

! WARNING

EVEN WITH ADVANCED AIR BAGS



- Children can be killed or seriously injured by the air bag
- The back seat is the safest place for children
- Never put a rear-facing child seat in the front
- Always use seat belts and child restraints
- See owner's manual for more information about air bags

SPECIAL CRASH INVESTIGATIONS:

FIRST GENERATION FRONTAL AIR BAGS A MODEL FOR FUTURE CORRECTIVE ACTION

DOT HS 811 261
January 2010

The accompanying report, *Counts of Frontal-Air-Bag-Related Fatalities and Seriously Injured Persons*, January 1, 2009, tracks the number of crash fatalities that were confirmed to be related to injurious interactions with air bag deployment. The National Highway Traffic Safety Administration (NHTSA) has tracked such fatalities and published periodic reports since the early 1990s.

Since reporting of air-bag-related incidents began, a remarkable decline in these cases has been realized. In 2007, there were two confirmed cases and in 2008, only a single confirmed case. With the count now at near-zero levels, NHTSA will no longer provide routine periodic reports on air bag fatality counts. However, the agency's Special Crash Investigations (SCI) program will continue to monitor the incidence of injuries or fatalities related to air bag deployment to identify any trends that could indicate design or performance problems.

The action comes almost two decades after frontal-air-bag-related fatalities were first identified as a serious safety concern. NHTSA initiated a successful collaboration of the Federal Government, the automobile industry, equipment suppliers, insurance companies, traffic safety advocates, law enforcement agencies from across the country, and the media to solve the problem.

Following is a summary of the nature of the air-bag-related injury problem, and factors associated with its reduction. NHTSA plans to use the frontal air bag experience and lessons learned as a model to tackle other safety problems and further save lives and reduce injuries on our Nation's roadways.



Top 10 Leading Causes of Death in the United States for 2006, by Age Group¹

National Highway Traffic Safety Administration's National Center for Statistics and Analysis

R A N K	Cause and Number of Deaths											Years of Life Lost ²
	Infants Under 1	Toddlers 1-3	Young Children 4-7	Children 8-15	Youth 16-20	Young Adults 21-24	Other Adults			Older Adults 65+	All Ages	
							25-34	35-44	45-64			
1	Perinatal Period 14,321	Congenital Anomalies 462	MV Traffic Crashes 449	MV Traffic Crashes 1,272	MV Traffic Crashes 5,689	MV Traffic Crashes 4,667	MV Traffic Crashes 7,162	Malignant Neoplasms 13,917	Malignant Neoplasms 151,788	Heart Disease 510,542	Heart Disease 631,636	Malignant Neoplasms 23% (8,908,211)
2	Congenital Anomalies 5,819	Accidental Drowning 395	Malignant Neoplasms 392	Malignant Neoplasms 723	Homicide 2,794	Homicide 2,749	Accidental Poisoning 5,267	Heart Disease 12,339	Heart Disease 103,572	Malignant Neoplasms 387,515	Malignant Neoplasms 559,888	Heart Disease 20% (7,685,448)
3	Heart Disease 346	MV Traffic Crashes 351	Congenital Anomalies 183	Homicide 472	Suicide 1,836	Suicide 2,162	Suicide 4,985	Accidental Poisoning 7,542	Diabetes 17,124	Stroke 117,010	Stroke 137,119	MV Traffic Crashes 5% (1,760,796)
4	Homicide 336	Homicide 317	Accidental Drowning 163	Suicide 410	Accidental Poisoning 1,086	Accidental Poisoning 1,821	Homicide 4,725	Suicide 6,591	Stroke 16,859	Chronic Lwr. Resp. Dis. 106,845	Chronic Lwr. Resp. Dis. 124,583	Stroke 4% (1,536,877)
5	Septicemia 269	Malignant Neoplasms 277	Homicide 141	Congenital Anomalies 256	Malignant Neoplasms 724	Malignant Neoplasms 812	Malignant Neoplasms 3,656	MV Traffic Crashes 6,470	Chronic Lwr. Resp. Dis. 16,299	Alzheimer's 71,660	Diabetes 72,449	Chronic Lwr. Resp. Dis. 4% (1,503,483)
6	Influenza/ Pneumonia 263	Exposure to Smoke/Fire 158	Exposure to Smoke/Fire 121	Heart Disease 249	Heart Disease 425	Heart Disease 598	Heart Disease 3,307	HIV 4,010	Chronic Liver Disease 14,929	Diabetes 52,351	Alzheimer's 72,432	Suicide 3% (1,176,020)
7	Nephritis/ Nephrosis 162	Heart Disease 144	Heart Disease 74	Accidental Drowning 198	Accidental Drowning 335	Accidental Drowning 239	HIV 1,182	Homicide 3,020	Suicide 12,009	Influenza/ Pneumonia 49,346	Influenza/ Pneumonia 56,236	Perinatal Period 3% (1,122,740)
8	Stroke 142	Influenza/ Pneumonia 111	MV Nontraffic Crashes⁴ 50	Exposure to Smoke/Fire 113	Congenital Anomalies 230	Congenital Anomalies 188	Diabetes 673	Chronic Liver Disease 2,551	MV Traffic Crashes 10,713	Nephritis/ Nephrosis 37,377	Nephritis/ Nephrosis 45,344	Diabetes 3% (1,084,880)
9	MV Traffic Crashes 139	MV Nontraffic Crashes⁴ 107	Benign Neoplasms 41	Chronic Lwr. Resp. Dis. 104	MV Nontraffic Crashes⁴ 135	HIV 153	Stroke 527	Stroke 2,221	Accidental Poisoning 10,649	Septicemia 26,201	MV Traffic Crashes 43,664	Accidental Poisoning 3% (1,071,895)
10	Malignant Neoplasms 76	Septicemia 78	Influenza/ Pneumonia 37	MV Nontraffic Crashes⁴ 100	Accidental Falls 116	Pregnancy Childbirth 124	Congenital Anomalies 437	Diabetes 2,094	Nephritis/ Nephrosis 6,613	Hypertension Renal Dis. 19,852	Septicemia 34,234	Homicide 2% (878,954)
ALL³	28,527	3,923	2,447	5,824	16,330	17,143	42,952	83,043	466,432	1,759,423	2,426,264	All Causes 100% (38,315,767)

¹When ranked by specific ages, motor vehicle crashes are the leading cause of death for each age 3 through 34.

²Number of years calculated based on remaining life expectancy (2005 data from CDC) at time of death; percents calculated as a proportion of total years of life lost due to all causes of death.

³Total of top 10 causes of death.

⁴A motor vehicle nontraffic crash is any vehicle crash that occurs entirely in any place other than a public highway.

Source: National Center for Health Statistics (NCHS) CDC, Mortality Data 2006.

Note: The cause of death classification is based on the National Center for Statistics and Analysis (NCSA) Revised 68 Cause of Death Listing. This listing differs from the one used by the NCHS for its reports on leading causes of death by separating out unintentional injuries into separate causes of death, i.e., motor vehicle traffic crashes, accidental falls, motor vehicle nontraffic crashes, etc. Accordingly, the rank of some causes of death will differ from those reported by the NCHS. This difference will mostly be observed for minor causes of death in smaller age groupings.

Motor Vehicle Crashes Remain a Leading Cause of Death

Motor vehicle travel is the primary means of transportation in the United States, providing an unprecedented degree of mobility. Yet for all its advantages, when ranked by specific ages, motor vehicle crashes are the leading cause of death for people of every age from 4 through 34 (based on the 2006 National Center for Health Statistics mortality data). Traffic fatalities account for nearly 95 percent of transportation-related fatalities.

Fortunately, much progress has been made in reducing the number of fatalities and serious injuries on our Nation's highways. Much of this progress can be attributed to significantly improved vehicle designs, which have either been deployed voluntarily or prompted through regulation. Today's vehicles are equipped with crash avoidance and crashworthiness safety systems that provide higher levels of protection to their occupants than those of the past. Government regulations have played an important role in ensuring motor vehicles meet minimum standards of safety. NHTSA is the regulatory agency responsible for setting Federal Motor Vehicle Safety Standards (FMVSSs).

NHTSA's Federal safety standards are written in terms of minimum safety performance requirements for motor vehicles or items of motor vehicle equipment. These requirements are specified in such a manner "that the public is protected against unreasonable risk of crashes occurring as a result of the design, construction, or performance of motor vehicles and is also protected against unreasonable risk of death or injury in the event crashes do occur."¹

History of FMVSS 208, "Occupant Crash Protection"

In the mid-1970s, General Motors was first to include frontal air bags as original equipment in as many as 10,000 of its vehicles. It was offered as optional equipment in 1974- to 1976-model-year vehicles, but General Motors terminated the program claiming a lack of consumer interest. It was not until model year (MY) 1985 that Mercedes-Benz voluntarily installed this safety feature. This was followed by Chrysler, which made driver air bags standard in all MY 1990 passenger cars. NHTSA research and analysis had found that drivers protected by air bags experienced reduced fatality risks of 31 percent in purely frontal crashes (12 o'clock point-of-impact on the vehicle), 19 percent in all frontal crashes (10 o'clock to 2 o'clock), and 11 percent in all crashes.

Initially, FMVSS 208, Occupant Crash Protection, as amended on July 17, 1984, required that automatic occupant protection such as air bags or automatic seat belts be phased into passenger cars during the period 1987 to 1990. When NHTSA issued FMVSS 208, it also began a continuing, nationwide effort to increase belt use through encouragement of State seat belt use laws, enforcement, and public education. Use of manual lap-shoulder belts was shown to reduce the risk of fatal injury to front-seat occupants by 45 percent, but in 1983, only 14 percent of drivers buckled up. Initially, automatic belts installed in response to FMVSS 208 helped increase seat belt use.

The phase-in requirement for FMVSS 208 for passenger car automatic occupant protection was: 10 percent of MY 1987, 25 percent of MY 1988, 40 percent of MY 1989, and all passenger cars manufactured after September 1, 1989 (or MY 1990). FMVSS 208 was later amended to allow an exclusion from the automatic protection requirement for the right-front passenger position until September 1, 1993, if an air bag was installed for the driver. All passenger cars manufactured after September 1, 1993, were required to have automatic protection for the

¹ "Motor Vehicle Safety." Title 49, U.S. Code, Chapter 301, Sec. 30102 Definitions. DOT HS 810 641. May 2008.

driver and right-front passenger. In 1991, NHTSA extended the automatic occupant protection requirements to light trucks and vans on a phased-in basis for MYs 1995, 1996, 1997, and 1998.

Thereafter, the Intermodal Surface Transportation Efficiency Act, passed by the Congress in 1991, mandated that all passenger cars manufactured after September 1, 1997, and light trucks manufactured after September 1, 1998, have driver and passenger air bags, plus manual lap-shoulder belts.

Life-Saving Benefits, Unintended Consequences

While government regulations have significantly improved highway safety, sometimes they have had unintended consequences. While the benefits of frontal air bags were well documented, the agency began receiving information of unintentional fatalities, mainly among children and small adults, from air bag-related injuries in relatively low speed crashes. NHTSA established a process to determine whether air bags, which were found to provide very effective protection in potentially fatal crashes, had the unintended consequence of fatally or severely injuring occupants in relatively minor crashes.

Air Bag Interaction Problems Documented

NHTSA began a discovery process and marshaled its data collection efforts. In 1991, NHTSA's SCI program investigated and confirmed the first allegation of a frontal-air-bag-induced fatality. At that time, the SCI was tasked with locating, investigating, confirming, and reporting air-bag-related life-threatening and fatal injury crashes. In 1993, the first air-bag-deployment-related child fatality was confirmed.

During its discovery process, the at-risk population was narrowed to:

- Infants in rear-facing child restraints;
- Short-statured adult drivers (mainly women) sitting too close to the air bag; and
- Right-front passengers (particularly unrestrained children) out-of-position due to pre-impact braking.

NHTSA found that the common characteristic among those who were fatally injured by air bags was the fact that the occupant was in the path of the deploying air bag or air bag cover flap. In a crash of minor to moderate severity, the occupant was most typically in the path of a deploying air bag (or out-of-position) in one of the following two scenarios:

1. The occupant's initial seating position placed the person in the air bag deployment path. Initial positioning may have included: an infant in rear-facing child restraint, a small or short-statured occupant seated in close proximity to the air bag, as well as an occupant who fell asleep, or was otherwise leaning into the air bag deployment path. This scenario included both belted and unbelted occupants.
2. The occupant was repositioned to a location within the air bag deployment path just prior to deployment by a pre-impact or at-impact event. The event that repositioned the occupant into the deployment path included a number of factors such as: pre-impact braking, multiple closely-spaced nondeployment events, and a front-corner impact where a

“As Administrator of NHTSA at the time, we faced this incredible situation: ‘What do you do when life-saving equipment turns out to be life-taking?’ Being a physician, the priority was to do no harm. The public had to know the risk and how to prevent it. Children were at risk and it became clear that similar to medication dosing, or in this case, deployment power, the strength or power for adults may not be the same for children and other vulnerable populations. Simple steps could and needed to be taken immediately.”

Dr. Ricardo Martinez
NHTSA's 10th Administrator,
August 1994—September 1999

large portion of the front structure was not engaged in the crash. Unbelted or improperly belted occupants were more likely to become out-of-position in these scenarios.

“Growing concern over the number of incidents involving air bags led to a joint Call to Action. The response was unwavering commitment by NHTSA and the U.S. Dept. of Transportation and an unprecedented commitment of resources by vehicle manufacturers, suppliers and insurers to form and support the organization that became the National Safety Council’s Air Bag & Seat Belt Safety Campaign. The campaign helped change the culture of how children ride in motor vehicles. In 1996, 78 percent of parents thought it was safe for children age 8 or under to ride in the front seats of cars equipped with passenger air bags. By 2002, only 18 percent of parents thought this was a safe practice. Surveys showed similar improvements in where parents said they actually placed their children. Sixteen percent of parents reported transporting infants in front seats in 1996. Four years later, only 1 percent of parents reported placing infants in front seats. This accomplishment can be rightfully characterized as one of the most remarkable changes in societal behavior in recent decades.”

John Ulczyk
Group Vice President - Research,
Communication & Advocacy
National Safety Council
and former Executive Director, Air Bag &
Seat Belt Safety Campaign

NHTSA estimates that since 1990, more than 290 fatalities have been attributable to frontal air bag inflation in minor- to moderate-severity crashes. Nearly 90 percent of these fatalities occurred in vehicles manufactured before 1998. Approximately 68 percent of people fatally injured by frontal air bags have been passengers. More than 90 percent of these fatalities were children and infants, most of whom were unbelted or in rear-facing child safety seats that placed their heads close to the deploying air bags. More than 80 percent of fatalities were unbelted or improperly restrained. These unbelted occupants were more likely to move forward when there was hard braking or an event before the frontal crash, placing occupants in contact with, or extremely close to their air bags as they began to inflate. Short-statured and older drivers were also vulnerable to inflation injuries from frontal air bags due to their tendency to sit close to the steering wheels.

Response to the Air Bag Interaction Problem

Concern over the number of frontal-air-bag-related fatality and injury incidents, especially to children, led to a joint “Call to Action” from NHTSA, the National Transportation Safety Board (NTSB), and the National Safety Council (NSC). The Call to Action created a coalition of automobile manufacturers, air bag suppliers, insurance companies, the media, law enforcement, and other traffic safety advocates. NHTSA served a central role in uniting these public sector and private sector partners. In January 1996, the Call to Action assembled more than 180 highway safety professionals, representing many disciplines and organizations to establish immediate and effective solutions. Coalition members voluntarily pledged almost \$10 million to pursue a three-point program:

- An extensive national effort to educate drivers, parents, and caregivers about seat belt and child safety seat use in all motor vehicles, with special emphasis on those equipped with air bags;
- A campaign to assist States to pass “primary” seat belt use laws; and
- Activities at State and local levels to increase enforcement of all seat belt and child safety seat use laws, such as increased public information and use of seat belt checkpoints.

NHTSA and its private and public partners committed high volumes of resources to public education, especially aimed at preventing air-bag-related injuries and fatalities to children. The 1996 addi-

tion of NHTSA’s Buckle Up America Campaign and the National Safety Council’s Air Bag & Seat Belt Safety Campaign, as well as others, stressed the following safety principles:

1. Always buckle your seat belt;
2. Never place a rear-facing infant seat in front of an air bag;

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3. Keep approximately 10 inches between your breastbone and the air bag; and
 4. Place children in the back seat and make sure they are properly restrained in appropriate child safety seats, or, if they are old enough, in the vehicle's restraints.

NHTSA had also issued the following three consumer advisory bulletins to tell parents and caregivers not to put children in front of an air bag:

NHTSA Warns Parents About Child Safety Seat Use in Cars With Air Bags, Press Release No. NHTSA 60-91, U.S. Department of Transportation, Office of the Assistant Secretary for Public Affairs, Washington, DC, 1991.

Safety Agency Issues Warning on Air Bag Danger to Children, Press Release No. NHTSA 72-95, U.S. Department of Transportation, Office of the Assistant Secretary for Public Affairs, Washington, DC, 1995.

Secretary Peña Announces Government/Industry Coalition for Air Bag Safety, Press Release No. NHTSA 24-96, U.S. Department of Transportation, Office of the Assistant Secretary for Public Affairs, Washington, DC, 1996.

Regulatory Actions

NHTSA also published a Federal Register notice in November 1995 seeking comment concerning strategies for reducing the adverse effects of air bags. The request for comments in particular sought information about possible technological changes to air bags to reduce the adverse effects, including possible regulatory changes.

The request for comments noted that while future technological enhancements could minimize the adverse effects of air bags, strategies were needed for minimizing the risk—and maximizing the benefit—of those air bag systems already in use. NHTSA was aware that the vehicle manufacturers and air bag suppliers were working on “smart air bags,” (now more commonly called “advanced air bags”) which could include advanced technologies for occupant sensing (including seat weight sensing and seat positioning sensing), phased deployment of air bags, and so forth. These technologies could prevent air bag deployment when they sense that an occupant is too close to the point of deployment, inflate the air bag at different speeds according to the severity of the crash, and prevent the front passenger air bag from deploying when that seat is not occupied.

While NHTSA anticipated that these “smart bag” systems would substantially reduce any adverse effects, there was still the question of what could be done in addition to public education for the near future. In November 1996, NHTSA announced a comprehensive approach to preserve the safety benefits of the current generation of frontal air bags while minimizing their danger to children and at-risk adults. The agency’s approach centered on accelerating the development of “smart air bag” technology for future vehicles. More immediate measures included:

- **On-Off Switches for Vehicles With No Rear Seat.** NHTSA issued a Final Rule, May 23, 1995 (60 FR 27233), extending its existing policy of permitting manufacturers to install a manual on-off switch in a new vehicle without a back seat, or with a back seat that is too small to install a child safety seat. An on-off switch would enable the driver of a pickup truck, for example, to disable the air bag when a child was in the passenger seat, and turn it back on for an adult passenger.
- **Increased Public Awareness.** NHTSA increased its own air bag public awareness activities and coordinated them with information efforts already underway by the national

Air Bag Safety Campaign (May 1996). The agency also worked with State motor vehicle offices, fast-food chains, convenience stores, and other outlets to distribute copies of its air bag warning label nationally, and used its popular public service characters, the “Vince and Larry” crash test dummies, to help convey information about air bag dangers as part of their seat belt message.

- **Improved Warning Labels.** NHTSA published a Final Rule on November 27, 1996 (61 FR 60206), requiring vehicles with air bags to bear three new warning labels. Two of the labels replaced existing labels on the sun visor. The third was a temporary label on the dash. These labels were not required on vehicles having “smart” passenger air bags. The rule also required a rear-facing child seat to bear a new, enhanced warning label. The label was affixed where the child’s head rests as to be seen readily by parents or others who have child passengers in their vehicles.
- **Redesigning Through Sled Certification.** NHTSA facilitated the redesign of air bags by permitting a sled test in lieu of a barrier impact to certify to FMVSS 208 Sled Certification, March 19, 1997 (62 FR 12960). The redesign of air bags in 1998-1999 consisted of depowering and/or some of the other innovations.² At the time NHTSA predicted a power reduction of approximately 20 to 35 percent to reduce the risk of air bag fatalities in low-speed crashes, while substantially preserving the life-saving capabilities in higher-speed crashes. In actuality NHTSA observed a 13- to 16-percent reduction in peak pressure and a 24- to 30-percent reduction in rise rate.³ Sled-test-certified air bags were permitted until “smart air bag” technology was phased into new cars.
- **Aftermarket On-Off Switches.** NHTSA allowed dealers to install aftermarket on-off switches, November 21, 1997 (62 FR 62406), for the air bags of any owner who submitted a request form and received approval from NHTSA. The request form contained important information about who should consider an on-off switch installation. The new policy permitted families who needed to have children in the front seats for medical monitoring purposes, car pools with front-seated children, short-statured individuals, and others who have reasonable concerns about a potential danger to turn the air bag off. Automobile dealers were asked to help their customers make informed decisions by providing them with NHTSA guidance on the benefits and dangers of deactivating the air bag system, and required them to install labels indicating that the air bags had been disabled. NHTSA continued to permit deactivation on a case-by-case basis for vehicles where no switch was available.
- **Advanced Air Bags.** NHTSA expanded its research program to improve the testing of air bags and crash protection for children and other small-statured occupants. This program helped pave the way for the advanced air bag final rule, May 12, 2000 (65 FR 30680). This standard required that, beginning in the 2003 model year, air bags be designed to create less risk of serious air-bag-induced injuries than current air bags, particularly for small adults and young children, and provide improved frontal crash protection for all occupants.

² An imminently available solution to reduce the initial pressure (peak pressure) and velocity (rise rate) of deployments was to “depower” air bags by removing some of the gas-generating propellant or stored gas from their inflators. Other innovations already in progress included reducing the volume or rearward extent of air bags, positioning them further from occupants, reducing the mass of the air bag cover flaps, revising air bag folding techniques, and tethering, venting, and recessing steering wheels.

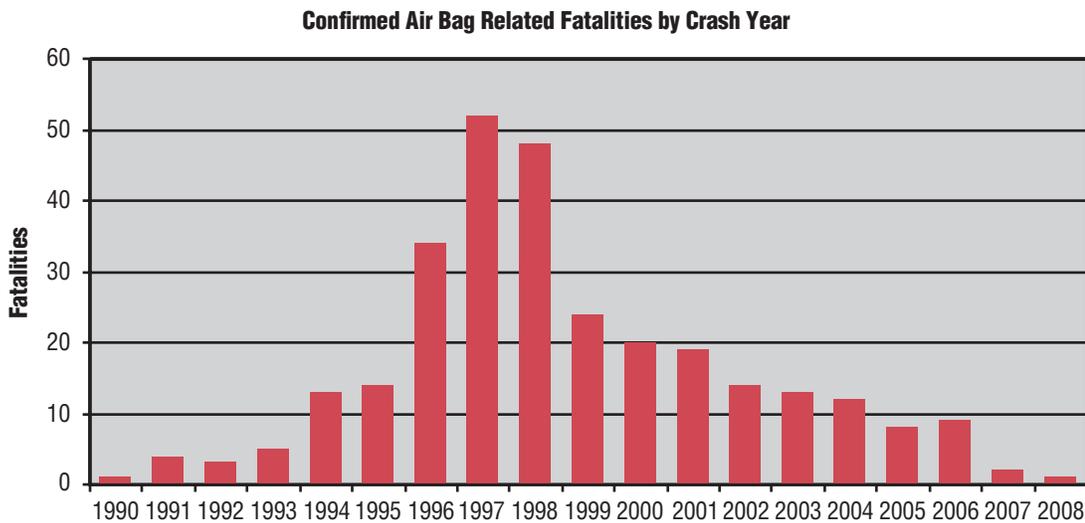
³ Hinch, J., Hollowell, W.T., Kaniyanthra, J., Evans, W.D., Klein, T., Longthorne, A., Ratchford, S., Morris, J., & Subramanian, R., Air Bag Technology in Light Passenger Vehicles. DOT HS 043 767. Washington, DC: National Highway Traffic Safety Administration.

All light vehicles had to meet new advanced-air-bag requirements as of September 1, 2007. These efforts have been very successful in mitigating the adverse effects of air bags for children and small-statured adults while maintaining the air bags' life-saving attributes.

Progress in Reducing Air-Bag-Related Fatalities

With each new model year, as technological advances were made and regulatory and behavioral changes took effect, the frontal air bag problem diminished. As of December 2008, the NHTSA SCI program has not confirmed an air-bag-induced fatality or life-threatening injury to a child or infant in a low- to moderate-severity crash of an air-bag-equipped vehicle certified to the advanced-air-bag requirements. Air-bag-induced child fatalities per 100 million registered vehicle years declined from 80 during 1996-97 to less than 0.01 in 2008-09. As described in the previous section, advanced air bags were phased in beginning with MY2003. By the end of 2008, the SCI program had not confirmed any child fatalities related to air bags in any vehicles of MY2004 or later. Furthermore, the SCI program confirmed only two driver fatalities and one adult passenger fatality in MY2004 and later vehicles.

As seen below, significant declines in air-bag-related fatality counts continue to trend downward to a near-zero level. In 2007, there were two confirmed cases, and in 2008 a single confirmed case. However, these fatalities were in pre-depowered and non-advanced-air-bag model year vehicles.



Source: SCI Counts of Frontal Air Bag Related Fatalities and Seriously Injured People, Table 1 (DOT HS 811 104, January 2009)

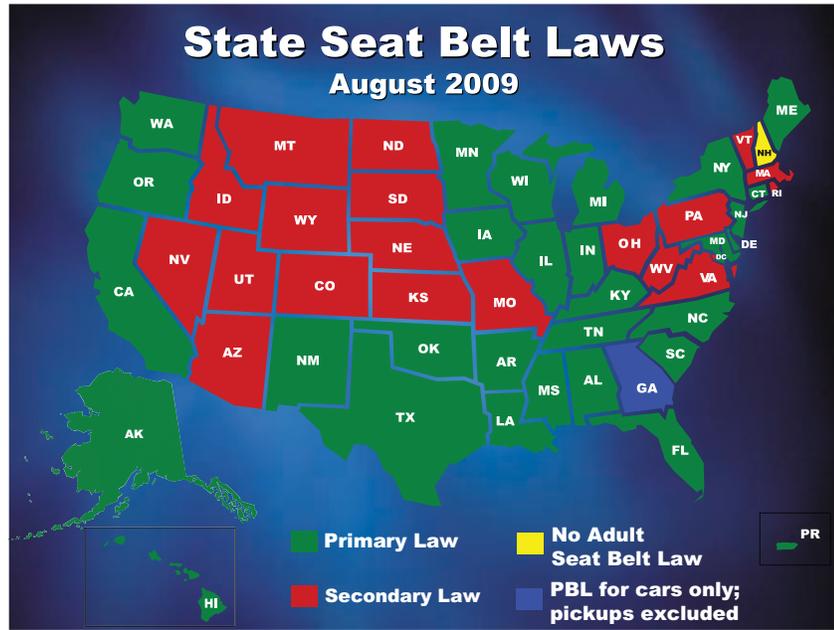
Key Factors Associated With the Reduction of Air Bag-Related Injuries

The gains achieved in reducing frontal-air-bag-related fatalities were accomplished through a broad and sustained effort coupling private and governmental resources with the volunteer energies and commitment of the public safety and public health communities. Coordinated law enforcement efforts accompanied by legislative and regulatory activities, and intensive education and public awareness programs saved many lives.

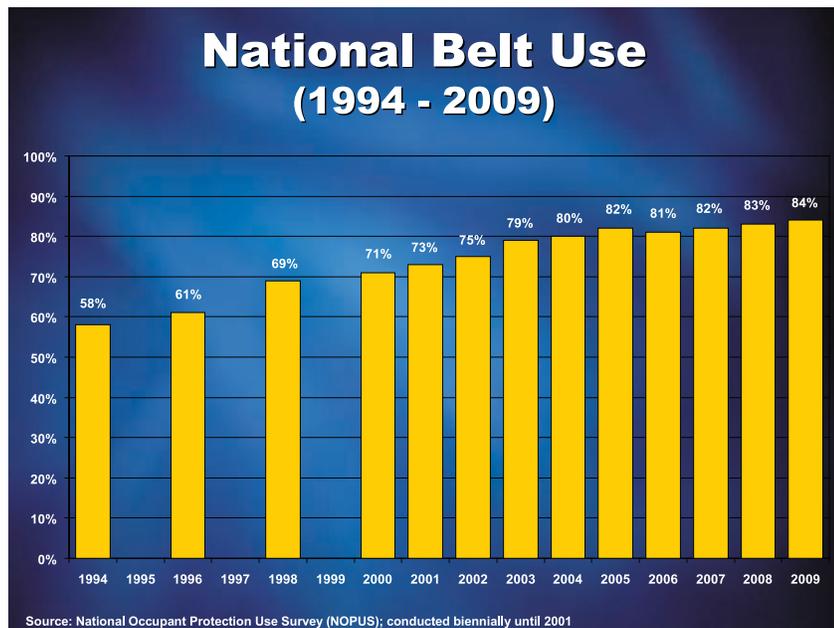
Seat belt use increased from about 60 percent in the early 1990s to 84 percent currently. Public education played a large role in this increase, both due to direct education about the benefits of belt use and due to increased support for seat belt use laws and upgrades to primary law enforcement. In 1994, 47 States, the District of Columbia, and Puerto Rico had seat belt use laws and 9 States and Puerto Rico allowed for primary enforcement. As shown

in the following figure, currently, 49 States, plus DC and Puerto Rico have seat belt use laws and 30 of these laws permit primary enforcement.⁴

Primary belt laws (PBLs) have a proven track record of increasing seat belt use. PBLs are much more effective than secondary laws, because people are more likely to buckle up and place their children in child safety seats when there is the perceived risk of receiving a citation for not doing so. NHTSA analysis has found that enactment of a PBL increases a State's belt use rate by 8 percent.



In addition, since 1994, the national seat belt use rate has risen dramatically from 68 percent to 84 percent in 2009. State PBLs have contributed significantly to this rise.



⁴ Primary enforcement allows a law enforcement officer to stop a vehicle and issue a citation when the officer simply observes an unbelted driver or passenger. Secondary enforcement means that a citation for not wearing a seat belt can only be written after the officer stops the vehicle or cites the offender for another infraction.

However, the most important behavioral factor affecting the reduction of air bag-related injuries was the coordinated private/public effort to educate parents and caregivers to properly restrain children 12 and younger in the rear seats. In 1996, 78 percent of parents surveyed by the Air Bag & Seat Belt Safety Campaign thought it was safe for children 8 and younger to ride in the front seat of vehicles equipped with frontal passenger air bags. By 2002, only 18 percent of parents thought this was a safe riding place for their children.

The 2003 NHTSA Research Note, “Moving Children From the Front Seat to the Back Seat,” also confirmed that more children were riding in the rear. NHTSA analyzed the seat positions of 363,579 child passengers in crash data from Florida, Maryland, and Utah. In 2001, only 8 percent of infants and toddlers up to age 3 still rode in front seats, down from 26 percent in 1995. The proportion of 4- to 7-year-old children in front seats had decreased to 19 percent from 33 percent. However, the proportion of 8- to 12-year-old children in front seats only declined to 35 percent from 39 percent. In other words, based simply on the reduction in exposure—even before taking the effect of redesigned air bags into account—it might be expected that fatalities from air bags would decrease. From 1995 to 2001 fatalities from air bags decreased by about two-thirds for infants and toddlers up to age 3, by half for children 4 to 7 years old, but only a little for pre-teens 8 to 12 years old.

While many organizations were involved, the success of the educational effort to move kids to the rear seats was largely due to the dedication of the Air Bag & Seat Belt Safety Campaign. This accomplishment alone has been characterized by the NTSB as “one of the most remarkably successful changes in societal behavior in recent decades, rivaling changes in attitudes toward smoking and drunk driving”⁵ for its impact on highway safety.

Air Bag Effectiveness

Based on their 11 percent effectiveness alone, NHTSA estimates that frontal air bags saved 27,022 occupants from 1987 to July 1, 2008. This estimate includes 22,126 drivers and 4,896 front-right passengers. These are significant life-saving results, especially noteworthy given that the fleet has yet to reach full penetration of driver and passenger frontal air bags. It usually takes several model years to allow for vehicle redesign cycles to phase safety technologies into the complete fleet. Even when an entire MY fleet is equipped with improved safety technology it can take decades for these newer, safer vehicles to replace the older vehicles in the on-road fleet. Driver frontal air bags, for example, will be in an estimated 82 percent of the on-road fleet in 2009 (75 percent for passenger frontal air bags). By 2020, roughly only 92 percent of the on-road fleet is expected to have driver frontal air bags (90 percent for passenger frontal air bags). Full on-road fleet penetration will yield even more life-saving results.

Plans for Monitoring Air Bag Safety and Future Corrective Actions

The first-generation frontal air bag experience brought the entire highway safety community together for the greater good. Recognizing the need to limit any unintended negative consequences for a very effective life-saving device, a collaborative Call to Action, coupled with technological advances and regulatory changes, led to the necessary corrective actions in reducing adverse effects of frontal air bags.

Getting children to ride in the back seats of cars has demonstrated “one of the most remarkably successful changes in societal behavior in recent decades, rivaling changes in attitudes toward smoking and drunk driving.”

Acting Chairman Mark Rosenker, National Transportation Safety Board, *Keeping Children in Back Seat Cuts Road Deaths, Study Says*, New York Times, Aug. 17, 2005

⁵ Wald, Matthew L. “Keeping Children in Back Seat Cuts Road Deaths, Study Says.” The New York Times. Aug. 17, 2005. <http://www.nytimes.com/2005/08/17/health/17cnd-baby.html>.

Air-bag-related fatalities have declined to almost zero. Any instances seen are with pre-depowered and non-advanced air bag model year vehicles, but behavioral changes have greatly reduced the child fatality risk. In 2007, there were two confirmed cases and in 2008 a single case was confirmed. All three cases were pre-certified, advanced compliant vehicles. With the downward trend continuing, NHTSA will no longer provide routine periodic reports on air bag fatality counts. However the agency's SCI program will continue to monitor the performance of occupant protection systems, especially air bags, to provide early detection of any other potential safety issues.

For future corrective actions, the agency plans to use the frontal air bag experience and the beneficial lessons learned as a model to tackle other safety problems and further save lives and reduce injuries on our Nation's roadways. Associated resources are being redirected toward other lifesaving discoveries, learning opportunities, and highway safety priorities.

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