

**Argument Section of
December 23, 2002 Friend
of Court brief of Insurance
Institute for Highway Safety
supporting the National
Highway Traffic Safety
Administration's 2001 Final
Rule on advanced airbags**

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ARGUMENT

Background

In the mid-1990s the National Highway Traffic Safety Administration (NHTSA) faced a significant public health problem resulting from the installation of airbags in new passenger vehicles in response to a federal mandate. Inflating airbags were identified as the cause of death or serious injury to a number of children, females of small stature, and other passenger vehicle occupants.¹

This problem first became obvious when deaths and serious injuries occurred in low-speed crashes that otherwise would have produced minor or no injuries.² The injuries in these crashes were of the types (ruptured aortas, basal skull fractures, etc.) that are most likely to occur when people are very close to airbags when they first begin to deploy. Most of the occupants killed or injured by inflating airbags were unbelted or improperly positioned, including infants in rear-facing restraints placed in front of passenger-side airbags.³

¹ Federal Motor Vehicle Safety Standards; Occupant Crash Protection, 62 Fed. Reg. 12,960 (March 19, 1997).

² Id.

³ Id.

As NHTSA, automakers, and other safety researchers studied this problem, it became apparent that reducing airbag inflation force levels could prevent many of the deaths and injuries.⁴ But airbag inflation force levels were largely governed by one of the requirements of Federal Motor Vehicle Safety Standard (FMVSS) 208, the regulation that mandated the installation of airbags.⁵ The problem requirement was the one specifying maximum injury measures that can be recorded by unbelted driver and right front passenger crash test dummies in 30 mph head-on impacts into a rigid barrier, the so-called “unbelted barrier test requirements.” It turns out that meeting such requirements (among the several tests specified in FMVSS 208) involves higher airbag force levels than any of the other required tests in FMVSS 208. For many passenger vehicles, airbag inflation force levels could not be reduced and still meet the unbelted barrier test requirements.⁶

⁴ Nat’l Highway Traffic Safety Admin., Preliminary Regulatory Evaluation, Actions to Reduce the Adverse Effects of Air Bags, FMVSS No. 208 (July 1996), NHTSA Docket No. 74-14, N.100-001. See also, Adrian K. Lund, Susan A. Ferguson, & Michael R. Powell, Fatalities in Air Bag-Equipped Cars: A Review of 1989-93 NASS Cases, Society of Automotive Engineers Technical Paper Series 960661 (Feb. 1996).

⁵ Nat’l Highway Traffic Safety Admin., 49 CFR § 571.208 (2001).

⁶ Toyota Comments to NHTSA Docket 74-14; Notice 108 (Feb. 1997). See also, BMW of North America, Inc., Comments to NHTSA Docket 74-14; Notice 108 (Feb. 1997), NHTSA Docket No. 74-14, N.108-136; Ford Motor Company, Supplemental Comments to NHTSA Docket 74-14; Notice 108 (Feb. 1997); Nissan Motor Company, LTD Comments to NHTSA Docket

The belted tests and other requirements could be met with lower airbag inflation forces.

Recognizing this problem, NHTSA amended FMVSS 208 in 1997 to introduce an optional alternative test to establish airbag performance for unbelted occupants that allowed manufacturers to depower airbag inflators.⁷ This alternative test involved the use of a crash simulation sled instead of a full-scale crash test. One of the principal reasons for allowing a sled test was that manufacturers could test and certify depowered airbags much faster than would have been possible with full-scale crash tests.⁸ This was important because NHTSA, the manufacturers, and other safety researchers recognized that it was desirable to depower airbags as quickly as possible to reduce the risks caused by deploying airbags.

The sled test was not intended to be a permanent solution. In 2001, as part of an extensive update of FMVSS 208 to further reduce the risks from

74-14; Notice 108 (Feb. 1997), NHTSA Docket No. 74-14, N.108-136; Volvo Cars of North America, Comments to NHTSA Docket 74-14; Notice 107 & 108 (Feb. 1997).

⁷ Federal Motor Vehicle Safety Standards; Occupant Crash Protection, 62 Fed. Reg. at 12,960 (March 19, 1997).

⁸ Id.

deploying airbags while still maintaining their significant protective benefits, NHTSA issued the rule that is the subject of this litigation.⁹

The unbelted test requirements adopted in the updated FMVSS 208 reverted to a full-width rigid barrier crash test, but the designated speed is 25 mph instead of the original 30 mph. NHTSA's decision to adopt a 25 mph barrier test was strongly supported by such highway safety organizations as the National Transportation Safety Board, American Trauma Society, National Safety Council, National Association of Governors Highway Safety Representatives (now the Governors Highway Safety Association), and the Institute.¹⁰ All of these organizations were concerned that returning to the 30 mph rigid barrier tests sought by the Petitioners would again result in air-bag inflator power levels that could cause deaths and injuries to out-of-position occupants without any improvement in overall occupant protection.¹¹

⁹ Federal Motor Vehicle Safety Standards; Occupant Crash Protection, Final Rule, 66 Fed. Reg. 65,376 (Dec. 18, 2001).

¹⁰ Letter from NTSB, IIHS, AAA, NSC, ATS, and NAGHSR to the Honorable Rodney E. Slater, Sec'y of DOT (Feb. 16, 2000), NHTSA Docket No. 99-6407-109.

¹¹ Id.

The 30 mph rigid barrier test speed cannot be directly related to real-world crash severities.

Petitioners argue now, as they did during the regulatory proceedings for this rule, that the 25 mph test speed is not sufficient to provide protection in most real-world fatal crashes. This argument has been made in several variations, including the claim that more than half of real-world fatalities occur in crashes with speeds greater than 30 mph.¹² Another variation of this claim, previously used by one of the Petitioners, is that 55 percent of the lives saved by airbags each year have been in crashes above 25 mph.¹³ The implication of both claims is that a barrier test speed of 25 mph is insufficient to provide protection to occupants in the majority of real-world fatal crashes.

This is misleading because, in fact, the speed measure used to assess severities in real-world crashes cannot be directly related to rigid barrier test speeds. When investigating real-world crashes, researchers estimate crash severity using a parameter referred to as velocity change, or delta V, which

¹² Br. for Pet'r at 5. See also, Federal Motor Vehicle Safety Standards; Occupant Crash Protection, 65 Fed. Reg. 30,694 (May 12, 2000).

¹³ Letter from Joan Claybrook to Nancy McFadden, DOT General Counsel (Apr. 26, 2000) (available at http://www.citizen.org/autosafety/Air_Bags/articles.cfm?ID=6016), NHTSA Docket No. 99-6407-137.

is an estimate of the change in velocity of the occupant compartment that occurs during a crash. But crash investigators and researchers recognize that delta V is a very limited indicator of crash severity. Consider, for example, a vehicle that is braked from 30 mph to a stop; it has a delta V of 30 mph, but the deceleration forces experienced by belted occupants are noninjurious because the stop occurs over a large distance.¹⁴ Now consider two different 30 mph crashes, one into a roadside impact attenuator and the other into a rigid barrier. The crash into the attenuator will have much lower decelerations inside the compartment than the crash into the rigid barrier. This is because the crash into the attenuator involves a greater deceleration distance (the crush of the attenuator plus the crush of the vehicle), whereas the rigid barrier crash involves only the crush of the vehicle. The greater deceleration distance of the crash into the attenuator takes a longer time, and thus produces lower occupant compartment decelerations, than the crash into the rigid barrier.

Among the spectrum of 30 mph crashes in the real world, a full-width crash into a rigid barrier will have the shortest duration and highest compartment decelerations. This means the full-width rigid barrier test in

¹⁴ An unaware unbelted occupant could be injured because he or she could move forward at 30 mph during the braking event and be stopped suddenly

FMVSS 208 is more severe (i.e., has greater decelerations) than most real-world 30 mph crashes. Real-world crashes involving only part of the front end (e.g., an offset crash), impacts with movable or deformable objects (e.g., a parked car or small tree), and almost every other type of real-world crash with a change in velocity of 30 mph will have lower occupant compartment decelerations than a rigid barrier crash test. The only time decelerations comparable to a full-width rigid barrier test occur in real-world crashes is if the full width of a vehicle perpendicularly strikes a rigid fixed object, such as a bridge abutment, or there is a full-width head-on collision between two vehicles. Both of these are relatively rare events.

In almost all real-world frontal crashes with a change in velocity of 25 or 30 mph, the average occupant compartment decelerations will be lower than in rigid barrier tests at the same speed. Thus, claims such as “55% of the lives saved by airbags each year occur in crashes above 25 mph” does not mean that 25 mph rigid barrier tests are less severe than 55 percent of the real-world crashes in which airbags have saved lives. The parameter that relates to risk of occupant injury is average deceleration, which is higher in barrier tests than in virtually all real-world crashes with the same changes in velocity.

by impact with the dashboard and/or windshield.

Higher test speeds in safety standards do not automatically equate to greater protection in real-world crashes.

While this statement may seem counterintuitive, there are a number of reasons why it is true. Consider, for example, a requirement that full-width crash tests into rigid barriers be conducted at 50 mph instead of 30 mph. This might seem like a good idea; however, it most likely would mean that the front ends of vehicles would become much stiffer than they would be for 30 mph tests.¹⁵ Though stiffer fronts could improve crashworthiness at the higher speed, they actually would produce poorer crash performance at lower crash speeds because the increased stiffness would result in less front-end crush and, therefore, higher deceleration forces inside the occupant compartments. Thus, the “improved” performance in the very rare real-world crashes in the 50 mph speed range most likely would result in poorer performance in the much more frequent, but still potentially life threatening, 20-30 mph crashes. The net result would be a deterioration in overall protection.

A similar analogy can be applied to airbag performance. The higher the test speed, the greater is the force level that is needed to quickly inflate

¹⁵ Alternatives such as making front ends longer would be unlikely, given other important vehicle design constraints.

airbags to catch unbelted test dummies and decelerate them without going through the airbags. Thus, an airbag with the inflation forces needed to restrain an unbelted crash test dummy at a high speed is likely to injure a person who is very close to the bag when it first begins to inflate. The challenge for regulators is to choose test requirements that are most appropriate for the complete spectrum of real-world crashes. The notion that higher and higher test speeds will result in greater and greater protection is simple-minded; inappropriately high test speeds can result in designs that reduce protection in the complete spectrum of real-world crashes.

Tests specified in federal standards should be constantly reevaluated to ensure that they are relevant and appropriate for the real-world crashes they are intended to address. This is what NHTSA did with FMVSS 208; it recognized that the 30 mph unbelted test requirement was producing adverse outcomes in the real world, so it changed its requirements so that airbags could be depowered.¹⁶ Based on the evidence, NHTSA concluded that depowered airbags could reduce the risks to out-of-position occupants without compromising the protection the airbags offer.¹⁷ Today, five years after the

¹⁶ Federal Motor Vehicle Safety Standards; Occupant Crash Protection, 62 Fed. Reg. at 12,960. See also, Federal Motor Vehicle Safety Standards; Occupant Crash Protection, 66 Fed. Reg. at 65,376.

¹⁷ Id.

first decision to change the unbelted test requirements, there is no scientific evidence that the less powerful airbags allowed by NHTSA's changed test requirements are resulting in less protection in real-world crashes. In fact, the real-world experience of airbag equipped vehicles indicates that airbags currently in the fleet, including many that are depowered, are at least as effective in reducing deaths in frontal crashes as they were several years ago.¹⁸ Further, since 1998 when manufacturers began to depower many of their airbags, deaths to out-of-position occupants in low-speed crashes have dropped dramatically. Some of this decline is due to a national effort to educate motorists about airbag risks and the benefits of putting infants and children in rear seats. However, the deaths that have occurred have primarily been in the earlier models. Since 1998 there have been 71 deaths in 1994-97 models, compared with 14 in 1998 and later models -- good evidence that depowered inflators have reduced the risks.¹⁹

¹⁸ Nat'l Highway Traffic Safety Admin., Fifth/Sixth Report to Congress, Effectiveness of Occupant Protection Systems and Their Use (Nov. 2001).

¹⁹ Nat'l Highway Traffic Safety Admin., Fatality and Serious Injury Summary Report, available at http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/SCI/3Q_2002/ABFSISR.pdf.

Crash tests with unbelted dummies have limited relevance to unbelted people in real-world crashes.

When FMVSS 208 first was proposed in the 1970s, safety belt use was very low, so it was important to try to set minimum performance requirements that would ensure protection for unbelted people in many real-world crashes.²⁰ Today more than 70 percent of motorists are buckled up.²¹ Protecting unbelted occupants continues to be a priority, but such protection should not compromise the protection for the (now) majority of occupants who use safety belts. Thus, FMVSS 208 includes requirements for testing with both belted and unbelted test dummies.

In the vehicle research and testing community, it is widely recognized that testing with unbelted dummies has much less relevance to unbelted people in real-world crashes than testing with belted dummies has for belted people. The principal reason for this is that for test repeatability (essential for regulatory tests) both belted and unbelted dummies are properly positioned, sitting back in their seats, immediately before the impacts with the rigid barrier (dummies that have moved out of position before impact will

²⁰ C.S. Robertson, Brian O’Neill, & C. W. Wixon, Factors Associated with Observed Safety Belt Use, 13 J. Health & Soc. Behavior, 18-24 (1972).

²¹ Nat’l Highway Traffic Safety Admin., Safety Belt and Helmet Use in 2002 – Overall Results (Sept. 2002).

not produce repeatable injury measures). Thus, rigid barrier crash tests establish minimum levels of performance that are primarily relevant for occupants in real-world crashes who are properly positioned (i.e., sitting back in their seats) immediately before their impacts. In many real-world crashes, however, events frequently occur prior to the impacts that cause the airbags to deploy, such events include precrash braking, running off the road, low-severity impacts with bushes, etc. Unbelted occupants are much more likely than people using belts to be jostled or bounced out of position by these events. The belts tend to hold people in position because belt locking mechanisms are activated by the forces created by precrash events such as emergency braking. Thus, crash tests with unbelted dummies are much less likely to reflect real-world crashes involving unbelted people. It is ironic that the 30 mph unbelted test requirements, which were intended to guarantee minimum levels of protection for unbelted people, actually put many of them at increased risk because the airbag force levels necessary for the 30 mph barrier test were harmful to many unbelted occupants, including children, who were out of position at the time their airbags deployed.²²

²² Federal Motor Vehicle Safety Standards; Occupant Crash Protection, 62 Fed. Reg. at 12,960.

The question then becomes, are these (potentially injurious) airbag inflation force levels necessary to provide effective protection in serious real-world crashes? If the protection is not adequate, then there should be real-world crashes in which unbelted occupants died because of inadequate airbag protection. In fact, in-depth crash investigations find no evidence that unbelted drivers who are killed in serious frontal crashes are dying because of inadequate airbag performance. Instead most of them are dying because of overwhelming intrusion of the vehicle structure into the occupant compartment or because of ejection from the vehicle, neither of which can be prevented by increasing airbag inflation forces.²³

Another conclusion from in-depth crash investigations is that fatalities caused by inflating airbags are occurring at all crash severities, not just in low-speed crashes.²⁴ Logically this is to be expected; if the forces of deploying airbags can cause serious injuries in low-speed crashes, there is absolutely no reason not to expect the same kinds of injuries in crashes at higher speeds. The fact that airbags have caused injuries, primarily to unbelted oc-

²³ David S. Zuby, Susan A. Ferguson, & Michael X. Cammisa, Analysis of Driver Fatalities in Frontal Crashes of Airbag-Equipped Vehicles in 1990-1998 NASS/CDS, Society of Automotive Engineers Technical Paper Series 2001-01-0156 (Mar. 2001).

²⁴ Id.

cupants, in high-speed crashes often is overlooked in routine crash investigations because the crash severities could have caused serious injuries. However, careful study of the injury types (basal skull fractures, ruptured (aortas, etc.) and the crash conditions strongly indicates that deaths and injuries caused by inflating airbags are occurring at all crash severities.²⁵

The finding that airbag inflation forces can be a problem in higher severity crashes is important because it means that one proposed solution to the airbag inflation injury problem – multistage inflators, i.e., airbag inflators with power levels that increase with crash severity – will not eliminate the problem. Multistage inflators still can produce airbag inflation injuries if the power levels in the higher severity crashes are at potentially injurious levels, as they would need to be to meet requirements for 30 mph unbelted tests into rigid barriers.

²⁵ Id. See also, Adrian K. Lund, Susan A. Ferguson, & Michael R. Powell, Fatalities in Air Bag-Equipped Cars: A Review of 1989-93 NASS Cases, Society of Automotive Engineers Technical Paper Series 960661 (Feb. 1996); Michael X. Cammisa, Susan A. Ferguson, & Adrian K. Lund, Driver Fatalities in Frontal Crashes of Airbag-Equipped Vehicles: A Review of 1989-96 NASS Cases, Society of Automotive Engineers Technical Paper Series 2000-01-1003 (Mar. 2000), NHTSA Docket No. 99-6407-114.

The rigid barrier tests are not representative of many real-world crashes.

There are several additional problems with the use of a 30 mph full-width rigid barrier test with unbelted dummies, beyond the fact that such tests only mimic properly positioned people. Another issue is that the duration of a rigid barrier crash test is much shorter, thus producing higher deceleration forces for the occupants, than most real-world crashes. This has important implications for airbag performance. Short-duration, high-speed barrier tests require airbag inflators to produce more gas faster so the airbag can catch the unbelted test dummy very early in the crash, before it has moved very far forward. In crashes of longer duration or lower speed, reduced airbag force levels still can provide protection because there is more time available and/or less energy in the moving dummy.

Another characteristic of the rigid barrier test is that it is easy for the crash sensors to quickly identify that airbag deployment is needed. This means the airbags can be inflated before the unbelted dummies have moved forward very much. In most real-world crashes, however, the initial deceleration forces are less than in a full-width crash into a rigid barrier. This means the airbag sensors will take a longer time to identify whether airbag deployment is needed and then inflate the bags. These longer sensing times

are another reason people in real-world crashes are much more likely to be out of position and closer to airbags when they first deploy than are test dummies in crashes into rigid barriers.

Testing by the Institute has demonstrated the problem posed to occupants because of a late-firing airbag in test crashes other than full-width rigid barrier tests. The Institute conducts 40 mph frontal offset crash tests to evaluate the crashworthiness of different vehicles. The offset test simulates a frontal impact in which 40 percent of the driver's side of one vehicle strikes 40 percent of the driver's side of another vehicle of the same weight. In contrast, NHTSA's test simulates a frontal impact in which the full front of identical vehicles strike each other. In the Institute's offset crash test, the airbags in eight 1999-2002-model vehicles deployed late. As a result, even belted test dummies were too close to the airbag at the time of deployment and recorded injury measures that exceeded the limits in FMVSS 208.

CONCLUSION

Petitioners argue that protection for unbelted occupants in high-speed crashes will be lessened if NHTSA's decision to adopt the 25 mph rigid barrier test is allowed to stand. As demonstrated in this brief, support for 30 mph tests sought by Petitioners follows from the mistaken belief that higher

test speeds guarantee protection in real-world crashes at higher speeds. The true consequences of a return to a 30 mph rigid barrier test sought by Petitioners is a probable increase in airbag power, which would pose additional risks to out-of-position occupants.

Depowered airbags have been on the road for some time, and Petitioners cite no evidence from real-world crashes that they have lessened the protection afforded to unbelted occupants. During the last round of FMVSS 208 rulemaking, the Institute challenged those who advocated a return to 30 mph unbelted tests into a rigid barrier to identify real-world crashes in which unbelted occupants had been killed because “depowered” airbags offered insufficient protection. For the Petitioners’ case to be valid, they should be able to identify many such instances because “depowered” airbags now are in millions of passenger vehicles. They have not identified such instances. On the contrary, the real-world crash experience of vehicles equipped with depowered airbags is good.

This supports NHTSA's decision to adopt the 25 mph test. Such a decision is supported by virtually the entire highway safety community. NHTSA’s decision should be upheld.