typically distinguishes between belt users and nonusers. For the present study, belt users have been grouped into three broad classifications—full-time users, part-time users, and hard-core nonusers. Understanding the relative size and possible differences in attitudes and belt use behavior among different groups of nonusers in particular—the target group for seat belt use technologies—is important to determine their potential receptivity to the new technologies. On the basis of this classification system and data from the most recent MVOSS, 76 percent of drivers can be classified as full-time belt users, 20 percent as part-time users, and 4 percent as hard-core nonusers.[3]

Belt use by rear-seat occupants is not collected by the NOPUS. However, the MVOSS provides self-reported data on rear-seat belt use.

[3] For this classification using the MVOSS data, the full-time user group excludes the 8 percent who classified themselves as wearing their belts "all the time" but who then reported not wearing their belts while driving at some time during the past week (6.64 percent of all respondents). The part-time user group includes this 6.64 percent as well as the 9 percent who reported wearing their belts "most of the time," and the 4 percent who reported wearing their belts "some of the time" for a total of 20 percent. The hard-core nonuser group includes those who reported wearing their belts rarely (2 percent) or never (2 percent) (Block 2001, 12).

Whereas 83 percent of respondents reported wearing their belts "all the time" while driving and 80 percent reported wearing belts as front-seat passengers, only 49 percent reported buckling up when they sat in the rear seat (Block 2001, iv).

CHARACTERISTICS OF NONUSERS

According to the most recent MVOSS, the vast majority (87 percent) of respondents strongly agreed that they would want to be wearing a seat belt in a crash (Block 2001, 91). Even among hard-core nonusers, more than half (56 percent) strongly or somewhat agreed that they would like to be belted in a crash (Block 2001, 92). Similar attitudes were found in the NHTSA interviews and focus groups conducted for the current study. All part-time users and 67 percent of the hard-core nonusers agreed that they greatly or somewhat reduced their risk of injury by wearing a seat belt.[4] (Respondents to the NHTSA interviews and focus groups were classified into three groups. Full-time belt users were identified as those who responded that they forgot to wear their seat belts only once or twice or never in the past month. Hard-core nonusers reported never using a seat belt in the past month. All other respondents were classified as part-time users.) Despite positive attitudes toward belt use, many drivers and occupants continue to ride unbelted. Reasons for not using belts stem from a complex mix of habitual, situational, and attitudinal factors.

Overview of Reasons for Belt Nonuse

Seat belt use is often characterized as a habitual behavior rather than a conscious choice (Calisir and Lehto 2002, 802). Drivers simply follow rules they have developed on the basis of experience, rather than continuously comparing risks against benefits in deciding whether to buckle up. An individual may be triggered to buckle up by sitting in the car or driver's seat, or by some other aspect of driving (Harrison et al. 2000, 20). Similarly, nonusers have failed to develop belt-wearing habits or have

[4] Respondents were asked to indicate which of five possible responses they agreed with the most: (*a*) "I greatly reduce my risk of serious injury in a crash by wearing a seat belt," (*b*) "I somewhat reduce my risk . . . ," (*c*) "I neither increase nor reduce my risk," (*d*) "I somewhat increase my risk," and (*e*) "I greatly increase my risk."

developed a habit of nonuse (Harrison et al. 2000, 20). The habit of wearing a seat belt is learned and can be influenced by the behavior of others, including parents, peers, and children (Harrison et al. 2000, 19; Shinar 1993, 754).

Belt use may also be situational. This is particularly characteristic of part-time users, who may be cued to buckle up in some driving situations but not in others (Harrison et al. 2000, 20). Many part-time users interviewed by NHTSA for the current study and in earlier focus groups reported that they did not wear seat belts in what they considered low-risk situations (Bentley et al. 2003, 18; Bradbard et al. 1998, 12). These included short trips on familiar roads at relatively low speeds. However, these situational users tended to buckle up in poor driving conditions, such as bad weather; on longer trips involving high-speed driving on Interstates; and under congested conditions where other drivers could pose a danger (Bentley et al. 2003, 19–20).

Belt use behavior may also stem from attitudes and beliefs. Nonuse of seat belts has been related to risk-taking and other problem behaviors, such as substance abuse (Wilson 1990, 175). Many hard-core nonusers object to being forced to buckle up, believing that belt use should be a matter of personal choice (Bentley et al. 2003, 20).

Belt use is also affected by ease of use and comfort of the belt system. For example, pressure or pain from seat belts (e.g., the belt is too tight or it chokes) was reported in the most recent MVOSS as the most common complaint among those who disliked seat belts or found them annoying, particularly among women (Block 2001, 8). Fortunately, measures to improve the ease and comfort of belt use have been introduced in the passenger vehicle fleet. For example, in briefings and correspondence with the committee, two major suppliers of seat belts—Breed Technologies and Autoliv North America—noted that seat belts with height and tension adjustors and improved belt access and buckling mechanisms are already on the market.

The importance of habit, situation, attitudes, and comfort for belt use is borne out by the MVOSS and the NHTSA interviews conducted for the current study. In the most recent MVOSS (Block 2001, 62), the following were the most frequent reasons reported by drivers for not wearing a seat belt:

- Driving a short distance (59 percent),
- Forgetting to buckle up (53 percent),
- Being in a rush (41 percent), and
- Discomfort from the seat belt (33 percent).

Similar reasons for not using seat belts were reported in the NHTSA interviews. Drivers cited forgetfulness and laziness as important reasons for not buckling up. When probed, these respondents made it clear that this behavior was particularly evident when they were going on short trips or driving in familiar circumstances or at low speeds (Bentley et al. 2003, 18). Some explained that under these conditions they are not as focused on driving and tend to forget to buckle up. Others indicated that they did not see the need for buckling up in what they perceive as low-risk driving conditions (Bentley et al. 2003, 18).

A much smaller group of hard-core nonusers reported negative attitudes toward seat belts as the primary reason for nonuse in the most recent MVOSS. These reasons include discomfort, concerns that belts are dangerous in a crash (e.g., could trap the driver in the vehicle), infringement of personal freedom and resentment of authority, and the attitude that they "just don't feel like wearing them" (Block 2001, 69–70). Similar attitudes, particularly the importance of personal choice in the decision to use a seat belt, were evident among the small group of hard-core nonusers interviewed by NHTSA for the present study (Bentley et al. 2003, 20).

Demographic and Socioeconomic Correlates of Nonuse

The literature review conducted for this study on characteristics of seat belt use identified numerous demographic and socioeconomic characteristics associated with belt use behavior. Many of the studies are based on observational surveys and, as such, do not differentiate between different nonuser groups, such as part-time users and hard-core nonusers. Thus, as noted earlier, the user group comprises full-time and part-time users, while the nonuser group combines part-time users and nonusers.

Gender and Belt Nonuse

In general, females are more likely to be observed wearing seat belts than are males. The 2002 NOPUS observed a statistically significant 7 percentage point gender difference. Females were observed using belts 79 percent of the time compared with 72 percent of the time for males (Glassbrenner 2003a, 3). A North Carolina survey of seat belt use following a high-visibility "Click It or Ticket" public information and enforcement campaign found that observed unbelted drivers were more likely to be male than observed belted drivers (Reinfurt et al. 1996, 211). Another study of primary and secondary belt use laws in four U.S. cities [Boston (secondary), Chicago (secondary), Houston (primary), and New York (primary)] observed that male drivers were less likely to buckle up than were female drivers, even in states with primary seat belt use laws (Wells et al. 2001, 5).

Age and Belt Nonuse

Generally, an individual's age is considered to have a positive impact on belt use; older individuals are more likely to buckle up. For example, reported "all the time" belt use in the most recent MVOSS was lowest among respondents aged 21 to 24 and highest among those aged 65 and older (Block 2001, 17). An observational survey of belt use at 12 high schools in Connecticut and Massachusetts confirmed findings from earlier studies that teenagers have low belt use rates relative to other age groups, even when they drive with their parents (Williams et al. 2001).[5]

Other individual characteristics associated with age (e.g., the structure of the individual's family), however, may confound the relation between age and belt use. One study, which compared seat belt use rates measured by observational surveys at preselected sites in Ohio with their demographic and socioeconomic characteristics as measured by U.S. Census Bureau data, did not find a strong positive correlation between age and belt use. One explanation is that older individuals may be less likely to use belts regularly when they are not living with children in

[5] For example, the survey found that 46 percent of teenagers who were being dropped off at school by their parents were not wearing their seat belts. And nearly half the time, the unbelted teenager was riding with an adult driver who was buckled up (Williams et al. 2001).

the home. Older parents with children at home may be more likely to buckle up because of their desire to set a positive example or because of pressure from children who have been exposed to public information and education media campaigns (Shinar 1993, 754). At the same time, young people (aged 18 to 24) were found to be more responsive to seat belt use when living within the traditional family structure (Shinar 1993, 754). This finding was confirmed by the most recent MVOSS. Among younger drivers who responded to the survey (aged 16 to 24), 65 percent reported that their habit of buckling up was instilled by their parents (Block 2001, vi).

Socioeconomic Status and Belt Nonuse

Socioeconomic status is also an important factor in belt use. For example, telephone surveys conducted after a "Click It or Ticket" campaign in North Carolina found that college graduates were more likely to report driving belted than blue collar or service workers (Reinfurt et al. 1996, 213). The study of belt use laws in Boston, Chicago, Houston, and New York also confirmed through driver interviews that higher educational attainment is a strong correlate of higher seat belt use (Wells et al. 2001, 8). Education level is frequently used in the literature as an indication of socioeconomic status.

Recent studies of seat belt use among different racial groups underscore the importance of an individual's socioeconomic status in determining the likelihood of buckling up. Racial differences alone have not proved to be important predictors of observed belt use (Reinfurt et al. 1996, 212; Glassbrenner 2003a, 13). When race is considered with other characteristics, such as gender, education, and enforcement type (i.e., primary versus secondary belt use laws), these other factors are stronger correlates of belt use (Shinar 1993, 754; Wells et al. 2001, 8). For example, the study of belt use in four cities cited above (Wells et al. 2001) observed no differences in belt use by race or ethnicity in primary law locations (p. 1). However, in secondary law locations, blacks were less likely to be belted among populations both with and without college degrees, confirming the results of other studies that show greater sensitivity to enforcement among black drivers (Wells et al. 2001, 1).

The most recent MVOSS suggests that different racial and ethnic groups may have very different perceptions about the efficacy of seat belts

that could also influence their use. The survey reported that whereas only one-third of whites agreed that seat belts were "just as likely to harm them as to help them," almost half of blacks (46 percent) believed this statement to be true (Block 2001, 107).[6] Forty-eight percent of Hispanics thought that seat belts were "just as likely to harm them as to help them" compared with one-third of non-Hispanics. Blacks were about twice as likely as whites to agree that putting on a seat belt made them worry more about being in a crash and were most likely to agree with the fatalistic notion that "if it was your time to die, you'll die," so that wearing a seat belt does not matter (Block 2001, 108).[7] Similar findings were reported for Hispanics versus non-Hispanics. When education level is considered without regard to race or ethnicity, however, individuals with more schooling tended to be less fatalistic, less ambivalent about the injury reduction benefits of seat belt use, and less self-conscious about going against group nonbuckling norms (Block et al. 2001, vii).

Risky Behavior and Belt Nonuse

Belt nonuse often is associated with a risky lifestyle, aggressive behavior, and irresponsible attitude (Wilson 1990, 176). Indeed, on the basis of self-reports, individuals who did not use seat belts or who used them inconsistently reported that they engaged in more behaviors that increase the risk for a crash, including consuming more alcohol and drugs and accumulating more traffic violations, than regular belt users (Wilson 1990, 175). A telephone interview of North Carolina motorists cited for not using seat belts found that crash rates for violators were nearly double those of a random sample of North Carolinians, and the researchers concluded that nonusers are a high-risk crash group (Williams et al. 1997, 71).

In another observational study of North Carolina drivers, unbelted drivers were significantly more likely than belted drivers to have had at

[6] The survey asks two questions to categorize respondents for analysis by race and ethnicity. First, the respondents are asked whether they consider themselves to be Hispanic or Latino. Second, and independent of the first question, respondents are asked to select among five racial categories, including black, white, Asian, Native American or Alaskan Native, or multirace. Because race and ethnicity are considered independently, each racial group can include both Hispanics and non-Hispanics, and the Hispanic subgroup can include both whites and blacks (Block 2001, xxvi).

[7] Thirty-six percent of blacks agreed with this statement versus 23 percent of whites. Thirty percent of Hispanics agreed with this statement versus 25 percent of non-Hispanics (Block 2001, 108).

least one conviction for a traffic violation and to have been involved as a driver in at least one fatal or injury crash during the most recent 4-year period (Reinfurt et al. 1996, 212). A follow-up survey revealed that nonusers were also less likely than users to report having health coverage, more likely to acknowledge having consumed large amounts of alcohol in the past year, and more likely to have an arrest record (Reinfurt et al. 1996, 209). Other studies of observed and self-reported seat belt use have confirmed from driver records that unbelted drivers have more traffic convictions and more crashes than those who were belted (Hunter et al. 1993, 545; Preusser et al. 1991, 475).

Seat Belt Use Laws and Belt Nonuse

Independent of individual demographic and socioeconomic characteristics, belt use is higher in states with primary belt use laws than in states with secondary belt use laws or in New Hampshire, which has no seat belt law (Dinh-Zarr et al. 2001, 54). The 2002 NOPUS confirms the importance of primary seat belt use laws. In primary law states, belt use rates were 80 percent. In secondary law states, belt use rates were only 69 percent, a statistically significant difference (Glassbrenner 2002, 5). Moreover, in those states that changed from a secondary to a primary belt use law, seat belt use rose (and fatalities declined) (Dinh-Zarr et al. 2001, 54). For example, when Washington State recently changed from a secondary to a primary law state, observed belt use rates rose from 83 percent in 2001 to 93 percent in 2002 (Glassbrenner 2003b, 1).

The implementation of primary enforcement laws may have a greater impact on black motorists than white motorists. In North Carolina, a primary law state, observed belt use was significantly higher among whites than blacks before implementation of the law. Since its enactment, observed belt use among blacks has exceeded use among whites (Reinfurt 2000 in Wells et al. 2001, 8). The apparent reason is that blacks perceive that they are more likely to get a ticket for belt nonuse than whites. Other studies in Louisiana, Georgia, and Maryland indicate that blacks are more sensitive to primary belt use laws because they believe that there will be a race differential in their enforcement (Solomon et al. 2000 in Wells et al. 2001, 9). Although the perception may be that blacks are targeted as offenders of primary belt use laws, studies in several states

that changed from secondary to primary laws show either no difference in the rate of ticketing between blacks and whites or a relative increase in the ticketing of whites after the enactment of a primary law (Dinh-Zarr et al. 2001, 54).

Differential enforcement is undesirable. However, the perception that laws are being strictly enforced makes them work (Wells et al. 2001, 9). According to the most recent MVOSS, the percentage of Americans who thought that ticketing for seat belt nonuse was an imminent threat was significantly higher in primary law states than in secondary law states (Block 2001, ix).

POTENTIAL EFFECTS OF SEAT BELT USE TECHNOLOGIES ON DIFFERENT NONUSER GROUPS

A review of the literature, survey data, and interview results suggests that the reasons for seat belt use and nonuse are complex. Age, gender, vehicle type, and enforcement level (i.e., primary versus secondary law states) have all been shown to affect belt use. Lower belt use is associated with young adults, males, pickup trucks, and states with secondary belt use laws or no law, like New Hampshire. These simple correlates of belt use, however, are confounded by other variables, such as education level, and by situational and attitudinal factors.

For purposes of this study, differences among nonuser groups are important for assessing the likely impact of seat belt use technologies. The literature is sparse, however, concerning the factors differentiating nonusers—the target group for seat belt use technologies. The available survey data, primarily from the MVOSS, suggest that there are at least two nonuser groups: part-time users (those who buckle up less than all the time) and hard-core nonusers (those who never buckle up).

Part-time users appear to be the predominant nonuser group. Members of this group generally express positive attitudes toward seat belts but do not always buckle up. Many appear not to have developed the habit of wearing a belt and thus forget to buckle up. Others choose to use belts only in situations of perceived risk—long trips at high speeds on unfamiliar roads. Part-time users should be amenable to seat belt use technologies that help remind them to buckle up. Moreover, if reminder

systems can help part-time users develop habits of belt use, they may have a lasting impact on this segment of the nonuser population.

Hard-core nonusers are a much smaller segment of the nonuser population. However, the importance of this group should not be understated, because of its overrepresentation in fatal crashes and other high-risk driving behaviors, such as speeding and driving while impaired by alcohol. Seat belt reminder systems are likely to have little effect on hard-core nonusers who choose not to buckle up. They generally do not acknowledge the benefits of seat belts and are opposed to their use. More aggressive solutions, such as interlock systems, may be needed to get this small, but important, nonuser group to buckle up. However, will the hard-core nonusers object to such intrusive technologies? In the next chapter, the U.S. experience with interlock systems, among other technologies, is reviewed.

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3

HISTORICAL EXPERIENCE WITH SEAT BELT USE TECHNOLOGIES

In this chapter, a brief review is provided of the 1970s experience with early seat belt reminder systems, the ignition interlock, and the 4- to 8-second belt reminder that remains in vehicles today. Although results from studies of the effectiveness and acceptability of these systems may not still be valid, the way in which these technologies were introduced has a continuing effect on their acceptability and likely effectiveness today. The chapter includes a review of experience with other key approaches for increasing seat belt use, primarily the enactment of seat belt use laws. The chapter ends with a brief summary of lessons learned from the past that can influence the successful introduction of seat belt use technologies today.

EARLY SEAT BELT USE TECHNOLOGIES

Early seat belt use technologies were introduced as alternatives or interim measures to the primary and preferred approach of the National Highway Traffic Safety Administration (NHTSA) for increasing seat belt use at that time—introduction of passive restraint systems.[1] On January 1, 1972, NHTSA required passenger vehicles for sale in the United States to be equipped with passive restraints protecting vehicle occupants in frontal barrier crashes up to and including 30 mph, or alternatively, with a buzzer–light reminder system. With few exceptions of cars sold with inflatable front cushions, the automobile manufacturers opted for the reminder system (Robertson 1975, 1320). The system consisted of a flashing light and buzzer, which activated continuously for at least 1 minute if the vehicle was placed in gear and the driver or front outboard passenger was not belted (Robertson 1975, 1320). The simple sensor system used to activate the reminder system, however, could be bypassed

[1] The primary focus was on air bags, but NHTSA also indicated that automatic belts could be used to meet automatic protection requirements (Kratzke 1995, 2).

easily. Moreover, once the belt was left in an extended position or buckled, the reminder system would not be activated again (Westefeld and Phillips 1976b, vii).

When it became evident that the introduction of passive restraint systems would be delayed, NHTSA moved to require ignition interlock systems on all cars as an interim measure. Effective August 15, 1973, NHTSA required that all Model Year (MY) 1974 passenger vehicles be equipped with an ignition interlock that allowed the vehicle to start only if the driver was seated and the belts were extended more than four inches from their normally stowed position or the belts were latched (Robertson 1975, 1320). In addition, an audible warning was activated if seat belts were unfastened during the trip.[2] It was hypothesized that the ignition interlock would increase seat belt use by eliminating two of the most popular ways of defeating the early belt reminder systems: leaving the belt fastened and tucking it behind the seat, or tying a knot in the belt so that it was held out of the retractor (Cohen and Brown 1973, 5).

When Congress passed legislation prohibiting NHTSA from requiring either the ignition interlock or continuous buzzer systems as described in Chapter 1, NHTSA changed Federal Motor Vehicle Safety Standard (FMVSS) 208 to a less aggressive requirement. Passenger vehicles manufactured after February 1975 were required to have a warning light of 4- to 8-seconds duration that is activated when the ignition is turned on regardless of whether the seat belt is fastened, and a chime of similar duration that sounds unless the driver's belt is buckled (Westefeld and Phillips 1976b, viii). This standard, which so far as can be determined was specified without any empirical justification, is still in effect today.

STUDIES OF THE EFFECTIVENESS AND ACCEPTABILITY OF EARLY SEAT BELT USE TECHNOLOGIES

NHTSA introduced the ignition interlock system without extensive study or pilot testing. Only one NHTSA-funded study could be found (Cohen

[2] MY 1974 vehicles incorporated a sequential logic system. The system required that the belt be fastened only after the appropriate seat had been occupied. The starter–interlock feature then prevented the engine from starting unless the logic system was satisfied that the front belts were fastened when the corresponding seating positions were occupied (Westefeld and Phillips 1976b, vii).

and Brown 1973) that had compared belt use in rental car fleets equipped with various combinations of buzzer–light and interlock systems prior to the interlock regulation.[3] That study found a significant increase in belt use for equipped vehicles relative to vehicles without any reminder or interlock system. However, it showed no significant difference in belt use by drivers of cars with buzzers versus those with interlock systems (Cohen and Brown 1973, 3; Robertson 1975, 1324). Rental car drivers without any reminder or interlock system used seat belts on 23 percent of their trips compared with 51 percent and 49 percent of rental car drivers with the two reminder-only systems, and 56 percent of rental car drivers with the reminder–interlock system (Cohen and Brown 1973, 3). Substantial resistance to each of the reminder and interlock systems was observed, however, with one-third of drivers in each group claiming that they would disconnect the system if it were installed in their personal vehicles. Drivers with the more demanding systems had less favorable attitudes and were more likely to say that they would either modify or disconnect the systems (Cohen and Brown 1973, 26).

The Insurance Institute for Highway Safety had conducted an earlier study that compared belt use in MY 1972 cars equipped with the NHTSA-required buzzer–light system with belt use in unequipped cars (Robertson and Haddon 1972 in States 1973). That study, which was focused on personal vehicles, did not detect any significant effect on seat belt use for vehicles equipped with the buzzer–light system. The result, which contradicted the NHTSA study of rental car fleets (Cohen and Brown 1973) that had observed a significant difference in belt use between buzzer–light and nonequipped vehicles, can be attributed in part to the fact that rental car drivers are less likely to attempt to disable a system on the rental car than on their personal vehicle—a finding noted in the NHTSA-funded rental car study (States 1973, 435; Cohen and Brown 1973, 26).

Following the interdiction of the ignition interlock and continuous buzzer–light systems, a 1975 study (Robertson 1975) documented the

[3] Three systems were investigated: (*a*) a detachable shoulder and lap belt and warning system based on the 1972 NHTSA standard; (*b*) a nondetachable shoulder and lap belt with an inertia reel on the shoulder belt that locks and restrains the wearer if the car stops suddenly, and a belt reminder based on the 1972 NHTSA standard with a logic system that detects whether the driver is seated; and (*c*) a nondetachable shoulder and lap belt with an inertia reel on the shoulder belt, and a warning, logic, and starter–interlock system based on the NHTSA 1973 standard (Cohen and Brown 1973, i).

extent of belt use observed in 1972, 1973, and 1974 passenger vehicles with different seat belt use technologies. Belt use was measured at 138 sites in Baltimore, Maryland; Houston, Texas; Los Angeles, California; the New Jersey suburbs of New York City; Richmond, Virginia; and Washington, D.C. Drivers in 48 percent of MY 1974 passenger vehicles equipped with ignition interlock systems were using lap and shoulder belts, and 11 percent were using lap belts only, for a total use rate of 59 percent. Only 7 percent of drivers in MY 1973 passenger vehicles equipped with the buzzer–light systems were using lap and shoulder belts, and 21 percent were using lap belts only, for a total use rate of 28 percent. Twenty-five percent of drivers of MY 1972 passenger vehicles equipped with buzzer–light systems were buckled up, and 23 percent of drivers of MY 1972 vehicles without any reminder systems were using one or both belts. Thus, the study showed an unambiguous positive effect on belt use for the 1974 interlock-equipped passenger vehicles relative to vehicles with reminder systems or without any system.

In 1976 NHTSA reported effectiveness rates for both buzzer–light and sequential logic seat belt interlock technologies by measuring belt use rates in 19 U.S. cities (Westefeld and Phillips 1976b). The study showed that ignition interlocks were initially effective and more than doubled belt use rates from about 28 percent in MY 1973 vehicles equipped only with buzzer–light reminders to about 67 percent in MY 1974 cars equipped with ignition interlocks (Westefeld and Phillips 1976b, vii). However, initial increases in use rates from seat belt interlocks decreased over time as many motorists eventually disconnected the seat belt interlock or circumvented it, thus never developing the intended positive belt use habits.

A 1976 NHTSA study (Westefeld and Phillips 1976a) examined the effectiveness of the 4- to 8-second chime and light reminder systems on MY 1975 and 1976 vehicles that replaced the ignition interlock as well as the effectiveness of various other types of warning systems allowable in the postinterlock environment. For that study, 818 rental cars were modified with reminders that met revised FMVSS 208, which included six different reminder systems. The effectiveness data reported were based on 5,429 observations of rental car drivers at a single location: the Sky Harbor Airport in Phoenix, Arizona (Westefeld and Phillips 1976a,

1). The control group for the study consisted of drivers of vehicles with no reminder systems. Of these drivers, 12.8 percent used lap and shoulder belts leaving the rental car terminal. Of the drivers of vehicles equipped with the FMVSS 208 8-second chime and light warning systems, 13.1 percent were buckled—an insignificant difference. Thus, the authors concluded that the 8-second reminder system required by FMVSS 208 (still in place today) was not effective in increasing seat belt use (Westefeld and Phillips 1976a, 2). Moreover, the study showed that the most effective system would include, in addition to the 8-second reminder technology required by FMVSS 208, a reminder light that would not turn off until the driver buckled up, as well as a sequential logic system that required the driver first to sit down on the seat and second to buckle the belt so that the system could not be easily circumvented (Westefeld and Phillips 1976a, 2).

OTHER APPROACHES FOR ENCOURAGING SEAT BELT USE

Since seat belts were first installed in passenger vehicles, the federal government, states, safety groups, and the private sector have tried a variety of approaches to increase seat belt use. Early efforts (late 1960s, early 1970s) to educate the public on the benefits of seat belts that relied solely on public service advertisements and major media campaigns proved largely ineffective in increasing belt use (O'Neill 2001; Haseltine 2001). NHTSA then turned to technological approaches—warning systems, ignition interlocks, and passive restraints—during the 1970s and 1980s to increase belt use. Enactment of state belt use laws, spurred by the 1984 regulation on passive restraints (details to follow) and accompanied by a massive industry lobbying campaign, resulted in significant gains in belt use by the early 1990s (Haseltine 2001). Efforts to strengthen belt use laws combined with well-publicized intensive enforcement campaigns further increased belt use rates during the 1990s (Haseltine 2001). The discussion that follows highlights a few of the key strategies.

Passive Restraints

After the interlock requirement interdiction, NHTSA turned its focus once again to passive restraint systems. A nationwide survey conducted

in 1978 suggested that the American public believed, by a two-to-one margin, that the government should require automatic crash protection in new cars rather than adopt policies that "force" behavior either by technology like the ignition interlock or by federal or state laws requiring the use of seat belts with fines for nonuse (Hart Research 1978, 4–5). At the time the survey was conducted, only one-quarter of the respondents reported that they used their seat belts all or most of the time. Among infrequent users, seat belts were seen as confining, bothersome, and uncomfortable. Many nonusers believed that seat belts posed serious safety problems (Hart Research 1978, 2–3).

The previously described Dole decision in 1984 provided for the phase-in of automatic protection in cars beginning with MY 1987 passenger vehicles; such protection would become mandatory in MY 1990 (Kratzke 1995, 7). Once the passive restraint requirement was mandated by NHTSA, the initial reaction of the industry was to develop passive seat belt systems that automatically restrained the occupant once in the vehicle. There were various types of two-point (passive shoulder belt with knee bolsters and active lap belts) and three-point motorized and nonmotorized systems.

One of the earliest passive belt systems was the two-point passive shoulder belt. It was developed and introduced in 1975 in the Volkswagen Rabbit and then in mid-1978 in the General Motors (GM) Chevette. It used an automatic diagonal shoulder belt with a manual lap belt and an energy-absorbing knee bolster for those who only used the passive belt. The system had initial acceptance, but use of the manual lap belt was low due to inconvenience of access and forgetfulness of the occupant.

The most popular passive belt designs involved a motorized shoulder belt that acted on a track running along the roof rail (Johannessen 1987, 3). In the stowed position, the upper anchor of the shoulder belt was forward in the vehicle close to the steering wheel. In the restrained position, the track moved rearward on the roof rail, bringing the upper anchor of the shoulder belt rearward in position to restrain the occupant in a crash. These systems also used a manual lap belt. This approach facilitated ingress and egress while serving as a passive shoulder belt restraint. However, failure to buckle the manual belt could result in an occupant sliding out of position in a crash (e.g., "submarining" or sliding under the belt) and thus being vulnerable to injury.

GM introduced a three-point nonmotorized passive belt system in 1980 to comply with the passive restraint requirement. It was designed so that, when the door was open, the shoulder and lap belt, which were attached to the rear edge of the door, swung outward with the door. This allowed ingress when the belts were pushed forward to give access to the seat. When the door was closed, the belts moved closer to the occupant and formed the passive three-point belt system. However, the system was almost always used as an active lap–shoulder belt configuration by unlatching the belt to exit the vehicle. Despite this common practice, field studies of belt use still showed an increase in wearing rates with this door-mounted system.

Most surveys after introduction of passive belt systems found an increase in wearing rates (Johannessen 1987, 3), but the systems proved cumbersome to wear, were fraught with reliability issues, and had a required easy disconnect feature. In addition, early studies showed potential injuries with use of the automatic two-point systems when the manual lap belt was not buckled (Evans 1990). It became clear that it was difficult for the passive belt systems to match the safety performance of active lap–shoulder belts, and the industry turned to the other option in the passive requirements—air bags.

Within a few years, most vehicles were being produced with driver air bags, and the conventional lap–shoulder belt system reemerged in vehicles. The introduction of air bags is now complete, with all light vehicles equipped with driver and passenger air bags and active three-point lap–shoulder belt systems. While voluntary belt wearing has now increased to 75 percent nationally with various measures discussed elsewhere in this report, the historic issue of technological solutions to encourage belt wearing has resurfaced.

Seat Belt Use Laws

The 1984 Dole decision also encouraged states to pass mandatory seat belt use laws, with the proviso that the automatic protection requirements might be eliminated if, by April 1989, the Secretary of Transportation found that two-thirds of the nation's population was covered by state-mandated seat belt use laws (Kratzke 1995, 8). The required threshold was not reached, but the widespread introduction of seat belt

use laws resulted in what has proved to be one of the most effective approaches for increasing belt use (Dinh-Zarr et al. 2001, 48). The automobile industry commenced a massive lobbying campaign and formed a new organization, Traffic Safety Now, to convince states to enact seat belt use laws (Haseltine 2001). By the time Traffic Safety Now closed its doors in 1992, 93 percent of the U.S. population was subject to state seat belt use requirements (Haseltine 2001).

Unfortunately, not all belt use laws are equal. Primary belt use laws allow a police officer to stop a motorist solely for not wearing a seat belt; secondary belt use laws allow a police officer to issue a seat belt citation to an unbuckled motorist only after the motorist has been stopped for another traffic violation (Glassbrenner 2002, 5). In the United States, primary belt use laws have been the exception rather than the rule. In contrast, secondary belt use laws are unknown outside the United States (Dinh-Zarr et al. 2001, 52).

According to NHTSA's most recent National Occupant Protection Use Survey (Glassbrenner 2002, 1), the difference in belt use rates between primary and secondary law states is a statistically significant 11 percent. Belt use rates are 80 percent in the 17 states plus the District of Columbia and Puerto Rico with primary laws, but only 69 percent in the 32 states with secondary belt use laws and in New Hamphsire, the only state without any belt use law for adults (Glassbrenner 2002, 5).

Strong enforcement is a necessary component of effective seat belt use laws. Motorists must be convinced that violators will be ticketed and nontrivial penalties exacted. State-conducted studies of belt use rates and state restraint law penalties in 1998 and 1999 found that belt use rates averaged 6 percentage points higher in states with fines and court costs of $30 and above than in states with fines and court costs less than $30 (Haseltine 2001). A study of the effectiveness of a seat belt use law in Texas, a primary enforcement state, found a statistically significant reduction in driver-involved injury rates when fines were introduced for belt use violations (Loeb 1995, 84). Another study evaluating a belt use law in North Carolina, also a primary enforcement state, found that traffic injuries were reduced more when traffic citations for belt nonuse were given rather than warnings (Reinfurt et al. 1990). The 1998–1999 state survey results suggest that penalty levels can also make a difference in secondary law states (Haseltine 2001).

Stronger state belt use laws (changing from secondary to primary laws), combined with well-publicized intensive enforcement campaigns, have largely accounted for gains in seat belt use during the 1990s (Haseltine 2001). NHTSA initiated the first wide-scale effort to mobilize state and local law enforcement agencies to enforce seat belt use laws, named "Operation Buckle Down," from 1990 to 1992 (Haseltine 2001). The comprehensive Canadian Selective Traffic Enforcement Program model, which combined training of law enforcement officials, high-visibility enforcement campaigns, and pre– and post–belt use surveys and public education efforts, was introduced in North Carolina in 1993. The 5-year statewide "Click It or Ticket" program became a model for high-visibility enforcement programs in other states (Haseltine 2001). Today, most states conduct month-long, federally supported "Click It or Ticket" seat belt campaigns, typically in May and November each year (*AASHTO Journal* 2003, 16).

IMPLICATIONS FOR NEW TECHNOLOGY INTRODUCTION

The early experience with technologies encouraging seat belt use suggests that the ignition interlock was effective initially in bringing about large increases in seat belt use at a time when belt use rates were low generally, laws mandating belt use were unknown, belt designs had not matured, and the general public was not convinced of the safety benefits of buckling up. However, the interlock technology was intrusive, and the general public was largely unprepared for its rapid introduction. Systems were implemented without adequate field trials and with evaluations that were at best unsophisticated and at worst unreliable, which caused the public to become disenchanted with the technology. For example, by definition the ignition interlock did not allow the driver to idle or drive at low speeds without wearing a belt. Although nearly 30 years has passed since the interlock experience, both NHTSA and the automobile manufacturers remain wary of technologies that the public may find excessively intrusive. Successful technology introduction today will require more careful balancing of effectiveness and intrusiveness and more attention to studying and evaluating different technologies.

The limited study of the 4- to 8-second light and chime reminder systems that replaced the interlock and remain in effect today showed no

statistically significant effect on belt use relative to passenger vehicles without the reminder systems. Moreover, there appears to be no scientific basis for the selection of the 4- to 8-second duration of the reminder.

Much has changed since the brief experiment with interlocks nearly 30 years ago. Observed seat belt use has increased from the teens in the 1970s to 75 percent in 2002, largely because of enactment and enforcement of state seat belt use laws. While highly publicized enforcement efforts have contributed to recent increases in observed use, weak state seat belt use laws with secondary enforcement provisions and low fines hinder progress. Seat belts in modern vehicles are easier to use and more comfortable than those of the 1970s. Electronics and sensor systems in vehicles are also vastly improved. Because of these circumstances, it is appropriate and potentially fruitful to explore new vehicle technologies to assist in increasing seat belt use.

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Abbreviation

AASHTO American Association of State Highway and Transportation Officials

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4

CURRENT EXPERIENCE WITH SEAT BELT USE TECHNOLOGIES

Ford Motor Company was the first automobile manufacturer to introduce an enhanced belt reminder system in the United States. Selected Model Year (MY) 2000 passenger vehicles were equipped with a light and chime system that embodies more than the 4- to 8-second light and buzzer system required by the National Highway Traffic Safety Administration (NHTSA). In Europe, development of generic specifications for seat belt reminder systems began in 1995, and belt reminder systems are currently available in several vehicles for sale in the European market.

The effectiveness and acceptability of new enhanced belt reminder systems and other in-vehicle technologies to increase belt use currently being introduced on a voluntary basis by the automobile industry are reviewed in this chapter. The information is drawn from briefings to the study committee by key automobile manufacturers, a literature review, and the results of interviews and focus groups conducted by NHTSA specifically for the present study. The chapter ends with a summary of the state of knowledge.

CHARACTERISTICS OF NEW SEAT BELT USE TECHNOLOGIES

Enhanced Belt Reminder Systems

Ford Motor Company introduced the BeltMinder™, a registered company trademark, on selected MY 2000 vehicles. By MY 2002, all Ford vehicles were equipped with the enhanced belt reminder for the driver, with a phase-in for the right front-seat passenger starting with MY 2003 vehicles. The BeltMinder complies with the NHTSA regulation for a 4- to 8-second reminder; however, after a pause, the enhanced reminder flashes and chimes intermittently—activating for 6 seconds, then pausing for 30 seconds—for up to 5 minutes if the driver (or passenger) fails to buckle up.

After the introduction of the BeltMinder, NHTSA Administrator Dr. Jeffrey Runge urged other automobile manufacturers to follow Ford's

lead and provide effective belt reminder systems or other appropriate technologies for increasing belt use.[1] Most of the major manufacturers responded that they were either studying or near to deploying enhanced belt reminder systems, some as early as 2003.[2] Most plan to introduce driver-side systems first, many at the same time as the introduction of advanced air bags. Front-passenger systems will not appear in significant volumes until MYs 2004 and 2005.[3] At the time of the present study, the Ford BeltMinder was the only commercially available system in the U.S. market.

All first-generation enhanced belt reminder systems deployed or under development for the U.S. market use a sequence of light and chime reminders[4] separated by a pause or a light-only interval from the initial 4- to 8-second "federal" light and chime system (see Box 4-1 for examples of systems). The enhanced systems vary in their loudness, urgency, and duration. They all include a speed or distance trigger, reflecting General Motors' findings that most drivers fasten their seat belts after the engine is started or when the vehicle is in gear or moving slowly. Only about 30 percent of drivers fasten their belts before starting the engine.[5]

The systems are currently offered for drivers and front-seat occupants, reflecting the availability of front-seat sensors that are or will soon be available on all U.S. vehicles to support the introduction of advanced air bags. The incremental cost of installing the enhanced reminder system is modest.[6] In contrast, no manufacturer is offering reminder systems for rear-seat occupants. The absence of rear-seat sensors to detect the presence of rear-seat occupants, the complexities of integrating reliable reminder systems with rear child seats and remov-

[1] The first appeal was contained in a letter dated February 25, 2002. A follow-up letter was sent on March 24, 2003.

[2] The responses from individual companies can be found in the NHTSA Docket No. 13226 in the U.S. Department of Transportation's electronic docket system (dms.dot.gov).

[3] This information was provided in the manufacturer briefings to the committee and in follow-up inquiries.

[4] According to some manufacturers, voice-synthesized systems are considered problematic in a global market.

[5] These findings, from research conducted in May 1999, can be found in General Motors' response to Administrator Runge's 2002 letter in the NHTSA Docket No. 13226.

[6] Several of the manufacturers who briefed the committee at its December 2002 meeting provided more precise cost data for belt reminder systems but indicated that the information is proprietary. Hence the report cannot provide detailed cost data.

Box 4-1

Description of Selected Seat Belt Reminder Systems

Ford BeltMinder: After the 4- to 8-second NHTSA-required reminder, the Ford system resumes a warning chime and flashing light at approximately 65 seconds if the driver remains unbuckled while the engine is running and the vehicle is moving at more than 3 mph (4.8 km/h). The system flashes and chimes for 6 seconds, then pauses for 30 seconds, and repeats this cycle of 6-second flashing lights and chimes and 30-second pauses for up to 5 minutes. The system can be disabled for a single trip by buckling the seat belt. It can be permanently disabled by following a series of instructions in the driver's manual. The BeltMinder is currently available for the driver on all Ford, Lincoln, and Mercury models and has been introduced for front-seat passengers on selected MY 2003 Ford, Lincoln, and Mercury models.

DaimlerChrysler belt reminder system: After the 4- to 8-second NHTSA-required reminder, the DaimlerChrysler system resumes a steady warning light if the driver is still not buckled. After 30 seconds, if the driver remains unbuckled and the vehicle is moving at more than 15 mph (24 km/h), a multistage progressive chime and flashing light commence and are emitted for a maximum of 60 seconds. The warning light remains permanently illuminated if the driver is still unbuckled after this time. A driver and front-seat passenger system will be phased in over the next several years on all Mercedes-Benz vehicles for sale in the United States. The system, which can be disabled in a Mercedes-Benz retail center, will be available on some MY 2005 vehicles and on all MY 2006 Mercedes-Benz vehicles. Chrysler, Dodge, and Jeep vehicles will have at least a driver-side system by MY 2006.

(continued on next page)

Box 4-1 (*continued*)

Description of Selected Seat Belt Reminder Systems

General Motors belt reminder system: Immediately after the 4- to 8-second NHTSA-required reminder, the General Motors (GM) system resumes a steady light for 12 more seconds if the driver does not buckle up. If the driver remains unbelted, a flashing light and limited chime commence for 55 seconds, followed by 30 seconds of silence. The system repeats the full cycle if the driver remains unbelted and the vehicle is traveling at 5 mph (8 km/h) or more. The cycle is followed by a 3-minute period of silence and repeats for a third and final time if the driver continues to ride unbelted. All warning functions stop when the belts are buckled. The system cannot be disabled. GM belt reminder systems are projected to be introduced on selected MY 2005 vehicles, some with driver-side only systems, and others with driver- and passenger-side systems.

Toyota belt reminder system: After the 4- to 8-second NHTSA-required reminder, the Toyota system resumes with a flashing light and mild buzzer for 10 seconds if the driver remains unbuckled and the vehicle is moving at more than 9 mph (14.5 km/h). If the driver remains unbuckled, the flashing light continues and the buzzer will sound in a more intense tone for 20 more seconds. If the vehicle speed drops below 9 mph within that time, the buzzer sound will continue. If the driver has not buckled up after the 20-second period, the flashing light continues but the buzzer ceases. The system can be deactivated by a series of steps. A driver-only light and buzzer system will be introduced on the MY 2004 Prius, and several 2005 models will have a light and buzzer system for the driver and front-seat passenger.

able backseats, and lower rear-seat occupancy rates currently make rear-seat systems appear relatively costly. For now, the manufacturers are offering systems that indicate to the driver whether rear-seat passengers have failed to put on or have unbuckled their belts during a trip.[7] All the systems, with the exception of General Motors' belt reminder, provide mechanisms to disconnect the system, either for a single trip or permanently.[8]

In Europe, the introduction of enhanced belt reminder systems began with a Swedish National Road Authority (SNRA) initiative in 1995. A special working group of researchers, insurance companies, and the automobile industry was formed to develop generic specifications for a seat belt reminder system (Fildes et al. 2002, 3). The specifications took into account some of the shortcomings of the early U.S. interlock systems, which were unable to differentiate between driving and low-speed maneuvers, such as parking or going in reverse. Thus, the new systems activate only after a specified minimum speed has been reached, or after a specified time or distance.

The European specifications have been incorporated in the European New Car Assessment Program (EuroNCAP), a consumer safety information program modeled on NHTSA's NCAP.[9] As an incentive to industry, EuroNCAP offers manufacturers up to 3 points out of a total of 37—the difference between a four-star and the top five-star rating of European automobiles—for seat belt reminder systems that meet certain minimum performance criteria (see Box 4-2). In 1999, Saab was the first company to develop a prototype seat belt reminder system that was consistent with the SNRA and subsequently the EuroNCAP reminder system specifications. Today, several vehicles for sale in the European market have belt reminder systems that meet EuroNCAP specifications.

[7] International Electronics and Engineering S.A. (IEE), a European sensor manufacturer, is currently working with three European car manufacturers on specifications for a rear-seat belt reminder system. IEE is leading a feasibility study on the development of rear-seat sensors and on the solution of problems related to removable seats, child restraints, and other technical obstacles (personal communication with Paul Schockmel, IEE, June 12, 2003).

[8] A permanent disconnection typically requires a series of steps that are detailed in the owner's manual.

[9] EuroNCAP Belt Reminder Assessment Protocol, Doc 61b, Version November 2002, contains the most recent specifications.

Box 4-2

EuroNCAP Protocols for Belt Reminder Systems

Manufacturers may receive points for belt reminder systems on the basis of system coverage and compliance with certain performance criteria. The most recent specifications of which the committee was aware are contained in the EuroNCAP Belt Reminder Assessment Protocol, Doc 61b, Version November 2002.

- **System coverage:** One point is given for systems that cover the driver, one point for systems that also cover the front-seat passenger, and a final point for systems that extend to rear-seat passengers, for a total of three possible points. Because of the complexities and perceived costs of installation of rear-seat reminder systems, a system that notifies the driver of the belt use status of rear-seat occupants may be substituted for audio and visual signals for the time being.
- **System activation:** Systems should alert front-seat occupants with sound and light only if the seat belts are not in use. Minimum thresholds of use are defined. For example, the audiovisual reminder should be activated if the car is used for more than 60 seconds, is being driven at speeds greater than 25 km/h (16 mph), or is driven a distance of more than 500 meters (547 yards). If the system includes an immediate alert more sophisticated than a simple sound signal (like a text or voice message), the start of the audiovisual reminder can be postponed for another 30 seconds or 500 meters, and the speed criterion can be increased to 40 km/h (25 mph).
- **Auditory signal loudness:** The auditory signal should be at least 65 dB, should be loud and clear under normal driving conditions, and should become increasingly aggressive the longer the seat belt remains unfastened. "Normal" conditions are defined as 50 km/h (31 mph) in top gear on a good asphalt road with the ventilation fan running at 75 percent (Fildes et al. 2002, 8).

- **System duration:** The reminder system should be active for at least 90 seconds, with quiet periods of no longer than 25 seconds.
- **Disconnection:** The system may provide a means of disconnection for a single trip, but it should be more complicated than simply buckling the belt. Permanent disconnection may be available to the owner on demand, but the information should not be provided in the owner's manual.

Interlock Systems

The 1970s experience with interlock systems still influences technology decisions by the automobile manufacturers for the sale of vehicles in the U.S. market. For example, no company is developing an interlock system for sale in the U.S. market as original equipment on vehicles intended for the general public because of concern about potential negative customer reaction. Interlock systems, however, are being developed for special fleets and aftermarket applications. For example, D&D Innovations, Inc., a small manufacturer, is currently marketing an aftermarket device that can be installed in vehicles already equipped with gearshift locks (locks that prohibit a vehicle from being put into gear if the vehicle's brake is not depressed). The interlock system prevents the vehicle from being put into gear if the driver and passenger are not buckled up at the start of the trip. (Chime and light sequences sound if driver or passenger unbuckles during a trip.) D&D Innovations is targeting the seat belt shifter lock to owners of fleet vehicles as well as to parents of teenage drivers—a high-crash-risk group. In the United States, 16-year-olds have almost 10 times the crash risk of drivers aged 30 to 59, and almost 3 times the risk of older teenage drivers (IIHS and Traffic Injury Research Foundation 2003, 1). D&D Innovations is also working with General Motors so that the shifter lock can be made available as a dealer-installed option. According to D&D Innovations, the cost of the device is less than $200 for aftermarket applications. The cost could be as low as $65 if production volumes were large enough.

Another option for seat belt interlocks involves an interlock system that works with a vehicle's entertainment systems rather than its gearshifts. For example, if a driver does not respond to a light and chime seat belt reminder that commences when the vehicle is started, the radio or CD player could be made inoperative until the driver or front-seat passenger buckles up. Although an entrepreneur has petitioned NHTSA's Chief Counsel regarding the legality of an entertainment interlock system he had developed, such a system is not currently being manufactured for sale, either as original equipment or for aftermarket applications.

Development of interlock systems for specific aftermarket applications is not without precedent. For example, the experience with alcohol ignition interlocks has been encouraging. The devices can be effective in reducing impaired driving by convicted offenders. However, in the United States, the practical effectiveness of alcohol interlocks has been limited by their cost and by the small number of offenders willing to install them to drive legally (Voas et al. 2002, 449; DeYoung 2002, 473). North Carolina, Pennsylvania, and California, among other states, have begun to mandate the installation of alcohol interlocks as a prerequisite for DUI offenders to apply for restricted licenses. The effectiveness of seat belt interlocks for high-risk drivers will also likely depend on the extent to which the states and the courts are willing to require their use.

EVIDENCE OF EFFECTIVENESS AND ACCEPTABILITY OF NEW SEAT BELT USE TECHNOLOGIES

Manufacturers' Briefings

At the second committee meeting in Dearborn, Michigan, four automobile manufacturers—General Motors, DaimlerChrysler, Ford, and Toyota—briefed the committee on the development status of seat belt use technologies and on company studies and market research on the effectiveness and acceptability of the new technologies. The committee also heard from D&D Innovations, Inc. Because the briefings were held in closed sessions to safeguard proprietary information, not all details can be disclosed.

The automobile manufacturers indicated that consumer acceptability is key to the success of new technology introduction, and hence they favor systems that provide a balance between effectiveness and acceptability. Their primary focus is on enhanced belt reminder systems that target part-time users—those who forget to buckle up or who find it uncomfortable or inconvenient on short trips—rather than on more aggressive systems targeting the hard-core nonuser.

The functional characteristics of these reminder systems have already been described in an earlier section. The manufacturers, however, recognized that a number of design decisions were made without the benefit of empirical human performance data, which—if available—might increase both effectiveness and acceptability. For example, the optimal loudness of the reminder's chime has not been determined, nor has its relation to other in-vehicle warning and information systems, which have been proliferating in recent years. It is well known that human attention and information-processing capacities are limited (Wickens 1991; Kahneman 1973), so the effectiveness of any belt reminder system (and its impact on other aspects of driver performance) must be considered within the context of the overall stimulus and task environment. According to the manufacturers, many such issues, which have not been resolved in the first generation of enhanced belt reminder systems, merit careful study as field evidence accumulates.

The companies were unable to provide systematic field information concerning the effectiveness of the new enhanced belt reminders, which reflects the recent entry of the technologies into the market. In fact, one company suggested that NHTSA should take responsibility for collecting data on the effectiveness of different enhanced belt reminder systems in getting motorists to buckle up, particularly those involved in crashes.

Manufacturers' Market Research

The manufacturers who briefed the committee provided some limited company-sponsored market research on consumer acceptability of

enhanced belt reminder systems. At the December committee meeting, General Motors reported the results of clinics of approximately 1,000 consumers conducted in California in 1999 to gather data on belt use habits and the perceived effectiveness and desirability of current and enhanced belt reminder systems. Forty-nine percent of the respondents reported that the current NHTSA-required 4- to 8-second reminder helps them remember to wear their seat belts. Eighty-one percent indicated interest in an enhanced belt reminder system for the driver and front-seat occupants. Seventy-one percent thought that the systems should be extended to rear-seat occupants, particularly drivers of sport utility vehicles (SUVs) and vans who frequently transport children and find it difficult to see whether their children are buckled up. Yet, only 35 percent reported that they wanted a rear-seat belt reminder system in their next vehicle.

After the December meeting, a January 2001 Ford Motor Company telephone survey of approximately 1,200 owners of Ford passenger cars, SUVs, vans, and pickup trucks—with and without the Ford BeltMinder—was made available to the committee. The purpose of the survey was to obtain customer feedback on the new technology. Ninety percent or more of owners of the Taurus/Sable, Lincoln LS, Ranger, Explorer Sport Trac, Excursion, and Econoline reported that they were completely satisfied with the BeltMinder. Approximately three-quarters of Focus/Cougar, Mustang, and Explorer Sport owners reported being completely or somewhat satisfied with the system (Ford Motor Company and Global Consumer Insights 2001, 5).[10] Eight in 10 BeltMinder owners indicated that they would purchase a vehicle with a belt reminder in the future. More than 7 in 10 would recommend the BeltMinder to other drivers, and almost 90 percent of Ford drivers with the BeltMinder want the system for their passengers (Ford Motor Company and Global Consumer Insights 2001). Female and older drivers (i.e., over 50) scored higher than male or younger drivers on satisfaction with the BeltMinder, interest in buying it again, and recommending it to others.

[10] Respondents were asked to report their satisfaction with the BeltMinder on a five-point scale, ranging from "completely satisfied" to "very dissatisfied."

U.S. Research Studies

Only two studies that provide an assessment of the effectiveness and acceptability of enhanced belt reminder systems in the U.S. market could be found in the literature. The lack of studies is not surprising in view of the limited commercial availability of these systems. The first study, conducted by the Insurance Institute for Highway Safety (IIHS) in cooperation with Ford Motor Company, provided an initial evaluation of the Ford BeltMinder and found preliminary evidence that the technology is encouraging increased belt use (Williams et al. 2002). Researchers unobtrusively observed belt use among drivers of vehicles brought in for service at 12 Ford dealerships in Tulsa and Oklahoma City, Oklahoma, in August and September 2001. Overall, seat belt use rates were 76 percent for drivers in vehicles equipped with the BeltMinder compared with 71 percent for drivers of late-model Fords without the reminder system—a statistically significant 7 percent gain (Williams et al. 2002, 295).[11] No follow-up studies have been conducted at other locations to determine whether these results can be replicated.

The second study, also conducted by IIHS just before completion of this committee's work, involved in-person interviews with 405 drivers of Ford vehicles with BeltMinder systems at five Ford dealerships in the metropolitan Boston area in March and April 2003 (Williams and Wells 2003). Ford Motor Company facilitated the study, but it was made clear to potential respondents that the research was being conducted independently. Approximately two-thirds of the 405 drivers interviewed reported that they had experienced the reminder system one or more times when they had neglected to buckle up. Seventy-three percent reported that they buckled up the last time this happened, and 46 percent of all respondents said that their belt use had increased since driving a vehicle with the BeltMinder (Williams and Wells 2003, 6, 10). These positive reports provide further evidence in support of the earlier observational study that the BeltMinder is increasing belt use. The system also appears to be acceptable to drivers. Seventy-eight percent of those interviewed said they liked the system. Seventy-nine percent reported that they would like a similar device in their next vehicle (Williams and Wells 2003, 1).

[11] The difference reflects a 5 percentage point gain in belt use but a 7 percent increase [i.e., (76 – 71)/71 = 0.07].

The responses of the 107 part-time belt users[12]—the primary target group for belt reminder systems—were encouraging. More than four-fifths had encountered the system at least once. Seventy percent had fastened their seat belts in response, and 76 percent reported that their seat belt use had increased since purchasing the vehicle (Williams and Wells 2003, 12). Seventy percent like the reminder system and an equivalent percent would want it in their next vehicle. (The findings concerning acceptability for part-time users were slightly lower than for all respondents, but since the latter include full-time users who are presumably favorably disposed to the reminder system, the results for the part-time users are indeed encouraging.)

Not surprisingly, of the 27 respondents who reported never wearing seat belts or wearing them only occasionally, the vast majority (85 percent) encountered the system more than once. However, only 22 percent fastened their seat belts in response, and only 8 percent reported increased use of seat belts (Williams and Wells 2003, 12). Furthermore, 26 percent disabled the system, suggesting that different technologies or strategies will be needed to get this group of hard-core nonusers to buckle up.

International Research Studies

No field studies could be found outside the United States on the effectiveness of enhanced belt reminder systems that meet EuroNCAP specifications. A Swedish study (Bylund and Björnstig 2001) evaluated the effectiveness of older, less aggressive belt reminder systems on Swedish seat belt use rates. On the basis of ambulance personnel data on driver belt use from a population of 477 drivers injured in crashes from 1991 to 1999, the researchers ascertained that only 12 percent of drivers were unbelted in cars with a belt reminder light-and-sound signal, compared with 23 percent in cars without a reminder system, a statistically significant difference (Bylund and Björnstig 2001, 3).

The only other relevant study was a prospective evaluation of the benefits of introducing belt reminder systems in Australia (Fildes et al. 2002), which estimated the potential injury reduction of different belt

[12] Part-time users were defined as those who reported that they typically wear a seat belt, but not on some occasions (Williams and Wells 2003, 7).

reminder system designs, assuming various system effectiveness levels. Using the Monash University–developed HARM model—a method for quantifying injury costs from road trauma—the study examined three belt reminder design options: a simple flashing light and warning tone (similar to the Ford BeltMinder), a slightly more complex system where the flashing light and warning tone increase in intensity at higher speeds, and a complex system where the hazard lights flash after a set period of noncompliance (Fildes et al. 2002, vii). The study assumed effectiveness rates (i.e., increases in belt use rates) of 10 percent for the BeltMinder-like system (slightly higher than the 7 percent belt usage increase found by the IIHS study), 20 percent for the somewhat more complex reminder system, and between 30 and 40 percent for the complex design (Fildes et al. 2002, vii). On the basis of several usage scenarios (i.e., driver only, front-seat occupants, and all occupants), discount rates, fleet life periods, and costs, the model estimated that the benefit–cost ratio was highest for the simplest driver-only belt reminder device. However, the model-estimated benefit–cost ratio was still greater than 1 for the most complex system assuming usage by all occupants, and this system showed the greatest estimated benefits (i.e., reduction in the societal costs of injury) (Fildes et al. 2002, viii).

Interviews conducted in Sweden (Dahlstedt 1999) and focus groups in Australia (Harrison et al. 2000) found that the Saab prototype belt reminder system, with an aggressive light-and-chime system that increases in intensity with speed, would generally be acceptable to drivers who describe themselves as part-time users. For example, of the 500 Swedish drivers interviewed after being observed not wearing their seat belts in traffic, 83 percent said they would buckle up if they rented a car with an aggressive audible warning system (Dahlstedt 1999, 9). When asked if they would buy a car with a gear interlock, 70 percent responded "yes," and approximately 20 percent said they would choose another car (Dahlstedt 1999, 9).

Automotive Coalition for Traffic Safety Telephone Surveys

In November 2000, the Automotive Coalition for Traffic Safety commissioned a nationwide telephone survey (Lawrence Research 2000) of 1,000 licensed drivers in conjunction with a 2001 national summit on

seat belt use. The survey oversampled part-time belt users and hard-core nonusers to determine attitudes toward belt reminder and interlock systems as well as state seat belt use laws.[13]

The survey found that 80 percent of full-time users and 78 percent of part-time users and nonusers reported that the current 4- to 8-second belt reminder system had no effect on their seat belt use behavior (ACTS 2000). When asked their reaction to a law that would require a reminder system that gets louder or brighter, an ignition interlock, or a radio interlock, 53 percent of all respondents and 47 percent of part-time users and nonusers strongly or somewhat favored the reminder system. Of the three options, the reminder system received the least opposition. Only 39 percent of all respondents, and the same percentage of part-time users and nonusers, strongly or somewhat opposed this device (ACTS 2000).

Response to the ignition interlock was polarized. Fifty-four percent of all respondents strongly or somewhat favored the ignition interlock,[14] but 43 percent of all respondents, and 55 percent of part-time users and nonusers, either strongly or somewhat opposed the device (ACTS 2000). The radio interlock received the least favorable rating. Forty-nine percent of all respondents, and 57 percent of part-time users and nonusers, either strongly or somewhat opposed the radio interlock.

NHTSA In-Depth Interviews and Focus Groups

Because of limited data on both the effectiveness and the acceptability of new seat belt use technologies, NHTSA conducted in-depth interviews for the present study of potential technology beneficiaries—part-time users and hard-core nonusers—to explore consumer reactions to the technologies. In addition, focus groups of full-time users were conducted to understand their views concerning new technologies, particularly any unintended negative consequences for those who already buckle up. A report detailing the results of this work is available from NHTSA (Bentley et al. 2003); only the highlights are summarized here.

[13] Respondents were divided into two groups—full-time users versus nonusers and part-time users—by their response to a question about how often they wore their seat belt. Full-time users were defined as those who indicated always wearing a belt. Non- and part-time users included everyone else.

[14] Fewer than half (42 percent) of part-time users and nonusers, however, strongly or somewhat favored the ignition interlock.

Methodology

After considering the desirability of various options for assessing the acceptability of different reminder systems, NHTSA concluded that in-depth interviews and focus groups would be more useful than a large population survey. Demonstration of the devices with follow-up questions would provide more valid data than asking hypothetical questions to respondents who were unfamiliar with the technologies and had no exposure to them. Limited resources and time constraints of the study restricted the number of in-depth interviews and focus groups that could be carried out.

The interviews were conducted in three locations: Phoenix, Arizona; St. Louis, Missouri; and Portsmouth, New Hampshire. These locations reflect a mix of geographic settings (e.g., urban, rural) and seat belt use laws (Arizona and Missouri are both secondary belt use law states; New Hampshire has no belt use law). The interviews, which were conducted individually and in person, were targeted primarily at self-reported part-time users—the largest nonuser group. A small group of self-reported hard-core nonusers was also recruited. Part-time users were defined as those who claimed to wear a seat belt "sometimes" but had forgotten or neglected to buckle up three times or more in the past month. Hard-core nonusers claimed never to wear a seat belt (Bentley et al. 2003, 9). Participants were limited to those who had purchased a vehicle within the previous 12 months or intended to purchase one within the next year, with the expectation that new or prospective car buyers would be more focused on desired new vehicle characteristics.[15] However, this group may not be representative of the general population. The goal was to recruit 40 participants at each of the three sites. Thirty-two to 35 would be part-time users, and 5 to 8 would be hard-core nonusers. A total of 106 in-depth interviews were conducted at the three sites (Bentley et al. 2003, 10).

In addition to the interviews, four focus groups of 8 to 9 each were conducted at one location—St. Louis—over a 2-day period for a total of

[15] Other eligibility criteria included (*a*) possessing a valid driver's license; (*b*) owning or planning to own an automobile, minivan, pickup truck, or SUV, and not a motorcycle, heavy truck, or other type of vehicle; and (*c*) never having worked in advertising, marketing, public relations, the federal government, or the automotive industry (Bentley et al. 2003, 9).

35 respondents (Bentley et al. 2003, 10).[16] Participants for both types of activities were recruited by random digit dialing. No specific attempt was made to represent the demographic characteristics of the areas.

The participants in both the in-depth interviews and the focus groups were exposed to four seat belt use technologies—two belt reminder systems and two interlock systems—reflecting technologies of increasing intrusiveness (see Figure 4-1 and Box 4-3 for system descriptions). The belt reminder systems were presented in the form of two short video clips; the interlock systems were described on two storyboards.[17]

Initially, the respondents discussed their opinions about seat belts and the reasons and circumstances affecting their use (see Chapter 2 for results). Then they were asked to rate the technologies, using a five-point scale, on both the effectiveness and the acceptability of each of the four devices.[18] (The order of presentation was rotated in a counterbalancing scheme to prevent order effect bias.) After commenting on each technology, the respondents were asked to rank order the four devices from one to four in terms of their relative effectiveness and acceptability.[19] Finally, the respondents were asked whether the technologies should be mandated (Bentley et al. 2003, 12).

The results of the NHTSA report do not provide quantitative results that can be subjected to meaningful statistical analysis for generalization to the entire automobile-buying population (Bentley et al. 2003, 12). Nevertheless, the findings provide useful qualitative information about consumer reactions to new technologies designed to increase belt use. The results that follow were developed by the committee from the original responses to the interview and focus group questions and do not appear in the NHTSA report.

[16] Focus group participants were asked to rate and rank the technologies individually and write their responses on a worksheet. Only then did they discuss their individual responses with the group.

[17] Reactions may have been different if the participants had been able to drive in vehicles equipped with the technologies, but time and resource constraints precluded this option. Human subjects' protection was also an issue, because participants would have had to drive unbelted to experience the reminder systems.

[18] The scale for effectiveness ranged from "very effective" to "not at all effective." The scale for acceptability ranged from "very acceptable" to "not at all acceptable."

[19] Responses to the ranking data were not considered reliable and hence were not included in this report. Several respondents were unable or unwilling to rank order the devices, ranking either some or all of them equivalently. For example, this was the case for approximately 10 percent of the rankings on acceptability. Without a better understanding of the respondents' intent, it was believed that these responses would skew the overall results.

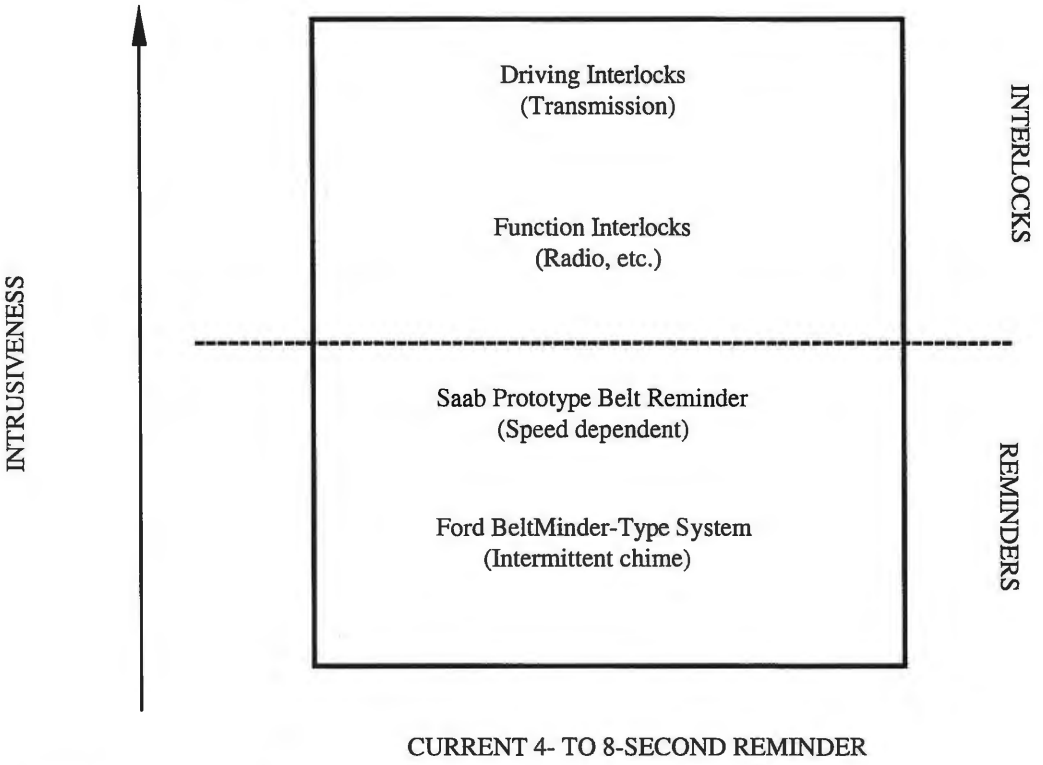

Figure 4-1 Seat belt use technologies arrayed by level of intrusiveness.

Results

Table 4-1 and the tables in Appendix B provide a summary of respondent ratings of the four technologies' effectiveness and acceptability. The results are first provided for all 141 respondents.[20] Then they are examined by user group (35 full-time users, 89 part-time users, and 17 hard-core nonusers), gender, age, and location (see Table B-1).

Overall Ratings A much higher percentage of the respondents rated each of the technologies "effective" than "not effective" (ranging from

[20] The respondents were asked to rate the effectiveness and acceptability of the technologies on a five-point scale. The ratings presented in this report range from "one" (least) to "five" (most) effective and acceptable. In Table 4-1, the ratings were further combined into three-point scales (combining "very effective" with "effective" and "very ineffective" with "ineffective," with similar combining of the acceptability scales) to provide greater contrast between positive and negative results. The responses for each of the five ratings can be found in Appendix B, Table B-2. Because of small sample sizes, only the mean rating was provided for responses analyzed on the basis of gender, age, and location (see Table B-3).

Box 4-3

Seat Belt Use Technology Concepts Tested

(Bentley et al. 2003, 8–9)

Intermittent chime and flashing symbol (Ford BeltMinder-type system)

The current standard 4- to 8-second reminder appears when the driver turns on the ignition. When the driver exceeds 3 mph (4.8 km/h), a flashing light and chime appear for 6 seconds. After 6 seconds the flashing light and chime cease. This cycle is repeated every 30 seconds for 5 minutes.

Continuous chime and flashing symbol connected to the speed of the vehicle (Saab prototype)

When the driver turns on the ignition, a symbol appears on the dashboard indicating that someone in the car is not wearing a safety belt. Another symbol on the dashboard indicates who is unbuckled; in the case of the video presentation it was the driver. When the driver reaches about 9 mph (14.5 km/h), an audio warning sounds (one ping) and a warning light starts to flash. At about 15 mph (24 km/h), the audio signal starts to ping continuously along with the flashing symbol. At about 30 mph (48 km/h), the light and audio warnings reach their maximum frequency.

As the driver slows down, so do the warnings, and when the vehicle stops the signals stop. When the driver accelerates again, the audio and visual warnings resume at their highest frequency. When the driver buckles up, the warnings cease. If for any reason the driver unbuckles while the vehicle is moving, the warning light reappears and a warning signal sounds (one ping). After 15 seconds, the symbol begins to flash and the audio warning starts to ping continuously, and after 30 seconds the reminders reach their highest frequency.

Entertainment interlock

The standard 4- to 8-second reminder appears after the driver starts the ignition. However, the vehicle stereo does not work until the driver buckles up.

Transmission interlock

The standard 4- to 8-second reminder appears after the driver starts the ignition. However, the vehicle cannot be shifted into gear until the driver buckles up.

61 to 88 percent). A higher percentage of respondents also rated the two reminder systems (Ford and Saab) "acceptable" than "not acceptable" (71 percent and 56 percent, respectively). However, this result did not hold for the interlock systems, which somewhat more respondents found not acceptable than acceptable (see Table 4-1). Anecdotally, several respondents, generally hard-core nonusers, indicated that the devices were acceptable but not effective because they believed they could circumvent them—for example, by drowning out the sound of the chime with the radio—or disable them entirely (Bentley et al. 2003, 4, 14). These responses obfuscate interpretation of the ratings.

Of the two reminder systems, respondents were more likely to rate the Ford BeltMinder as acceptable (71 percent versus 56 percent for the Saab system) but were also somewhat less likely to rate it effective compared with the more insistent Saab system (78 percent versus 83 percent) (Table 4-1). The transmission interlock was most likely of all the devices to be rated effective—88 percent rated it effective. However, only 43 percent of the respondents rated it acceptable. A somewhat lower percentage of respondents (37 percent) rated the entertainment interlock acceptable. However, 40 percent rated that device as either not effective or neutral (Table 4-1). Follow-up questions found that the effectiveness of the entertainment interlock depended largely on the extent to which drivers use their stereo systems (Bentley et al. 2003, 14).

Table 4-1 Analysis of Ratings from NHTSA In-Depth Interviews and Focus Groups by Technology, Overall and by User Group (Percentage)

Reported Acceptability	Ford	Saab	Entertainment Interlock	Transmission Interlock	Reported Effectiveness	Ford	Saab	Entertainment Interlock	Transmission Interlock
Overall (N = 141)									
Not acceptable	15	27	45	45	Not effective	12	10	27	8
Neutral	14	16	18	11	Neutral	9	7	13	4
Acceptable	71	56	37	43	Effective	78	83	61	88
Full-Time Users (N = 35)									
Not acceptable	3	28	51	55	Not effective	0	9	34	3
Neutral	3	11	29	14	Neutral	0	6	14	0
Acceptable	94	60	20	32	Effective	100	86	52	97
Part-Time Users (N = 89)									
Not acceptable	16	22	41	37	Not effective	14	9	24	10
Neutral	20	18	15	11	Neutral	12	7	14	2
Acceptable	64	60	45	52	Effective	74	84	63	88
Hard-Core Nonusers (N = 17)									
Not acceptable	35	53	53	71	Not effective	30	18	30	6
Neutral	0	12	12	6	Neutral	12	12	6	18
Acceptable	64	36	35	24	Effective	59	70	65	77

NOTE: "Not acceptable" is the sum of ratings "very unacceptable" and "unacceptable" (1 and 2); "acceptable" is the sum of ratings "very acceptable" and "acceptable" (4 and 5). "Not effective" is the sum of ratings "very ineffective" and "ineffective" (1 and 2); "effective" is the sum of ratings "very effective" and "effective" (4 and 5). The percentages may not add to 100 because of rounding. See Table B-2 for a more detailed breakdown by rating category.

With the exception of the entertainment interlock, the higher the effectiveness rating for a device, the lower the acceptability rating. This was most pronounced for the transmission interlock—88 percent rated the transmission interlock effective but only 43 percent rated it acceptable.

Ratings by User Group The responses of different user groups, especially part-time users, were of particular interest to the committee because they are the primary group to which the technologies are directed. Nearly two-thirds of part-time users rated the belt reminder systems acceptable (64 percent for the Ford BeltMinder and 60 percent for the Saab system). The reminder systems also were likely to be rated effective (74 percent for the Ford BeltMinder and 84 percent for the Saab system). Approximately twice as many part-time users, however, rated the interlocks unacceptable compared with the reminder systems (Table 4-1). Nevertheless, part-time users were more likely to rate the interlocks as acceptable than other user groups.

Of the much smaller group of 17 hard-core nonusers, fewer were likely to rate the more aggressive technologies—the Saab belt reminder and the transmission interlock—as acceptable compared with the other groups. For example, only 36 percent rated the Saab system acceptable (Table 4-1). And the hard-core nonusers were the most likely of any user group to rate the transmission interlock as unacceptable, with 71 percent rating it not acceptable. Not surprisingly, hard-core nonusers were more likely to give the Saab reminder and the transmission interlock high effectiveness ratings compared with the other two technologies, 70 percent and 77 percent, respectively. The particularly negative reaction to the transmission interlock from hard-core nonusers stemmed in part from their belief that this device infringes on an individual's right to choose whether to buckle up (Bentley et al. 2003, 15). However, a relatively high percentage (55 percent) of full-time users also rated the transmission interlock not acceptable. This group did not like systems that affect the operability of the vehicle, nor were they sympathetic to the idea of having an intrusive device in their vehicle just because others do not buckle up (Bentley et al. 2003, 34).

Ratings by Gender, Age, and Location Mean ratings are provided by gender, age, and location (Table B-3). Because of small sample sizes, no attempt was made to break down the data further by rating category (e.g., acceptable, neutral, not acceptable) as was done in Table 4-1.

The mean effectiveness and acceptability ratings are higher for females than for males and for the oldest age group than for the youngest age group for all technologies except the entertainment interlock. Males and the two youngest age groups rated the entertainment interlock more effective than did females or the oldest age group, which probably reflects greater use of the stereo system by these groups. However, none of the age groups rated the entertainment interlock very highly on acceptability. Mean acceptability ratings for reminder systems were higher than for interlocks for all three locations. This pattern did not hold for mean effectiveness ratings, mainly because the transmission interlock was rated most effective in all locations.

Mandating Seat Belt Use Technologies Respondents were asked whether they agreed that reminder systems and interlocks should be required in vehicles. If they responded positively, they were then asked whether the federal government should mandate this. Quantitative results were not available for these questions, but a summary of the responses provided in the NHTSA report suggests that most participants were supportive of the idea of mandating seat belt reminder systems and interlocks (Bentley et al. 2003, 38). Although many stated that mandates for reminders were acceptable, some thought that requiring interlocks was not. These devices were considered to be excessive in their attempt to control driver behavior and limit freedom of choice (Bentley et al. 2003, 38). Some hard-core nonusers were against mandates altogether. They believed that wearing a seat belt is a matter of personal choice that should not involve government intervention (Bentley et al. 2003, 15).

SUMMARY OF THE STATE OF KNOWLEDGE

Nearly 30 years after NHTSA was prohibited from requiring seat belt interlock systems or continuous buzzer reminders longer than 8 seconds in duration, the automobile manufacturers are voluntarily introducing

enhanced seat belt use technologies in passenger vehicles. Ford Motor Company started the move toward a new generation of enhanced belt reminder systems with the introduction of the Ford BeltMinder on selected MY 2000 vehicles. Enhanced belt reminder systems are also being introduced in Europe, where belt use rates are higher, and incentives are being offered to manufacturers through the EuroNCAP program to improve vehicle consumer safety ratings by providing systems that meet certain performance criteria. No automobile manufacturer, either in the United States or abroad, is providing vehicles with interlock systems as original equipment, targeted to the general consumer. However, a seat belt shifter lock is being developed for special fleets and aftermarket applications in the United States.

Because enhanced seat belt use technologies are so new, few studies of their effectiveness have been conducted. Nevertheless, the available evidence suggests that consumers generally find new belt reminder systems somewhat successful in convincing part-time users—the largest nonuser group—to buckle up. For example, the initial IIHS study (Williams et al. 2002), which was limited to two locations in Oklahoma, observed a statistically significant 7 percent increase in seat belt use by drivers in passenger vehicles equipped with the Ford BeltMinder compared with drivers of nonequipped late-model Fords. A subsequent IIHS study corroborated these findings. In interviews in Boston with drivers of BeltMinder-equipped Ford vehicles, overall, two-thirds reported that they had activated the system. Of these, approximately three-fourths buckled up and nearly half of all respondents said their belt use had increased. Results were encouraging for part-time belt users. More than four-fifths of this user group had activated the system at least once, 70 percent fastened their belts in response, and approximately 75 percent said their belt use had increased. No studies of the effectiveness of new European belt reminder systems could be found.

Information on consumer acceptability of seat belt use technologies from the manufacturers, the recent IIHS study, and the NHTSA interviews and focus groups conducted for the present study suggest a generally positive response to enhanced belt reminder systems. For example, nearly two-thirds of self-reported part-time users rated

reminder systems acceptable in the NHTSA interviews. As a general rule, the more intrusive the system, the less acceptable it is. This finding was particularly pronounced for the transmission interlock, which, of the four technologies, was most likely to be rated effective by all user groups who participated in the NHTSA interviews and focus groups, but was less likely to be rated acceptable across the board than reminder systems.

Self-reported hard-core nonusers who participated in the NHTSA interviews were more likely to be opposed to all systems than other user groups, with the exception of the Ford BeltMinder, which two-thirds of hard-core nonusers found acceptable, as was the case for part-time users. However, as the earlier IIHS study noted, acceptance does not necessarily lead to increased belt use, particularly for hard-core nonusers. More intrusive technologies may be required to convince this group to buckle up.

In sum, the data available to date provide strongly converging evidence in support of both the potential effectiveness and consumer acceptance of many new seat belt use technologies, particularly enhanced belt reminder systems. Despite limitations in the individual studies, surveys, and other pieces of evidence that are spelled out in the present report, the fact that findings from such a diverse set of information sources converge on this core conclusion is extremely important. However, much remains to be learned. Fortunately, larger numbers of belt reminder systems will soon be introduced in the marketplace. With characteristics that vary across manufacturers in the loudness, urgency, and duration of their chime and light components, these systems provide a natural laboratory for study.

Key knowledge gaps remain concerning the design, effectiveness, and acceptability of enhanced belt reminders. For example, unresolved design issues include the optimal loudness of the reminder's chime and its relation to other warning and information systems. Temporary muting of nonessential systems (e.g., radio, CD player) could be considered so that drivers do not drown out the chime. Appropriate design of disconnection systems is also likely to influence both the effectiveness and the acceptability of belt reminder systems. Finally, because of the benefits of rear-seat belt use, resolution of tech-

nical problems hindering the installation of rear-seat belt reminder systems is important, especially as the cost of sensors for the rear seats declines.

More comprehensive studies of the effects of reminder systems on belt use need to be conducted. Comparative studies of the effectiveness of aggressive belt reminder systems would be helpful in determining whether they can provide additional gains in belt use, particularly among the hard-core nonuser groups.

Finally, more data are needed on consumer acceptance. For example, although initial reactions toward interlock systems were negative, several of their undesirable features (e.g., inability to play the radio when the vehicle is not in motion) could be engineered out. As more consumers actually experience the systems, attitudes may differ from those expressed in interviews, where respondents could only be given general explanations or visual presentations of how the systems work.

The converging evidence of the effectiveness and consumer acceptance of enhanced belt reminder systems is favorable. In the next chapter, potential statutory and regulatory impediments to their installation are addressed.

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Abbreviations

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IIHS	Insurance Institute for Highway Safety

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5

A Strategy for Increasing Seat Belt Use Through Technology

A key purpose of this study is to assess whether, in light of findings regarding the benefits and acceptability of new seat belt use technologies, the 1974 legislation prohibiting the National Highway Traffic Safety Administration (NHTSA) from requiring their use in vehicles should be reconsidered. In particular, the congressional request asks whether any legislative or regulatory actions may be necessary to enable installation of devices to encourage seat belt use in passenger vehicles.

This chapter begins with an overview of NHTSA's current interpretation of the statutory provision prohibiting its regulation of new seat belt use technologies. The manufacturers' perspective on the need for regulation, as reported in briefings to the committee, is then discussed. Drawing on this material as well as on the findings concerning the effectiveness and acceptability of new seat belt use technologies summarized in the preceding chapters, the committee provides its key findings and recommends a strategy to help ensure the successful introduction of new seat belt use technologies as part of an overall effort to increase belt use. The chapter ends with a brief assessment of the potential benefits of that strategy.

NHTSA's Interpretation of Current Statutory Constraints

In 1998, NHTSA was petitioned to commence a rulemaking to amend Federal Motor Vehicle Safety Standard (FMVSS) 208 so that the agency could require effective seat belt inducements in new vehicles other than the ignition interlock or a continuous buzzer of the type NHTSA is prohibited from requiring (Nash and Friedman 1998). The petitioners cited the irrelevance of the interlock experience today in view of substantially higher levels of belt use and more comfortable belt designs. They recommended that NHTSA consider requiring such technologies as continuous visual reminders, intermittent and repeating audible warnings,

interlocks that disrupt comfort systems (e.g., radio and CD player, heat and air-conditioning), and other similar systems.[1]

NHTSA denied the petition on the grounds of the uncertainty of the safety benefits and the questionable acceptability to the public of the proposed devices, citing earlier public resistance to the ignition interlock system (*Federal Register* 1999, 60,626). The response also noted that some of the suggested systems (e.g., audible warnings beyond 8 seconds) fall outside of NHTSA's regulatory authority. NHTSA is prohibited by law from requiring buzzers beyond the 8-second time period, and the agency has interpreted this to mean that it cannot require manufacturers to provide audible sound beyond 8 seconds. The response, however, recognized the life-saving potential of even small increases in seat belt use that new technologies could achieve. Citing the newly introduced Ford BeltMinder™, NHTSA noted that the agency does not have the authority to require such a system, but encouraged vehicle manufacturers to consider voluntarily introducing belt reminder systems and other innovative technologies that could increase seat belt use in ways acceptable to their customers (*Federal Register* 1999, 60,626).

Since this response and NHTSA Administrator Runge's appeal to the automobile industry encouraging installment of systems such as the Ford BeltMinder that go beyond the minimum federal requirements, NHTSA's Chief Counsel has issued several clarifications concerning the legality of voluntarily provided belt reminder and interlock systems.[2] In response to questions about the legality of the Ford BeltMinder and an enhanced seat belt reminder system recently developed by General Motors Corporation, the Chief Counsel noted that the federal requirement for a 4- to 8-second system is a minimum standard. Voluntary chime-and-light belt reminder systems that go beyond the minimum standard do not conflict with the requirements of FMVSS 208 as long as

[1] The petition also suggested that NHTSA take the lead in encouraging nonmandatory measures, such as a joint government–industry research and testing program to identify effective seat belt use technologies, a voluntary committee to develop a consensus consumer information standard for seat belt inducement systems, and insurance discounts for equipped vehicles that meet the consensus standard (Nash and Friedman 1998).

[2] These interpretation letters can be found in the U.S. Department of Transportation's electronic docket management system (dms.dot.gov) at Docket Nos. 9899 (Items 1 and 2), 13379, 14742, 15006, and 15156 (Items 1, 2, and 3).

the vehicle manufacturer provides some way of distinguishing the voluntary chime from the "federal" chime for compliance-testing purposes. This can be accomplished either by a break in time between the required and voluntary signal or by audible alerts with different tones.[3] The Chief Counsel noted further that cost should not be a deterrent to vehicle manufacturers in voluntarily installing enhanced belt reminder systems, at least for front-seat occupants. As advanced air bag requirements are phased into the new vehicle fleet starting on September 1, 2003, all manufacturers will have some type of front-seat occupant-sensing devices. The marginal cost of the additional hardware to detect that drivers and front-seat occupants are buckled up to support driver and front-seat passenger belt reminder systems is relatively modest and thus, in the opinion of the Chief Counsel, should not serve as a deterrent to seat belt use technology introduction.[4]

The clarifications just discussed pertain to enhanced belt reminder systems on vehicles for sale in the U.S. market. Recently, Mazda asked for a clarification of whether an enhanced seat belt reminder system being designed to meet the European New Car Assessment Program (EuroNCAP) criteria for belt reminders would meet FMVSS 208 requirements and could be sold legally in the United States. The Chief Counsel noted that the proposed Mazda system should be in compliance because EuroNCAP-compliant belt reminder systems are activated only after the vehicle reaches a certain speed or travels a certain distance (see Chapter 4 for details), thus providing for an adequate separation between the NHTSA-required 4- to 8-second reminder system that begins when the ignition is turned to the "start" or "on" position and the enhanced belt reminder.[5] More generally, in the opinion of NHTSA's Chief Counsel, it should be possible to design systems that meet both FMVSS 208 requirements and EuroNCAP protocols.

[3] See response in the May 5, 2001, letter from NHTSA to Bob Snyder, Docket No. 9899.

[4] See response in the April 3, 2003, letter from NHTSA to Dr. William Howell, Docket No. 15156-3.

[5] The Chief Counsel further noted that a warning system on a vehicle in use that does not provide any separation from the NHTSA-required warning signal would not violate FMVSS 208 because the test procedure used to verify compliance with the NHTSA-required 4- to 8-second reminder only checks vehicles that are in "park" once the ignition is engaged. Thus, the Mazda system in which the belt use reminder chime is triggered by speed is not in violation because the compliance test is conducted on a stationary vehicle. See response in the May 7, 2003, letter from NHTSA to David Robertson, Manager for Environmental and Safety Engineering of Mazda North American Operations, Docket No. 15156-1.

NHTSA also issued interpretation letters concerning the legality of a voluntarily provided seat belt shifter lock system and an entertainment interlock that would suppress the radio or sound system unless occupants are buckled up.[6] These systems are being considered for sale as original equipment or as dealer-installed aftermarket devices. The Chief Counsel found that such devices would be in compliance with FMVSS 208 requirements as long as any audible warning connected with the systems is clearly distinguishable from the federally required warning. However, such devices are considered as motor vehicle equipment for purposes of federal law protecting the public against products with safety defects. As such, the manufacturers would have to assume responsibility for any defects in their manufacture, design, or performance.

In sum, from NHTSA's perspective, enhanced belt reminder systems and certain interlock devices voluntarily provided by the automobile manufacturers should not be in violation of FMVSS 208 as long as they clearly distinguish between the NHTSA-required 4- to 8-second system and the enhanced system. Moreover, it should be possible to design systems that are in compliance with both FMVSS 208 requirements and EuroNCAP performance criteria.

PERSPECTIVE OF THE AUTOMOBILE MANUFACTURERS

In their briefings to the study committee, the four participating manufacturers—General Motors, DaimlerChrysler, Ford, and Toyota—commented on perceived problems with current regulations that could negatively affect the voluntary introduction of new seat belt use technologies, and more generally on the desirability of regulating new seat belt use technologies.[7] One point of confusion was whether belt reminder systems developed to meet EuroNCAP criteria would also meet FMVSS 208 requirements.[8] At least one manufacturer is developing two systems—one for the U.S. market and a more aggressive system for the European market. This dual approach reflects, in part, perceived differ-

[6] See responses in the letter of September 13, 2002, from NHTSA Chief Counsel, Docket No. 13379, and in the letter of April 11, 2003, from NHTSA to Warren Howard, Docket No. 15006.

[7] Honda provided written comments after the meeting.

[8] This issue was raised before NHTSA's Chief Counsel wrote the interpretation letter clarifying the situation (see Docket No. 15156-1).

ences in regulatory requirements; it may also reflect concerns about the acceptability of more intrusive systems in the U.S. market.

The companies differed in their views about the desirability of regulating seat belt use technologies, in particular, seat belt reminder systems. Some thought that regulation would be helpful in removing potential negative consumer backlash against companies that choose to introduce more aggressive systems. NHTSA has a long-standing responsibility to upgrade safety standards as new information and technology make existing standards outdated, so it is natural for the agency to consider requirements for belt reminder systems. Regulatory requirements would also overcome any objections that might be raised by internal marketing staff concerning the desirability of such devices. Finally, regulation would help eliminate any potential consumer confusion arising from the introduction of reminder systems with different operating characteristics. That being said, some companies were skeptical that one technology could "fit" all markets. They noted the need and likely tolerance for more aggressive systems in many European countries, Australia, and Japan, where belt use rates are considerably higher than in the United States. However, some companies were unconvinced that these systems could be successfully introduced in the United States because of the potential backlash from the still sizeable numbers of motorists who continue to drive unbuckled, at least some of the time.

Those companies opposed to regulation noted that the automobile manufacturers are already voluntarily introducing belt reminder systems; hence there is no need for regulation. Others thought that regulation was premature and could stifle innovation. They believe that more on-road experience with systems of different designs is needed and more evaluations of their effectiveness must be conducted before minimum performance standards should be established. Some companies went further to suggest that NHTSA should assume the responsibility for monitoring and evaluating the effectiveness of different seat belt use technologies.

The companies were in agreement that, at present, the introduction of rear-seat belt reminder systems, even in Europe, will be limited to systems that notify the driver whether rear-seat occupants are not wearing their belts or unbuckle them during a trip. According to the

manufacturers, the current high cost of rear-seat belt reminder systems[9] and lower occupancy rates make rear-seat devices less cost-effective than other safety devices, such as side impact protection (e.g., side air bags, window curtains), which could be provided. According to the companies, regulation would be necessary if rear-seat systems or more intrusive technologies like interlocks are deemed to be desirable for the mass market. The companies also noted their conviction that by far the most effective way to encourage seat belt use is through the enactment of primary seat belt use laws and strong enforcement efforts.

FINDINGS

On the basis of its review of the literature, the interviews and focus groups conducted by NHTSA for the study, and the briefings provided by the automobile manufacturers and NHTSA's Chief Counsel, the committee offers its key findings in response to its charge in this section. The committee believes that new seat belt use technologies, in particular enhanced belt reminder systems, could increase belt use and be favorably received by consumers, particularly by part-time users, who apparently would welcome a reminder according to the results of the NHTSA interviews. The current statute that prohibits NHTSA from requiring such technologies or setting performance standards appears outdated and unnecessarily limits the agency. The reasoning behind these findings is elaborated below.

New seat belt use technologies exist that present opportunities for increasing belt use without being overly intrusive. The current NHTSA-required 4- to 8-second light-and-chime belt reminder has proved ineffective in increasing belt use (Westefeld and Phillips 1976, 2). There is no scientific basis for the 8-second maximum duration of the system. Many motorists—the majority of whom do not buckle up until some time after starting their vehicles (70 percent according to General Motors'

[9] The high cost arises because of the lack of rear-seat sensors, the most costly component of a belt reminder system. International Electronics and Engineering S.A. (IEE), a European sensor manufacturer, is currently working with three European car manufacturers on specifications for a rear-seat belt reminder system. IEE is leading a feasibility study on the development of rear-seat sensors and on the solution to problems related to removable seats, child restraints, and other technical obstacles (personal communication with Paul Schockmel, IEE, June 12, 2003).

survey data)—report that they ignore the chime or simply do not hear it over the radio or have forgotten it by the time they are backing out of the driveway and could use a stronger reminder to buckle up. In contrast, the results of the NHTSA interviews and the manufacturer briefings suggest that motorists would be aware of and heed the characteristics of enhanced belt reminder systems now being introduced by industry, although some still thought the chime would be difficult to hear over the radio. More important, although the results are based on a limited sample, many part-time users interviewed by NHTSA—the primary target group for the technology—were receptive to the new systems. Nearly two-thirds rated the reminders "acceptable," and approximately 80 percent thought that they would be "effective."

Preliminary research on the only system currently deployed in the United States—the Ford BeltMinder—found a statistically significant 7 percent increase (5 percentage point gain) in seat belt use for drivers of vehicles equipped with the Ford system compared with drivers of unequipped late-model Fords (Williams et al. 2002, 295). The results were gathered in two Oklahoma locations and provide a snapshot of belt use behavior, but they are suggestive of the potential benefits of enhanced belt reminder systems. The achievement of such gains nationwide would represent a modest but important increase in belt use. In a subsequent study in Boston of drivers of BeltMinder-equipped Ford vehicles, of the two-thirds who activated the system, three-quarters reported buckling up, and nearly half of all respondents said their belt use had increased (Williams and Wells 2003, 6, 10).

Enhanced belt reminder systems can be provided at minimal cost for front-seat occupants because of the availability of sensors that can detect the presence of front-seat occupants for advanced air bag systems.[10] The absence of rear-seat sensors on many vehicles, installation complexities (e.g., removable seats, child seats), and low rear-seat occupancy rates currently make rear-seat systems appear costly compared with systems for front-seat occupants. However, lower-cost systems that alert the driver when rear-seat occupants have not buckled up or have unbuckled

[10] The committee was provided with more specific cost data in the briefings, but the manufacturers indicated that the data are proprietary.

their belts during a trip are currently available on some vehicles in Europe. The risks posed to all vehicle occupants by unbelted rear-seat occupants, particularly in more severe crashes, suggest that the benefits of full-scale rear-seat reminder systems could be significant (Ichikawa et al. 2002) and thus may warrant greater attention than they have received to date.

Transmission interlock systems are perceived to be highly effective—more than 85 percent of all respondents to the NHTSA interviews and focus groups rated them effective. However, fewer than half rated them acceptable. The highest percentage of respondents who rated the transmission interlock not acceptable—71 percent—came from the small group of hard-core nonusers. Objections to entertainment interlock systems, which were thought to be most effective for younger drivers, were weaker among full-time users and even among hard-core nonusers. This result can be attributed in part to the fact that the system would not be experienced by some people (e.g., older people who do not use the radio, drivers on short trips) or could be circumvented (e.g., by installing an aftermarket stereo). Part-time users, who found the entertainment interlock slightly more objectionable than the transmission interlock, were the exception.

Interlock systems could be engineered to avoid many motorists' objections. For example, they could be designed to enable drivers to start their cars without buckling up and to drive in reverse and perhaps at low speeds to accommodate the majority of drivers who do not buckle up before starting their vehicles. However, the negative reaction indicated by the NHTSA interviews and focus groups and the hesitancy of industry to reintroduce interlock systems for the general driving public suggest that, for the moment, their use be considered only for certain high-risk groups (e.g., drivers impaired by alcohol, teenage drivers) who are overrepresented in crashes.

The current legislation prohibiting NHTSA from requiring new seat belt use technologies other than the ineffective 4- to 8-second belt reminder is outdated and unnecessarily prevents the agency from requiring effective technologies to increase belt use. Seat belt use has grown fivefold since 1974. Many more motorists now recognize the benefits of seat belts and appear to be receptive to their use. Although many

manufacturers are moving voluntarily to install belt reminder systems, some are concerned about their compliance with FMVSS 208 requirements. Others are wary of marketing systems that their customers may consider too intrusive. Hence they are hesitant to introduce more aggressive and potentially more effective systems. However, NHTSA does not currently have the authority to establish performance standards to encourage development of minimum performance criteria for the most effective systems or to require them to be sold in the U.S. market.

RECOMMENDED STRATEGY

On the basis of its findings, the committee reached consensus on the following recommendations:

1. **Congress should amend the statute regarding belt reminder systems by lifting the restrictions on systems with lights and chimes longer than 8 seconds, which would provide NHTSA more flexibility and the authority to require effective belt reminder technologies.** Amending the statute should remove any remaining legal restrictions perceived by the manufacturers to integrating these technologies in passenger vehicles. Should voluntary efforts to install effective belt reminder systems fall short, NHTSA will have the necessary authority to regulate. At this time, the committee does not see any compelling need to delete the prohibition on requiring interlock systems. However, this subject should be revisited in 5 years (see Recommendation 8).[11]
2. **Every new light-duty vehicle should have as standard equipment an enhanced belt reminder system for front-seat occupants with an audible warning and visual indicator that are not easily disconnected. Any auditory signal should be audible over other sounds in the vehicle. For the short term, manufacturers should be encouraged to provide these systems voluntarily** so that field experience can be gained concerning the absolute and differential effectiveness and acceptability of a range of systems. Enhanced reminder systems are of longer

[11] NHTSA interprets the statutory prohibition against interlocks to refer to those systems designed to prevent starting or operating a motor vehicle (see April 3, 2003, letter from NHTSA to Dr. Howell, p. 6, Docket No. 15156-3).

duration than the currently required 4- to 8-second reminder, and some are integrated with the speed of the vehicle. Those who rate vehicles—NHTSA, the Insurance Institute for Highway Safety (IIHS), Consumers Union—should be urged to note those vehicles that have enhanced belt reminder systems in their consumer vehicle safety rating publications. For example, NHTSA could indicate those vehicles in its consumer publication *Buying a Safer Car*. Similarly, IIHS could note such information in its publication *Shopping for a Safer Car*. Consumers Union is already noting the presence of enhanced reminder systems in its vehicle safety checks and is planning to provide points for equipped vehicles and publicize the information in *Consumer Reports*.

3. **NHTSA should encourage industry to develop and deploy enhanced belt reminder systems in an expeditious time frame, and NHTSA should monitor the deployment. As differences in effectiveness and acceptability of belt reminder systems are identified, manufacturers should install systems that are determined by empirical evidence to result in the greatest degree of effectiveness while remaining acceptable to the general public. Should voluntary efforts not produce sufficient results, NHTSA should mandate the most effective acceptable systems as determined by the current data.** The agency should also conduct studies to identify factors that will increase the effectiveness and acceptability of the systems. (See the next section, Proposed Research Program, for details.)
4. **Rear-seat reminder systems should be developed at the earliest possible time as rear-seat sensors become available,** to take advantage of the benefits of restrained rear occupants to the safety of both front- and rear-seat occupants. Until that time, manufacturers should provide systems that notify the driver if rear-seat occupants either have not buckled up or have unbuckled their belts during a trip.
5. **NHTSA and the private sector should strongly encourage research and development of seat belt interlock systems for specific applications.** For example, the courts should consider requiring the use of interlocks for motorists with driving-under-the-influence-of-alcohol convictions or with high numbers of points on their driver's licenses. The experience with alcohol ignition interlocks has been encouraging. Interlocks could also be made available for young drivers. Teenage

drivers, particularly the youngest drivers, have much higher crash rates on average than do older drivers, reflecting their lack of experience and their risk-taking behaviors. Insurance companies could lower premium rates for young drivers who install interlock systems. Finally, interlocks could be installed on company fleets.

6. **Seat belt use technologies should be viewed as complementary to other proven strategies for increasing belt use, most particularly enactment of primary seat belt use laws that enable police to pull over and cite drivers who are not buckled up and well-publicized enforcement programs.** Seat belt use technologies have the potential to increase belt use, but their effect is largely confined to new vehicle purchasers, whereas seat belt use legislation affects all drivers.
7. **Congress should provide NHTSA funding of about $5 million annually[12] to support a multiyear program of research on the effectiveness of different enhanced seat belt reminder systems.** NHTSA should coordinate its efforts with other federal agencies, such as the Centers for Disease Control and Prevention (CDC), that are conducting related research. The research would involve conducting more comprehensive studies of the effects of reminder systems on belt use; undertaking controlled fleet studies of more aggressive reminder systems; gathering more survey data on the effectiveness and acceptability of belt reminder systems from existing NHTSA and public health sources; and examining design issues, such as loudness of the chime, desirability of muting the radio when the chime is sounding, duration and cycling of the systems, and presence and design of any cutoff capability. (See the following section—Proposed Research Program—for more details.) This research should help establish the scientific basis for regulation of belt reminder systems should regulation be needed.
8. **In 2008 another independent review of seat belt use technologies should be conducted to evaluate progress and to consider possible revisions in strategies for achieving further gains in belt use,**

[12] The committee developed the $5 million estimate for the cost of this research in consultation with NHTSA staff and consultants, who, together, have been involved in many similar efforts to estimate the effectiveness of various motor vehicle safety features. Although the figure is not intended to be precise, it should be about the right amount given the complexity of the proposed activities and NHTSA's extensive experience in conducting such evaluations.

including elimination of the legislative restriction against NHTSA's requiring vehicle interlock systems.[13]

PROPOSED RESEARCH PROGRAM

Several million new vehicles that are equipped with enhanced seat belt reminder systems will soon be added to the U.S. passenger vehicle fleet. For example, approximately 15 million Ford vehicles have already been equipped with the Ford BeltMinder since its introduction on Model Year (MY) 2000 vehicles. Approximately 4 million new Ford vehicles are sold each year in North America. General Motors, DaimlerChrysler, Toyota, Mazda, and others are planning to introduce enhanced belt reminder systems on MY 2004 and MY 2005 vehicles, in many cases concurrent with the introduction of advanced air bags. The availability of vehicles with a range of reminder systems provides the basis for a number of natural experiments. NHTSA should take the lead in monitoring the introduction of the technologies and evaluating their ability to generate increases in belt use by undertaking a broad program of research, including observational studies and surveys, controlled fleet studies, and laboratory studies. More specifically, this research would comprise the following:

- Observational studies, modeled on the IIHS study (Williams et al. 2002), of the Ford BeltMinder and other enhanced belt reminder systems as they are introduced. These studies should provide an independent evaluation of various enhanced belt reminder systems in a range of settings (e.g., high belt use states, primary versus secondary law states) to determine whether they produce increases in belt use and, if so, whether the results are sensitive to differences in system design or other factors affecting belt use.
- Follow-up surveys of drivers and front-seat passengers to understand how they respond to these systems. Individuals who did not use their belts in reminder-equipped vehicles should be oversampled to explore why and how they defeated the technology.

[13] The committee selected 5 years as a reasonable target for a progress review. In 5 years, many more belt reminder systems of various types should be commercially available, and much of the proposed program of research should be under way. Thus, it should be possible to take stock of the adequacy of voluntary efforts and make a judgment as to whether regulation is needed.

- Expanded coverage in the National Occupant Protection Use Survey (NOPUS) to examine the effect of enhanced belt reminders on national belt use levels. More specifically, the NOPUS should be modified to collect make and model information on recent MY vehicles (i.e., MY 2002 or later) so that belt use in reminder-equipped vehicles can be compared with belt use in nonequipped vehicles. Expansion of coverage (e.g., more state-level data, nighttime surveys) and an increase in the frequency of the NOPUS could be considered to obtain a more complete picture of belt use and to monitor any degradation in belt use reminder effectiveness. In addition to the NOPUS, questions could be added to two large annual national health surveys—the Behavioral Risk Factor Surveillance System (BRFSS) and the National Health Interview Survey (NHIS)—to obtain information on belt use and the effectiveness of reminder systems.[14]
- Analyses for the National Automotive Sampling System and the Fatality Analysis Reporting System databases to evaluate the effects of vehicles equipped with belt reminder systems on injury reduction in crashes while adjusting for other important crash factors. These analyses should not require the addition of a special code to the databases. Rather, researchers could use the unique Vehicle Information Number, which is associated with every crash-involved vehicle, to identify the vehicle make, model, and model year. Using these data, it should be a relatively simple task to determine whether crash-involved vehicles were equipped with belt reminders.
- Controlled fleet studies to be conducted in conjunction with field evaluations of currently available enhanced belt reminder systems. Using rental car fleets, as in earlier NHTSA seat belt use technology studies, researchers would examine whether it is possible to generate belt use increases significantly larger than those produced by the first generation of belt reminder systems. Controlled fleets could be equipped with modified reminder systems to examine the effects of such features as systems that mute the radio and CD player when the audible seat belt warning system is activated. Systems in which the intensity of the audible warning increases over time or as a function

[14] The BRFSS is a state-level telephone survey, supported and funded by the National Center for Chronic Disease Prevention and Health Promotion (of CDC), that tracks health risks in the United States. The NHIS is conducted through a personal household interview. Supported by the National Center for Health Statistics of CDC, this survey is the principal source of information on the health of the civilian household population of the United States.

of increasing vehicle speed could also be systematically studied. In deciding the specific design parameters to be studied, NHTSA should carefully monitor the development of new belt reminder technologies throughout the world, with particular emphasis on more aggressive technologies. Furthermore, NHTSA should collaborate with the EuroNCAP to evaluate advanced belt reminder technologies that might be introduced in the European market.

- Laboratory studies focused on belt reminder design features that may contribute to differential belt use increases. Once field data are available on reminder system characteristics that appear to increase belt use, more focused human factors studies can be conducted on such design features as optimum timing of system start-up in view of different buckling behaviors, loudness of the warning chime, duration and cycling of the system, and presence and design of any disconnection mechanisms.

Of course, this research will cost money. On the basis of informal discussions with NHTSA staff and agency consultants, the committee believes that a targeted increase in the agency's research budget on the order of $5 million per year should be sufficient to support the proposed research program.

The committee believes that NHTSA should begin the field evaluations quickly in view of the large numbers of belt reminder–equipped vehicles coming onto the U.S. market over the next several model years. The agency has two projects on belt use technologies under way or soon to be started.[15] The research program just described would substantially increase these efforts and provide the agency with the scientific basis to regulate, if such action proves necessary.

BENEFITS OF PROPOSED STRATEGY

The potential benefits of enhanced seat belt use technologies could be significant. If increases in belt use rates on the order of 7 percent (5 per-

[15] The first project, already under way, is a $100,000 study under the Small Business Innovation Research Program to examine parental reaction to belt use technologies for younger drivers, such as intrusive belt reminder systems, interlock systems, and recorders to monitor belt use. The second study, which is planned to get under way in FY 2003, is a $450,000 fleet study of currently available belt reminder systems to determine their effectiveness, their acceptability, reasons for deactivation, and possible enhancements for subsequent systems.

centage points) found in the initial evaluation of the Ford BeltMinder could be achieved nationally, an additional 1,250 lives could be saved annually, according to NHTSA's estimates (Glassbrenner 2002, 1), once all passenger vehicles have been equipped with enhanced belt reminder systems. These figures do not include the potential lives saved from the installation of rear-seat belt reminder systems or the hundreds of thousands of injuries that could also be prevented each year. The modest additional costs of installing the systems, particularly once sensor systems are available for all seating positions, and the annual $5 million cost of conducting the recommended multiyear research program, constitute a small price to pay for the lives saved and the hundreds of thousands of costly injuries prevented.

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Appendix A

Congressional Request for Seat Belt Use Technology Study

House Report 107-108 to accompany Appropriations for the Department of Transportation and Related Agencies for Fiscal Year 2002, June 22, 2001:

> Newly developed vehicle technologies may present opportunities for increasing seat belt use, without being overly intrusive. The Committee directs NHTSA to contract with the Transportation Research Board of the National Academy of Sciences to conduct a study on the benefits and acceptability of these technologies, as well as any legislative or regulatory actions that may be necessary to enable installation of devices to encourage seat belt use in passenger vehicles.

Appendix B

Analysis of Ratings from National Highway Traffic Safety Administration In-Depth Interviews and Focus Groups

Table B-1 Summary of Participants in NHTSA In-Depth Interviews and Focus Groups by Location and User Group

User Category	Phoenix, Ariz.	Portsmouth, N.H.	St. Louis, Mo.	Total
In-depth (individual, in-person) interviews				
Part-time users	25	30	34	89
Hard-core nonusers	6	8	3	17
Focus groups of full-time users	0	0	35	35
Total	31	38	72	141

Table B-2 Analysis of Ratings from NHTSA In-Depth Interviews and Focus Groups by Technology, Overall and by User Group (Rating Scale: 1 = Least; 5 = Most) (Percentage of Respondents' Ratings)

Reported Acceptability					Reported Effectiveness				
Rating	Ford	Saab	Entertainment Interlock	Transmission Interlock	Rating	Ford	Saab	Entertainment Interlock	Transmission Interlock
Overall (N = 141)									
1	9	16	27	31	1	6	5	15	4
2	6	11	18	14	2	6	5	12	4
3	14	16	18	11	3	9	7	13	4
4	21	18	14	13	4	21	23	11	4
5	50	38	23	30	5	57	60	50	84
Full-Time Users (N = 35)									
1	0	14	31	29	1	0	6	17	0
2	3	14	20	26	2	0	3	17	3
3	3	11	29	14	3	0	6	14	0
4	14	20	11	9	4	11	26	6	0
5	80	40	9	23	5	89	60	46	97
Part-Time Users (N = 89)									
1	9	11	24	27	1	7	3	14	6
2	7	11	17	10	2	7	6	10	4
3	20	18	15	11	3	12	7	14	2
4	22	18	17	16	4	25	19	12	6
5	42	42	28	36	5	49	65	51	82
Hard-Core Nonusers (N = 17)									
1	29	47	35	59	1	18	12	18	6
2	6	6	18	12	2	12	6	12	0
3	0	12	12	6	3	12	12	6	18
4	29	18	6	6	4	24	35	12	6
5	35	18	29	18	5	35	35	53	71

NOTE: The percentages may not total 100 because of rounding.

Table B-3 Analysis of Ratings from NHTSA In-Depth Interviews and Focus Groups by Gender, Age, and Location

Mean Acceptability	Ford	Saab	Entertainment Interlock	Transmission Interlock
Analysis by Gender				
Male (N = 57)	3.82	3.33	2.89	2.54
Female (N = 84)	4.08	3.63	2.89	3.26
Analysis by Age				
16–25 (N = 22)	4.00	3.23	3.09	2.59
26–40 (N = 52)	3.60	3.40	2.92	2.54
41–55 (N = 38)	4.18	3.58	2.89	3.21
56 and over (N = 29)	4.38	3.83	2.69	3.72
Analysis by Location				
St. Louis (N = 72)	4.18	3.36	2.57	2.76
Phoenix (N = 31)	3.87	3.77	3.45	3.35
Portsmouth (N = 38)	3.68	3.58	3.05	3.05

Mean Effectiveness	Ford	Saab	Entertainment Interlock	Transmission Interlock
Male (N = 57)	3.88	3.98	3.74	4.42
Female (N = 84)	4.38	4.49	3.64	4.74
16–25 (N = 22)	3.73	4.09	4.36	4.32
26–40 (N = 52)	4.08	4.33	4.02	4.52
41–55 (N = 38)	4.21	4.05	3.26	4.74
56 and over (N = 29)	4.65	4.66	3.11	4.83
St. Louis (N = 72)	4.46	4.29	3.61	4.72
Phoenix (N = 31)	4.05	4.35	4.06	4.42
Portsmouth (N = 38)	3.74	4.21	3.50	4.55

STUDY COMMITTEE BIOGRAPHICAL INFORMATION

William C. Howell, *Chair,* is currently retired but holds Adjunct Professorships at both Arizona State and Rice Universities. After earning his doctorate in psychology in 1958 from the University of Virginia, he joined the Aviation Psychology Laboratory at Ohio State University (OSU), eventually serving as its Director and holding a professorship in the OSU psychology department. In 1968 he moved to Rice University, where he was instrumental in establishing the doctoral-level psychology department that he chaired for 17 years. On leave from Rice, he served as Chief Scientist for Human Resources for the U.S. Air Force from 1989 to 1992, and following that, he was appointed Executive Officer for Science of the American Psychological Association—a position he held until his retirement in 1997. His research, mostly on topics in human performance and engineering psychology, has resulted in more than 125 publications. He has served on the editorial boards of seven journals; positions have included the Editorship of *Human Factors* and the Associate Editorship of *American Psychologist* and the *Journal of Applied Psychology.* He has held a variety of elected offices in the profession and appointments to advisory boards, including Presidency of the Human Factors and Ergonomics Society, Chair of the Technical Advisory Board for the Navy's Tactical Decision Making Under Stress (TADMUS) program and the National Research Council's (NRC's) Committee on Human Factors, and the current Chairmanship of the Board of Convention Affairs of the American Psychological Association.

David A. Champion is Director of the Auto Test Department at Consumers Union (CU). An engineer with extensive experience in automotive testing, design, and development, Mr. Champion oversees testing operations at CU's facility, the largest independent automobile testing center in the world. Before joining CU in 1997, Mr. Champion was a senior engineer with Nissan Motor Corporation, and before that he worked for Land Rover of North America, supervising start-up of their test facility and the hot climate test programs in Phoenix, Arizona. Prior to that, he worked for Land Rover UK, Ltd., where he led a new-vehicle development group. Mr. Champion received a bachelor's degree

in mechanical engineering and metal and material science from the University of Aston in Birmingham, England.

Patricia R. DeLucia is Associate Professor in Experimental Psychology and former Associate Chairperson in the Department of Psychology at Texas Tech University, which she joined in 1991. She is also Coordinator of the Human Factors Psychology Program at the university. Dr. DeLucia's teaching experience includes courses in human factors psychology, research methods, and perception—theory and applications. Her current research interests are focused on theoretical and applied issues in visual perception and performance, with applications in transportation (driving and aviation), among other areas. She has received numerous grants and published extensively on these topics. Dr. DeLucia received her doctorate in experimental psychology from Columbia University. She is on the editorial board of *Human Factors* and is a member of the Human Factors and Ergonomics Society, the American Psychological Association, the Association for Aviation Psychologists, and the Vision Sciences Society.

T. Bella Dinh-Zarr is Director of Traffic Safety Policy at the National Office of the American Automobile Association. Before that, she was Scientist in the Office of Plans and Policy of the National Highway Traffic Safety Administration, Research Associate with the Texas Transportation Institute, Fellow at the U.S. Centers for Disease Control and Prevention (CDC), and Production Editor for the *International Journal of Technology Assessment in Health Care.* Dr. Dinh-Zarr has published on the topics of interventions to increase the use of safety belts and to reduce injuries from problem drinking. She received her doctorate in health policy from the University of Texas School of Public Health. She is a member of the American Public Health Association and the Delta Omega Public Health Honor Society.

Michael M. Finkelstein is Principal of Michael Finkelstein & Associates. He previously worked for the National Highway Traffic Safety Administration, serving as Policy Advisor for the Intelligent Vehicle Highway System, Associate Administrator for R&D, Associate Administrator for Rulemaking, and Associate Administrator for Planning and Evaluation.

He served as Chief of the Highway and Mass Transit Program Division in the Office of the Secretary of Transportation. Mr. Finkelstein has a master's degree from Rutgers University. He has served as a member of numerous Transportation Research Board (TRB) committees—the Committee on Transportation Safety Management, the Committee for a Review of the National Automated Highway System Consortium Research Program, and the Committee to Review the Intelligent Vehicle Initiative (IVI) Program. He is currently a member of the Committee to Review the IVI Program, Phase 2. Mr. Finkelstein consults for an automobile manufacturer and an automotive supplier.

Philip W. Haseltine is President of the Automotive Coalition for Traffic Safety, Inc. (ACTS), a nonprofit safety organization funded by domestic and international automobile manufacturers and major suppliers, whose mission is to educate the general public and targeted audiences about technology-related safety issues. Prior to joining ACTS in 1988, Mr. Haseltine served as Chief of Staff of the U.S. Department of Transportation, where he directed the Office of the Secretary, and as Deputy Assistant Secretary for Policy and International Affairs. Before that he was Executive Director of Michigan's Office of Highway Safety Planning and the Governor's Highway Safety Representative. Mr. Haseltine has extensive experience with many initiatives for increasing safety belt use. He moderated the 2001 Seat Belt Summit, which considered policy options for increasing safety belt use in the United States. Mr. Haseltine holds a bachelor's degree in economics from Michigan State University. He is a member of the Society of Automotive Engineers, the National Press Club, and the Washington Automotive Press Association.

Peter D. Loeb is Professor of Economics and former Chair of the Department of Economics at Rutgers University, where he has taught courses in econometrics, advanced economic statistics and statistical analysis, economics and quantitative analysis, and applied economics. Dr. Loeb has published on the effectiveness of seat belt legislation on motor vehicle fatality and injury rates and is coauthor of a book entitled *Causes and Deterrents of Transportation Accidents: An Analysis by Mode.* Other areas of transportation that he has investigated include

the effect of alcohol consumption and related variables on motor vehicle fatalities. He has a doctorate in economics from Rutgers University. Dr. Loeb is a member of the American Economic Association, the Southern Economic Association, the Eastern Economic Association, and the Transportation Research Forum.

Donald W. Reinfurt retired as Deputy Director of the Highway Safety Research Center (HSRC) and Adjunct Professor in the Department of Biostatistics, both at the University of North Carolina. He joined HSRC in 1968 and held positions of increasing responsibility, from Research Assistant and Research Associate to Staff Associate, Associate Director, and Deputy Director. Dr. Reinfurt is an expert on traffic safety data and has written numerous reports and articles on highway safety topics, including safety belt use. He earned a doctorate in statistics from North Carolina State University. Dr. Reinfurt is a Fellow of the Association for the Advancement of Automotive Medicine and previously served on the TRB Committee to Review Federal Estimates of the Relationship of Vehicle Weight to Fatality and Injury Risk.

Judith M. Tanur is Distinguished Teaching Professor in the Department of Sociology at the State University of New York at Stony Brook. Her research interests include statistics, methodology, survey research, and social psychology. She received a doctorate in sociology from State University of New York at Stony Brook. Dr. Tanur is a Fellow of the American Statistical Association (ASA) and recipient of ASA's Founders' Award, a Fellow of the American Association for the Advancement of Science, and an elected member of the International Statistical Institute. She serves on the Board of Trustees of the National Opinion Research Center and on the Board of Directors of the Social Science Research Council. Dr. Tanur has served as a member of numerous NRC committees, including the Committee on Applied and Theoretical Statistics and the Committee on National Statistics, chairing its Advanced Research Seminar on Cognitive Aspects of Survey Methodology.

David C. Viano retired as Principal Scientist for Safety Integration at General Motors Corporation North America, where he held numerous

positions of responsibility, including Manager of Advanced Body, Interior and Safety for Saab Automobile AB and Principal Research Scientist for GM Research Laboratories. Currently, he is the Director of the Sport Biomechanics Laboratory and Adjunct Professor of Engineering at Wayne State University. Dr. Viano is an expert on occupant restraint systems, biomechanics, and injury control. He is also Adjunct Professor of Traffic Safety at Chalmers University of Technology, Gothenburg, Sweden, and Editor-in-Chief of *Traffic Injury Protection.* He received a Ph.D. in applied mechanics from the California Institute of Technology and a Doctor of Medicine from Karolinska Institute and Medical University in Stockholm, Sweden. Dr. Viano has served on numerous NRC panels, including the Committee to Identify Research Needs for Occupant Restraints, the Committee to Review the Status and Progress of the Injury Control Program at CDC, and the Committee on Trauma Research. He holds stock in an automobile company.

Allan F. Williams is Chief Scientist at the Insurance Institute for Highway Safety, where he has held increasing positions of responsibility—Social Psychologist, Senior Behavioral Scientist, Vice President for Research, and Senior Vice President for Research—since joining the organization in 1972. Dr. Williams has published extensively on a wide range of highway safety topics including safety belt use and has been involved in numerous driver surveys. He received his doctorate in social psychology from Harvard University. Dr. Williams has served as Associate Editor of *Crash Prevention and Injury Control* and the *Journal of Traffic Medicine.* He has also served on the NRC Committee on Injury Prevention and Control, the TRB Committee for a Study of Consumer Automotive Safety Information, and the TRB Committee to Identify Research Needs for Occupant Restraints.

Johanna P. Zmud is President of NuStats Partners, LP, a research and consulting firm that provides behavioral analysis and demographic forecasting to corporations and public agencies throughout the United States and Mexico. Dr. Zmud has 18 years of market research experience with a special interest in the problems associated with survey approaches to complex policy issues. She has published papers on statistical imputation, controlling item nonresponse in survey research,

quality in survey research among non-English-speaking populations, instrument design, and stated preference applications. She received her doctorate in communication research from the Annenberg School of Communication at the University of Southern California. Dr. Zmud chairs TRB's Committee on Travel Survey Methods and is a member of TRB's Committee on Public Transit Marketing and Fare Policy.

PETITIONERS' EXHIBIT J

Euro NCAP SBR data

2002 - 2008: "old" rating scheme (SBR part of "adult protection")
since 2009: Overall Rating Scheme

year	# tested	driver SBR	driver (%)	passenger SBR	passenger (%)	rear seat SBR	rear seat (%)
2002	24	8	33	5	21	0	0
2003	31	21	68	12	39	0	0
2004	26	21	81	14	54	3	12
2005	29	27	93	16	55	4	14
2006	27	22	81	17	63	4	15
2007	33	30	91	26	79	12	36
2008	32	27	84	19	59	7	22
2009	33	33	100	31	94	15	45
2010	24	24	100	21	88	8	33
2011	52	52	100	52	100	29	56
2012	30	30	100	30	100	15	50
2013	31	31	100	31	100	22	71
2014	40	40	100	38	95	32	80
2015	39	39	100	39	100	35	95
2016	19	19	100	19	100	19	100
2017	28	28	100	28	100	23	82

status September 2017
two 2-seater vehicles not considered in rear SBR ststistics

PETITIONERS' EXHIBIT K

Australia NCAP SBR data							
year	cars tested	driver SBR	driver (%)	passenger SBR	passenger (%)	rear seat SBR	rear seat (%)
2005	18	4	22.22	2	11.11	0	0.00
2006	61	18	29.51	9	14.75	1	1.64
2007	57	44	77.19	31	54.39	6	10.53
2008	52	39	75.00	30	57.69	6	11.54
2009	21	17	80.95	13	61.90	3	14.29
2010	34	27	79.41	25	73.53	8	23.53
2011	50	46	92.00	40	80.00	15	30.00
2012	42	41	97.62	38	90.48	18	42.86
2013	39	38	97.44	36	92.31	18	46.15
2014	28	26	92.86	26	92.86	20	71.43
2015	30	29	96.67	29	96.67	27	90.00
2016	34	34	100	33	97.06	30	90.91
2017	27	27	100	26	96.30	22	84.62
one 2-seater vehicle, not considered in rear SBR statistics							
status September 2017							

PETITIONERS' EXHIBIT L

United Nations ECE/TRANS/WP.29/2016/99

Economic and Social Council

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Economic Commission for Europe

Inland Transport Committee

World Forum for Harmonization of Vehicle Regulations

170th session
Geneva, 15-18 November 2016
Item 4.8.2 of the provisional agenda
1958 Agreement :
Consideration of draft amendments
to existing Regulations submitted by GRSP

Proposal for 07 series of amendments to Regulation No. 16 (Safety-belts, ISOFIX and i-Size)

Submitted by the Working Party on Passive Safety *

The text reproduced below was adopted by the Working Party on Passive Safety (GRSP) at its fifty-ninth session (ECE/TRANS/WP.29/GRSP/59, para. 20). It is based on ECE/TRANS/WP.29/GRSP/2016/2 as amended by Annex II to the report. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee AC.1 for consideration.

* In accordance with the programme of work of the Inland Transport Committee for 2016–2017 (ECE/TRANS/254, para. 159 and ECE/TRANS/2016/28/Add.1, cluster 3.1), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

07 series of amendments to Regulation No. 16 (Safety-belts, ISOFIX and i-Size)

Paragraph 1.4., amend to read and delete the footnote:

"1.4. All seating positions in vehicle categories M and N fitted with safety belt with regard to safety belt reminder."

Paragraph 2.41., amend to read:

"2.41. "*Safety-belt reminder*", means a system dedicated to alert the driver when any of the occupants do not use the safety-belt. The system is constituted by a detection of an unfastened safety-belt and by two levels of driver's alert: a first level warning and a second level warning."

Paragraphs 2.44. to 2.46., amend to read:

"2.44. "*First level warning*" means a visual warning activated when the ignition switch or master control switch is activated and any of the occupants' safety-belt is not fastened. An audible warning can be added as an option.

2.45. "*Second level warning*" means a visual and audible warning activated when the vehicle is operated in accordance with paragraphs 8.4.2.4.1.1. to 8.4.2.4.1.3. with the safety-belt for any of the front row occupants being unfastened and the safety-belt for any of the rear row occupants either being or becoming unfastened.

2.46. "*Safety-belt is unfastened*" means, at the option of the manufacturer, either the safety-belt buckle of any occupant is not engaged or the length of the pulled out webbing is less than the length of the webbing which is needed to buckle an un-occupied seat in the rear most seating position."

Paragraph 5.2.2., amend to read:

"5.2.2. An approval number shall be assigned to each type approved. Its first two digits (at present 07 corresponding to the 07 series of amendments) shall indicate the series of amendments …"

Paragraphs 8.4.1. and 8.4.1.1., shall be deleted

Insert new paragraphs 8.4.1. to 8.4.1.3., to read:

"8.4.1. Requirements per specific seating position and exemptions

8.4.1.1. The seating position of the driver of M and N categories of vehicles[10] as well as the seating positions of the occupants of seats in the same row as the driver seat of M and N categories of vehicles shall be equipped with a safety-belt reminder satisfying the requirements of paragraph 8.4.3.

8.4.1.2. All seating positions of the rear seat row(s) of M_1 and N_1 category vehicles[10] shall be equipped with a safety-belt reminder satisfying the requirements of paragraph 8.4.4.

Where the vehicle manufacturer provides a safety-belt reminder system on a rear seating position in another category of vehicle, the safety-belt reminder system may be approved according to this Regulation.

8.4.1.3. A safety-belt reminder is not compulsory on folding seats (i.e. normally folded and designed for occasional use, e.g. foldable crew seats in the buses and coaches) as well as seating positions fitted with an S-type belt (including Harness belt).

Notwithstanding paragraphs 8.4.1.1. and 8.4.1.2 above, safety belt reminders are also not required for rear seats in ambulances, hearses, and motor-caravans as well as for all seats for vehicles used for transport of disabled persons, vehicles intended for use by the armed services, civil defence, fire services and forces responsible for maintaining public order.

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[10] As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.4, para. 2 - www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html"

Paragraphs 8.4.2., amend to read:

"8.4.2. General requirements"

Paragraph 8.4.2.1., amend to read:

"8.4.2.1. Visual warning"

Paragraph 8.4.2.1.1., amend to read:

"8.4.2.1.1. The visual warning shall be so located as to be readily visible and recognisable in the daylight and at night time by the driver and distinguishable from other alerts."

Paragraph 8.4.2.1.2., amend to read:

"8.4.2.1.2. The visual warning shall be a steady or flashing tell-tale."

Insert new paragraph 8.4.2.2., to read:

"8.4.2.2. Audible warning"

Paragraph 8.4.2.1.3., renumber as 8.4.2.2.1. and amend to read:

"8.4.2.2.1. The audible warning shall consist of a continuous or an intermittent (pauses shall not exceed 1 second) sound signal or of continuous vocal information. Where vocal information is employed, the vehicle manufacturer shall ensure that the alert is able to employ the languages of the market into which the vehicle is intended to be placed."

Paragraph 8.4.2.1.4., renumber as 8.4.2.2.2. and amend to read:

"8.4.2.2.2. The audible warning shall be easily recognized by the driver."

Insert new paragraph 8.4.2.3., to read:

"8.4.2.3. First level warning"

Paragraph 8.4.2.2., renumber as 8.4.2.3.1. and amend to read:

"8.4.2.3.1. The first level warning shall be at least a visual warning activated for 30 seconds or longer for seating positions covered by paragraph 8.4.1.1. and for 60 seconds or longer for seating positions covered by paragraph 8.4.1.2. when the safety-belt of any of the seats is not fastened and the ignition switch or master control switch is activated."

Insert a new paragraph 8.4.2.3.2., to read:

"8.4.2.3.2. The first level warning may be discontinued when

(i) None of the safety-belts which triggered the warning are unfastened, or

(ii) The seat or seats which triggered the warning are no longer occupied."

Paragraph 8.4.2.3., renumber as 8.4.2.3.3.

Insert a new paragraph 8.4.2.4., to read:

"8.4.2.4. Second level warning"

Paragraph 8.4.2.4., renumber as paragraph 8.4.2.4.1. and amend to read:

"8.4.2.4.1. The second level warning shall be a visual and audible signal activated for at least 30 seconds not counting periods in which the warning may stops for up to 3 seconds when at least one or any combination of the conditions at the choice of manufacturer, set out in paragraphs 8.4.2.4.1.1. to 8.4.2.4.1.3. is/are fulfilled. The second level warning shall supersede the first level warning when the first level warning is still active."

Paragraphs 8.4.2.4.1. to 8.4.2.4.3., renumber as 8.4.2.4.1.1. to 8.4.2.4.1.3. and amend to read:

"8.4.2.4.1.1. The distance driven greater than the distance threshold. The threshold shall not exceed 500 m. The distance driven when the vehicle is not in normal operation shall be excluded."

8.4.2.4.1.2. The vehicle speed greater than the speed threshold. The threshold shall not exceed 25 km/h.

8.4.2.4.1.3. The duration time (engine running, propulsion system activated, etc.) is greater than the duration time threshold. The threshold shall not exceed 60 seconds. The first level warning duration time and the duration time when the vehicle is not in normal operation shall be excluded."

Insert new paragraphs 8.4.2.4.2. to 8.4.2.4.5., to read:

"8.4.2.4.2. The thresholds to trigger safety belt reminder listed in paragraphs 8.4.2.4.1.1. to 8.4.2.4.1.3., may be reset when :

(i) Any of the doors have been opened while the vehicle is not in normal operation or

(ii) The seat or seats which triggered the warning are no longer occupied.

8.4.2.4.3. The second level warning may be discontinued when

(i) None of the safety-belts which triggered the warning are unfastened,

(ii) The vehicle ceases to be in normal operation, or

(iii) The seat or seats which triggered the warning are no longer occupied.

8.4.2.4.4. The second level warning shall be resumed for the remainder of the required duration when one or any combination of the conditions, at the choice of the manufacturer, set out in paragraphs 8.4.2.4.1.1. to 8.4.2.4.1.3. is/are again fulfilled.

8.4.2.4.5. For the condition that a safety belt becomes unfastened pursuant to paragraphs 8.4.3.3. and 8.4.4.5., the thresholds set out in paragraphs 8.4.2.4.1.1. to 8.4.2.4.1.3. shall be measured from the point in time at which unfastening occurs."

Paragraph 8.4.2.5., renumber as 8.4.2.4.6.

Insert new paragraphs 8.4.3. to 8.4.4.5., to read:

"8.4.3. Safety-belt reminder for driver and occupants of seats in the same row as the driver

8.4.3.1. Safety-belt reminders for driver and occupants of seats in the same row as the driver shall fulfil the requirements set out in paragraphs 8.4.2.

8.4.3.2. The colour and symbol of the visual warning shall be as defined in item 21 in Table 1 of Regulation No. 121.

8.4.3.3. The second level warning shall be activated when a safety-belt is or becomes unfastened while the vehicle is in normal operation and while, at the same time, any one condition or any combination of the conditions, at the choice of the manufacturer, set out in paragraphs 8.4.2.4.1.1. to 8.4.2.4.1.3. is satisfied.

8.4.4. Safety-belt reminder for occupants of rear seat row(s).

8.4.4.1. Safety-belt reminders for occupants of rear row(s) shall fulfil the requirements set out in paragraphs 8.4.2.

8.4.4.2. The visual warning shall indicate at least all rear seating positions to allow the driver to identify, while facing forward as seated on the driver seat, any seating position in which the safety-belt is unfastened. For vehicles that have information on the occupancy status of the rear seats, the visual warning does not need to indicate unfastened safety-belts for unoccupied seating positions.

8.4.4.3. The colour of the visual warning may be other than red and the symbol of the visual warning for safety-belts covered by paragraph 8.4.1.2 may contain different symbols other than defined in Regulation No.121. In addition, the first level warning of seating positions covered by paragraph 8.4.1.2 may be cancellable by the driver.

8.4.4.4. A common tell-tale may be used for safety-belts covered by paragraphs 8.4.1.1 and 8.4.1.2.

8.4.4.5. The second level warning shall be activated when a safety-belt becomes unfastened while the vehicle is in normal operation and while, at the same time, any one condition or any combination of the conditions, at the choice of the manufacturer, set out in paragraphs 8.4.2.4.1.1. to 8.4.2.4.1.3. is satisfied."

Paragraphs 8.4.2.6. to 8.4.2.6.2., renumber as 8.4.5. to 8.4.5.2. and amend to read:

"8.4.5. The safety-belt reminder may be designed to allow deactivation.

8.4.5.1. In the case that a short term deactivation is provided, it shall be significantly more difficult to deactivate the safety-belt reminder than buckling the safety-belt on and off (i.e. it shall consist of an operation of specific controls that are not integrated in the safety-belt buckle) and this operation shall only be possible when the vehicle is stationary. When the ignition or master control switch is deactivated for more than 30 minutes and activated again, a short-term deactivated safety-belt reminder shall reactivate. It shall not be possible to provide short term deactivation of the relevant visual warning(s).

8.4.5.2. In the case that a facility for a long term deactivation is provided, it shall require a sequence of operations to deactivate, that are detailed only in the manufacturer's technical manual and/or which requires the use of tools (mechanical, electrical, digital, etc.) that are not provided with the vehicle. It shall not be possible to provide long term deactivation of the relevant visual warning(s)"

Insert new paragraphs 15.4. to 15.10., to read:

"15.4 As from the official date of entry into force of the 07 series of amendments, no Contracting Party applying this UN Regulation shall refuse to grant or refuse

to accept UN type approvals under this UN Regulation as amended by the 07 series of amendments. Contracting Parties shall continue to grant extensions of approvals to the preceding series of amendment.

15.5 As from 1 September 2019, Contracting Parties applying this UN Regulation shall not be obliged to accept UN type approvals to the preceding series of amendments that were first issued on or after 1 September 2019.

15.6. A safety-belt reminder is not compulsory on removable rear seats and on any seat in a row in which there is a suspension seat, for the purpose of granting type-approval to the 07 series of amendment, until 1 September 2022.

15.7 Until 1 September 2021, Contracting Parties applying this UN Regulation shall accept UN type approvals to the preceding series of amendments that were first issued before 1 September 2019

15.8 As from 1 September 2021, Contracting Parties applying this Regulation shall not be obliged to accept type approvals issued to the preceding series of amendments to this Regulation.

15.9. Notwithstanding paragraph 15.8, Contracting Parties applying the UN Regulation shall continue to accept UN type approvals of safety-belts and restraint systems to the preceding series of amendments to the UN Regulation.

15.10 Notwithstanding paragraph 15.8, Contracting Parties applying the UN Regulation shall continue to accept UN type approvals to the preceding series of amendments to the UN Regulation, for vehicles which are not affected by the changes introduced by the 07 series of amendments."

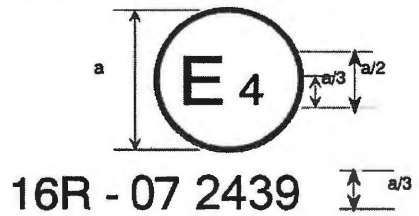
Annex 2, amend to read:

"Annex 2

Arrangements of approval marks

1. Arrangements of the vehicle approval marks concerning the installation of safety-belts

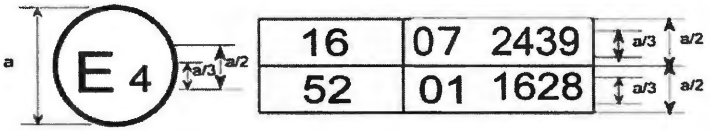
Model A
(See paragraph 5.2.4. of this Regulation)



a = 8 mm min.

The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to safety-belts, been approved in the Netherlands (E 4) pursuant to Regulation No. 16. The approval number indicates that the approval was granted according to the requirements of Regulation No. 16 as amended by the 07 series of amendments.

Model B
(See paragraph 5.2.5. of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to Regulations Nos. 16 and 52.[1] The approval numbers indicate that, at the dates when the respective approvals were given, Regulation No. 16 included the 07 series of amendments and Regulation No. 52 the 01 series of amendments.

...

[1] The second number is given merely as an example."

Annex 18,

Paragraph 1., amend to read:

"1. The first level warning shall be tested according to the following conditions:

(a) Safety-belt is not fastened;

(b) Engine or propulsion system is stopped or idling, and the vehicle is not in forward or reverse motion;

(c) Transmission is in neutral position;

(d) Ignition switch or master control switch is activated.

(e) A load of 40 kg is placed on each seat cushion in the same row as the driver's seat, or the state in which occupants are on board the vehicle is simulated by an alternative method specified by the vehicle manufacturer, provided an occupant's load does not exceed 40 kg. This may also be done for the rear seats at the request of the vehicle manufacturer.

Or alternatively (at the choice of the manufacturer):

An object or human representing a 5th percentile adult female[1] is placed on each seat cushion as specified by the manufacturer in the same row as the driver seat, or the state in which occupants are on board the vehicle is simulated by an alternative method specified by the vehicle manufacturer as agreed by the technical service and the approval authority. This may also be done for the rear seats at the request of the vehicle manufacturer.

(f) The state of the safety-belt reminder is checked for all of the relevant seat(s), in conditions (a) to (e).

[1] The technical specifications and detailed drawings of Hybrid III, corresponding to the principal dimensions of a fifth percentile female of the United States of America, and the specifications for its adjustment for this test are deposited with the Secretary-General of the United Nations and may be consulted on request at the secretariat of the Economic Commission for Europe, Palais des Nations, Geneva, Switzerland. A female who weighs between 46.7 and 51.25 kg, and who is between 139.7 and 150 cm tall may be used."

Paragraph 2., amend to read:

"2. The second level warning shall be tested according to the conditions set out in paragraphs 2.1. to 2.3. of this Annex, respectively."

Paragraphs 2.1. to 2.3., shall be deleted.

Insert new paragraphs 2.1. to 2.3., to read:

"2.1. Testing the driver's seating position

2.1.1. Testing the driver's seat when the safety-belt is unfastened before the journey

(a) The safety-belt of the driver's seat is not fastened;

(b) The safety-belts of seats other than the driver's seat are fastened;

(c) Test vehicle driven with one or any combination of the conditions of paragraphs 2.1.1.1. to 2.1.1.3. of this annex at the manufacturer's choice.

(d) The state of the safety-belt reminder is checked for the driver's seat, in conditions (a) to (c).

2.1.1.1. Accelerate the test vehicle to 25 -0/+10 km/h from a halt and continue on the same speed.

2.1.1.2. The test vehicle is driven forward at least 500m from a halt position.

2.1.1.3. The vehicle is tested when the vehicle is in normal operation for at least 60 seconds.

2.1.2. Testing the driver's seat when the safety-belt becomes unbuckled during the journey.

(a) The safety-belts of the driver's seat and seats other than the driver's seat are fastened.

(b) The test vehicle is driven, at the choice of the manufacturer, under one of the conditions in paragraphs 2.1.1.1. to 2.1.1.3. of this annex or a combination thereof;

(c) The safety-belt of the driver's seat is unbuckled.

2.2. Testing the seating position(s) in the same row as the driver's seat

2.2.1. Testing the seat(s) in the same row as the driver's seat when the safety-belt is unfastened before the journey:

(a) The safety-belt(s) of the seat(s) in the same row as the driver's seat is/are not fastened;

(b) The safety-belts of the seats other than the seat(s) in the same row as the driver's seat are fastened;

(c) A load of 40 kg is applied to the seat(s) in the same row as the driver's seat, or the state in which occupants are on board the vehicle is simulated by a method specified by the manufacturer;

Or alternatively (at the choice of the manufacturer):

An object or human representing a 5thpercentile adult female is placed on each seat cushion as specified by the manufacturer in the same row as the driver seat, or the_state in which occupants are on board the vehicle is simulated by an alternative method specified by the vehicle manufacturer as agreed by the technical service and the approval authority. This may also be done for the rear seats at the request of the vehicle manufacturer.

(d) The test vehicle is driven, at the choice of the manufacturer, under one of the conditions in paragraphs 2.1.1.1. to 2.1.1.3. of this annex or combination thereof;

(e) The state of the safety-belt reminder is checked for all of the seat(s) in the same row as the driver's seat, in conditions (a) to (d).

2.2.2. Testing the seating position in the same row as the driver's seat when the safety-belt becomes unbuckled during the journey.

(a) The safety-belts of the driver's seat and seats other than the driver's seat are fastened;

(b) A load of 40 kg is applied to the seat(s) in the same row as the driver's seat, or the state in which occupants are on board the vehicle is simulated by a method specified by the manufacturer;

Or alternatively (at the choice of the manufacturer):

An object or human representing a 5thpercentile adult female is placed on each seat cushion as specified by the manufacturer in the same row as the driver seat, or the_state in which occupants are on board the vehicle is simulated by an alternative method specified by the vehicle manufacturer as agreed by the technical service and the approval authority. This may also be done for the rear seats at the request of the vehicle manufacturer.

(c) The test vehicle is driven, at the choice of the manufacturer, under one of the conditions in paragraphs 2.1.1.1. to 2.1.1.3. of this annex or combination thereof;

(d) The safety-belt(s) of the seats in the same row as the driver's seat is (are) unbuckled.

(e) The state of the safety-belt reminder is checked for all of the seat(s) in the same row as the driver's seat, for each condition (a) to (d).

2.3. Testing the rear seats

(a) With the test vehicle stationary, the safety-belts of all seats are fastened;

(b) The test vehicle is put in normal operation and kept running;

(c) The safety-belt of one of the rear seats is unfastened;

(d) The functioning of the safety-belt reminder is checked for all of the seating positions in all seating rows;

(e) Alternatively, at the request of the vehicle manufacturer, the test procedures specified in paragraphs 2.2. to 2.2.2. for the seating position(s) in the same row as the driver's seat may be used for any rear seating position instead."

Paragraph 3., amend to read:

"3. The first level warning test shall have a duration of at least the minimum required time as specified in paragraph 8.4.2.3. of this Regulation for the first level warning. The second level warning test may be initiated after completion of the first level warning test. However, it shall also be ensured that the second level warning supersedes the first level warning when the first level warning is still active."

PETITIONERS' EXHIBIT M

UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

KIDS AND CARS, Inc., and THE CENTER FOR AUTO SAFETY Petitioners.	)	No.

DECLARATION OF JANETTE E. FENNELL

1. I am the President of KIDS AND CARS, Inc., one of the Petitioners in this case

2. KIDS AND CARS is a 501(c)(3) nonprofit organization founded to protect children in and around motor vehicles. It is dedicated to data collection; education and raising public awareness; survivor advocacy; promoting state and federal laws, regulations and policies aimed at redesigning motor vehicles to make them safer for children and others; and to reducing or eliminating preventable causes of injury and death. KIDS AND CARS, Inc. advocated for, supported, and testified in favor of Congress's enactment of the portion of the MAP-21 legislation that requires the Secretary of the Department of Transportation ("DOT") to promulgate a rear seat belt warning standard as an effective way to ensure that

those sitting in the back seat of motor vehicles, including young children, are protected from injury and death in the event of a crash. *See* Testimony of Janette E. Fennell, before the Subcommittee on Commerce, Trade and Consumer Protection of the House Commerce Committee on Energy and Commerce (May 18, 2009), Petitioners' Exhibit ("Pet. Ex.") N.

3. KIDS AND CARS, Inc. brings this case on behalf of its officers and board members who, with their families, as a result of DOT's failure to promulgate the mandated standard at issue in this case, are exposed to the increased risk of economic and personal injury, and even death from a vehicle crash if they are sitting in the rear seat of a vehicle and not wearing their seat belts.

4. As a result of DOT's failure to promulgate the requisite standard, KIDS AND CARS' officers and board members, and their family members, may forget to fasten their seatbelts in the rear seats of vehicles, not fasten them correctly, or have children who remove their seat belts while traveling and thereby are at risk of dying or being seriously injured if the car is involved in a crash. In addition to the personal and emotional injuries they confront, they also face economic and other injuries that attend such incidents, including the costs associated with dealing with the death of a family member or the hospitalization of individuals injured in a car crash because they were not wearing a seat belt. These injuries are present, continuing, and imminent, as the officers and board members

of KIDS AND CARS, and their families, ride in the back seats of vehicles every day.

5. There is no question that if the mandated standard were in place, these injuries would be greatly reduced. A warning would go off in the car every time a seating position is occupied and the rear seat belt was not fastened. This would in turn ensure that more back seat passengers fastened their seat belts. For example, we know that as a result of the present Federal Motor Vehicle Safety Standard that requires a warning if the driver of a vehicle is not buckled up, FMVSS 208, many more drivers wear seat belts than if that warning did not go off. According to a recent report by the International Electronics and Engineering ("IEE") presented at the 2015 Enhanced Safety of Vehicles Conference held by the National Highway Traffic Administration ("NHTSA"), the audio warnings now provided for drivers in the *front* seat have proven to be "*highly effective in increasing belt wearing rates of a vehicle's front seat occupants*." "Advanced Seat Belt Reminder System for Rear Seat Passengers," report of the IEE, Pet. Ex. H (emphasis added). According to that same report, a laboratory study conducted in Japan in 2012 demonstrated that use of an audiovisual warning to remind rear seated passengers to fasten their seat belts resulted in 95% of the initially non-belted rear seat occupants fastening their seat belts. *Id.* at 3. Further, a recent study by the Insurance Institute of Highway Safety ("IIHS") found that a high percentage of

people sitting in the rear seats of vehicles would be more likely to fasten their seat belts if there were an audio warning when those seat belts were not fastened. *See* Status Report, "Unbelted," Insurance Institute for Highway Safety (Aug. 3, 2017), Pet. Ex. C, Congress itself has recognized this fact, which is why it enacted the legislation requiring this standard—*i.e.*, it concluded that a rear seat belt warning would save lives.

6. The imminent risk of injury described above is by no means speculative. NHTSA has reported that of the tens of thousands of people who die in automobile crashes every year, close to 50% were not wearing their seat belts, and that a high percentage of those individuals would have survived the crash if they had worn their seat belts. *See, e.g.,* NHTSA Seat Belt Report, Pet. Ex. A. There is also no dispute that although seat belts save lives, a high percentage of individuals, particularly those that ride in the rear seats of cars, often do not wear their seat belts, fasten them incorrectly, or remove them at some point while the car is still in motion. In addition, parents cannot always ensure that their children who ride in the back seats of cars are fastened in their seat belts, especially when those children are riding in cars driven by others. There is no question that having a rear seat belt warning in cars would greatly increase the number of people, including children, who are fastened in their seat belts.

7. All of these injuries are caused by DOT's failure to promulgate the standard Congress mandated as part of the MAP-21 legislation in 2012. For example, despite the fact that seat belt reminders save lives, we know that less than 3 percent of models sold in the United States in 2015 came equipped with rear seat belt reminders. *See* IIHS Study, Pet. Ex. C. Therefore, voluntary efforts to include such warnings simply are not effective, and, absent the standard mandated by Congress, cars will continue to be sold without this extremely important life-saving device.

8. For the same reasons, the injuries described herein will be at least partially redressed if Petitioners prevail in this case because DOT will finally be required to promulgate the standard that was mandated by Congress in 2012, and the officers and board members of KIDS AND CARS, and their families, will have an additional measure of protection against a fatal or severe injury that they currently do not have because DOT has failed to implement Congress's mandate. For example, as discussed in paragraph 5 above, we know that as a result of the present Federal Motor Vehicle Safety Standard requiring a warning if the *driver* of a vehicle is not buckled up, FMVSS 208, many more drivers wear seat belts than if that warning were not in place. Further, the IIHS reported that nearly two-thirds of part-time and nonusers of seat belts said audible rear seat belt reminders would make them more likely to fasten their seat belts, Pet. Ex. C at 4—a finding that is

supported by a previous study by the National Academy of Sciences. *See* Buckling Up Technologies to Increase Seat Belt Use, Special Report 278 (2003), Transportation Research Board, National Academy of Sciences, Pet. Ex .I, at 13 (73 percent of drivers interviewed reported that they had buckled their seat belts *after being reminded to do so by a reminder system).* Congress itself has recognized this fact, which is precisely why it enacted the legislation requiring this standard—*i.e.*, it concluded that a rear seat belt warning would in fact save lives.

Pursuant to 28 U.S.C. §1746, I declare under penalty of perjury that the foregoing is true and accurate to the best of my knowledge.

Janette E. Fennell

Janette E. Fennell

Date: October 25, 2017

PETITIONERS' EXHIBIT N

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Testimony of

Janette E. Fennell
Founder and President
KidsAndCars.org

on

the "Auto Safety: Existing Mandates and Emerging Issues" hearing

before the

Subcommittee on Commerce, Trade and Consumer Protection
of the
House Committee on Energy and Commerce

May 18, 2009

Mr. Chairman, members of the Subcommittee, Good Afternoon, my name is Janette Fennell and I am the founder and president of the national nonprofit organization KidsAndCars.org; an agency dedicated to improving the safety of children in and around motor vehicles. I wish to thank you and the members of the Subcommittee on Commerce, Trade and Consumer Protection for inviting me to appear before you today to testify on the important issue of child safety. I come before you today because there are a number of legislative measures that Congress can enact that will save the lives of thousands of people each year, but in particular to express our views on the issue of transportation safety as it relates to children.

I would like to share a bit of my background with you so you can better understand why I personally have dedicated my life to the issue of vehicle safety.

My family and I were victims of a trunk entrapment incident in 1995. Without getting into too much detail, I will quickly share our story.

We were pulling into our garage a little before midnight when two masked men slipped in under our garage door before it had a chance to close. My husband and I were ordered at gunpoint to get into the trunk of our car. Our nine-month-old son, Alexander, was asleep in his car seat when the gunmen noticed him. The gunmen drove off with us in the trunk as we wondered what the abductors had done with our son. We were taken in the trunk of our car to a remote area where we were robbed, assaulted and left to die. The abductors then fled and left us locked inside the trunk of our car. Desperate to find out what had happened to our son, we tore at the insulation at the front of the trunk. We miraculously were able to locate the cable for the trunk release, and popped open the trunk lid. Happy to have escaped the confines of the trunk, we ran to the back seat of our car only to find an empty back seat...no baby and no car seat.

Although we did not know it, Alexander was thrown outside of our home in his car seat, alone in the middle of the night. After placing a call to 911, a police officer was sent to our home and found our son unharmed, still in his car seat. Now you may think this is a story about how a car seat can save the life of a child—even when the seat is not in a car; because literally that is what saved his life that night. But, instead I share this story with you because it shows how very small engineering changes can make a tremendous difference in the lives of people in this country. After this incident we dedicated our lives to make sure this type of trauma would not happen to another family.

After collecting a tremendous amount of data and bringing this issue to the national agenda we were successful in getting a Federal Regulation written that requires all motor vehicles beginning with model year 2002 to have a phosphorescent trunk release handle inside the trunk of a vehicle. Since the implementation of this regulation, there has *not* been ONE fatal trunk entrapment incident in a vehicle that has this escape mechanism. So please, never doubt the importance and significance of the interventions implemented by this committee; I can tell you this small change has saved countless lives.

You may just see me here today before the committee but know that KidsAndCars.org is a collaborative entity and sought input from leaders in child passenger safety for today's testimony. Included in my submission are thoughts and comments from the American Academy of Pediatrics, Children's Hospital of Philadelphia (CHOP), SafeRide News, the Traffic Safety Center at the School of Public Health, University of California, Berkeley, Department of Emergency Medicine and Center for Trauma and Injury Prevention Research at the University of California, Irvine, Safety Belt Safe USA, Traffic Safety Projects, Consumers Union, Advocates for Highway and Auto Safety, Public Citizen and the National Coalition for School Bus Safety.

The fundamental idea I would like to communicate today is that children (mechanically, psychologically, and socially) are not small adults. Therefore, their special, unique and specific needs deserve to be examined and dealt with in a manner different than the adult population.

Vehicles are designed for an average size adult male. Children's size and relative proportions vary greatly throughout the pediatric age range and are very different from the average size of an adult male. Unfortunately, children are an after-thought during the vehicle design process.

Motor vehicle injuries are the leading cause of death and acquired disability for children after the age of one in the U.S. But many of these deaths can be prevented. Placing children in age and size-appropriate car seats and booster seats reduces serious and fatal injuries by more than half.

How big is the problem?

- In the United States during 2005, 1,335 children ages 14 years and younger died as occupants in motor vehicle crashes, and approximately 184,000 were injured. That's an average of 4 deaths and 504 injuries each day.
- Among children under age 5, in 2006, an estimated 425 lives were saved by car and booster seat use.

What are the risk factors?

- Restraint use among young children often depends upon the driver's seat belt use. Almost 40% of children riding with unbelted drivers were themselves unrestrained.
- Child restraint systems are often used incorrectly. One study found that 72% of nearly 3,500 observed car and booster seats were misused in a way that could be expected to increase a child's risk of injury during a crash.

How can injuries to children in motor vehicles be prevented?

- Child safety seats reduce the risk of death in passenger cars by 71% for infants, and by 54% for toddlers ages 1 to 4 years.
- There is strong evidence that child safety seat laws, safety seat distribution and education programs, community-wide education and enforcement campaigns, and incentive-plus-education programs are effective in increasing child safety seat use.
- According to researchers at the Children's Hospital of Philadelphia, for children 4 to 7 years, booster seats reduce injury risk by 59% compared to seat belts alone.

- All children ages 12 years and younger should ride in the back seat. Adults should avoid placing children in front of airbags. Putting children in the back seat eliminates the injury risk of deployed front passenger-side airbags and places children in the safest part of the vehicle in the event of a crash.
- Overall, for children less than 16 years, riding in the back seat is associated with a 40% reduction in the risk of serious injury.

There are many transportation related issues that deal with children. Due to the limited amount of time, I will highlight the areas that we view can significantly reduce the number of injuries and death to your youngest constituents.

They are:
Progress to date - The Cameron Gulbransen Kids Transportation Safety Act
Auto-reverse power windows
Rear Visibility
Rear seatbelt reminders systems
Reminder Systems To Prevent Unattended Children
Child Passenger safety-LATCH improvements
Improving the ease of installing child restraints (CRs) in the center of the back seat
Weight limits for children in CRs installed with the universal anchorage system LATCH
Improving tether use and tether anchor access
Reconsider the mandate to states to include the 4'9" provision in state laws
Assessing methods to reduce entanglement of children in safety belts
Encourage innovative child restraint designs that could increase protection for children
Identification of safety seats
Improve access to safety seats
School Bus Safety
Inside the Bus
Outside the Bus
Data Collection
Funding for the National Highway Traffic Safety Administration (NHTSA)

Progress to date - The Cameron Gulbransen Kids Transportation Safety Act

The Cameron Gulbransen Kids Transportation Safety Act was signed by the President on February 28, 2008 and directs the Secretary of Transportation to issue safety standards to decrease the incidence of child injury and death. The law:

- Establishes reasonable rulemaking deadlines regarding child safety, applicable to all passenger motor vehicles, in three ways:
  - Ensures that power windows and panels automatically reverse direction when they detect an obstruction to prevent children from being trapped, injured or killed.
  - Requires a rearward visibility performance standard that will provide drivers with a means of detecting the presence of a person behind the vehicle in order to prevent backing incidents involving death and injury, especially to small children and disabled people.

  - Requires the vehicle service brake to be depressed whenever the vehicle is taken out of park in order to prevent incidents resulting from children disengaging the gear shift and causing vehicles to roll away.
- Establishes a child safety information program, administered by the Secretary of Transportation. This will involve collecting non-traffic incident data, informing parents about these hazards to children and ways to mitigate them, as well as making this information available to the public through the Internet and other means.

To date, NHTSA has done an excellent job meeting the deadlines prescribed in the act and published it's first report utilizing a virtual system about incidents that take place off our public roads and highways. Entitled, "Not-in-Traffic Surveillance 2007 – Highlights" this summary brings to light the different ways people are injured via the interaction with a vehicle; but only reports incidents that take place exclusively on private property. The Not-in-Traffic Surveillance (NiTS) system produced an overall annual estimate of 1,747 fatalities and 841,000 injuries in nontraffic crashes and noncrash incidents. Backovers accounted for 221 fatalities and 14,000 injuries. There were another 393 fatalities and 20,000 injury nonoccupant noncrash events (e.g., frontovers, vehicles set into motion, etc.) reported. More research is needed to better understand the causal factors involved (beyond knowing that SUVs increase risk) and evaluate potential countermeasures (e.g., rearview camera systems and sensors, educational campaigns, etc.)

Power Windows

No later than August 2009, the act requires NHTSA to initiate rulemaking requiring power windows and panels to automatically reverse direction when detecting an object or person. Electric power windows are a decades-old convenience feature that most drivers take for granted. Millions of parents use them every day, but few know how dangerous these devices can be to children when not equipped with the proper safeguards.

Since their introduction into the U.S. market (without any safety controls) in the late 1950s and early 1960s, power windows have repeatedly been the instruments of death and/or serious physical injury to children and others. According to the NiTS system, there were at least 5 fatalities and 2000 people injured severely enough to require emergency room treatment in 2007.

The accidental activation of power windows has resulted in the deaths of dozens of children and thousands more have been injured over the course of their history. In almost every case, the child died from strangulation after becoming lodged between the window and the frame.

If a child (or someone else in the vehicle) activates a window unintentionally, the consequences can be instantaneous and often tragic. In as little as two seconds, an inadvertently activated power window can clamp down on a child's head, neck or other body part, causing severe injury or death.

How much pressure can a power window exert? Enough to pull the body of a small child off the seat of a vehicle. The mechanics of an electric power window are very simple. By applying a small two pound force on a power window switch, the window motor is activated to exert an upward raising force of between 50-80 pounds. Since only eight to 12 pounds of force is

needed to raise the average car window glass, these excessively overpowered windows have enough power to lift and strangle a child between the glass and the upper window frame.

For decades the American automotive industry has been aware of the dangers of power windows, but has arbitrarily chosen not to act. The history of their awareness of the problem goes back to the earliest days of power window usage.

One early highly publicized instance occurred literally in the American auto industry's own back yard. In 1962, Christopher Cavanaugh, the 3-year-old son of Detroit's Mayor was nearly strangled by the tailgate power window on a Dodge Station Wagon.

Recognizing the terrible toll being taken by power windows, Ralph Nader sent a letter in May of 1968 to Dr. William Haddon, Jr. Administrator of the National Highway Safety Board urging the NHSB to order a recall and require the immediate modification of power windows -- or at least to issue a public warning of the dangers.

Unfortunately, Nader's suggestions were rejected.

However, later that same year, the U.S. Government, due to numerous reported deaths and injuries, issued advisory warnings to the public regarding the dangers of power windows to children who were left alone in automobiles. This advisory, which was distributed to all major automobile manufacturers, as well as the public, even recommended that the dangers could be lessened by wiring power windows so they would not operate without the ignition switch being on.

The following year, in response to the known dangers of power windows, Dr. Haddon, Jr. called for a Federal Motor Vehicle Safety Standard "which will reduce, if not eliminate, the toll of deaths and injuries resulting from accidents involving power-operated windows." (FMVSS) (8-23-69; 34FR13608).

Decades later, American consumers are still waiting for a safety standard that lives up to that initial mandate.

Just as the dangers posed by power windows to children have been known for years, so too have been workable solutions that could easily prevent these senseless tragedies. Patent information which addresses the safety of power windows has been available to Ford and other automakers for decades.

The first window-reversing patent (Patent 3,465,476) was issued in 1967, and in 1972 a French mechanism company was issued a reversing electrical switch patent (Patent 3,662,491). This patent clearly points out the hazards that are presented to a child's head and neck by a power window. During the period 1980 to 1987, at least nine additional patents were issued addressing power window safety and window reversing mechanisms.

Numerous technically feasible alternative designs were and are available that would have prevented these tragedies.

Automatic power window reversing mechanisms exist in several forms, including optical sensors, which detect an object in the window path; voltage load buildup sensors, which reverse at contact with an obstruction; or infrared sensors, which reverse the window without contact. Some Japanese vehicles made in the 1980's were equipped with windows that stop - but do not reverse - when they meet with resistance.

A representative of the European Automobile Manufacturers' Association has estimated that more than 90 percent of vehicles on the road in Europe are equipped with a power window auto-reverse feature, including vehicles sold by American manufacturers.

The cost for this added safety feature is about $6 to $8 dollars per window, according to a German-based company that is one of the prime suppliers of auto-reverse technology in Europe.

Oddly enough, many American manufacturers commonly include this feature on cars sold overseas, many times on the same models available in the United States. They have simply chosen not to offer what should be a basic safety feature to North American consumers.

Are European children more precious than American children? I think not.

These deaths and injuries are 100% preventable. After 4 decades of death and dismemberment, we need a final rule.

Rear Visibility

In March NHTSA published an Advanced Notice of Proposed Rule Making (ANPRM) to amend the rearview mirror standard. The agency also solicited comments on the state of current research and countermeasures that might assist it in amending Federal Motor Vehicle Safety Standard (FMVSS) 111 to eliminate blind zones. The agency sought answers to 52 questions in seven different areas, including the scope of the problem, technologies for improving rear visibility, effectiveness, driver behavior, options for measuring rear visibility and countermeasure performance. The sheer volume of questions is a good sign that the agency wants to take an in-depth look at all available information before crafting a standard.

KidsAndCars.org would like to re-emphasize that the rear visibility standard needs to apply to all passenger vehicles because every vehicle has a blind zone.

Rear Seatbelt Reminders Systems

The importance of seat belts in saving lives is indisputable. We should do everything possible to get people to buckle up. European vehicle manufacturers employ seat belt use reminder systems using chimes and other audible sounds, which become more insistent based on increasing vehicle speed or distance driven. In 2003 the National Academy of Sciences conducted a study of new seat belt reminder technologies for NHTSA, recommending, among other actions, that all new light-duty vehicles be equipped with an enhanced belt reminder system that includes an audible warning and a visual indicator for front seat occupants and that the current 4-8 second limitation on audible warnings be amended to remove the time limit. *See Buckling Up: Technologies to Increase Seat Belt Use*, Transportation Research Board Special Report No. 278 (http://trb.org/publications/sr/sr278.pdf)

In recent years the government and safety organizations have made a major effort to educate the public about securing children in child restraints in the rear seat of vehicles for their safety. At the same time, rear seat occupancy by older children using booster seats and teens who use adult seat belts has also increased but seat belt use rates lag well behind front seat belt use rates. Rear seat reminder systems can both remind the driver and rear seat occupants to buckle up and alert the driver when a passenger unbuckles their seat belt while the vehicle is moving.

Although safety belt systems are installed at all designated seating positions in passenger vehicles, systems to remind passengers to buckle their seat belts are limited to the front seats of passenger vehicles only. Seat belt reminder systems should be available for all designated seating positions to remind the driver and each passenger to buckle their seat belt.

On August 28, 2007, safety groups filed a petition with NHTSA requesting that seat belt reminder systems be required in the rear seats of cars and in the second and third row of seats in multipurpose passenger vehicles including minivans and sport utility vehicles. Though NHTSA is required to respond to petitions within 120 days (49 CFR Section 552.8) the agency has not yet responded to this petition after almost 2 years.

I submit the 2007 petition to my testimony as it cites multiple studies and provides every justification needed to move quickly on this proposal.
(http://www.regulations.gov/fdmspublic/component/main?main=DocketDetail&d=NHTSA-2007-29108)
Reasons Congress needs to direct NHTSA to require a rear safety belt reminder system include:

- requiring rear seat belt reminders would save hundreds of lives each year, a large percentage of which would be children;
- rear seat belt reminders are necessary to save lives because primary enforcement of seat belt laws does not typically cover rear seat occupants;
- multiple studies have proven that rear seat belt use would increase significantly if rear seat belt reminders were required;
- requiring rear seat belt reminders is consistent with NHTSA's statements, Rulemaking Agenda, and SAFETEA-LU requirements to increase safety belt use for all passengers because implementing rear safety belt reminder systems would be the easiest way to achieve further gains in safety belt use and lives saved;
- rear seat belt reminders are technologically feasible and
- rear seat belt reminders would be less costly per unit if required in all vehicles

Government, industry and safety groups all agree seatbelts save lives.

There are two 30-second Public Service Announcements from Britain that are excellent examples of why rear seatbelt reminders systems are crucial to every passenger in the vehicle. I strongly encourage you to view these.

http://www.youtube.com/watch?v=e6Qhmdk4VNs&feature=related

http://www.youtube.com/watch?v=4SEy_FCJlpk&feature=related

Reminder Systems To Prevent Unattended Children can easily be incorporated after seatbelt reminder systems have been added.

A riveting article, "Fatal Distraction," was published by Pulitzer Prize winning author, Gene Weingarten, in the Washington Post Magazine on March 8, 2009. He did a phenomenal job bringing together the many complicated and misunderstood reasons how children can be inadvertently left alone in a hot car and why these unthinkable deaths continue to happen. Mr. Weingarten explained the ways our brain/memory function and how lack of sleep, stress and a change in routine can have devastating consequences. It conveys a powerful message and tells the heart-breaking stories of parents who have lost their young child so tragically. I submit this article for the record. This article has been blogged about in the New York Times, Wall Street Journal, etc. It has been characterized as a "must read" for this year. Examples of comments follow:

As a new parent, I've read as much of this stuff as I can find. This article drives home very well that this can happen to anybody, as in no amount of education or wealth makes a person immune from making this mistake.

But I agree with Wise Old Woman that "it can happen to anyone" and the fact that we're looking at cases of "mere" negligence has pushed some to minimize what happened here. There's a reason that these otherwise good parents struggle with guilt: they were catastrophically bad parents, albeit on one occasion. It wasn't criminal and the results weren't fair, but the were still awful and still preventable.

Preventing this is not out of a parents hands, and I hope this article and people push cars to be better going forward. But in the end, these would be machines, like our memories, and could fail. Nothing avoids the simple reality that each parent paying attention to what their doing is the best way to avoid such tragedies.

###

I think what this article stresses is the need for prevention. Simply saying these are cases of bad parenting is not enough. They were not bad parents. They were like most parents: they had multiple responsibilities, and they were human. They made mistakes, and these were incredibly unfortunate ones. More needs to be done to prevent this from happening again. Saying horrible things about the parents involved is not enough. In fact, it is completely counter-productive. Focus on solutions, not on making yourself feel like a better human being for never having made this particular mistake with your children.

###

Every Christian at least knows the story of Jesus teaching in the Temple at the age of twelve. The priests wondered at his precocious wisdom. Jesus was there alone because Joseph and Mary accidentally left him when they started for home. Each thought he was with the other, until they had an "I thought he was with you!" moment. If the Holy Family can make this mistake, then anyone can.

###

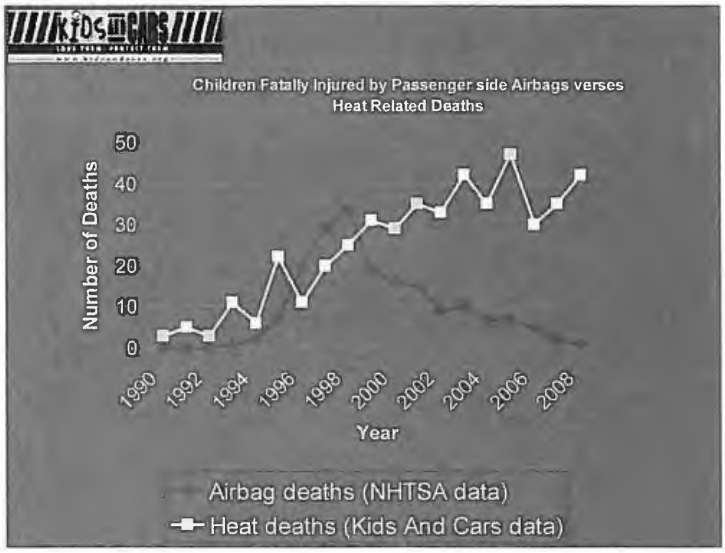
This is one of the saddest articles I have ever read. There but for the grace of God go ALL of us. If you have ever let your child play outside by himself, if you have ever turned your back on your child at the grocery store to grab something off the shelf, if you have ever let your 5-year-old go to the bathroom at McDonalds without accompanying him or her, you are no different from these people whose momentary lapses of memory caused the agonizing, tortuous deaths of their beloved infants.

###

During the 1990s, there were many reports of deaths caused by airbags. At least 180 children were killed by deploying passenger side airbags between 1990 and 2008; while during those same years over 500 children died in vehicles due to hyperthermia. Where's the outrage?

NHTSA's latest report on side passenger airbag deaths shows that in 2007, for the first time since 1992, there were no child or adult deaths caused by deploying airbags. Industry, government and safety groups worked together to prevent these unnecessary deaths by educating parents about the importance of transporting children only in the back seat. The campaign changed forever how Americans transport their children in motor vehicles.

But today, we are suffering from an unintended consequence of moving children to the backseat. The attached chart shows as we reduced the number of airbag deaths, the numbers of children who died because they were inadvertently left alone in the backseat of a vehicle began. This modern day a phenomenon was responsible for forty-two child deaths due to vehicular hyperthermia just last year. Many more children have died from being forgotten in a motor vehicle than have ever been killed by an airbag.



Reminder Systems To Prevent Unattended Children can easily be incorporated after seatbelt reminder systems have been added. All too often, adults inadvertently leave infants and young children in child restraint systems in the rear seats of passenger vehicles. Exposure of young children, particularly in hot weather, leads to hyperthermia that can result in death or severe injuries. Such inadvertent deaths can be avoided by equipping vehicles with sensors to detect the presence of the child and sound a warning at the time the driver locks the vehicle with a child inside.

These systems also prevent children from being inadvertently forgotten in vehicles by signaling the driver that a seat belt is still buckled once the vehicle is locked. Similar warning features currently remind drivers when they have left the key in the ignition, left the headlamps on and when a door is open while the vehicle is in motion.

Child Passenger Safety-LATCH Child Safety System Improvements

When children are moved from a rear-facing restraint to a forward-facing restraint, it is a demotion. It is not anything to celebrate. We would all, in fact, be safer rear-facing in the backseat. We need to promote keeping children rear-facing as long as possible. Did you know in Sweden children ride rear-facing until the age of 3 or 4?

When children are then moved from a forward-facing restraint to a belt-positioning booster, it is a bigger demotion. Notice the lack of 'restraint' in the name of the device they will be using in a vehicle. Belt-positioning boosters do not restrain children. They boost children so the adult seatbelt system fits them better.

When children are moved from a belt-positioning booster and allowed to ride in a vehicle using the adult seatbelt, this is the biggest demotion in safety terms. Remember for whom these adult seatbelts were originally designed - 170 lb male.

And then at the magic age of 15 (formerly 13), it is safe for children to ride in the front seat! With only two or three years to their high school graduation... we finally 'graduate' them into the adulthood of becoming a driver.

We all need to help parents stretch out the time kids spend at each stage -- keeping the kids there "as long as possible." Every step is a learning step for both parents and kids. Celebrities ride in the back--where it is 40% safer.

As a prelude to any discussions about child restraints I'm always struck by one basic fact. There is not another consumer product that is *required by law* that takes 32 hours to learn how to install correctly and continues to have an 80 -90% mis-installation rate. Scholars and Moms alike are literally brought to their knees when trying to ensure the safety seat they chose for their child will provide with the best protection possible. Child restraint manuals contradict vehicle manuals and vice-versa. In 1999 NHTSA required that passenger vehicles and child restraints must be equipped with Lower Anchorages and Tethers for Children – the "LATCH" system – by 2002, in order to promote an easier system of child restraint in place of using vehicle seat belts to secure child restraints.

The Chicago Tribune published an article entitled "Car seat test reveal 'flaws' on March 1, 2009 calling into question once again the efficacy of child restraints and the testing procedures necessary to determine what is needed to keep children safe.

The Insurance Institute for Highway Safety (IIHS) responded to the article with the recommendation that consumers put the findings of that particular study in perspective with the overall history of real-life crashes that take place everyday on our roads and highways.

Safe Ride News (March/April 2009) published an article entitled, "Putting the Latest Car Seat Testing Revelations in Perspective" highlighting the following information:

- Today's CRs provide extremely good protection in the vast majority of crashes. There has not been an epidemic of babies killed or seriously injured from infant seats flying off their bases, as confirmed by the response from CHOP to the Tribune article: "'Our investigations of real-world crashes over the past ten years found infants in rear-facing car seats had an extremely low risk of injury in a crash. Of the crashes studied, very few infants in rear-facing seats were injured,' said Kristy Arbogast, Ph.D., director of engineering at the Center for Injury Research and Prevention. 'Of the few injuries we did see, most were minor and without long term consequences.'"
- CRs made today pass tests that are stringent, although limited to frontal crashes. The 30-mph speed of the FMVSS 213 sled test is more severe than at least 95% of actual crashes.
- Very, very few crashes are of the severity of the 35-mph tests of vehicles run by the New Car Assessment Program (NCAP) and reported in the Tribune article. At 35 mph, the forces are about one-third higher than in the 30-mph sled test. (To learn more about this, see "Physics 201" on page 3.)
- Testing every CR in every vehicle model every year would be an extraordinarily complicated, time-consuming, and expensive process that would greatly increase the cost of CRs. The benefit of having a single test standard is that it offers a reproducible test process that uses a representative crash pulse that is reasonably severe. No one should expect a CR to protect its occupant in all possible crash conditions.

In general, it appeared to be a 'blip' that generated interest for a short period of time followed by a period of questioning the results. It has caused the agency to look more closely at child restraint testing and an appropriate response came from Secretary LaHood. We hope this is helpful to the agency to continue working on the best methods to test car seats and improve the transparency consumers' demand in today's marketplace.

Although parents have long been advised that the center rear seating position is the safest for a child, no LATCH System was required in the center rear seat position, only the outboard seating positions. A 2005 agency report also established that many parents and other adults were confused about how the LATCH system works, could not identify or find the lower anchorages, or did not realize that there were no LATCH systems in the rear center seating position of cars. Although NHTSA identified technical improvements that could be made to make the use of LATCH system hardware easier, the agency has not yet proposed a solution. In conjunction with the agency's efforts to increase education regarding the use of the LATCH system, certain changes to the LATCH hardware are necessary and should be pursued.

Major issues concerning the LATCH System as per Deborah Davis Stewart
Editor/Publisher, Safe Ride News Publications

Improving the ease of installing child restraints in the center of the back seat

The center rear is known to be safer for children and many parents prefer to have their children positioned there.

There are various design features that hinder center position use, such as a hump in the cushion, narrow space for a third (center) occupant, and fold-down arm-rests. These are primarily designed for adult use/comfort, but since the back seat is predominantly the domain of children, it should be maximized for their safety.

FMVSS 225 does not address installation of child restraints (CRs) in the center seating position. Most CRs have flexible lower attachments so it is feasible to install them in the center rear using the anchors from the side position. The recommendations of original vehicle manufacturers (OEMs)* vary, as do the allowances of the CR manufacturers.

Making the center rear more accommodating to children, by having lower LATCH anchors installed there in all vehicles would not be a simple matter. Some OEMs that have done so have inadvertently created other compatibility issues. If separate anchors for the center position were mandated, the requirement would have to include a test for usability without causing other safety problems.

The other solution, requiring a built-in CR in the center rear, would greatly improved child safety in the back seat for children large/old enough to ride forward facing. Since forward-facing position has increased hazard for the occupant, compared to rear-facing infant position, there would be justification for encouraging the forward-facing occupants to ride in the center. Today, they are less likely than an infant to ride in the center position.

Weight limits for children in CRs installed with the universal anchorage system, LATCH

Since FMVSS 225 fails to determine a uniform maximum weight for children in CRs installed with LATCH, it is being interpreted differently by various OEMs.* Some limit lower and tether anchors to 40 lb, others specify 48 lb, and some stating no limit or following the CR manufacturers' recommendations on their products. Therefore, the system is not uniform. Users have to know the limits for the particular vehicles they own.

At the same time, CR manufacturers have developed more restraint systems with harnesses for children weighing over 48 pounds. There are now over 30 CR models. These are particularly useful for obese youngsters (a growing group) who are not mature enough to sit reliably in a booster seat. These also have different recommendations for the use of the tether and lower anchors.

Vehicle and CR manufacturers have organized a committee of the SAE to work on this issue. However, without support of NHTSA, this effort is slow and any definitive weight limits arrived at will only be voluntary. Until this problem is dealt with in regulation, it will hinder maximum effectiveness of FMVSS 225.

Improving tether use and tether anchor access

The top tether that is part of the LATCH system is widely recognized as providing substantial benefit to children riding in forward-facing CRs. However, caregivers often do not use the tether on their child's forward-facing CRs, and one common reason is because it is a hassle to attach. In the recent NHTSA-MVOSS report, only 60% of caregivers who know their CRs have tethers actually use it every time and 28 percent never fasten it.

In many vehicles, it is very hard to reach the tether anchor to hook the strap. For example, caregiver may have to climb into the back of a SUV or into the other side of the vehicle in order to attach the tether. Access to the tether anchor needs to be improved, so it will be convenient to use. This could be encouraged by a "usability" rating for vehicle LATCH systems that could be implemented by NHTSA.

*See attached Quick Reference List from The LATCH Manual, 2009, published by Safe Ride News Publications, Edmonds, WA

Please note that Ms. Stewart who is perhaps one of the foremost experts on LATCH has produced a full-sized book that has already been updated 3 times as an essential tool for the child passenger safety technicians (who have already received over 32 hours of training) to assist families through the puzzling process of securing a child restraint in their family vehicle. Have we made this easier?

Stephanie M. Tombrello, LCSW, CPST I0061, Executive Director, SafetyBeltSafe U.S.A. provides several suggestions to be considered priorities for Congressional action regarding car safety seats as well:

Reconsider the mandate to states to include 4'9" in state laws to qualify for incentive funding for improving state laws to protect older children in motor vehicles

We recommend providing incentive funding to states that pass laws to protect the safety of older children by requiring the correct use of a safety seat or booster until the child is big enough to wear a properly fitted safety belt. However, 4'9" is not an appropriate determinant.

To assess whether a child needs a booster seat or can ride safely wearing just a vehicle belt, one has to take into account the specific vehicle dimensions, including placement of safety belt attachments and angles and depth of vehicle seats. Recent research at the University of Michigan Transportation Safety Institute has reinforced the fact that in a two-variable problem like this one (i.e., the variability of the child's torso and leg lengths and the variability of the vehicle's belts and seat cushions), the evaluation must be conducted with the child in the actual vehicle.

Since 2001, SBS USA has offered such an approach, the 5-Step Test**, which can be presented in a 4-minute video or quickly understood from reading a simple handout. It does not require the parent or child to know either the child's height or the dimensions of the vehicle, and it can be done quickly in any vehicle in which the child rides. However, a state that uses those criteria in their law does not qualify for incentive funding from the U.S. government.

The 5-Step Test** works well, can be applied by non-experts—indeed, by the children themselves as they get older—and, in hundreds of "tests," has shown that age 8 is, by far, NOT the cut-off for booster use if one's goal is to protect children who do not fit properly in belts. A great many youngsters ages 10-12 need boosters to get the belts to fit. Using these criteria for the law would allow law enforcement officers in the field to assess belt fit easily when considering citing parents for non-compliance of "correct use" of belts.

It has been shown by many field assessments that it is common for parents NOT to know the height of their children. Even if the child's height is known, it is still necessary to have the child sit in the family vehicle to find out if the child needs a booster for proper belt fit.

We suggest that, at the very least, the 5-Step Test** system of evaluation be permitted as part of state laws to qualify for incentive funding. Even more important, this change would make it easier for parents to make good decisions about protecting their children. Frequently, we have found that parents still own a booster but do not use it because they do not know how to assess whether or not the child needs it. We know of cases in which children were injured while the booster sat unused in the family garage because the child had attained the age specified by state law.

Assessing methods to reduce entanglement of children in safety belts

Although shoulder-and-lap belts are considered the most protective safety feature in motor vehicles, there have been several instances of children who have strangled or nearly strangled because they placed a belt with a locking (switchable) retractor around their necks while traveling. It can be assumed that many more unreported cases have occurred. Most of the parents who experienced this frightening situation state that they were not even aware of the possibility that their children could be harmed by a vehicle belt. We recommend funding an exploratory study of a technological method for preventing such unintentional consequences. We also recommend that warnings to parents be provided not only in vehicle and safety seat owner's manuals but also in educational materials and media campaigns.

Suggestions for current, practical methods to reduce this risk should be solicited. The effectiveness of such a two-level approach in reducing deaths of children attributed to frontal passenger air bags has already been demonstrated. Finally, we want to make it clear that belt lockability is still an important feature for child restraint installation. NHTSA has issued a Notice of Proposed Rulemaking to remove the sunset clause that would rescind the lockability requirement for safety belts in 2012. A petition requesting this action was submitted by SafetyBeltSafe U.S.A. and Safe Ride News and supported by 177 CPS advocates.

Revising regulations to encourage innovative child restraint designs that could increase protection for children

We recommend that NHTSA consider permitting U.S. companies to manufacture and/or distribute child restraints designed for specified vehicles to improve compatibility, even if the design requires use of vehicle-specific equipment so the restraint could not be used in other vehicles. LATCH has not solved all incompatibility problems. Since vehicles have different configurations of seat cushions and belt anchors, it could be beneficial in some cases to have a child restraint designed to fit a particular car. However, FMVSS 213 requires that every child restraint be capable of being attached to the vehicle with two standard methods: a safety belt and the LATCH system (using one, not both). According to NHTSA, the restraint cannot be attached only by a special mechanism that not every vehicle has. It can have a supplementary, vehicle-specific attachment mechanism in addition to those universal means of attachment, but it must pass testing with only the standard attachment. A NHTSA representative states that the reason for requiring a standardized means of attachment is to reduce the likelihood of misuse. However, this should not be a concern if the restraint is available only through the vehicle manufacturer.

Identification of safety seats

It is not currently required that safety seat model names be visible to users. Because it is totally unrealistic to expect consumers to remember lengthy model numbers, which are used primarily by manufacturers for quality control and inventory control, it is very important that products have clearly discernible names permanently attached. It is as if we expected car buyers to remember the VINs on their vehicles so they could look up features and other characteristics of their vehicles or ask questions about them. Imagine having to remember a 17-digit number for your Ford Focus in order to identify it in a discussion with a service department!

Improve access to safety seats

Today, most families can easily obtain safety seats for a reasonable price. However, there are definitely pockets of the community who do not have the resources to purchase safety seats to protect their children. Economic analysis has shown that providing free or low-cost safety seats generates considerable savings in parents' lost work time and in medical, educational and long term disability costs for the injured children in addition to the considerable effects on families of a child with substantial physical, mental, and emotional challenges.

Since there is no consistent, national program that provides needy families with access to low-cost safety seats, local programs must rely on short-term, inconsistent funding through a variety of state and local resources. This makes it difficult for families to locate programs; moreover, it makes it very difficult for social service personnel to locate resources for their clients. Parents seeking specialized, expensive safety seats for youngsters with special needs face even greater challenges.

School Bus Safety

There is a great deal of published information that tells us sending our child to school on the big yellow school bus is beyond the safest way to transport them. KidsAndCars.org, the American Academy of Pediatrics and School Transportation News data collection efforts are questioning the accuracy of reported injuries and death regarding pupil transportation.

The American Academy of Pediatrics studied school bus related injuries actually treated in US emergency departments from 2001 to 2003. The physicians found an estimated 51,100 school bus–related injuries, two and a half times the accepted national estimates of 17,000.[1]

In a like manner, a year-long study of national and local newspaper headlines by industry journal *School Transportation News* found school bus riders killed outside the school bus were actually three times those reported in the highly respected 2006-2007 National School Bus Loading and Unloading Survey. [2]

The need for seatbelts on school buses has been debated for decades. After studying this issue for 10 years an announcement was made by the agency in October of 2008. The U.S. Department of Transportation released a final rule from NHTSA that requires three-point lap/shoulder restraint systems on all newly purchased *small* school buses, updating a previous

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[1] McGeehan, J et al., "School Bus–Related Injuries Among Children and Teenagers in the United States, 2001-2003" PEDIATRICS Vol. 118 No. 5 November 2006, pp. 1978-1984.

[2] Wegbrit, D., "Trying Figures, Independent Research Highlights Challenges to the National Loading and Unloading Survey," *School Transportation news Magazine,* Jan. 2008, pg. 54.

regulation that the vehicles come equipped with lap belts. There is *no requirement* for larger school buses to install lap/shoulder belts.

It is strongly recommended that NHTSA require lap/shoulder belts on all newly manufactured school buses produced. All riders will be provided with protection during side impact and roll over accidents, discipline will be improved, incidents reduced and the life long habit of seat belt use reinforced.

Another aspect of school bus safety that gets little to no attention is that more children are killed outside of a school bus than have ever been killed inside a school bus. When assessing the overall safety a complete picture of the entire ride to and from school should be analyzed.

Attached is a copy of the response from the National Coalition for School Bus Safety to the NPRM (NHTSA 2007-0014). The document provides a good synopsis of the current state of affairs.

Data Collection

In order for government and industry to effectively and prudently address these issues, they need a quality real-world child-focused crash data system, as outlined in the National Child Occupant Special Study white paper and supported by the NHTSA, the automotive and insurance industries, as well as the pediatric health and traffic safety advocacy communities. (attached)

Funding for the National Highway Traffic Safety Administration (NHTSA)

One of the most critical weapons in the battle to reduce deaths and injuries is adequate financial resources to support programs and initiatives to advance safety. At present, nearly 95 percent of all transportation-related fatalities are the result of motor vehicle crashes but NHTSA's budget is less than one percent of the entire DOT budget.

Motor vehicle safety regulatory actions languish and NHTSA data collection is hampered because of insufficient resources to address these problems. Insufficient program funding and staff resources can contribute to the agency's missteps in identifying and acting upon the problems.

Since 1980, the agency has been playing a game of catch-up. Today, funding levels for motor vehicle safety and traffic safety programs are not much higher than 1980 funding levels in current dollars.

For over twenty years, NHTSA has been underfunded and its mission compromised because of a lack of adequate resources to combat the rising tide of increased highway deaths and injuries. Increase funding authorization for NHTSA's motor vehicle safety and consumer information programs.

Safety, medical, health, and law enforcement groups and DOT all agree that seat belt use is critical to safety in most crash modes. Last year, statistics show that the majority of fatally injured victims were not wearing their seat belts. It is incumbent on safety advocates, the Administration, and Congress, to ensure that everyone gets the message to "click it, or ticket." Please provide sufficient funding resources for the agency to fulfill it's mission.

**The "5-Step Test" is the best way to determine if a child can be demoted/graduated to wearing an adult safety belt.

The 5-Step Test.

1. Does the child sit all the way back against the back of the auto seat?
2. Do the child's knees bend comfortably at the edge of the auto seat?
3. Does the belt cross the shoulder between the neck and arm?
4. Is the lap belt as low as possible, touching the thighs?
5. Can the child stay seated like this for the whole trip?

If you answered "no" to any of these questions, your child needs a booster seat to make both the shoulder belt and the lap belt fit right for the best crash protection. Your child will be more comfortable, too and will be able to see out the back window better!

The back seat is the safest part of the car for all passengers. Recent research shows that children should ride in the back seat until they reach age 15. At my house we say, you can sit up front when you start driving.

PETITIONERS' EXHIBIT O

UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

KIDS AND CARS, Inc., and THE CENTER FOR AUTO SAFETY Petitioners.	)	No.

DECLARATION OF JASON LEVINE

1. I am the Executive Director of the Center for Auto Safety ("the Center"), one of the Petitioners in this case. The Center is a non-profit membership organization founded in 1970 by Consumers Union and Ralph Nader to advocate for auto safety and economic fairness on behalf of consumers. It is the nation's leading consumer advocacy group dedicated to these issues, and a recognized expert in the field of auto safety; for decades it has been so recognized by Congress, the media, and courts.

2. The Center has long supported motor vehicle safety standards that would increase the use of safety belts, and has consistently advocated incorporating available safety technology into motor vehicle safety standards wherever possible.

3. The Center brings this case on behalf of its thousands of members who, with their families, as a result of the failure of the Department of Transportation ("DOT") to promulgate the mandated standard, are exposed to the increased risk of economic and personal injury, and even death, from a vehicle crash if they are sitting in the rear seat of a vehicle and not wearing their seat belts.

4. As a result of DOT's failure to promulgate the requisite standard, Center members and their families may forget to fasten their seatbelts in the rear seats of vehicles, not fasten them correctly, or have children who remove their seat belts while traveling, and are thereby at risk of dying or being seriously injured if the car is involved in a crash. In addition to the personal and emotional injuries that will ensue, these members and their families also face economic and other injuries that attend such incidents, including the costs associated with dealing with the death of a family member or the hospitalization of individuals injured in a car crash because they were not wearing a seat belt. These injuries are present, continuing, and imminent, as Center members and their families travel in the back seats of vehicles every day.

5. There is no question that if the mandated standard were in place, less Center members and their family members would be at risk of personal injury or death, because a warning would go off in the car every time a rear seat belt was not fastened, which in turn would ensure that more back seat passengers fastened their

seat belts. For example, we know that as a result of the present Federal Motor Vehicle Safety Standard that requires a warning if the driver of a vehicle is not buckled up, FMVSS 208, many more drivers wear seat belts than if that warning did not go off. According to a recent report from the International Electronics Engineering ("IEE") presented at the 2015 Enhanced Safety of Vehicles Conference convened by the National Highway Traffic Safety Administration ("NHTSA"), the audio warnings now provided for drivers in the *front* seat have proven to be "*highly effective in increasing belt wearing rates of a vehicle's front seat occupants*." "Advanced Seat Belt Reminder System for Rear Seat Passengers," Report of the IEE, Pet. Ex. H (emphasis added). According to that same report, a laboratory study conducted in Japan in 2012 demonstrated that use of an audiovisual warning to remind rear seated passengers to fasten their seat belts resulted in 95% of the initially non-belted rear seat occupants fastening their seat belts. *Id.* at 3. Further, a recent study by the Insurance Institute of Highway Safety ("IIHS") found that a high percentage of people sitting in the rear seats of vehicles would be more likely to fasten their seat belts if there were an audio warning when those seat belts were not fastened. *See* Status Report, "Unbelted," Insurance Institute for Highway Safety (Aug. 3, 2017), Pet. Ex. C. Congress itself has recognized this, which is why it enacted the legislation requiring this standard—*i.e.*, it concluded that a rear seat belt warning would save lives.

6. The risks faced by Center members and their families are actual and concrete. NHTSA has reported that of the tens of thousands of people who die in automobile crashes every year, close to 50% were not wearing their seat belts, and that a high percentage of those individuals would have survived the crash if they had worn their seat belts. *See, e.g.,* NHTSA Seat Belt Report, Pet. Ex. A. There is also no dispute that although seat belts save lives, a high percentage of individuals, particularly those that ride in the rear seats of cars, often do not wear their seat belts, fasten them incorrectly, or remove them at some point while the car is still in motion. In addition, parents cannot always make sure their children who ride in the back seat of cars are fastened in their seat belts, especially when those children are riding in cars driven by others. There is no question that having a rear seat belt warning in cars would greatly increase the number of people, including children, who are fastened in their seat belts.

7. All of these injuries are caused by DOT's failure to promulgate the standard Congress mandated as part of the MAP-21 legislation in 2012. For example, despite the fact that seat belt reminders save lives, we know that less than 3 percent of models sold in the United States in 2015 came equipped with rear seat belt reminders. IIHS Study, Pet. Ex. C. Therefore, voluntary efforts to include such warnings simply are not effective, and, absent the standard mandated by Congress, cars will continue to be sold without this extremely important life-saving device.

8. For the same reasons, the injuries described above will be at least partially redressed if Petitioners prevail in this case because DOT will finally be required to promulgate the standard that was mandated by Congress in 2012, and Center members and their families will have an additional measure of protection against a fatal or severe injury that they currently do not have because DOT has failed to implement Congress's mandate. For example, as discussed in paragraph 5 above, we know that as a result of the present Federal Motor Vehicle Safety Standard requiring a warning if the *driver* of a vehicle is not buckled up, FMVSS 208, many more drivers wear seat belts than if that warning were not in place. Further, the IIHS reported that nearly two-thirds of part-time and nonusers of seat belts said audible rear seat belt reminders would make them more likely to fasten their seat belts, Pet. Ex. C at 4—a finding that is supported by a previous study by the National Academy of Sciences. *See* Buckling Up Technologies to Increase Seat Belt Use, Special Report 278 (2003), Transportation Research Board, National Academy of Sciences, Pet. Ex .I, at 13 (73 percent of drivers interviewed reported that they had buckled their seat belts *after being reminded to do so by a reminder system).* Congress itself has recognized this fact, which is precisely why it enacted the legislation requiring this standard—*i.e.*, it concluded that a rear seat belt warning would in fact save lives.