



FOCUS - 5 of 5 DOCUMENTS

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REAR- END CRASHES. THE U.S. HAS KNOWN FOR YEARS ITS MINIMUM STANDARD IS INADEQUATE.

**BYLINE:** RICARDO ALONSO-ZALDIVAR and RICHARD SIMON, TIMES STAFF WRITERS

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**BODY:**

Every day, parents across America buckle their kids into the back seats of family vehicles, heeding warnings that air bags can kill or injure children in the front seat.

But the back seat is not as safe as parents believe.

A little-known hazard is documented in government files, industry crash tests and lawsuits: Children in the back risk severe injury and even death from front seats that may suddenly snap backward in rear-end collisions.

Most vehicles on U.S. roads are designed with front seats that may not support the weight of adults in these kinds of crashes. Auto safety tests have found that seat backs sometimes break when a car is rear-ended by a vehicle traveling as slowly as 16 miles per hour.

"We lost our daughter, not ever knowing that the back seat was deadly," said Kevin Gleason of Florence, Ky. Five-year-old Sarah was strapped into the back seat of the family's four-door Buick Century when it was rear-ended in 1996 by a pickup traveling an estimated 24 mph. Sarah's heart ruptured after the front passenger seat carrying Kevin Gleason collapsed backward.

At least five other children have died in the 1990s in accidents involving collapsing seats, The Times found. Another death--of a 7-week-old infant--was reported to the government in 1990. While federal authorities issued air bag warnings in 1995 after the deaths of eight children, it has not notified consumers about the seat back hazard.

Last year, the federal agency in charge of auto safety, the National Highway Traffic Safety Administration, received 390 complaints from consumers about seat failure, including 112 injuries and one death in 80 accidents. Most

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of the reported injuries were to drivers and adult passengers, who also are at risk when front seats fail. The bulk of the complaints involved seats that collapsed in normal conditions, such as when a driver reaches for pocket change at a tollbooth.

NHTSA has been studying the problem for more than a decade but only recently has begun taking steps to address it. Similarly, car makers have known of the hazard for 30 years but have never reached a consensus on what to do.

Major U.S. and foreign car companies contacted by The Times said their seats are safe.

Yet there is virtually no way for consumers to learn the strength of seats in different vehicles. That's because the auto companies, citing proprietary concerns, decline to release seat-strength specifications. The government does not require public disclosure.

Now parents find themselves in the position of having to weigh safety concerns in the front seat against those in the back.

"As a parent, you're really between a rock and hard place," said Alan Cantor, a Philadelphia-area safety consultant who runs tests for crash victims.

Safety experts such as Cantor say the risk of injury from collapsing seats can be reduced by putting children behind an unoccupied front seat when possible. Without the weight of an occupant, a seat is far less likely to fail in a rear-end crash.

On the whole, the back seat is still the safest place because most fatal crashes are head-on. The rear middle seat offers the most protection for children, particularly with a shoulder belt that fits properly.

Motor vehicle accidents are the leading killer of children age 1 and older, according to the federal Centers for Disease Control and Prevention. While auto travel is safer today, fatality rates for children have not declined as much as for others. Last year, 1,842 fewer drivers and passengers age 15 and older died in auto crashes than in 1990, while 56 more children were killed.

NHTSA conceded last December that its 32-year-old requirement for seat strength, Federal Motor Vehicle Safety Standard 207, is "inadequate" to prevent seat back collapse.

Robert Shelton, the agency's head of safety standards, acknowledged in a recent interview that children have been killed or seriously injured by collapsing seats. "I know it happens. . . . I'm not debating that there is a serious need to look at Standard 207."

Several safety experts said the seat standard needs to be raised by at least 10 times the current level. Shelton said his agency plans to propose a new seat standard in coming months. It usually takes several years to incorporate such safety requirements in new cars.

Federal statistics show that 82 children in back seats died in rear-end crashes during 1997, and an estimated 30,000 were injured. The number of children killed and injured by collapsing seats is not available because NHTSA doesn't track such fatalities in the same way it investigates deaths involving air bags.

But a review of industry documents, government records and litigation papers reveals that the human toll from seat back failure is significant: Injuries to children range from skull fractures and broken legs to facial wounds and chest trauma.

Moreover, American car companies have been sued hundreds of times by families of victims who were killed or injured in accidents involving collapsing seat backs.

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Seat strength varies widely, according to limited testing by the government and independent experts. For example, seat backs in a 1995 Ford Windstar were significantly stronger than those in a 1996 Ford Explorer, and seats in a 1995 Nissan Maxima were much sturdier than those in a 1995 Honda Passport.

Whether a car is a two-door or four-door model makes little difference in whether seats are prone to failure, safety experts say. The strongest seats on the market typically are those that feature shoulder belts attached to the seat rather than the car frame.

Seat strength has been hotly--though privately--debated within the auto industry for years.

Some companies have argued that seats should be designed to "yield"--that is, collapse--in a controlled manner to prevent front-seat occupants from getting whiplash. Despite the evidence, they maintain that children in the back seat are rarely hurt.

"It's a matter of trade-offs," said Priya Prasad, manager of safety research and development for Ford Motor Co. "Maybe you can save the child, but the adult who is driving will end up with very severe injuries. It's a very difficult problem."

Yet European auto makers such as Mercedes-Benz and Volvo traditionally have provided stronger seat backs. The companies declined to disclose seat specifications.

"It's not rocket science," said Mercedes spokesman Fred Heiler. "You build seats strong enough to protect everybody in the car."

The world's largest auto maker, General Motors Corp., began to phase in stronger seats in 1997, after contending for decades they were unnecessary. Today the stronger seats are standard equipment in 26 models, a spokesman said. The company lists 55 models on its Web site. GM says it plans to upgrade the rest of its fleet within the next three years. Two other American vehicles that feature sturdier seats are made by DaimlerChrysler AG.

Seats can fail in several ways: Bolts that hold seat backs break, hardware that fastens seats to the floor peels apart or pops out, recliner teeth shear off or seat frames buckle. Strengthening seats can cost as little as \$ 5 per vehicle, according to a GM document from the early 1990s.

The federal government requires under Standard 207 that the upper part of the seat back resist a load of about 200 pounds, but the average man can generate forces up to five times higher in a rear-end crash of 30 mph. NHTSA's own crash tests for fuel tanks show that front seats routinely collapse in 30-mph rear-end collisions.

Standard 207 is so deficient that it can be exceeded by aluminum beach chairs, said Mike Markushewski, a Pennsylvania engineer who has tested more than 70 car seats for victims in lawsuits. "We've also demonstrated that seats built out of cardboard can pass."

Crash data and industry documents show that seat back failure is a serious problem and has caused severe injury to numerous adult and child passengers:

\* One GM engineer in the mid-1990s estimated that as many as 400 lives could be saved and 11,000 serious injuries prevented each year among drivers and front-seat passengers if all cars had stronger seats. During a five-year period in the late 1980s, GM was named in almost 550 lawsuits and received nearly 5,600 owner complaints citing seat backs. In 1991, GM spent \$ 20 million defending seat-collapse lawsuits.

\* Ford disclosed in 1996 in a Michigan lawsuit that it had been sued 91 times by victims alleging seat failures in Tempo and Topaz sedans. "Even more startling," wrote Kent County Circuit Court Judge Dennis Kolenda, "Ford has defended hundreds of lawsuits involving the same seat in other models."

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\* The Times examined a dozen rear-end crashes in which six children were killed and eight others seriously injured. A pattern emerged: Children riding behind seats that collapsed were severely hurt, while passengers behind front seats that remained upright emerged with lesser or no injuries.

\* A study for The Times, conducted by Santa Barbara auto safety researcher Keith Friedman, projected that 1,800 back seat passengers, including 400 children, suffered serious to fatal injuries from 1988 to 1997. Analyzing a government database of tow-away crashes, Friedman found a sampling of 72 rear-end accidents in which front seats failed with passengers in the back seat. He concluded that passengers were 25 times more likely to be seriously injured if they were behind a seat that failed. Government researchers said there are not enough cases in the database to make a reliable estimate.

\* DaimlerChrysler last month recalled 227,283 Dodge Shadow and Plymouth Sundance coupes sold between 1991 and 1994 because broken bolts could cause front seats to suddenly fail. DaimlerChrysler agreed to replace a bolt in each car at the base of the seat back. Saturn recalled 136,300 1994 and 1995 models in March because of a defect in the cars' recliner mechanism that could cause seat backs to collapse.

These recalls did not address the central question of whether the federal seat strength standard is adequate.

Most domestic and foreign vehicles have seats two to three times stronger than the federal standard, according to safety experts and tests performed by NHTSA.

Several safety experts said that Standard 207 should be strengthened by at least 10 times, to require that a seat can resist a force of 2,000 pounds or more. Some models already reach that level, among them the Buick Park Avenue and the Chrysler Sebring convertible, according to independent experts.

Some in the industry continue to insist that yielding seats provide better protection. Behind the scenes, however, auto companies have been making changes.

GM's basic new "high-retention" seat is nearly five times stronger than the federal standard. It is available in 19 models, including the Pontiac Grand Prix and Chevrolet Impala, a spokesman said. The company has installed even sturdier seats in seven other models, including the Cadillac DeVille and Buick Le Sabre, the company said. These are easy for consumers to identify because the shoulder belts are attached to the seats.

GM says it deserves credit for voluntarily acting in the absence of an upgraded federal requirement. GM Safety Director Robert C. Lange said: "There are no forgotten children at General Motors."

But a look at the history of Standard 207 shows how GM and the auto industry averted tougher requirements, even as their own research documented the hazards of seat back failure.

Meanwhile, the government has studied the seat issue for 10 years without alerting consumers.

The following chronology is based on industry records and reports disclosed in litigation, as well as interviews with plaintiffs' lawyers, government officials, safety experts and auto executives:

When the federal seat standard was first proposed in President Lyndon B. Johnson's administration, U.S. auto makers objected, calling it "a radical change." When the standard was adopted in 1967, its language was softened. The objective was no longer to "prevent" seat failure but to "minimize the possibility of failure."

Even before the regulation took effect, auto industry engineers conducting crash tests on new models noticed that something was amiss. When a car was struck forcefully from behind, the front seat backs gave way, propelling crash dummies into the rear.

At first, the engineers focused on drivers and front seat passengers. But in a 1968 study of 40-mph rear-end crashes

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conducted by GM, engineers noted that the collapsing seats also could harm people in the back seats.

"Had there been a rear passenger, he most certainly would have incurred leg and possible lower abdomen injuries from the front seat back," GM engineers reported, adding this failure was a "problem area we must correct." Tests by Ford showed similar findings.

By 1974, NHTSA proposed to upgrade Standard 207 by requiring seats to pass the same 30-mph crash tests as fuel tanks. "The purpose of this standard is to reduce the number of deaths and the severity of injuries that result from the failure of seats," NHTSA stated.

Again the industry fought back, warning that the proposal "could actually increase injury to occupants" because of whiplash. The industry argued that a "yielding" seat helps keep the torso in line with the head and neck during a rear-end collision.

NHTSA backed off and withdrew the upgrade on April 26, 1979. Joan Claybrook, NHTSA's administrator at the time, said that she decided to concentrate on higher priorities, such as encouraging air bags and side-impact protection.

A decade later, in 1989, NHTSA reconsidered Standard 207, this time at the request of Kenneth J. Saczalski, a Newport Beach engineer and a persistent critic of the seat regulation.

As part of NHTSA's review, Canada's transportation agency submitted a detailed study of 23 seat-failure crashes. In one case, a 7-week-old baby was killed while strapped in a rear child seat. But the auto makers continued to hold the line.

Eight manufacturers filed formal responses objecting to NHTSA's imposing a strengthened seat standard. Only Mercedes-Benz recommended an upgrade of Standard 207 to require that seats withstand a 30-mph rear impact.

NHTSA officials decided to keep studying the issue. "They put their heads in the sand," Saczalski said.

Meanwhile, faced with a stream of complaints, lawsuits and settlements, GM launched an internal investigation. The auto maker found that it was having difficulty defending seats before juries and had no test data to support its own claims that yielding seats reduced neck injuries.

"We are unable to effectively demonstrate that we exercised 'reasonable care' as a caring corporation to design seats which will reduce the risk of injury or injury enhancement to our customers in rear collisions," GM lawyer Gary Toth wrote in a 1992 memo.

A year later, a study from Sweden challenged the industry's whiplash claims. Scientists at Chalmers University of Technology, one of Europe's leading technical schools, found that seats could be made substantially stronger while reducing whiplash with better head rests and changes in seat padding.

GM's principal research scientist, David Viano, was coming to similar conclusions. In a confidential 1994 research paper, he called for new design specifications. Viano estimated that the improvements, if applied to all U.S. vehicles, could save as many as 400 lives a year and prevent 11,000 serious injuries among front-seat occupants alone.

Acting on Viano's advice, GM approved a new design that called for seat backs nearly five times as strong as the federal standard, limits on how far a seat back could drop and changes in headrest position to protect against whiplash. At the time, the company estimated the cost of phasing in stronger seats at \$ 3.50 to \$ 4.75 per vehicle. The company in 1997 began phasing in the upgrade.

Another safety problem was occupying NHTSA's attention in the mid-1990s.

After confirming that air bags had killed at least eight children, the agency warned parents to buckle kids in the

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back seat. As concerns grew, in 1996 NHTSA ordered a strong warning affixed to the windshield visors of all new cars.

The results have been dramatic: While a total of 86 children have been killed by air bags since 1993, the number of fatalities has dropped from 26 in 1997, to 15 in 1998, to seven through October of this year.

But the growing acceptance of the back seat as a safe zone for kids only increased the shock for parents who blamed their children's death on seat failures. During a three-month period in 1996, four children were killed in accidents involving collapsing front seats.

Rheid Bucich died of massive head injuries suffered in a crash in suburban Seattle as his parents were returning home after buying presents for his third birthday. The family sued GM, and the company recently settled for an undisclosed amount.

Phaedra Ritting and Phillip Winborn, 7-year-old cousins, burned to death in a gas tank fire in Tomball, Texas, near Houston. The children were behind a seat that collapsed in a 1992 Chevrolet Blazer S-10. GM later agreed to pay the families an estimated \$ 8.9 million, according to court documents.

The fourth casualty was Sarah Gleason. Her parents sued GM, which paid the family an undisclosed amount.

In each case, GM acknowledged no liability. The company declined to comment.

In 1997, NHTSA itself noted the correlation between the agency's air bag warnings and the danger to kids from seat collapse. The acknowledgment came in a research paper, which called for further study of injuries to back seat passengers.

"It may be important to assess the injuries caused by the interaction of rear and front seat occupants due to the front seat collapse," the paper noted. "This is especially true with the increased emphasis of placing children in the rear seats."

In December 1998--24 years after NHTSA first proposed to upgrade Standard 207--the agency conceded in a research update that the federal seat requirement is too weak:

"Generally, it is acknowledged that the current standard requires inadequate seat strength to ensure that the seat does not fail when a car is subject to a severe rear impact."

The agency agreed on April 12 to again study whether Standard 207 should be suspended because of "fatal flaws." NHTSA acted on a petition by Alabama attorney Ben Hogan, who sued Mazda for the family of Eddie Jean Curry, a 50-year-old woman who burned to death in 1997. "Ms. Curry was trapped in the back seat when the front driver's seat collapsed onto her," Hogan wrote to the government. "She could not escape." The suit is pending. Mazda blamed the truck driver who hit the car.

In his petition, Hogan concluded: "It would be better to have no federal seat standard at all than continue the existing standard."

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Times researchers John Beckham in Chicago, Robin Cochran in Washington, Lianne Hart in Houston, Janet Lundblad in Los Angeles, Lynn Marshall in Seattle and Edith Stanley in Atlanta contributed to this story.

**GRAPHIC: PHOTO:** Strapped in the back seat of her family's car, 5-year-old Sarah Gleason died after the car was struck from behind and her father's seat collapsed on her. **GRAPHIC: How Car Seats Fail GRAPHIC: Safety Tips for Riding With Children GRAPHIC: (no caption), LORENA INIGUEZ / Los Angeles Times**

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