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## Kids and cars: The hidden dangers

According to recent traffic statistics, motor-vehicle crashes are the most common cause of death for children between the ages of four and 14. In the year 2000, an average of six children were killed and 797 children were injured every day in automobile accidents. The sad fact is that many of these children died or were injured because of hidden hazards in automobiles and child restraints. While parents usually are unaware of the potential risk of harm to their children, the auto and child seat manufacturers are often well aware of the dangers but fail to change product designs to protect children. Seat belts, booster seats and car seats, and power windows all present risks of severe injury or death to children because of design flaws that can easily be remedied by manufacturers.

### The forgotten child: Neglect of four to eight-year-old children

According to Ford Motor Company's former CEO, Jacque Nasser, over 20 million children fall into the category he called "forgotten children," children ages four to eight years of age. (See press release: "Ford Motor Company Announces 'Boost America!' Campaign to Protect 'The Forgotten Child,'" 4/19/00.) These children have outgrown their child seats but are still too small for adult belts. According to Ford, children within this age group have been totally ignored, creating a dangerous "safety gap." (*Ibid.*, See also Ford's pamphlet "Car Safety Tips to Grow On," 2000.) The problem actually extends to at least 12 year-olds (or those equivalent in size to a fifth percentile female, who is approximately five-feet tall and 100 lbs). Bidez, Martha and Syson, Steve, *Kinematics, Injury Mechanisms and Decision Considerations for Older Children in Adult Torso Belts*, S.A.E., 2001, (01-0173), reaches a conclusion similar to Ford regarding children in adult belts.

The tragedy is that Ford and other automobile manufacturers have known about this "safety gap" since the late 1960s and certainly by 1973, when lap/

shoulder belts were becoming commonplace in American cars. In 1967, Richard Snyder, a well-known Ford biomechanical engineer, documented that shoulder belts presented dangers to small occupants from loads on the neck. (Ford Motor Company intra-office memo from R.G. Synder to John Verdace, 9/19/67, subject: Protection Offered By Shoulder Belt (3-Point System).)

Just six years later, in response to an inquiry from the National Highway Traffic and Safety Administration (NHTSA), Ford admitted that it was aware that shoulder belts do not fit children and in fact were extremely uncomfortable for them because the shoulder belt rested on their necks. (Letter of J.C. Eckhold of Ford Motor Company to NHTSA Associate Administrator Robert L. Carter 10/17/73, (Reference N41-41).) It is interesting that Ford sidestepped the actual inquiry of NHTSA, which was at what age (or size) could Ford's lap and shoulder belts safely accommodate children. Ford never answered this question.

In another response to a NHTSA inquiry, this time in 1980, Ford unequivocally stated that a belt on the neck was completely unacceptable and was a safety risk to smaller occupants. (Letter of Roger Maugh of Ford Motor Company to NHTSA Administrator Joan B. Claybrook, 4/1/80, (Docket 74-14, Notice 17).) Additional Ford documents revealed that up to 80 percent of children in the forgotten child age group, when wearing their belts correctly, had the shoulder belt on their necks. (See Ford Motor Company document entitled "Restraints Engineering Department Evaluation Report," 1987.) Finally, Ford stated to NHTSA in July 1987 that three-point lap and shoulder belts were unacceptable for children in this age group. (Letter of R.H. Munson of Ford Motor Company to NHTSA Administrator Diane K. Steed, 7/31/87, (Docket 87-08, Notice 1).)

Unfortunately, as late as 2001, Ford was aware that parents in America still had no idea that this "safety gap" existed.

"Although they want to do the right thing, parents and caregivers are misinformed about the right types of safety devices to use at different ages, and are not using the correct device for children four to eight. Up to 79 percent of parents and caregivers are not using the correct device for children between the ages of four to eight." (Ford Motor Company Comments re: Docket Number NHTSA-01-9785, National Booster Seat Strategy, submitted by Sarah Kinkish of Ford Motor Company, 7/10/01.)

Despite its awareness of the ignorance of parents on this issue, Ford waited until April 2000 before telling the public about this safety gap. At that time, Ford, with other organizations, started the "Boost America Campaign" acknowledging publicly for the first time that there was a safety gap for the forgotten child. (See Ford's press release of 4/19/00, *supra.*) However, instead of fixing the problem, Ford decided to put the responsibility on parents to close this safety gap.

Ford offered to hand out 1 million booster seats for children in this age group. (*Ibid.* See also statement of James Vondale, Director Automotive Safety Office, Ford Motor Company to Congress, 2001, re: Boost America Campaign.) Unfortunately this effort had several major flaws. It was never advertised on TV or radio. Ford did put pamphlets in some doctors' offices and schools, but the American public was by and large unaware of this program. (See trial testimony of Paul Butler, Ford Motor Company engineer, in *Henderson v. Ford Motor Company*, United States District Court, E.D. of Texas, (Case No. 2:03CV167) on 4/22/04, page 215 of transcript.) In fact, despite promising a multi-year effort to educate the American public and to give away 1 million child seats, Ford actually gave away only 500,000 child seats (it is estimated that 20 million children are between four to eight years of age); and dropped the effort after a little more than

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a year. (See trial testimony of Dr. Bidez, biomechanical engineer, in *Henderson v. Ford*, *supra*, page 165 of transcript.)

### The hidden hazards of child seats and booster seats

Child safety seats and booster seats are completely dependent upon vehicle design. (Ford Motor Company, Safety Brochure, dated 7/28/93, page 14. See also Paul Butler, Ford Motor Company engineer, e-mail dated 8/31/01.) Many are poorly designed, and when placed in a vehicle seat that is also poorly designed, the risks to children multiply.

For example, backless booster seats provide no head and neck protection and are dependent on the vehicle seat back to restrain a child's head from rotating rearward upon impact. But many vehicle rear seats, particularly in some SUVs, have low seat backs without headrests. The combination of a booster seat, which raises the child up, and a low seat back without a head restraint, can be extremely hazardous to a young child, whose head and neck can be snapped rearward over the top of the seat, potentially causing a life-threatening spinal cord injury.

Isaiah Rapan, age three, was seated in a Cosco shield booster seat, in the rear seat of a Jeep Cherokee, when the Jeep was struck in the side and spun around. The centrifugal forces caused his head and neck to wrap over the top of the rear seat, which was only 18 inches high, causing a C1 distraction injury that left Isaiah a ventilator-dependent quadriplegic. All of the experts, including those for the defendants, agreed that Isaiah had suffered no injuries from the side impact. But the plaintiff's experts opined that a headrest or higher seat back would have allowed Isaiah to walk away from the collision without injury, like his father and older brother.

Furthermore, there has been a significant pattern of misuse of safety and booster seats because parents and caregivers do not know how to properly install them. (See *Patterns of Misuse of Child Safety Seats*, NHTSA Final Report, (DOT HS 808 440), January 1996. See also *Child Restraint Systems*, Ford Report, World Wide Regulatory Ping, 10/31/95; and Butler e-mail of 8/30/01, *supra*. Also

note articles such as "Misuse of Booster Seats," Morris, S., et al., *Injury Prevention* 2000, 16:281-284; and "Not All Child Safety Seats Are Created Equal: The Potential Dangers of Shield Booster Seats," Edgerton, E, et al, *Pediatrics*, Vol. 113, No. 3, March 2004, pages 113 ff.)

Shield booster seats, for instance, which do not have any internal harness or upper torso restraint, have been found to have a higher incidence of misuse than other types of child restraints, and are particularly dangerous for children under 30 lbs. According to one recent study, children in shield booster seats were eight times more likely to be seriously injured compared to children in full size forward facing child restraints. (See "Not All Child Safety Seats Are Created Equal: The Potential Dangers of Shield Booster Seats," *supra*.)

Child safety seats and booster seats have been the target of an unacceptably high recall rate according to NHTSA. (See National Highway Traffic Safety Administration's Child Safety Recall Campaign listing, January 1990 through January 26, 2004. See also letter of Ricardo Martinez, Administrator of NHTSA, to heads of child booster seat manufacturers, dated 9/14/99, noting "the woeful status of the design of child safety seats and booster seats in the United States.")

### Inadequate government standards

Consumers trust the government to create and enforce strict safety regulations when it comes to protecting children in cars. But the reality is that the federal motor vehicle safety standards also have huge gaps when it comes to kids. For example, ever since the public learned that air bags can kill children riding in front seats, parents have been urged to place their children in the back seats. But the government has never adopted any dynamic seat belt standards for seat belts in back seats. Automobile manufacturers have campaigned vigorously against any seat belt or head restraint standards in the rear seating area.

Children in rear seats are also exposed to injury from collapse of the front seats in a rear impact. Federal Motor Vehicle Safety Standard 207, which has been unchanged for more than 30

years, imposes a minimal static strength test that even a lawn chair can pass. When vehicles are rear ended, and the driver or front seat passenger's seat back collapses rearward, the head of the adult occupant of the front seat may crush the head of a child seated in the rear seat.

For example, Jocelyn Aboytes, age two-and-one half, was in a car seat directly behind her father, when her family's minivan was rear-ended at 20 mph. Her father's seat back collapsed, causing his head to crush her skull, leaving her with severe brain damage, paralysis and blindness in one eye.

Similar cases, particularly involving Chrysler minivans, whose seat back collapses in rear impacts have caused serious injury or death to children in the rear seat, have occurred all over the country. Automobile manufacturers insist that seat back collapse helps the occupant of the seat "manage the energy" of the collision, but disregard the threat to people, and particularly children, who are seated behind the collapsing seat. Recent verdicts against auto manufacturers attest to the fact that jurors are willing to reject the "compliance with government standards" defense in cases where children are the innocent victims of products that do nothing more than pass the minimal test.

Child safety seat standards are also severely lacking in many respects. As with all federal motor vehicle safety standards, those that do exist are just minimum standards. For example, the only federal safety standard for child seats, FMVSS 213, is a frontal test that measures and limits forward excursion in a frontal impact. There are no requirements for safe performance of a child seat in a rear impact, side impact or rollover. (For a further discussion of the inadequacy of the federal child seat standards, see Dr. Martha Bidez's 10/5/03 submission to NHTSA, comments on Docket NHTSA-03-15817, Federal Motor Vehicle Safety Standards, Occupant Crash Protection.) When child safety seats and booster seats are actually tested under crash conditions, they perform very poorly, allowing the dummies to be ejected from the child seats or seriously hurt by the child seats themselves. (By way of example, see Ford

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sled tests number 30080 of Fisher-Price 9101 and Century 2000 child seats, with and without tethers.)

There are safety strategies that could have closed this safety gap. First, vehicle manufacturers could have offered integrated child and booster seats. It was admitted by Ford that integrated child seats (child and booster seats that are actually built-in to the vehicles) are the safest form of restraint for children available. They perform very well in frontal crashes and are superior to other forms of protection in side impacts. (See Child Restraint Systems, Ford Report, World Wide Regulatory Ping, 10/31/95, *supra*. See also trial testimony of Paul Butler, Ford Motor Company engineer, *Henderson v. Ford, supra*, page 217 of transcript.) In fact, Ford did make integrated child safety seats and booster seats available as an option between 1995 through 1998 in a series of its vehicles.

Unfortunately in 1998, the same year that the National Transportation Safety Board (NTSB) recommended that integrated seats be made standard in all vehicles (National Transportation Safety Board, Report #11-96-31, (1996)) Ford quit offering them even as an option. (See trial testimony of Paul Butler, Ford Motor Company engineer, *Henderson v. Ford, supra*, page 215 of transcript.) Interestingly, Ford continues to this day to offer integrated child and booster seats on their Galaxy minivan and Mondeo in Europe. Furthermore, North American Daimler-Chrysler and General Motors still offered integrated child and booster seats as an option at least as of model year 2004. Ford was the only domestic manufacturer to not offer integrated child seats at least as an option in this latest model year.

Another option that was readily available to the manufacturers would have been to produce their own child and booster seats, designed specifically for their own vehicles, so that the seats would work properly with a particular vehicle's restraint system and seat. In fact, both Ford and General Motors did at one time design and fine tune child seats for their own vehicles. Ford designed its "tot guard" and offered them for a number of years in the late 60s and 70s. (See Ford

Press Release, Wednesday, 10/4/67; and Ford Child Restraint – Discussion Paper, Agenda Item #6, 10/5/90.)

As recently as 1990, Ford considered entering into a joint-program with Fisher Price to design and develop child seats and booster seats for its vehicles. General Motors for many years designed and sold its own well-known LUV child seats. (See trial testimony of Steve Syson, former General Motors engineer, *Henderson v. Ford, supra*, 4/20/04, page 167 of the transcript. Both companies got out of the child seat business as competition grew in this market from the aftermarket car child seat manufacturers. See Ford Meeting Minutes of the Child Restraint Task Force Meeting #3, 1/23/91. See also deposition of Paul Butler, *Henderson v. Ford, supra*, 2/4/04, page 59.)

Another option for closing the safety gap would have been to recommend a specific aftermarket child safety or booster seat for a specific vehicle. In Europe, once again, the automobile manufacturers, including Ford, are required to recommend specific child safety and booster seats for their vehicles. Ford considered very seriously following the same procedure here in the United States, but never did so. (See Ford Meeting Minutes of the Child Restraint Task Force Meeting #3, 1/23/91; and Ford Meeting Minutes of the Child Restraint Task Force Meeting #6, 3/7/91.) Child safety is approached differently in Europe, as automobile manufacturers must recommend specific child seats that work effectively in their vehicles and list them in their Owners Guides. In the United States, child seats are only certified on a standard non-specific test buck, and therefore it is unknown whether any specific child safety or booster seat is safe in a particular vehicle.

### Power window hazards

Another hidden danger that claims unnecessary lives of kids in automobiles is the power window feature. Power windows are a largely unknown menace to children, although they have killed dozens and injured thousands since toggle-type power window switches were added to car doors. A downward push on

these switches activates the "up" as well as "down" direction of the window – a most dangerous condition. Most parents are unaware of the danger these convenient devices present to children left alone, even for short periods, in automobiles. The organization Kids 'N Cars asserts that this ignorance cuts across all economic levels in our society.

Very few parents appreciate that most power windows are strong enough to lift a small child's body. By exerting only a two-pound force (average) on the power window toggle switch, the window is activated to exert an upward force of between 50 and 80 pounds. Since only eight to 12 pounds are required to lift the actual window, the excess available force (40 to 70 pounds) is more than enough to trap and choke a child between the glass and upper window frame.

Even an inadvertent touch on the "up" side of the toggle switch can zip a window to the tightly closed position in two to four seconds. This is often faster than a child can move out of harm's way, resulting in entrapment of the child's head, neck or other body part. An unrecalled power window toggle switch is a dangerous and defective device, because it allows the release of so much deadly energy through minimal accidental contact by a child's elbow, knee or foot.

### Shocking track record

The automotive industry has for decades been aware of the dangers of power windows. Power windows have been instruments of death and/or serious physical injury to children (and others) since their introduction into the U.S. Market (without safety controls) in the late 1950s and early 1960s. A highly publicized example, literally in the U.S. auto industry's backyard, occurred in the mid 1960s when the three-year-old son of Detroit's Mayor Cavanaugh was nearly strangled by the power tailgate window on a station wagon.

During ensuing years, many other tragedies have occurred due to power windows. In 1963, a power window killed a three-year-old Wilmington, Delaware girl, Kathleen Nockett. In 1968 a two-

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year-old boy in West Los Angeles died from entrapment in a power window.

Recognizing the dangers, Ralph Nader sent a May 6, 1968, letter to the Department of Transportation (DOT) urging DOT to order a recall and modification of power windows – or at least to issue a public warning of the dangers. His suggestions were rejected, but warnings were issued to the public by the U.S. government later that year. The government advisories explained the dangers of power windows to children, and recommended that power windows be wired so that they could not operate without the car's ignition switch being on.

Despite this warning, the automotive industry continued to produce power windows that were a hazard to children. In 1969, an eight-year-old Dunsmore, California, boy was killed by a power window; and two-year-old Kelly Chermock died after being comatose for six months from entrapment in a power window. In 1970, six-year-old Rosemary Walton of Philadelphia, was strangled by a power window.

The tragic list has gone on, year after year, to the present day. In 1994, children died from power windows in La Crosse, Wisconsin, and Anchorage, Alaska. In 1996 a Springfield, New Jersey, child was killed. In 1998, power windows killed children in Iowa, Arizona and Florida. In 2001 and 2002, two children died in Kansas from power window entrapment. In Oklahoma, a 15-year-old boy died from power window strangulation, and a three-year-old child suffered severe brain damage from entrapment in the power window of her mother's car. According to Janette Fennell, President of Kids 'N Cars, at least 59 children have died in a power window accident since 1962.

### Change is slow

In response to the known dangers of power windows, the Federal Highway Administration in 1969 proposed a Federal Motor Vehicle Safety Standard (34FR13608) to provide some minimum safety standards on passenger car power windows. The proposal cited a number of deaths and injuries to children; urged a

goal of minimizing the likelihood of such tragedies; and suggested that operation of power windows should be possible only with the ignition on. That same year the FHA proposed the requirement of reversing power windows by the 1972 model year.

By 1986, some European governments began to require automakers, including U.S.-made vehicles for sale in Europe, to incorporate anti-trapping/anti-pinching power windows. In 1987, NHTSA proposed that an automatic reverse function be incorporated in certain power window systems, but comment from much of the auto industry was resistant to this proposed requirement. NHTSA eventually only required automatic reverse on vehicles equipped with remote or keyless window actuation devices.

Child strangulation and other pinching/entrapment injuries by automotive power windows have been recognized over the years in various technical papers and by NHTSA. Patent information addressing the safety of power windows also has been available for decades to the auto industry. 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 to a child's head and neck presented by a power window.

From 1980 to 1987, at least nine additional patents were issued addressing power window safety and window-reversing mechanisms. The automobile manufacturers' engineers and patent office personnel should have been aware of these devices, and of the great need for improved power window safety which gave rise to them.

Despite this longstanding knowledge of the dangers, and despite a number of technically feasible alternative designs, most manufacturers have failed to take action, and have designed and manufactured power window mechanisms to merely meet minimum requirements of FMVSS 118. It is clear that such design decisions do not address the defects in the inherently dangerous design of power windows.

On April 12, 2006, NHTSA issued a decision, in response to Congressional approval of the Safe, Accountable, Flexible and Efficient Transportation Equity Act in 2005, which basically outlaws rocker and toggle switches. The new regulation will become effective in October 2008.

### Better designs work

Numerous technically feasible alternative designs were, and are, available that could have prevented many tragedies. Automatic power window reversing mechanisms exist in several forms, including optical sensors that detect an object in the window path; voltage load buildup sensors that reverse on contact with an obstruction; or infrared sensors that reverse the window without contact. Some 1980s Japanese vehicles were equipped with windows that stopped (but did not reverse) when they met with resistance.

The simplest and least expensive alternative design available is a horizontal "pull-up/push-down" power window switch. This intuitively simple switch requires the user to deliberately pull upward on the switch to raise the window, reducing the possibility of inadvertently raising the window by accidental contact. The cost of such a switch would be virtually the same as the cost of the dangerous toggle type switch still used by some manufacturers.

The pull-up/push-down power window switches are obviously feasible, as demonstrated by their use on many vehicles over the years. These include the Eagle Talon, Eagle Summit, Toyota, Mazda, Lexus, Honda, Isuzu, Saab, Suzuki, Mitsubishi Eclipse, Acura, Chrysler Sebring, GM, Dodge Avenger, Hyundai, KIA, Infiniti and Volvo.

### Conclusion

Manufacturers have been slow to change the design of their vehicles and car seats to eliminate hidden hazards to kids in cars. As a result, children across the country will continue to be exposed to these dangers. Educating parents about these hazards is not enough. Product liability cases are essential to expose the hazards and to force manufacturers to put the safety of children ahead of profits.

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